

# Holemaking Made Easy and Economical

From sturdy, general-purpose solid carbide drills to high-precision fine boring systems, we offer the most comprehensive line of holemaking products available on the market today. If you need unmatched performance and reliability, look no further than our wide range of solid carbide, modular, and indexable drills, and hole finishing products.

## Solid Carbide Drills

**VariDrill™**

**TOP DRILL S™ for Steel**

**TOP DRILL S™ for Cast Iron**

**TOP DRILL S+™**

**TOP DRILL S+ 12 x D**

**TOP DRILL Deep-Hole Drill**

**TOP DRILL G™**

## Modular Drills

**TOP DRILL M1™**

**Spade Blades**



## Indexable Drills

**Top Cut 4™**

## Hole Finishing

**Reaming Tools**

**ROTAFLEX Boring System**

**Countersinking Tools**

### Added Value for Your Performance

#### Increase of Productivity and Efficiency

- Material and application-specific solutions.
- Maximum metal removal rates and repeatability.
- Standardised design platforms for special tools based on “proven solutions” for individual optimisations and combination tools.

#### Optimised Purchase

- Broad selection of holemaking tools.
- Integrated into a full range of cutting tools and service offers.
- Onsite service for an efficient development and implementation of machining solutions.

#### Control of Total Tooling Costs

- High tool utilisation through material and application-specific solutions.
- Process-safe regrinding service.
- Reduction of stocks through efficient modular concepts.
- Multiple platforms per application to achieve the most cost-efficient solution.

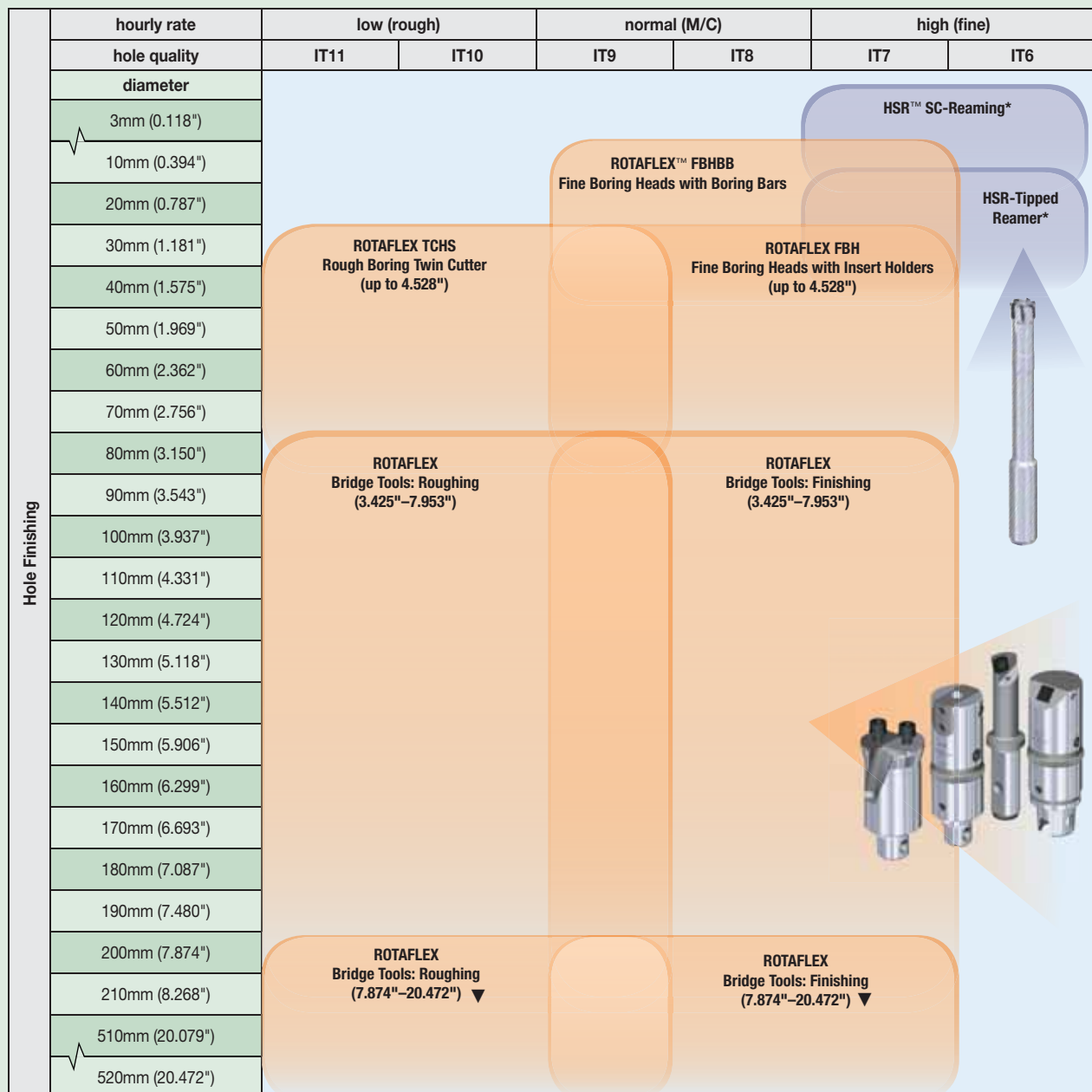
### Select the Correct Holemaking Product Platform for Your Application

|                | hourly rate    | low (rough)                        |      | normal (M/C) |     | high (fine) |     |
|----------------|----------------|------------------------------------|------|--------------|-----|-------------|-----|
|                | hole quality   | IT11                               | IT10 | IT9          | IT8 | IT7         | IT6 |
| Solid Drilling | diameter       | Solid Carbide Drills<br>1–25mm     |      |              |     |             |     |
|                | 3mm (0.118")   |                                    |      |              |     |             |     |
|                | 6mm (0.236")   | WIDIA™ Spade Blades<br>9,2–101,6mm |      |              |     |             |     |
|                | 9mm (0.354")   |                                    |      |              |     |             |     |
|                | 12mm (0.472")  | Top Drill M1™<br>7,94–27,99mm      |      |              |     |             |     |
|                | 15mm (0.591")  |                                    |      |              |     |             |     |
|                | 18mm (0.709")  | Top Cut™ 4<br>12–68mm              |      |              |     |             |     |
|                | 21mm (0.827")  |                                    |      |              |     |             |     |
|                | 24mm (0.945")  |                                    |      |              |     |             |     |
|                | 27mm (1.063")  |                                    |      |              |     |             |     |
|                | 30mm (1.181")  |                                    |      |              |     |             |     |
|                | 33mm (1.299")  |                                    |      |              |     |             |     |
|                | 36mm (1.417")  |                                    |      |              |     |             |     |
|                | 39mm (1.535")  |                                    |      |              |     |             |     |
|                | 42mm (1.654")  |                                    |      |              |     |             |     |
|                | 45mm (1.772")  |                                    |      |              |     |             |     |
|                | 58mm (2.283")  |                                    |      |              |     |             |     |
|                | 51mm (2.008")  |                                    |      |              |     |             |     |
|                | 54mm (2.126")  |                                    |      |              |     |             |     |
|                | 57mm (2.244")  |                                    |      |              |     |             |     |
|                | 60mm (2.362")  |                                    |      |              |     |             |     |
|                | 110mm (4.331") |                                    |      |              |     |             |     |

Determine the hole quality and diameter to show the available options and then decide the platform that will best fulfill your requirements.

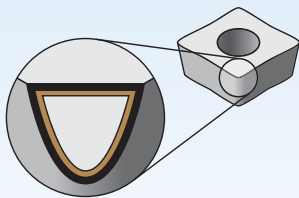
- Solid Carbide Drills
- Modular Drills
- Indexable Drills
- Precision Hole Finishing
- Reaming

## Select the Correct Holemaking Product Platform for Your Application



\*IT6 is possible above 10mm (0.394") for both HSR SC-Reaming and HSR-Tipped Reamer in custom solutions.



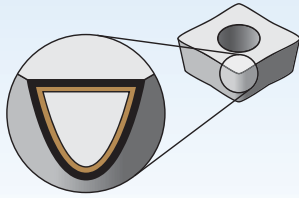


Coatings provide high-speed capability and are engineered for finishing to heavy roughing.

|   |                    |
|---|--------------------|
| P | Steel              |
| M | Stainless Steel    |
| K | Cast Iron          |
| N | Non-Ferrous        |
| S | High-Temp Alloys   |
| H | Hardened Materials |

wear resistance ← → toughness

| Coating |                                                                                     | Grade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |   | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|----|----|
| WU25PD  |    | <b>Composition:</b> With a multilayered PVD TiN-TiAlN coating and a high-quality submicron carbide substrate, this grade gives a high level of wear resistance at medium to high cutting speeds.<br><b>Application:</b> First choice for high reliability in all materials. This grade should be used at medium to high speeds and feeds. It is a general purpose grade that performs very well for alloyed and high-alloy steel and cast iron, but can also be used with excellent performance in all other material groups. | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | N |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |
| WP20PD  |    | <b>Composition:</b> With a multilayered PVD TiN-TiAlN coating, a high-quality submicron carbide substrate and a state-of-the-art surface condition, this grade gives the highest level of wear resistance at high cutting speeds.<br><b>Application:</b> A high productivity grade for high speeds and feeds. First choice for high productivity with excellent reliability in alloyed and high-alloyed steels and cast irons.                                                                                                | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | N |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |
| WK15PD  |  | <b>Composition:</b> With a newly developed unique multilayered PVD AlCrN coating and a high-quality submicron carbide substrate, this grade gives the highest level of wear resistance at high cutting speeds.<br><b>Application:</b> This grade offers extraordinary wear resistance in drilling of cast iron materials. With its high hot hardness it allows for high speed machining.                                                                                                                                      | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | N |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |
| WU20PD  |  | <b>Composition:</b> With a multilayered PVD TiN-TiAlN coating, a high-quality submicron carbide substrate and a state-of-the-art surface condition, this grade gives the highest level of wear resistance at high cutting speeds.<br><b>Application:</b> First choice for alloyed and high-alloyed steels and cast irons. A state-of-the-art surface condition enables superior chip evacuation even when MQL is applied.                                                                                                     | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | N |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |
| WN10HD  |  | <b>Composition:</b> This uncoated fine grain carbide with high hardness offers excellent abrasive wear resistance.<br><b>Application:</b> First choice for precision drilling of non-ferrous materials.                                                                                                                                                                                                                                                                                                                       | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | N |    |    |    |    |    |    |    |    |    |
|         |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | S |    |    |    |    |    |    |    |    |    |

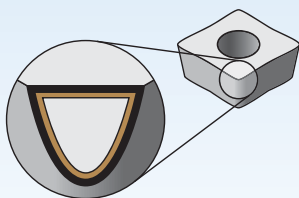


Coatings provide high-speed capability and are engineered for finishing to light roughing.

|   |                    |
|---|--------------------|
| P | Steel              |
| M | Stainless Steel    |
| K | Cast Iron          |
| N | Non-Ferrous        |
| S | High-Temp Alloys   |
| H | Hardened Materials |

wear resistance ← → toughness

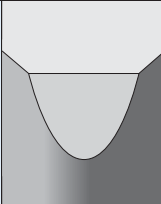
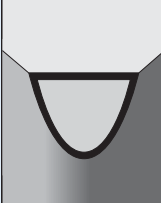
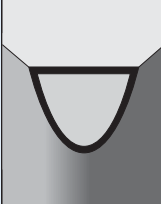
| Coating | Grade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|----|----|
| WU25PD  | <p><b>Composition:</b> With a multilayered PVD TiN-TiAlN coating and a high-quality submicron carbide substrate, this grade gives a high level of wear resistance at medium to high cutting speeds.</p> <p><b>Application:</b> First choice for high reliability in most materials. This grade should be used at medium to high speeds and feeds. It is a general purpose grade that performs very well for alloyed and high-alloy steel and cast iron, but can also be used with excellent performance in stainless steels.</p> <p>NOTE: Previously named K20FTiAlN.</p> | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |    |    |    |    |    |    |    |    |    |
| WPK10CH | <p><b>Composition:</b> With an advanced CVD TiCN-Al<sub>2</sub>O<sub>3</sub> coating combined with a cobalt-enriched carbide substrate, this grade offers a balanced combination of deformation resistance and edge toughness.</p> <p><b>Application:</b> Offers outstanding abrasion and crater wear resistance for high-speed machining of steels and cast irons. Use for very high cutting speeds with low to medium feed rates.</p>                                                                                                                                   | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |    |    |    |    |    |    |    |    |    |
| WU25CH  | <p><b>Composition:</b> Advanced CVD TiCN-Al<sub>2</sub>O<sub>3</sub> coating together with a newly engineered tough carbide substrate. Ensures adequate deformation resistance and excellent edge strength and offers very good wear resistance over a wide range of machining conditions.</p> <p><b>Application:</b> A high productivity grade with high speeds and feeds. First choice for high productivity with excellent reliability in steels, stainless steels, and cast iron rates.</p>                                                                           | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |    |    |    |    |    |    |    |    |    |
| WU40PH  | <p><b>Composition:</b> With a multilayered PVD TiN-TiAlN coating and a tough substrate, this grade withstands interruptions and provides high wear resistance for long tool life.</p> <p><b>Application:</b> First choice for high reliability in most materials. This grade should be used at medium speeds and high feeds due to sharper edges and as a grade for high-toughness applications. It covers steel, stainless steel, cast iron, and high-temp alloys under certain conditions.</p>                                                                          | P |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | M |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | K |    |    |    |    |    |    |    |    |    |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |    |    |    |    |    |    |    |    |    |



Coatings provide high-speed capability and are engineered for finishing to heavy roughing.

|   |                    |
|---|--------------------|
| P | Steel              |
| M | Stainless Steel    |
| K | Cast Iron          |
| N | Non-Ferrous        |
| S | High-Temp Alloys   |
| H | Hardened Materials |

wear resistance ← → toughness

| Coating    |                                                                                    | Grade Description                                                                                                                                                                                                                                                                                           |   | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|----|----|
| K10F       |   | <b>Composition:</b> This uncoated fine grain carbide with high hardness offers excellent abrasive wear resistance paired with excellent toughness for fine-finishing applications.<br><b>Application:</b> First choice for precision reaming of non-ferrous materials.                                      | P |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | M |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | K |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | N |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | S |    |    |    |    |    |    |    |    |    |
| K10F-DCFD  |   | <b>Composition:</b> With a PVD TiAlN coating and a fine grain carbide substrate, this grade offers excellent wear resistance paired with good toughness for medium speed fine-finishing applications.<br><b>Application:</b> First choice for precision reaming of steels, stainless steel, and cast irons. | P |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | M |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | K |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | N |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | S |    |    |    |    |    |    |    |    |    |
| CERMETDCFD |  | <b>Composition:</b> With a PVD TiAlN coating and a cermet substrate, this grade offers exceptional wear resistance for high speed fine finishing applications.<br><b>Application:</b> First choice for precision reaming of steels and cast irons.                                                          | P |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | M |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | K |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | N |    |    |    |    |    |    |    |    |    |
|            |                                                                                    |                                                                                                                                                                                                                                                                                                             | S |    |    |    |    |    |    |    |    |    |





# High-Performance Solid Carbide Drills

|                                  |           |
|----------------------------------|-----------|
| Introduction.....                | T2-T4     |
| VariDrill .....                  | T6-T45    |
| TOP DRILL S .....                | T48-T75   |
| TOP DRILL S+ .....               | T76-T96   |
| TOP DRILL S+ 12 x D .....        | T98-T103  |
| TOP DRILL Deep-Hole Drills ..... | T104-T117 |
| TOP DRILL G .....                | T118-T139 |
| Technical Information .....      | T142-T149 |



| solid carbide drills<br>for external coolant<br>or dry machining                  |                                                            | series | grade  | standard                             |   |         |         |   |  | hole<br>tolerance | standard range |             |                           |
|-----------------------------------------------------------------------------------|------------------------------------------------------------|--------|--------|--------------------------------------|---|---------|---------|---|--|-------------------|----------------|-------------|---------------------------|
|                                                                                   |                                                            |        |        | ● first choice<br>○ alternate choice |   |         |         |   |  |                   | diameter range |             | drilling<br>depth<br>L/D1 |
|                                                                                   |                                                            |        |        |                                      |   |         |         |   |  |                   |                |             |                           |
|                                                                                   |                                                            |        |        |                                      |   |         |         |   |  |                   |                |             |                           |
| P                                                                                 | M                                                          | K      | N      | S                                    | H | min-max | min-max |   |  |                   |                |             |                           |
|  | VariDrill™<br>multiple-material drilling                   | VDS20  | WU25PD | ●                                    | ● | ●       | ●       | ● |  | IT9–IT10          | 1,0–20,0       | .0394–.7874 | 3 x–5 x                   |
|  | TOP DRILL S™ for steel<br>application-specific drilling    | TDS202 | WP20PD | ●                                    | ○ | ○       |         |   |  | IT9–IT10          | 3,0–20,0       | .1181–.7874 | 5 x D                     |
|  | TOP DRILL S for cast iron<br>application-specific drilling | TDS212 | WK15PD | ○                                    |   | ●       |         |   |  | IT9–IT10          | 3,0–20,0       | .1181–.7874 | 5 x D                     |
|  | TOP DRILL S+™<br>multiple-application drilling             | TDS301 | WU25PD | ●                                    | ○ | ●       | ○       | ○ |  | IT9–IT10          | 3,0–20,0       | .1181–.7874 | 3 x D                     |

| solid carbide drills<br>with internal coolant channel                               |                                                               | series | grade  | standard                             |   |   |   |   |   | hole<br>tolerance | standard range |             |                           |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------|--------|--------|--------------------------------------|---|---|---|---|---|-------------------|----------------|-------------|---------------------------|
|                                                                                     |                                                               |        |        | ● first choice<br>○ alternate choice |   |   |   |   |   |                   | diameter range |             | drilling<br>depth<br>L/D1 |
|                                                                                     |                                                               |        |        | P                                    | M | K | N | S | H |                   |                |             |                           |
|  | VariDrill<br>multiple-material drilling                       | VDS40  | WU25PD | ●                                    | ● | ● | ● | ● | ○ | IT9-IT10          | 1,0-20,0       | .0394-.7874 | 3 x-8 x                   |
|  | TOP DRILL S for steel<br>application-specific drilling        | TDS40  | WP20PD | ●                                    | ○ | ○ |   |   |   | IT9-IT10          | 3,0-20,0       | .1181-.7874 | 3 x-8 x                   |
|  | TOP DRILL S for cast iron<br>application-specific drilling    | TDS41  | WK15PD | ○                                    |   | ● |   |   |   | IT9-IT10          | 3,0-20,0       | .1181-.7874 | 3 x-8 x                   |
|  | TOP DRILL S+<br>multiple-application drilling                 | TDS50  | WU25PD | ●                                    | ○ | ● | ○ | ○ |   | IT9-IT10          | 3,0-20,0       | .1181-.7874 | 3 x-8 x                   |
|  | TOP DRILL S+ 12 x D<br>deep-hole drilling without<br>piloting | TDS504 | WU20PD | ●                                    | ● | ● |   | ○ |   | IT9-IT10          | 3,0-20,0       | .1181-.7874 | 3 x-8 x                   |
|  | TOP DRILL Deep<br>superior deep-hole drilling                 | TDD10  | WU20PD | ●                                    | ○ | ● |   |   |   | IT9-IT10          | 3,0-20,0       | .1181-.5118 | 15 x-<br>30 x             |
|  | TOP DRILL G™<br>difficult drilling applications               | TDG53  | WN10HD |                                      |   |   | ● |   |   | IT8-IT9           | 3,0-20,0       | .1181-.7874 | 5 x-12 x                  |
|  | TOP DRILL Flat-Bottom<br>for flat-bottom applications         | TDF51  | WU20PD | ●                                    | ○ | ● |   |   |   | IT9-IT10          | —              | —           | —                         |
|                                                                                     |                                                               |        | WN15HD |                                      |   |   | ● |   |   | IT9-IT10          | —              | —           | —                         |

| custom solution range |            |                | ● standard<br>○ engineered solution capabilities                                  |                                                                                   |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | page(s) |
|-----------------------|------------|----------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--|--|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------|
| diameter range        |            | drilling depth |                                                                                   |                                                                                   |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |         |
| D1 mm                 | D1 in      |                |                                                                                   |                                                                                   |  |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |         |
| min-max               | min-max    |                |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |         |
| 1,0–20,0              | .0394–1.00 | 1.5–8 x        | ●                                                                                 | ●                                                                                 |  |  | ●                                                                                 |                                                                                   |                                                                                   | ●                                                                                 |                                                                                   |                                                                                   | ○                                                                                 | ○                                                                                 |                                                                                    |                                                                                     | ○                                                                                   | ●                                                                                   | ●                                                                                   | ○                                                                                   | T8–T21  |
| 3,0–25,0              | .1181–1.00 | 1.5–8 x        | ●                                                                                 | ●                                                                                 |  |  | ●                                                                                 | ●                                                                                 |                                                                                   | ●                                                                                 |                                                                                   |                                                                                   | ○                                                                                 | ○                                                                                 | ●                                                                                  | ○                                                                                   | ○                                                                                   | ●                                                                                   | ○                                                                                   |                                                                                     | T50–T75 |
| 3,0–25,0              | .1181–1.00 | 1.5–8 x        | ●                                                                                 | ●                                                                                 |  |  | ●                                                                                 | ●                                                                                 |                                                                                   | ●                                                                                 |                                                                                   |                                                                                   | ○                                                                                 | ○                                                                                 | ○                                                                                  | ●                                                                                   | ●                                                                                   | ●                                                                                   | ○                                                                                   |                                                                                     | T50–T75 |
| 3,0–25,0              | .1181–1.00 | 1.5–5 x        | ●                                                                                 | ●                                                                                 |  |  | ●                                                                                 | ●                                                                                 |                                                                                   | ●                                                                                 |                                                                                   |                                                                                   | ○                                                                                 | ○                                                                                 | ○                                                                                  | ●                                                                                   | ○                                                                                   | ●                                                                                   | ●                                                                                   |                                                                                     | T78–T96 |

| engineered solution range |             |                | ● standard<br>○ engineered solution capabilities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |   |   |   |   |   |   |   |   |   |   |   |                                                                                       |   |   |   |   | page(s)   |
|---------------------------|-------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---|---|---|---|---|---|---|---|---|---|---|---------------------------------------------------------------------------------------|---|---|---|---|-----------|
| diameter range            |             | drilling depth |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |   |   |   |   |   |   |   |   |   |   |   |                                                                                       |   |   |   |   |           |
| D1 mm                     | D1 in       |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |   |   |   |   |   |   |   |   |   |   |   |                                                                                       |   |   |   |   |           |
| min-max                   | min-max     |                |                    |  |   |   |   |   |   |   |   |   |   |   |   |                                                                                       |   |   |   |   |           |
| 1,0–20,0                  | .0394–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● |   | ● |   |   |   | ○ | ○ |   |                                                                                       | ○ | ● | ● | ○ | T8–T45    |
| 3,0–25,0                  | .1181–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● |   | ● |   |   |   | ○ | ● | ● | ○                                                                                     | ○ | ● | ○ |   | T50–T75   |
| 2,4–20,0                  | .1181–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● |   | ● |   |   | ○ | ○ |   | ●                                                                                     | ● | ● | ○ |   | T50–T75   |
| 3,0–25,0                  | .1181–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● |   | ● |   |   | ○ | ○ | ○ | ●                                                                                     | ○ | ● | ○ |   | T78–T96   |
| 2,4–16,0                  | .1181–.7874 | 1.5–12 x       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● |   | ● |   |   | ○ | ○ | ○ | ●                                                                                     | ○ | ● | ○ |   | T100–T103 |
| 3,0–25,0                  | .0938–.6299 | 500mm          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● |   | ● |   |   |   |   | ○ | ●                                                                                     | ○ | ● | ○ |   | T106–T117 |
| 3,0–25,0                  | .1181–1.00  | 1.5–12 x       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● | ● | ● | ● |   | ○ | ○ | ○ |  | ○ | ● | ○ |   | T120–T139 |
| 3,0–25,0                  | .1181–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● | ● |   | ● | ● | ○ | ○ | ○ | ●                                                                                     | ● | ● | ○ |   | T46       |
| 3,0–25,0                  | .1181–1.00  | 1.5–8 x        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  | ● | ● | ● | ● | ● |   | ● | ● | ○ | ○ | ○ | ●                                                                                     | ● | ● | ○ |   | T46       |



**Solid Carbide Drills • Recommendation Chart**

|          |                                               | Versatile                                                                         |                                                                                                                |                                                                                   |                                                                                   | Application-specific                                                              |                                                                                     |                                                                                                  |
|----------|-----------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|          |                                               |  |                               |  |  |  |  |               |
|          |                                               | General Purpose                                                                   | General Purpose                                                                                                | Multipurpose                                                                      | Multipurpose                                                                      | High-Performance                                                                  | High-Performance                                                                    | Deep-Hole Drilling                                                                               |
|          |                                               | VariDrill™                                                                        | VariDrill™                                                                                                     | Top Drill S+™                                                                     | Top Drill S+                                                                      | Top Drill S/G                                                                     | Top Drill S/G                                                                       | WIDIA TDS+<br>WIDIA TDD                                                                          |
| <b>P</b> | <b>Steel</b>                                  | 3 x D - VDS201A<br>3 x D - VDS201F<br>5 x D - VDS202A<br>5 x D - VDS202F          | 3 x D - VDS401A<br>3 x D - VDS401F<br>5 x D - VDS402A<br>5 x D - VDS402F<br>8 x D - VDS403A<br>8 x D - VDS403F | 3 x D - TDS301A                                                                   | 3 x D - TDS501A<br>5 x D - TDS502A<br>8 x D - TDS503A                             | 5 x D - TDS202A                                                                   | 3 x D - TDS401A<br>5 x D - TDS402A<br>8 x D - TDS403A                               | 12 x D - TDS504A<br>15 x D - TDD105Z<br>20 x D - TDD106Z<br>25 x D - TDD107Z<br>30 x D - TDD108Z |
| <b>M</b> | <b>Stainless Steel</b>                        | 3 x D - VDS201A<br>3 x D - VDS201F<br>5 x D - VDS202A<br>5 x D - VDS202F          | 3 x D - VDS401A<br>3 x D - VDS401F<br>5 x D - VDS402A<br>5 x D - VDS402F<br>8 x D - VDS403A<br>8 x D - VDS403F | 3 x D - TDS301A                                                                   | 3 x D - TDS501A<br>5 x D - TDS502A<br>8 x D - TDS503A                             | –                                                                                 | WIDIA-Rübig™<br>Series Type WD                                                      | 12 x D - TDS504A<br>15 x D - TDD105Z<br>20 x D - TDD106Z<br>25 x D - TDD107Z<br>30 x D - TDD108Z |
| <b>K</b> | <b>Cast Iron</b>                              | 3 x D - VDS201A<br>3 x D - VDS201F<br>5 x D - VDS202A<br>5 x D - VDS202F          | 3 x D - VDS401A<br>3 x D - VDS401F<br>5 x D - VDS402A<br>5 x D - VDS402F<br>8 x D - VDS403A<br>8 x D - VDS403F | 3 x D - TDS301A                                                                   | 3 x D - TDS501A<br>5 x D - TDS502A<br>8 x D - TDS503A                             | 5 x D - TDS212A                                                                   | 3 x D - TDS411A<br>5 x D - TDS412A<br>8 x D - TDS413A                               | 12 x D - TDS504A<br>15 x D - TDD105Z<br>20 x D - TDD106Z<br>25 x D - TDD107Z<br>30 x D - TDD108Z |
| <b>N</b> | <b>Non-Ferrous</b>                            | 3 x D - VDS201A<br>3 x D - VDS201F<br>5 x D - VDS202A<br>5 x D - VDS202F          | 3 x D - VDS401A<br>3 x D - VDS401F<br>5 x D - VDS402A<br>5 x D - VDS402F<br>8 x D - VDS403A<br>8 x D - VDS403F | 3 x D - TDS301A                                                                   | 3 x D - TDS501A<br>5 x D - TDS502A<br>8 x D - TDS503A                             |                                                                                   | 5 x D - TDG531A<br>8 x D - TDG532A<br>12 x D - TDG533A                              | TDD*<br>uncoated, sharp                                                                          |
| <b>S</b> | <b>Heat-Resistant Alloys, Titanium Alloys</b> | 3 x D - VDS201A<br>3 x D - VDS201F<br>5 x D - VDS202A<br>5 x D - VDS202F          | 3 x D - VDS401A<br>3 x D - VDS401F<br>5 x D - VDS402A<br>5 x D - VDS402F<br>8 x D - VDS403A<br>8 x D - VDS403F | 3 x D - TDS301A                                                                   | 3 x D - TDS501A<br>5 x D - TDS502A<br>8 x D - TDS503A                             | –                                                                                 | WIDIA-Rübig<br>Series Type WD                                                       | 12 x D - TDS504A<br>15 x D - TDD105Z<br>20 x D - TDD106Z<br>25 x D - TDD107Z<br>30 x D - TDD108Z |
| <b>H</b> | <b>Hard Materials</b>                         | VDS<br>3 x D - M155                                                               | VDS                                                                                                            |                                                                                   | TDS+                                                                              |                                                                                   |                                                                                     |                                                                                                  |

*standard first choice*

*alternate choice*

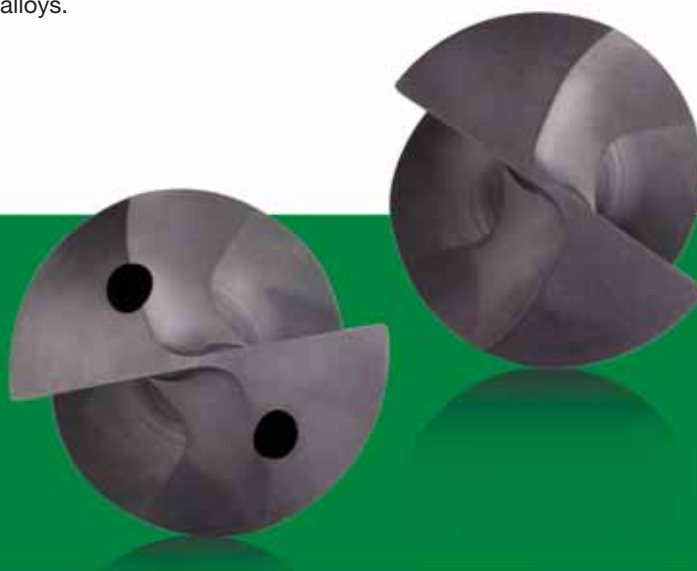
*simple special*



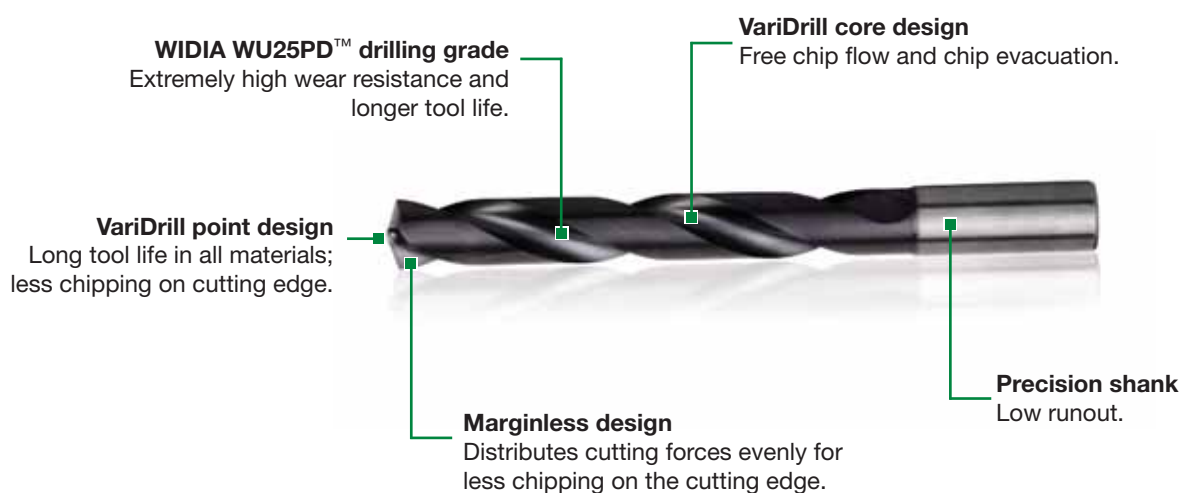
## Multiple-Material Drilling • **WIDIA™ VariDrill™**

The VariDrill advanced-point geometry design offers the ultimate solution for multipurpose drilling operations. It offers dependable tool life in all materials due to less chipping on the cutting edge.

- Reduced chipping on cutting edge means longer tool life.
- Geometry design offers strength and versatility.
- Delivers proper surface finish across multiple materials: steel, stainless steel, cast iron, aluminium, and high-temp alloys.



# VariDrill™



### **Innovative Technology**

VariDrill™ is a technologically advanced holemaking solution. These high-performance solid carbide drills were designed in Germany to provide the transportation, aerospace, general engineering, and energy industries with a tool that performs on multiple materials.

### **Elegance, Strength, and Versatility**

The engineers at WIDIA™ developed an innovative new design to deliver drilling performance. These solid carbide drills have a distinctive geometry and marginless design. The VariDrill point is versatile enough to work through steel, stainless steel, cast iron, aluminium, and a range of high-temp alloys.

### **Optimum Hole Quality**

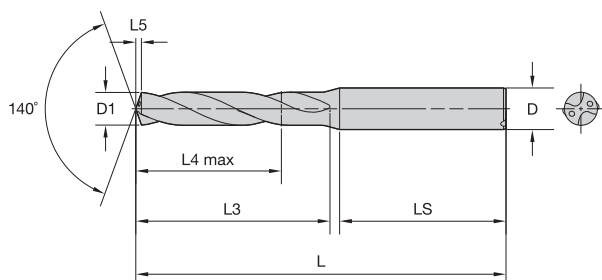
The unique marginless design reduces chipping on the tool's edge and stabilises cutting forces. This unique tool geometry enables chips to roll smoothly and evacuate easily, resulting in noticeably less friction, heat, jamming, and scratching. By minimising these drilling issues, VariDrill delivers an optimum surface finish with every hole — no matter the material.

### **More Options and Longer Tool Life**

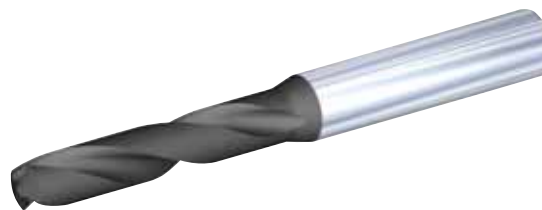
Aside from its uniquely engineered design, VariDrill also offers a broad portfolio of drilling options. With more than 2,200 items, VariDrill offers more choices than any other drill for general engineering operations. And because most drills can be reconditioned, your tools will gain extended life.

*VariDrill — Innovatively designed and technologically advanced.  
Make VariDrill your go-to drill for hole after hole...after hole.*

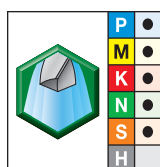




For information on L, L3, and L4 max, see page T143.



## ■ VDS201A • VDS401A • 3 x D

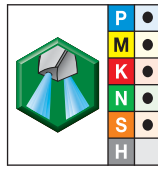
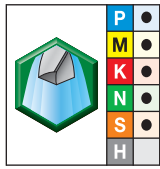


● first choice  
○ alternate choice

| grade WU25PD TiAlN |              | grade WU25PD TiAlN |              | D1 diameter |       |        |    |     |    |    |   |  |
|--------------------|--------------|--------------------|--------------|-------------|-------|--------|----|-----|----|----|---|--|
| order #            | catalogue #  | order #            | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |  |
| 4144195            | VDS201A01000 | —                  | —            | 1,000       | .0394 | 5      | 7  | 0,1 | 58 | 28 | 4 |  |
| 4144196            | VDS201A01016 | —                  | —            | 1,016       | .0400 | 5      | 7  | 0,1 | 58 | 28 | 4 |  |
| 4144197            | VDS201A01041 | —                  | —            | 1,041       | .0410 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144198            | VDS201A01067 | —                  | —            | 1,067       | .0420 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144199            | VDS201A01092 | —                  | —            | 1,092       | .0430 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144200            | VDS201A01100 | —                  | —            | 1,100       | .0433 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144201            | VDS201A01181 | —                  | —            | 1,181       | .0465 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144202            | VDS201A01191 | —                  | —            | 1,191       | .0469 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144523            | VDS201A01200 | —                  | —            | 1,200       | .0472 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144524            | VDS201A01300 | —                  | —            | 1,300       | .0512 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144525            | VDS201A01321 | —                  | —            | 1,321       | .0520 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144526            | VDS201A01397 | —                  | —            | 1,397       | .0550 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144527            | VDS201A01400 | —                  | —            | 1,400       | .0551 | 5      | 7  | 0,2 | 58 | 28 | 4 |  |
| 4144528            | VDS201A01500 | 4140270            | VDS401A01500 | 1,500       | .0591 | 6      | 9  | 0,2 | 58 | 28 | 4 |  |
| 4144529            | VDS201A01600 | 4140271            | VDS401A01600 | 1,600       | .0630 | 6      | 9  | 0,2 | 58 | 28 | 4 |  |
| 4144530            | VDS201A01700 | 4140272            | VDS401A01700 | 1,700       | .0669 | 6      | 9  | 0,3 | 58 | 28 | 4 |  |
| 4144531            | VDS201A01800 | 4140423            | VDS401A01800 | 1,800       | .0709 | 6      | 9  | 0,3 | 58 | 28 | 4 |  |
| 4144532            | VDS201A01900 | 4140424            | VDS401A01900 | 1,900       | .0748 | 6      | 9  | 0,3 | 58 | 28 | 4 |  |
| 4144533            | VDS201A01984 | 4140425            | VDS401A01984 | 1,984       | .0781 | 10     | 13 | 0,3 | 58 | 28 | 4 |  |
| 4144534            | VDS201A02000 | 4140426            | VDS401A02000 | 2,000       | .0787 | 10     | 13 | 0,3 | 58 | 28 | 4 |  |
| 4144535            | VDS201A02100 | 4140427            | VDS401A02100 | 2,100       | .0827 | 10     | 13 | 0,3 | 58 | 28 | 4 |  |
| 4144536            | VDS201A02200 | 4140428            | VDS401A02200 | 2,200       | .0866 | 10     | 13 | 0,3 | 58 | 28 | 4 |  |
| 4144537            | VDS201A02300 | 4140429            | VDS401A02300 | 2,300       | .0906 | 10     | 13 | 0,4 | 58 | 28 | 4 |  |
| 4144538            | VDS201A02383 | 4140430            | VDS401A02383 | 2,383       | .0938 | 12     | 17 | 0,4 | 58 | 28 | 4 |  |

(continued)

(VDS201A • VDS401A • 3 x D — continued)

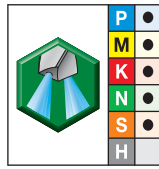


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |   |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 4144539               | VDS201A02400 | 4140431               | VDS401A02400 | 2,400       | .0945 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144540               | VDS201A02439 | 4140432               | VDS401A02439 | 2,439       | .0960 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144541               | VDS201A02489 | 4140433               | VDS401A02489 | 2,489       | .0980 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144542               | VDS201A02500 | 4140434               | VDS401A02500 | 2,500       | .0984 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144543               | VDS201A02578 | 4140435               | VDS401A02578 | 2,578       | .1015 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144544               | VDS201A02600 | 4140436               | VDS401A02600 | 2,600       | .1024 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144545               | VDS201A02642 | 4140437               | VDS401A02642 | 2,642       | .1040 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144546               | VDS201A02700 | 4140438               | VDS401A02700 | 2,700       | .1063 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144547               | VDS201A02705 | 4140439               | VDS401A02705 | 2,705       | .1065 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144548               | VDS201A02779 | 4140440               | VDS401A02779 | 2,779       | .1094 | 12     | 17 | 0,4 | 58 | 28 | 4 |
| 4144549               | VDS201A02800 | 4140441               | VDS401A02800 | 2,800       | .1102 | 12     | 17 | 0,5 | 58 | 28 | 4 |
| 4144550               | VDS201A02820 | 4140442               | VDS401A02820 | 2,820       | .1110 | 12     | 17 | 0,5 | 58 | 28 | 4 |
| 4144551               | VDS201A02870 | 4140443               | VDS401A02870 | 2,870       | .1130 | 12     | 17 | 0,5 | 58 | 28 | 4 |
| 4144552               | VDS201A02900 | 4140444               | VDS401A02900 | 2,900       | .1142 | 12     | 17 | 0,5 | 58 | 28 | 4 |
| 4144553               | VDS201A02947 | 4140445               | VDS401A02947 | 2,947       | .1160 | 12     | 17 | 0,5 | 58 | 28 | 4 |
| 4143907               | VDS201A03000 | 4140299               | VDS401A03000 | 3,000       | .1181 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143908               | VDS201A03048 | 4140300               | VDS401A03048 | 3,048       | .1200 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143909               | VDS201A03100 | 4140301               | VDS401A03100 | 3,100       | .1220 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143910               | VDS201A03175 | 4140302               | VDS401A03175 | 3,175       | .1250 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143911               | VDS201A03200 | 4140303               | VDS401A03200 | 3,200       | .1260 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143912               | VDS201A03264 | 4140304               | VDS401A03264 | 3,264       | .1285 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143913               | VDS201A03300 | 4140305               | VDS401A03300 | 3,300       | .1299 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4143914               | VDS201A03400 | 4140306               | VDS401A03400 | 3,400       | .1339 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143915               | VDS201A03455 | 4140307               | VDS401A03455 | 3,455       | .1360 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143916               | VDS201A03500 | 4140308               | VDS401A03500 | 3,500       | .1378 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143917               | VDS201A03571 | 4140309               | VDS401A03571 | 3,571       | .1406 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143918               | VDS201A03600 | 4140310               | VDS401A03600 | 3,600       | .1417 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143919               | VDS201A03658 | 4140311               | VDS401A03658 | 3,658       | .1440 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143920               | VDS201A03700 | 4140312               | VDS401A03700 | 3,700       | .1457 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143921               | VDS201A03734 | 4140313               | VDS401A03734 | 3,734       | .1470 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4143922               | VDS201A03800 | 4140314               | VDS401A03800 | 3,800       | .1496 | 17     | 24 | 0,6 | 66 | 36 | 6 |
| 4143923               | VDS201A03900 | 4140315               | VDS401A03900 | 3,900       | .1535 | 17     | 24 | 0,6 | 66 | 36 | 6 |
| 4143924               | VDS201A03970 | 4140316               | VDS401A03970 | 3,970       | .1563 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143925               | VDS201A04000 | 4140317               | VDS401A04000 | 4,000       | .1575 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143926               | VDS201A04039 | 4140318               | VDS401A04039 | 4,039       | .1590 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143927               | VDS201A04090 | 4140319               | VDS401A04090 | 4,090       | .1610 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143928               | VDS201A04100 | 4140320               | VDS401A04100 | 4,100       | .1614 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143929               | VDS201A04200 | 4140321               | VDS401A04200 | 4,200       | .1654 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143930               | VDS201A04217 | 4140322               | VDS401A04217 | 4,217       | .1660 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143931               | VDS201A04300 | 4140323               | VDS401A04300 | 4,300       | .1693 | 17     | 24 | 0,7 | 66 | 36 | 6 |

(continued)

(VDS201A • VDS401A • 3 x D — continued)

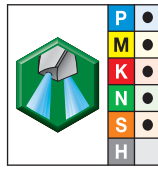
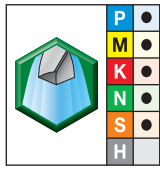


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |   |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 4143932               | VDS201A04366 | 4140324               | VDS401A04366 | 4,366       | .1719 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143933               | VDS201A04400 | 4140325               | VDS401A04400 | 4,400       | .1732 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143934               | VDS201A04500 | 4140326               | VDS401A04500 | 4,500       | .1772 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4143935               | VDS201A04600 | 4140328               | VDS401A04600 | 4,600       | .1811 | 17     | 24 | 0,8 | 66 | 36 | 6 |
| 4143936               | VDS201A04623 | 4140329               | VDS401A04623 | 4,623       | .1820 | 17     | 24 | 0,8 | 66 | 36 | 6 |
| 4143937               | VDS201A04700 | 4140330               | VDS401A04700 | 4,700       | .1850 | 17     | 24 | 0,8 | 66 | 36 | 6 |
| 4143938               | VDS201A04763 | 4140331               | VDS401A04763 | 4,763       | .1875 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143939               | VDS201A04800 | 4140332               | VDS401A04800 | 4,800       | .1890 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143940               | VDS201A04852 | 4140333               | VDS401A04852 | 4,852       | .1910 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143941               | VDS201A04900 | 4140334               | VDS401A04900 | 4,900       | .1929 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143942               | VDS201A05000 | 4140335               | VDS401A05000 | 5,000       | .1969 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143943               | VDS201A05100 | 4140336               | VDS401A05100 | 5,100       | .2008 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143944               | VDS201A05106 | 4140337               | VDS401A05106 | 5,106       | .2010 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4143945               | VDS201A05159 | 4140338               | VDS401A05159 | 5,159       | .2031 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143946               | VDS201A05200 | 4140339               | VDS401A05200 | 5,200       | .2047 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143947               | VDS201A05300 | 4140340               | VDS401A05300 | 5,300       | .2087 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143948               | VDS201A05400 | 4140341               | VDS401A05400 | 5,400       | .2126 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143949               | VDS201A05410 | 4140342               | VDS401A05410 | 5,410       | .2130 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143950               | VDS201A05500 | 4140343               | VDS401A05500 | 5,500       | .2165 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143951               | VDS201A05558 | 4140344               | VDS401A05558 | 5,558       | .2188 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143952               | VDS201A05600 | 4140345               | VDS401A05600 | 5,600       | .2205 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143953               | VDS201A05616 | 4140346               | VDS401A05616 | 5,616       | .2211 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4143954               | VDS201A05700 | 4140347               | VDS401A05700 | 5,700       | .2244 | 20     | 28 | 1,0 | 66 | 36 | 6 |
| 4143955               | VDS201A05800 | 4140348               | VDS401A05800 | 5,800       | .2283 | 20     | 28 | 1,0 | 66 | 36 | 6 |
| 4143956               | VDS201A05900 | 4140349               | VDS401A05900 | 5,900       | .2323 | 20     | 28 | 1,0 | 66 | 36 | 6 |
| 4143957               | VDS201A05954 | 4140350               | VDS401A05954 | 5,954       | .2344 | 20     | 28 | 1,0 | 66 | 36 | 6 |
| 4143958               | VDS201A06000 | 4140351               | VDS401A06000 | 6,000       | .2362 | 20     | 28 | 1,0 | 66 | 36 | 6 |
| 4143959               | VDS201A06100 | 4140352               | VDS401A06100 | 6,100       | .2402 | 24     | 34 | 1,0 | 79 | 36 | 8 |
| 4143960               | VDS201A06200 | 4140353               | VDS401A06200 | 6,200       | .2441 | 24     | 34 | 1,0 | 79 | 36 | 8 |
| 4143961               | VDS201A06300 | 4140354               | VDS401A06300 | 6,300       | .2480 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143962               | VDS201A06350 | 4140355               | VDS401A06350 | 6,350       | .2500 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143963               | VDS201A06400 | 4140356               | VDS401A06400 | 6,400       | .2520 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143964               | VDS201A06500 | 4140357               | VDS401A06500 | 6,500       | .2559 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143965               | VDS201A06528 | 4140358               | VDS401A06528 | 6,528       | .2570 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143966               | VDS201A06600 | 4140359               | VDS401A06600 | 6,600       | .2598 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143967               | VDS201A06630 | 4140360               | VDS401A06630 | 6,630       | .2610 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143968               | VDS201A06700 | 4140361               | VDS401A06700 | 6,700       | .2638 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143969               | VDS201A06746 | 4140362               | VDS401A06746 | 6,746       | .2656 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143970               | VDS201A06800 | 4140363               | VDS401A06800 | 6,800       | .2677 | 24     | 34 | 1,1 | 79 | 36 | 8 |
| 4143971               | VDS201A06900 | 4140364               | VDS401A06900 | 6,900       | .2717 | 24     | 34 | 1,2 | 79 | 36 | 8 |

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(VDS201A • VDS401A • 3 x D — continued)



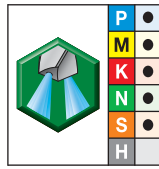
● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D  |
| 4143972               | VDS201A07000 | 4140365               | VDS401A07000 | 7,000       | .2756 | 24     | 34 | 1,2 | 79 | 36 | 8  |
| 4143973               | VDS201A07100 | 4140366               | VDS401A07100 | 7,100       | .2795 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4143974               | VDS201A07145 | 4140367               | VDS401A07145 | 7,145       | .2813 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4143975               | VDS201A07200 | 4140368               | VDS401A07200 | 7,200       | .2835 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4143976               | VDS201A07300 | 4140369               | VDS401A07300 | 7,300       | .2874 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4143977               | VDS201A07400 | 4140370               | VDS401A07400 | 7,400       | .2913 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143978               | VDS201A07500 | 4140371               | VDS401A07500 | 7,500       | .2953 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143979               | VDS201A07541 | 4140372               | VDS401A07541 | 7,541       | .2969 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143980               | VDS201A07600 | 4140373               | VDS401A07600 | 7,600       | .2992 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143981               | VDS201A07700 | 4140374               | VDS401A07700 | 7,700       | .3031 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143982               | VDS201A07800 | 4140375               | VDS401A07800 | 7,800       | .3071 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143983               | VDS201A07900 | 4140376               | VDS401A07900 | 7,900       | .3110 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143984               | VDS201A07938 | 4140377               | VDS401A07938 | 7,938       | .3125 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4143985               | VDS201A08000 | 4140378               | VDS401A08000 | 8,000       | .3150 | 29     | 41 | 1,4 | 79 | 36 | 8  |
| 4143986               | VDS201A08100 | 4140379               | VDS401A08100 | 8,100       | .3189 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143987               | VDS201A08200 | 4140380               | VDS401A08200 | 8,200       | .3228 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143988               | VDS201A08300 | 4140381               | VDS401A08300 | 8,300       | .3268 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143989               | VDS201A08334 | 4140382               | VDS401A08334 | 8,334       | .3281 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143990               | VDS201A08400 | 4140383               | VDS401A08400 | 8,400       | .3307 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143991               | VDS201A08433 | 4140384               | VDS401A08433 | 8,433       | .3320 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143992               | VDS201A08500 | 4140385               | VDS401A08500 | 8,500       | .3346 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4143993               | VDS201A08600 | 4140386               | VDS401A08600 | 8,600       | .3386 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143994               | VDS201A08700 | 4140387               | VDS401A08700 | 8,700       | .3425 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143995               | VDS201A08733 | 4140388               | VDS401A08733 | 8,733       | .3438 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143996               | VDS201A08800 | 4140389               | VDS401A08800 | 8,800       | .3465 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143997               | VDS201A08900 | 4140390               | VDS401A08900 | 8,900       | .3504 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143998               | VDS201A09000 | 4140391               | VDS401A09000 | 9,000       | .3543 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4143999               | VDS201A09100 | 4140392               | VDS401A09100 | 9,100       | .3583 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4144000               | VDS201A09129 | 4140393               | VDS401A09129 | 9,129       | .3594 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144001               | VDS201A09200 | 4140394               | VDS401A09200 | 9,200       | .3622 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144002               | VDS201A09300 | 4140395               | VDS401A09300 | 9,300       | .3661 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144003               | VDS201A09347 | 4140396               | VDS401A09347 | 9,347       | .3680 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144004               | VDS201A09400 | 4140397               | VDS401A09400 | 9,400       | .3701 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144005               | VDS201A09500 | 4140398               | VDS401A09500 | 9,500       | .3740 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144006               | VDS201A09525 | 4140399               | VDS401A09525 | 9,525       | .3750 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144007               | VDS201A09600 | 4140400               | VDS401A09600 | 9,600       | .3780 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4144008               | VDS201A09700 | 4140401               | VDS401A09700 | 9,700       | .3819 | 35     | 47 | 1,7 | 89 | 40 | 10 |
| 4144009               | VDS201A09800 | 4140402               | VDS401A09800 | 9,800       | .3858 | 35     | 47 | 1,7 | 89 | 40 | 10 |
| 4144010               | VDS201A09900 | 4140403               | VDS401A09900 | 9,900       | .3898 | 35     | 47 | 1,7 | 89 | 40 | 10 |
| 4144011               | VDS201A09921 | 4140404               | VDS401A09921 | 9,921       | .3906 | 35     | 47 | 1,7 | 89 | 40 | 10 |

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(VDS201A • VDS401A • 3 x D — continued)

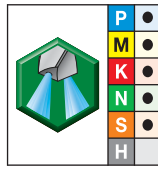
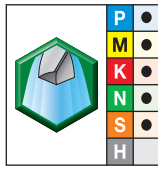


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4144172               | VDS201A10000 | 4140001               | VDS401A10000 | 10,000      | .3937 | 35     | 47 | 1,7 | 89  | 40 | 10 |
| 4144423               | VDS201A10100 | 4140002               | VDS401A10100 | 10,100      | .3976 | 40     | 55 | 1,7 | 102 | 45 | 12 |
| 4144424               | VDS201A10200 | 4140163               | VDS401A10200 | 10,200      | .4016 | 40     | 55 | 1,7 | 102 | 45 | 12 |
| 4144425               | VDS201A10300 | 4140164               | VDS401A10300 | 10,300      | .4055 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144426               | VDS201A10320 | 4140165               | VDS401A10320 | 10,320      | .4063 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144427               | VDS201A10400 | 4140166               | VDS401A10400 | 10,400      | .4094 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144428               | VDS201A10500 | 4140167               | VDS401A10500 | 10,500      | .4134 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144429               | VDS201A10600 | 4140168               | VDS401A10600 | 10,600      | .4173 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144430               | VDS201A10700 | 4140169               | VDS401A10700 | 10,700      | .4213 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144431               | VDS201A10716 | 4140170               | VDS401A10716 | 10,716      | .4219 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144432               | VDS201A10800 | 4140171               | VDS401A10800 | 10,800      | .4252 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4144433               | VDS201A10900 | 4140172               | VDS401A10900 | 10,900      | .4291 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144434               | VDS201A11000 | 4140173               | VDS401A11000 | 11,000      | .4331 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144435               | VDS201A11100 | 4140174               | VDS401A11100 | 11,100      | .4370 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144436               | VDS201A11113 | 4140175               | VDS401A11113 | 11,113      | .4375 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144437               | VDS201A11200 | 4140176               | VDS401A11200 | 11,200      | .4409 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144438               | VDS201A11300 | 4140177               | VDS401A11300 | 11,300      | .4449 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4144439               | VDS201A11400 | 4140178               | VDS401A11400 | 11,400      | .4488 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144440               | VDS201A11500 | 4140179               | VDS401A11500 | 11,500      | .4528 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144441               | VDS201A11509 | 4140180               | VDS401A11509 | 11,509      | .4531 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144442               | VDS201A11600 | 4140181               | VDS401A11600 | 11,600      | .4567 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144443               | VDS201A11700 | 4140182               | VDS401A11700 | 11,700      | .4606 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144444               | VDS201A11800 | 4140183               | VDS401A11800 | 11,800      | .4646 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144445               | VDS201A11900 | 4140184               | VDS401A11900 | 11,900      | .4685 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144446               | VDS201A11908 | 4140185               | VDS401A11908 | 11,908      | .4688 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4144447               | VDS201A12000 | 4140186               | VDS401A12000 | 12,000      | .4724 | 40     | 55 | 2,1 | 102 | 45 | 12 |
| 4144448               | VDS201A12100 | 4140187               | VDS401A12100 | 12,100      | .4764 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144449               | VDS201A12200 | 4140188               | VDS401A12200 | 12,200      | .4803 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144450               | VDS201A12300 | 4140189               | VDS401A12300 | 12,300      | .4843 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144451               | VDS201A12304 | 4140190               | VDS401A12304 | 12,304      | .4844 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144452               | VDS201A12400 | 4140191               | VDS401A12400 | 12,400      | .4882 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144453               | VDS201A12500 | 4140192               | VDS401A12500 | 12,500      | .4921 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4144454               | VDS201A12600 | 4140194               | VDS401A12600 | 12,600      | .4961 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4144455               | VDS201A12700 | 4140195               | VDS401A12700 | 12,700      | .5000 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4144456               | VDS201A12800 | 4140196               | VDS401A12800 | 12,800      | .5039 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4144457               | VDS201A12900 | 4140197               | VDS401A12900 | 12,900      | .5079 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4144458               | VDS201A13000 | 4140198               | VDS401A13000 | 13,000      | .5118 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4144459               | VDS201A13096 | 4140199               | VDS401A13096 | 13,096      | .5156 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144460               | VDS201A13100 | 4140200               | VDS401A13100 | 13,100      | .5157 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144461               | VDS201A13200 | 4140201               | VDS401A13200 | 13,200      | .5197 | 43     | 60 | 2,3 | 107 | 45 | 14 |

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(VDS201A • VDS401A • 3 x D — continued)

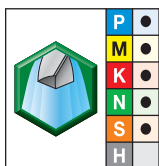


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4144462               | VDS201A13300 | 4140202               | VDS401A13300 | 13,300      | .5236 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144463               | VDS201A13400 | 4140203               | VDS401A13400 | 13,400      | .5276 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144464               | VDS201A13500 | 4140204               | VDS401A13500 | 13,500      | .5315 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144465               | VDS201A13600 | 4140205               | VDS401A13600 | 13,600      | .5354 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4144466               | VDS201A13700 | 4140206               | VDS401A13700 | 13,700      | .5394 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4144467               | VDS201A13800 | 4140207               | VDS401A13800 | 13,800      | .5433 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4144468               | VDS201A13891 | 4140208               | VDS401A13891 | 13,891      | .5469 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4144469               | VDS201A13900 | 4140209               | VDS401A13900 | 13,900      | .5472 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4144470               | VDS201A14000 | 4140210               | VDS401A14000 | 14,000      | .5512 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4144471               | VDS201A14100 | 4140211               | VDS401A14100 | 14,100      | .5551 | 45     | 65 | 2,4 | 115 | 48 | 16 |
| 4144472               | VDS201A14200 | 4140212               | VDS401A14200 | 14,200      | .5591 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144473               | VDS201A14288 | 4140213               | VDS401A14288 | 14,288      | .5625 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144474               | VDS201A14300 | 4140214               | VDS401A14300 | 14,300      | .5630 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144475               | VDS201A14400 | 4140215               | VDS401A14400 | 14,400      | .5669 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144476               | VDS201A14500 | 4140216               | VDS401A14500 | 14,500      | .5709 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144477               | VDS201A14600 | 4140217               | VDS401A14600 | 14,600      | .5748 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144478               | VDS201A14684 | 4140218               | VDS401A14684 | 14,684      | .5781 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144479               | VDS201A14700 | 4140219               | VDS401A14700 | 14,700      | .5787 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4144480               | VDS201A14800 | 4140220               | VDS401A14800 | 14,800      | .5827 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144481               | VDS201A14900 | 4140221               | VDS401A14900 | 14,900      | .5866 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144482               | VDS201A15000 | 4140222               | VDS401A15000 | 15,000      | .5906 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144483               | VDS201A15083 | 4140223               | VDS401A15083 | 15,083      | .5938 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144484               | VDS201A15100 | 4140224               | VDS401A15100 | 15,100      | .5945 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144485               | VDS201A15200 | 4140225               | VDS401A15200 | 15,200      | .5984 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144486               | VDS201A15300 | 4140226               | VDS401A15300 | 15,300      | .6024 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4144487               | VDS201A15400 | 4140227               | VDS401A15400 | 15,400      | .6063 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144488               | VDS201A15479 | 4140228               | VDS401A15479 | 15,479      | .6094 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144489               | VDS201A15500 | 4140229               | VDS401A15500 | 15,500      | .6102 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144490               | VDS201A15600 | 4140230               | VDS401A15600 | 15,600      | .6142 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144491               | VDS201A15700 | 4140231               | VDS401A15700 | 15,700      | .6181 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144492               | VDS201A15800 | 4140232               | VDS401A15800 | 15,800      | .6220 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144493               | VDS201A15875 | 4140233               | VDS401A15875 | 15,875      | .6250 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4144494               | VDS201A15900 | 4140234               | VDS401A15900 | 15,900      | .6260 | 45     | 65 | 2,8 | 115 | 48 | 16 |
| 4144495               | VDS201A16000 | 4140235               | VDS401A16000 | 16,000      | .6299 | 45     | 65 | 2,8 | 115 | 48 | 16 |
| 4144496               | VDS201A16100 | 4140236               | VDS401A16100 | 16,100      | .6339 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4144497               | VDS201A16200 | 4140237               | VDS401A16200 | 16,200      | .6378 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4144498               | VDS201A16271 | 4140238               | VDS401A16271 | 16,271      | .6406 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4144499               | VDS201A16300 | 4140239               | VDS401A16300 | 16,300      | .6417 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4144500               | VDS201A16400 | 4140241               | VDS401A16400 | 16,400      | .6457 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4144501               | VDS201A16500 | 4140242               | VDS401A16500 | 16,500      | .6496 | 51     | 73 | 2,9 | 123 | 48 | 18 |

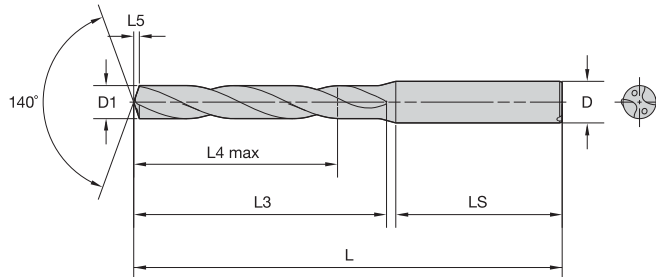
(continued)

(VDS201A • VDS401A • 3 x D — continued)

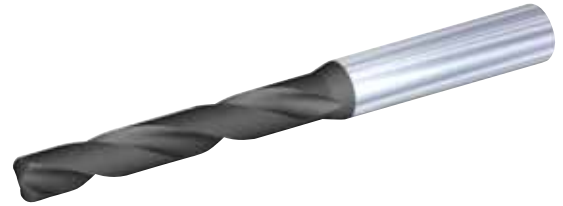


● first choice  
○ alternate choice

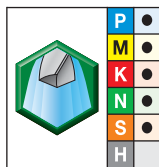
| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4144503               | VDS201A16600 | 4140243               | VDS401A16600 | 16,600      | .6535 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144504               | VDS201A16670 | 4140244               | VDS401A16670 | 16,670      | .6563 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144505               | VDS201A16700 | 4140245               | VDS401A16700 | 16,700      | .6575 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144506               | VDS201A16800 | 4140246               | VDS401A16800 | 16,800      | .6614 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144507               | VDS201A16900 | 4140247               | VDS401A16900 | 16,900      | .6654 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144508               | VDS201A17000 | 4140248               | VDS401A17000 | 17,000      | .6693 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4144509               | VDS201A17100 | 4140249               | VDS401A17100 | 17,100      | .6732 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144510               | VDS201A17200 | 4140250               | VDS401A17200 | 17,200      | .6772 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144511               | VDS201A17300 | 4140251               | VDS401A17300 | 17,300      | .6811 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144512               | VDS201A17400 | 4140252               | VDS401A17400 | 17,400      | .6850 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144513               | VDS201A17463 | 4140253               | VDS401A17463 | 17,463      | .6875 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144514               | VDS201A17500 | 4140254               | VDS401A17500 | 17,500      | .6890 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4144515               | VDS201A17600 | 4140255               | VDS401A17600 | 17,600      | .6929 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144516               | VDS201A17700 | 4140256               | VDS401A17700 | 17,700      | .6969 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144517               | VDS201A17800 | 4140257               | VDS401A17800 | 17,800      | .7008 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144518               | VDS201A17859 | 4140258               | VDS401A17859 | 17,859      | .7031 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144519               | VDS201A17900 | 4140259               | VDS401A17900 | 17,900      | .7047 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144590               | VDS201A18000 | 4140449               | VDS401A18000 | 18,000      | .7087 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4144591               | VDS201A18100 | 4140450               | VDS401A18100 | 18,100      | .7126 | 55     | 79 | 3,1 | 131 | 50 | 20 |
| 4144592               | VDS201A18200 | 4140451               | VDS401A18200 | 18,200      | .7165 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144593               | VDS201A18258 | 4140452               | VDS401A18258 | 18,258      | .7188 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144594               | VDS201A18300 | 4140463               | VDS401A18300 | 18,300      | .7205 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144595               | VDS201A18400 | 4140464               | VDS401A18400 | 18,400      | .7244 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144596               | VDS201A18500 | 4140465               | VDS401A18500 | 18,500      | .7283 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144597               | VDS201A18600 | 4140466               | VDS401A18600 | 18,600      | .7323 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144598               | VDS201A18654 | 4140467               | VDS401A18654 | 18,654      | .7344 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144599               | VDS201A18700 | 4140468               | VDS401A18700 | 18,700      | .7362 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4144600               | VDS201A18800 | 4140469               | VDS401A18800 | 18,800      | .7402 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144601               | VDS201A18900 | 4140470               | VDS401A18900 | 18,900      | .7441 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144602               | VDS201A19000 | 4140471               | VDS401A19000 | 19,000      | .7480 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144603               | VDS201A19050 | 4140472               | VDS401A19050 | 19,050      | .7500 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144604               | VDS201A19100 | 4140473               | VDS401A19100 | 19,100      | .7520 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144605               | VDS201A19200 | 4140474               | VDS401A19200 | 19,200      | .7559 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4144606               | VDS201A19300 | 4140475               | VDS401A19300 | 19,300      | .7598 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144607               | VDS201A19400 | 4140476               | VDS401A19400 | 19,400      | .7638 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144608               | VDS201A19500 | 4140477               | VDS401A19500 | 19,500      | .7677 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144609               | VDS201A19600 | 4140478               | VDS401A19600 | 19,600      | .7717 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144610               | VDS201A19700 | 4140479               | VDS401A19700 | 19,700      | .7756 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144611               | VDS201A19800 | 4140480               | VDS401A19800 | 19,800      | .7795 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4144612               | VDS201A19900 | 4140481               | VDS401A19900 | 19,900      | .7835 | 55     | 79 | 3,5 | 131 | 50 | 20 |
| 4144613               | VDS201A20000 | 4140482               | VDS401A20000 | 20,000      | .7874 | 55     | 79 | 3,5 | 131 | 50 | 20 |



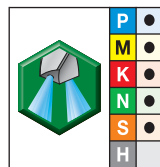
For information on L, L3, and L4 max, see page T143.



### ■ VDS202A • VDS402A • 5 x D



grade WU25PD  
TiAlN



grade WU25PD  
TiAlN

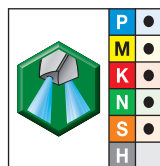
D1 diameter

- first choice
- alternate choice

| order # | catalogue #  | order # | catalogue #  | mm    | in    | L4 max | L3 | L5  | L  | LS | D |
|---------|--------------|---------|--------------|-------|-------|--------|----|-----|----|----|---|
| 4148000 | VDS202A01000 | —       | —            | 1,000 | .0394 | 6      | 9  | 0,1 | 58 | 28 | 4 |
| 4148001 | VDS202A01016 | —       | —            | 1,016 | .0400 | 6      | 9  | 0,1 | 58 | 28 | 4 |
| 4148002 | VDS202A01041 | —       | —            | 1,041 | .0410 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148003 | VDS202A01067 | —       | —            | 1,067 | .0420 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148004 | VDS202A01092 | —       | —            | 1,092 | .0430 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148005 | VDS202A01100 | —       | —            | 1,100 | .0433 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148006 | VDS202A01181 | —       | —            | 1,181 | .0465 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148007 | VDS202A01191 | —       | —            | 1,191 | .0469 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148008 | VDS202A01200 | —       | —            | 1,200 | .0472 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148009 | VDS202A01300 | —       | —            | 1,300 | .0512 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148010 | VDS202A01321 | —       | —            | 1,321 | .0520 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148011 | VDS202A01397 | —       | —            | 1,397 | .0550 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148012 | VDS202A01400 | —       | —            | 1,400 | .0551 | 6      | 9  | 0,2 | 58 | 28 | 4 |
| 4148013 | VDS202A01500 | 4142871 | VDS402A01500 | 1,500 | .0591 | 9      | 12 | 0,2 | 58 | 40 | 4 |
| 4148014 | VDS202A01600 | 4142884 | VDS402A01600 | 1,600 | .0630 | 9      | 12 | 0,2 | 58 | 28 | 4 |
| 4148015 | VDS202A01700 | 4142887 | VDS402A01700 | 1,700 | .0669 | 9      | 12 | 0,3 | 58 | 28 | 4 |
| 4148016 | VDS202A01800 | 4142890 | VDS402A01800 | 1,800 | .0709 | 9      | 12 | 0,3 | 58 | 28 | 4 |
| 4148017 | VDS202A01900 | 4142893 | VDS402A01900 | 1,900 | .0748 | 9      | 12 | 0,3 | 58 | 28 | 4 |
| 4148018 | VDS202A01984 | 4142896 | VDS402A01984 | 1,984 | .0781 | 14     | 18 | 0,3 | 58 | 28 | 4 |
| 4148019 | VDS202A02000 | 4142899 | VDS402A02000 | 2,000 | .0787 | 14     | 18 | 0,3 | 58 | 28 | 4 |
| 4148020 | VDS202A02100 | 4142902 | VDS402A02100 | 2,100 | .0827 | 14     | 18 | 0,3 | 58 | 28 | 4 |
| 4148021 | VDS202A02200 | 4142905 | VDS402A02200 | 2,200 | .0866 | 14     | 18 | 0,3 | 58 | 28 | 4 |
| 4148022 | VDS202A02300 | 4142908 | VDS402A02300 | 2,300 | .0906 | 14     | 18 | 0,4 | 58 | 28 | 4 |
| 4148023 | VDS202A02383 | 4142911 | VDS402A02383 | 2,383 | .0938 | 17     | 22 | 0,4 | 58 | 28 | 4 |

(continued)

(VDS202A • VDS402A • 5 x D — continued)

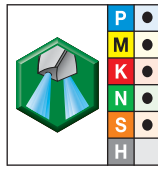
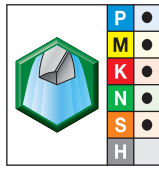


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |   |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 4148024               | VDS202A02400 | 4142924               | VDS402A02400 | 2,400       | .0945 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148025               | VDS202A02439 | 4142927               | VDS402A02439 | 2,439       | .0960 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148026               | VDS202A02489 | 4142930               | VDS402A02489 | 2,489       | .0980 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148027               | VDS202A02500 | 4142933               | VDS402A02500 | 2,500       | .0984 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148028               | VDS202A02578 | 4142936               | VDS402A02578 | 2,578       | .1015 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148029               | VDS202A02600 | 4142939               | VDS402A02600 | 2,600       | .1024 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148030               | VDS202A02642 | 4142942               | VDS402A02642 | 2,642       | .1040 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148031               | VDS202A02700 | 4142945               | VDS402A02700 | 2,700       | .1063 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148032               | VDS202A02705 | 4142948               | VDS402A02705 | 2,705       | .1065 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148033               | VDS202A02779 | 4142951               | VDS402A02779 | 2,779       | .1094 | 17     | 22 | 0,4 | 58 | 28 | 4 |
| 4148034               | VDS202A02800 | 4142964               | VDS402A02800 | 2,800       | .1102 | 17     | 22 | 0,5 | 58 | 28 | 4 |
| 4148035               | VDS202A02820 | 4142967               | VDS402A02820 | 2,820       | .1110 | 17     | 22 | 0,5 | 58 | 28 | 4 |
| 4148036               | VDS202A02870 | 4142970               | VDS402A02870 | 2,870       | .1130 | 17     | 22 | 0,5 | 58 | 28 | 4 |
| 4148037               | VDS202A02900 | 4142973               | VDS402A02900 | 2,900       | .1142 | 17     | 22 | 0,5 | 58 | 28 | 4 |
| 4148038               | VDS202A02947 | 4142976               | VDS402A02947 | 2,947       | .1160 | 17     | 22 | 0,5 | 58 | 28 | 4 |
| 4148142               | VDS202A03000 | 4142844               | VDS402A03000 | 3,000       | .1181 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148143               | VDS202A03048 | 4142846               | VDS402A03048 | 3,048       | .1200 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148144               | VDS202A03100 | 4142847               | VDS402A03100 | 3,100       | .1220 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148145               | VDS202A03175 | 4142849               | VDS402A03175 | 3,175       | .1250 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148146               | VDS202A03200 | 4142851               | VDS402A03200 | 3,200       | .1260 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148147               | VDS202A03264 | 4142864               | VDS402A03264 | 3,264       | .1285 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148148               | VDS202A03300 | 4142865               | VDS402A03300 | 3,300       | .1299 | 23     | 28 | 0,5 | 66 | 36 | 6 |
| 4148149               | VDS202A03400 | 4142867               | VDS402A03400 | 3,400       | .1339 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148150               | VDS202A03455 | 4142869               | VDS402A03455 | 3,455       | .1360 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148151               | VDS202A03500 | 4142872               | VDS402A03500 | 3,500       | .1378 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148152               | VDS202A03571 | 4142885               | VDS402A03571 | 3,571       | .1406 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148153               | VDS202A03600 | 4142888               | VDS402A03600 | 3,600       | .1417 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148154               | VDS202A03658 | 4142891               | VDS402A03658 | 3,658       | .1440 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148155               | VDS202A03700 | 4142894               | VDS402A03700 | 3,700       | .1457 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148156               | VDS202A03734 | 4142897               | VDS402A03734 | 3,734       | .1470 | 23     | 28 | 0,6 | 66 | 36 | 6 |
| 4148157               | VDS202A03800 | 4142900               | VDS402A03800 | 3,800       | .1496 | 29     | 36 | 0,6 | 74 | 36 | 6 |
| 4148158               | VDS202A03900 | 4142903               | VDS402A03900 | 3,900       | .1535 | 29     | 36 | 0,6 | 74 | 36 | 6 |
| 4148159               | VDS202A03970 | 4142906               | VDS402A03970 | 3,970       | .1563 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148160               | VDS202A04000 | 4142909               | VDS402A04000 | 4,000       | .1575 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148161               | VDS202A04039 | 4142912               | VDS402A04039 | 4,039       | .1590 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148162               | VDS202A04090 | 4142925               | VDS402A04090 | 4,090       | .1610 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148163               | VDS202A04100 | 4142928               | VDS402A04100 | 4,100       | .1614 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148164               | VDS202A04200 | 4142931               | VDS402A04200 | 4,200       | .1654 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148165               | VDS202A04217 | 4142934               | VDS402A04217 | 4,217       | .1660 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148166               | VDS202A04300 | 4142937               | VDS402A04300 | 4,300       | .1693 | 29     | 36 | 0,7 | 74 | 36 | 6 |

(continued)

(VDS202A • VDS402A • 5 x D — continued)



● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |   |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 4148167               | VDS202A04366 | 4142940               | VDS402A04366 | 4,366       | .1719 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148168               | VDS202A04400 | 4142943               | VDS402A04400 | 4,400       | .1732 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148169               | VDS202A04500 | 4142946               | VDS402A04500 | 4,500       | .1772 | 29     | 36 | 0,7 | 74 | 36 | 6 |
| 4148170               | VDS202A04600 | 4142949               | VDS402A04600 | 4,600       | .1811 | 29     | 36 | 0,8 | 74 | 36 | 6 |
| 4148171               | VDS202A04623 | 4142952               | VDS402A04623 | 4,623       | .1820 | 29     | 36 | 0,8 | 74 | 36 | 6 |
| 4148172               | VDS202A04700 | 4142965               | VDS402A04700 | 4,700       | .1850 | 29     | 36 | 0,8 | 74 | 36 | 6 |
| 4148173               | VDS202A04763 | 4142968               | VDS402A04763 | 4,763       | .1875 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148174               | VDS202A04800 | 4142971               | VDS402A04800 | 4,800       | .1890 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148175               | VDS202A04852 | 4142974               | VDS402A04852 | 4,852       | .1910 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148176               | VDS202A04900 | 4142977               | VDS402A04900 | 4,900       | .1929 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148177               | VDS202A05000 | 4142979               | VDS402A05000 | 5,000       | .1969 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148178               | VDS202A05100 | 4142981               | VDS402A05100 | 5,100       | .2008 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148179               | VDS202A05106 | 4142994               | VDS402A05106 | 5,106       | .2010 | 35     | 44 | 0,8 | 82 | 36 | 6 |
| 4148180               | VDS202A05159 | 4142996               | VDS402A05159 | 5,159       | .2031 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148181               | VDS202A05200 | 4142997               | VDS402A05200 | 5,200       | .2047 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148182               | VDS202A05300 | 4142999               | VDS402A05300 | 5,300       | .2087 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148183               | VDS202A05400 | 4143000               | VDS402A05400 | 5,400       | .2126 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148184               | VDS202A05410 | 4143001               | VDS402A05410 | 5,410       | .2130 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148185               | VDS202A05500 | 4143002               | VDS402A05500 | 5,500       | .2165 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148186               | VDS202A05558 | 4143003               | VDS402A05558 | 5,558       | .2188 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148187               | VDS202A05600 | 4143004               | VDS402A05600 | 5,600       | .2205 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148188               | VDS202A05616 | 4143005               | VDS402A05616 | 5,616       | .2211 | 35     | 44 | 0,9 | 82 | 36 | 6 |
| 4148189               | VDS202A05700 | 4143006               | VDS402A05700 | 5,700       | .2244 | 35     | 44 | 1,0 | 82 | 36 | 6 |
| 4148190               | VDS202A05800 | 4143007               | VDS402A05800 | 5,800       | .2283 | 35     | 44 | 1,0 | 82 | 36 | 6 |
| 4148191               | VDS202A05900 | 4143008               | VDS402A05900 | 5,900       | .2323 | 35     | 44 | 1,0 | 82 | 36 | 6 |
| 4148192               | VDS202A05954 | 4143009               | VDS402A05954 | 5,954       | .2344 | 35     | 44 | 1,0 | 82 | 36 | 6 |
| 4148193               | VDS202A06000 | 4143010               | VDS402A06000 | 6,000       | .2362 | 35     | 44 | 1,0 | 82 | 36 | 6 |
| 4148194               | VDS202A06100 | 4143011               | VDS402A06100 | 6,100       | .2402 | 43     | 53 | 1,0 | 91 | 36 | 8 |
| 4148195               | VDS202A06200 | 4143012               | VDS402A06200 | 6,200       | .2441 | 43     | 53 | 1,0 | 91 | 36 | 8 |
| 4148196               | VDS202A06300 | 4143023               | VDS402A06300 | 6,300       | .2480 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148197               | VDS202A06350 | 4143024               | VDS402A06350 | 6,350       | .2500 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148198               | VDS202A06400 | 4143025               | VDS402A06400 | 6,400       | .2520 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148199               | VDS202A06500 | 4143026               | VDS402A06500 | 6,500       | .2559 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148200               | VDS202A06528 | 4143027               | VDS402A06528 | 6,528       | .2570 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148201               | VDS202A06600 | 4143028               | VDS402A06600 | 6,600       | .2598 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148202               | VDS202A06630 | 4143029               | VDS402A06630 | 6,630       | .2610 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148203               | VDS202A06700 | 4143030               | VDS402A06700 | 6,700       | .2638 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148204               | VDS202A06746 | 4143031               | VDS402A06746 | 6,746       | .2656 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148205               | VDS202A06800 | 4143032               | VDS402A06800 | 6,800       | .2677 | 43     | 53 | 1,1 | 91 | 36 | 8 |
| 4148206               | VDS202A06900 | 4143043               | VDS402A06900 | 6,900       | .2717 | 43     | 53 | 1,2 | 91 | 36 | 8 |

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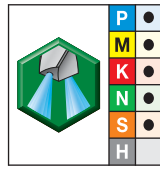
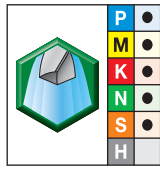


# Solid Carbide Drills

VariDrill™ • Steel, Stainless Steel, Cast Iron, Aluminium, and High-Temp Alloys • 5 x D



(VDS202A • VDS402A • 5 x D — continued)

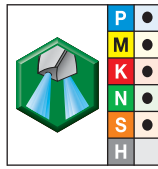
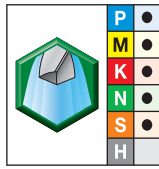


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |       |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|-------|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS D  |
| 4148207               | VDS202A07000 | 4143044               | VDS402A07000 | 7,000       | .2756 | 43     | 53 | 1,2 | 91  | 36 8  |
| 4148208               | VDS202A07100 | 4143045               | VDS402A07100 | 7,100       | .2795 | 43     | 53 | 1,2 | 91  | 36 8  |
| 4148209               | VDS202A07145 | 4143046               | VDS402A07145 | 7,145       | .2813 | 43     | 53 | 1,2 | 91  | 36 8  |
| 4148210               | VDS202A07200 | 4143047               | VDS402A07200 | 7,200       | .2835 | 43     | 53 | 1,2 | 91  | 36 8  |
| 4148211               | VDS202A07300 | 4143048               | VDS402A07300 | 7,300       | .2874 | 43     | 53 | 1,2 | 91  | 36 8  |
| 4148212               | VDS202A07400 | 4143049               | VDS402A07400 | 7,400       | .2913 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148213               | VDS202A07500 | 4143050               | VDS402A07500 | 7,500       | .2953 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148214               | VDS202A07541 | 4143051               | VDS402A07541 | 7,541       | .2969 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148215               | VDS202A07600 | 4143052               | VDS402A07600 | 7,600       | .2992 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148216               | VDS202A07700 | 4143063               | VDS402A07700 | 7,700       | .3031 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148217               | VDS202A07800 | 4143064               | VDS402A07800 | 7,800       | .3071 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148218               | VDS202A07900 | 4143065               | VDS402A07900 | 7,900       | .3110 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148219               | VDS202A07938 | 4143066               | VDS402A07938 | 7,938       | .3125 | 43     | 53 | 1,3 | 91  | 36 8  |
| 4148220               | VDS202A08000 | 4143067               | VDS402A08000 | 8,000       | .3150 | 43     | 53 | 1,4 | 91  | 36 8  |
| 4148221               | VDS202A08100 | 4143068               | VDS402A08100 | 8,100       | .3189 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148222               | VDS202A08200 | 4143069               | VDS402A08200 | 8,200       | .3228 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148223               | VDS202A08300 | 4143070               | VDS402A08300 | 8,300       | .3268 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148224               | VDS202A08334 | 4143071               | VDS402A08334 | 8,334       | .3281 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148225               | VDS202A08400 | 4143072               | VDS402A08400 | 8,400       | .3307 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148226               | VDS202A08433 | 4143083               | VDS402A08433 | 8,433       | .3320 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148227               | VDS202A08500 | 4143084               | VDS402A08500 | 8,500       | .3346 | 49     | 61 | 1,4 | 103 | 40 10 |
| 4148228               | VDS202A08600 | 4143085               | VDS402A08600 | 8,600       | .3386 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148229               | VDS202A08700 | 4143086               | VDS402A08700 | 8,700       | .3425 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148230               | VDS202A08733 | 4143087               | VDS402A08733 | 8,733       | .3438 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148231               | VDS202A08800 | 4143088               | VDS402A08800 | 8,800       | .3465 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148232               | VDS202A08900 | 4143089               | VDS402A08900 | 8,900       | .3504 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148233               | VDS202A09000 | 4143090               | VDS402A09000 | 9,000       | .3543 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148234               | VDS202A09100 | 4143091               | VDS402A09100 | 9,100       | .3583 | 49     | 61 | 1,5 | 103 | 40 10 |
| 4148235               | VDS202A09129 | 4143092               | VDS402A09129 | 9,129       | .3594 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148236               | VDS202A09200 | 4143103               | VDS402A09200 | 9,200       | .3622 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148237               | VDS202A09300 | 4143104               | VDS402A09300 | 9,300       | .3661 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148238               | VDS202A09347 | 4143105               | VDS402A09347 | 9,347       | .3680 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148239               | VDS202A09400 | 4143106               | VDS402A09400 | 9,400       | .3701 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148240               | VDS202A09500 | 4143107               | VDS402A09500 | 9,500       | .3740 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148241               | VDS202A09525 | 4143108               | VDS402A09525 | 9,525       | .3750 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148242               | VDS202A09600 | 4143109               | VDS402A09600 | 9,600       | .3780 | 49     | 61 | 1,6 | 103 | 40 10 |
| 4148243               | VDS202A09700 | 4143110               | VDS402A09700 | 9,700       | .3819 | 49     | 61 | 1,7 | 103 | 40 10 |
| 4148244               | VDS202A09800 | 4143111               | VDS402A09800 | 9,800       | .3858 | 49     | 61 | 1,7 | 103 | 40 10 |
| 4148245               | VDS202A09900 | 4143112               | VDS402A09900 | 9,900       | .3898 | 49     | 61 | 1,7 | 103 | 40 10 |
| 4148246               | VDS202A09921 | 4143113               | VDS402A09921 | 9,921       | .3906 | 49     | 61 | 1,7 | 103 | 40 10 |

(continued)

(VDS202A • VDS402A • 5 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |       |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|-------|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS D  |
| 4148258               | VDS202A10000 | 4142823               | VDS402A10000 | 10,000      | .3937 | 49     | 61 | 1,7 | 103 | 40 10 |
| 4148259               | VDS202A10100 | 4142825               | VDS402A10100 | 10,100      | .3976 | 56     | 71 | 1,7 | 118 | 45 12 |
| 4148260               | VDS202A10200 | 4142827               | VDS402A10200 | 10,200      | .4016 | 56     | 71 | 1,7 | 118 | 45 12 |
| 4148261               | VDS202A10300 | 4142829               | VDS402A10300 | 10,300      | .4055 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148262               | VDS202A10320 | 4142831               | VDS402A10320 | 10,320      | .4063 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148283               | VDS202A10400 | 4142832               | VDS402A10400 | 10,400      | .4094 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148284               | VDS202A10500 | 4142834               | VDS402A10500 | 10,500      | .4134 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148285               | VDS202A10600 | 4142836               | VDS402A10600 | 10,600      | .4173 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148286               | VDS202A10700 | 4142838               | VDS402A10700 | 10,700      | .4213 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148287               | VDS202A10716 | 4142840               | VDS402A10716 | 10,716      | .4219 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148288               | VDS202A10800 | 4142842               | VDS402A10800 | 10,800      | .4252 | 56     | 71 | 1,8 | 118 | 45 12 |
| 4148289               | VDS202A10900 | 4142855               | VDS402A10900 | 10,900      | .4291 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148290               | VDS202A11000 | 4142857               | VDS402A11000 | 11,000      | .4331 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148291               | VDS202A11100 | 4142858               | VDS402A11100 | 11,100      | .4370 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148292               | VDS202A11113 | 4142861               | VDS402A11113 | 11,113      | .4375 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148293               | VDS202A11200 | 4142862               | VDS402A11200 | 11,200      | .4409 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148294               | VDS202A11300 | 4142873               | VDS402A11300 | 11,300      | .4449 | 56     | 71 | 1,9 | 118 | 45 12 |
| 4148295               | VDS202A11400 | 4142874               | VDS402A11400 | 11,400      | .4488 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148296               | VDS202A11500 | 4142875               | VDS402A11500 | 11,500      | .4528 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148297               | VDS202A11509 | 4142876               | VDS402A11509 | 11,509      | .4531 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148298               | VDS202A11600 | 4142877               | VDS402A11600 | 11,600      | .4567 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148299               | VDS202A11700 | 4142878               | VDS402A11700 | 11,700      | .4606 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148300               | VDS202A11800 | 4142879               | VDS402A11800 | 11,800      | .4646 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148301               | VDS202A11900 | 4142880               | VDS402A11900 | 11,900      | .4685 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148302               | VDS202A11908 | 4142881               | VDS402A11908 | 11,908      | .4688 | 56     | 71 | 2,0 | 118 | 45 12 |
| 4148313               | VDS202A12000 | 4142882               | VDS402A12000 | 12,000      | .4724 | 56     | 71 | 2,1 | 118 | 45 12 |
| 4148314               | VDS202A12100 | 4142913               | VDS402A12100 | 12,100      | .4764 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148315               | VDS202A12200 | 4142914               | VDS402A12200 | 12,200      | .4803 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148316               | VDS202A12300 | 4142915               | VDS402A12300 | 12,300      | .4843 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148317               | VDS202A12304 | 4142916               | VDS402A12304 | 12,304      | .4844 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148318               | VDS202A12400 | 4142917               | VDS402A12400 | 12,400      | .4882 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148319               | VDS202A12500 | 4142918               | VDS402A12500 | 12,500      | .4921 | 60     | 77 | 2,1 | 124 | 45 14 |
| 4148320               | VDS202A12600 | 4142919               | VDS402A12600 | 12,600      | .4961 | 60     | 77 | 2,2 | 124 | 45 14 |
| 4148321               | VDS202A12700 | 4142920               | VDS402A12700 | 12,700      | .5000 | 60     | 77 | 2,2 | 124 | 45 14 |
| 4148322               | VDS202A12800 | 4142921               | VDS402A12800 | 12,800      | .5039 | 60     | 77 | 2,2 | 124 | 45 14 |
| 4148343               | VDS202A12900 | 4142922               | VDS402A12900 | 12,900      | .5079 | 60     | 77 | 2,2 | 124 | 45 14 |
| 4148344               | VDS202A13000 | 4142953               | VDS402A13000 | 13,000      | .5118 | 60     | 77 | 2,2 | 124 | 45 14 |
| 4148345               | VDS202A13096 | 4142954               | VDS402A13096 | 13,096      | .5156 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148346               | VDS202A13100 | 4142955               | VDS402A13100 | 13,100      | .5157 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148347               | VDS202A13200 | 4142956               | VDS402A13200 | 13,200      | .5197 | 60     | 77 | 2,3 | 124 | 45 14 |

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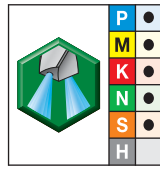
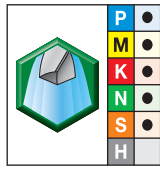


# Solid Carbide Drills

VariDrill™ • Steel, Stainless Steel, Cast Iron, Aluminium, and High-Temp Alloys • 5 x D



(VDS202A • VDS402A • 5 x D — continued)

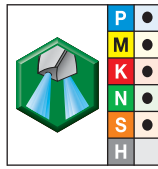
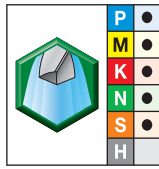


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |       |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|-------|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS D  |
| 4148348               | VDS202A13300 | 4142957               | VDS402A13300 | 13,300      | .5236 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148349               | VDS202A13400 | 4142958               | VDS402A13400 | 13,400      | .5276 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148350               | VDS202A13500 | 4142959               | VDS402A13500 | 13,500      | .5315 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148351               | VDS202A13600 | 4142960               | VDS402A13600 | 13,600      | .5354 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148352               | VDS202A13700 | 4142961               | VDS402A13700 | 13,700      | .5394 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148353               | VDS202A13800 | 4142962               | VDS402A13800 | 13,800      | .5433 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148354               | VDS202A13891 | 4142983               | VDS402A13891 | 13,891      | .5469 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148355               | VDS202A13900 | 4142984               | VDS402A13900 | 13,900      | .5472 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148356               | VDS202A14000 | 4142985               | VDS402A14000 | 14,000      | .5512 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148357               | VDS202A14100 | 4142986               | VDS402A14100 | 14,100      | .5551 | 63     | 83 | 2,4 | 133 | 48 16 |
| 4148358               | VDS202A14200 | 4142987               | VDS402A14200 | 14,200      | .5591 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148359               | VDS202A14288 | 4142988               | VDS402A14288 | 14,288      | .5625 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148360               | VDS202A14300 | 4142989               | VDS402A14300 | 14,300      | .5630 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148361               | VDS202A14400 | 4142990               | VDS402A14400 | 14,400      | .5669 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148362               | VDS202A14500 | 4142991               | VDS402A14500 | 14,500      | .5709 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148363               | VDS202A14600 | 4142992               | VDS402A14600 | 14,600      | .5748 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148364               | VDS202A14684 | 4143013               | VDS402A14684 | 14,684      | .5781 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148365               | VDS202A14700 | 4143014               | VDS402A14700 | 14,700      | .5787 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148366               | VDS202A14800 | 4143015               | VDS402A14800 | 14,800      | .5827 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148367               | VDS202A14900 | 4143016               | VDS402A14900 | 14,900      | .5866 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148368               | VDS202A15000 | 4143017               | VDS402A15000 | 15,000      | .5906 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148369               | VDS202A15083 | 4143018               | VDS402A15083 | 15,083      | .5938 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148370               | VDS202A15100 | 4143019               | VDS402A15100 | 15,100      | .5945 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148371               | VDS202A15200 | 4143020               | VDS402A15200 | 15,200      | .5984 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148372               | VDS202A15300 | 4143021               | VDS402A15300 | 15,300      | .6024 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148373               | VDS202A15400 | 4143022               | VDS402A15400 | 15,400      | .6063 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148374               | VDS202A15479 | 4143033               | VDS402A15479 | 15,479      | .6094 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148375               | VDS202A15500 | 4143034               | VDS402A15500 | 15,500      | .6102 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148376               | VDS202A15600 | 4143035               | VDS402A15600 | 15,600      | .6142 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148377               | VDS202A15700 | 4143036               | VDS402A15700 | 15,700      | .6181 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148378               | VDS202A15800 | 4143037               | VDS402A15800 | 15,800      | .6220 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148379               | VDS202A15875 | 4143038               | VDS402A15875 | 15,875      | .6250 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148380               | VDS202A15900 | 4143039               | VDS402A15900 | 15,900      | .6260 | 63     | 83 | 2,8 | 133 | 48 16 |
| 4148381               | VDS202A16000 | 4143040               | VDS402A16000 | 16,000      | .6299 | 63     | 83 | 2,8 | 133 | 48 16 |
| 4148382               | VDS202A16100 | 4143041               | VDS402A16100 | 16,100      | .6339 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148383               | VDS202A16200 | 4143042               | VDS402A16200 | 16,200      | .6378 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148384               | VDS202A16271 | 4143053               | VDS402A16271 | 16,271      | .6406 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148385               | VDS202A16300 | 4143054               | VDS402A16300 | 16,300      | .6417 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148386               | VDS202A16400 | 4143055               | VDS402A16400 | 16,400      | .6457 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148387               | VDS202A16500 | 4143056               | VDS402A16500 | 16,500      | .6496 | 71     | 93 | 2,9 | 143 | 48 18 |

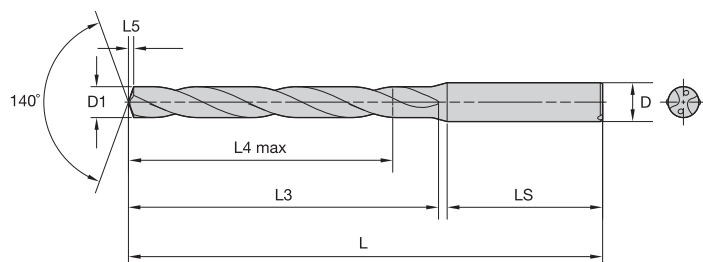
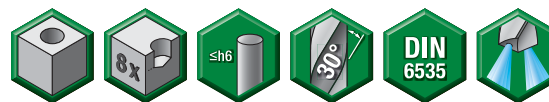
(continued)

(VDS202A • VDS402A • 5 x D — continued)

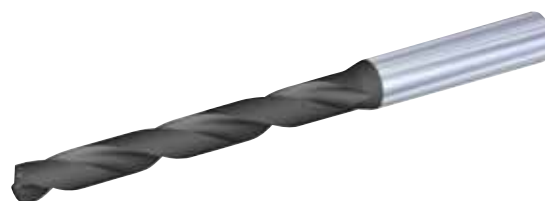


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |       |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|-------|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS D  |
| 4148388               | VDS202A16600 | 4143057               | VDS402A16600 | 16,600      | .6535 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148389               | VDS202A16670 | 4143058               | VDS402A16670 | 16,670      | .6563 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148390               | VDS202A16700 | 4143059               | VDS402A16700 | 16,700      | .6575 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148391               | VDS202A16800 | 4143060               | VDS402A16800 | 16,800      | .6614 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148392               | VDS202A16900 | 4143061               | VDS402A16900 | 16,900      | .6654 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148393               | VDS202A17000 | 4143062               | VDS402A17000 | 17,000      | .6693 | 71     | 93  | 2,9 | 143 | 48 18 |
| 4148394               | VDS202A17100 | 4143073               | VDS402A17100 | 17,100      | .6732 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148395               | VDS202A17200 | 4143074               | VDS402A17200 | 17,200      | .6772 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148396               | VDS202A17300 | 4143075               | VDS402A17300 | 17,300      | .6811 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148397               | VDS202A17400 | 4143076               | VDS402A17400 | 17,400      | .6850 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148398               | VDS202A17463 | 4143077               | VDS402A17463 | 17,463      | .6875 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148399               | VDS202A17500 | 4143078               | VDS402A17500 | 17,500      | .6890 | 71     | 93  | 3,0 | 143 | 48 18 |
| 4148400               | VDS202A17600 | 4143079               | VDS402A17600 | 17,600      | .6929 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4148401               | VDS202A17700 | 4143080               | VDS402A17700 | 17,700      | .6969 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4148402               | VDS202A17800 | 4143081               | VDS402A17800 | 17,800      | .7008 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4148403               | VDS202A17859 | 4143082               | VDS402A17859 | 17,859      | .7031 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4148404               | VDS202A17900 | 4143093               | VDS402A17900 | 17,900      | .7047 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4147921               | VDS202A18000 | 4142803               | VDS402A18000 | 18,000      | .7087 | 71     | 93  | 3,1 | 143 | 48 18 |
| 4147922               | VDS202A18100 | 4142804               | VDS402A18100 | 18,100      | .7126 | 77     | 101 | 3,1 | 153 | 50 20 |
| 4148303               | VDS202A18200 | 4142805               | VDS402A18200 | 18,200      | .7165 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148304               | VDS202A18258 | 4142806               | VDS402A18258 | 18,258      | .7188 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148305               | VDS202A18300 | 4142807               | VDS402A18300 | 18,300      | .7205 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148306               | VDS202A18400 | 4142808               | VDS402A18400 | 18,400      | .7244 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148307               | VDS202A18500 | 4142809               | VDS402A18500 | 18,500      | .7283 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148308               | VDS202A18600 | 4142810               | VDS402A18600 | 18,600      | .7323 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148309               | VDS202A18654 | 4142811               | VDS402A18654 | 18,654      | .7344 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148310               | VDS202A18700 | 4142812               | VDS402A18700 | 18,700      | .7362 | 77     | 101 | 3,2 | 153 | 50 20 |
| 4148311               | VDS202A18800 | 4142824               | VDS402A18800 | 18,800      | .7402 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148312               | VDS202A18900 | 4142826               | VDS402A18900 | 18,900      | .7441 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148323               | VDS202A19000 | 4142828               | VDS402A19000 | 19,000      | .7480 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148324               | VDS202A19050 | 4142830               | VDS402A19050 | 19,050      | .7500 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148325               | VDS202A19100 | 4142833               | VDS402A19100 | 19,100      | .7520 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148326               | VDS202A19200 | 4142835               | VDS402A19200 | 19,200      | .7559 | 77     | 101 | 3,3 | 153 | 50 20 |
| 4148327               | VDS202A19300 | 4142837               | VDS402A19300 | 19,300      | .7598 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148328               | VDS202A19400 | 4142839               | VDS402A19400 | 19,400      | .7638 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148329               | VDS202A19500 | 4142841               | VDS402A19500 | 19,500      | .7677 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148330               | VDS202A19600 | 4142853               | VDS402A19600 | 19,600      | .7717 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148331               | VDS202A19700 | 4142854               | VDS402A19700 | 19,700      | .7756 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148332               | VDS202A19800 | 4142856               | VDS402A19800 | 19,800      | .7795 | 77     | 101 | 3,4 | 153 | 50 20 |
| 4148333               | VDS202A19900 | 4142859               | VDS402A19900 | 19,900      | .7835 | 77     | 101 | 3,5 | 153 | 50 20 |
| 4148334               | VDS202A20000 | 4142860               | VDS402A20000 | 20,000      | .7874 | 77     | 101 | 3,5 | 153 | 50 20 |



For information on L, L3, and L4 max, see page T143.



## ■ VDS403A • 8 x D

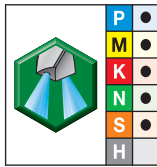


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 6023126               | VDS403A01000 | 1,000       | .0394 | 10     | 12 | 0,1 | 58 | 28 | 4 |
| 6023127               | VDS403A01016 | 1,016       | .0400 | 10     | 12 | 0,1 | 58 | 28 | 4 |
| 6023128               | VDS403A01067 | 1,067       | .0420 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023129               | VDS403A01100 | 1,100       | .0433 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023130               | VDS403A01181 | 1,181       | .0465 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023131               | VDS403A01191 | 1,191       | .0469 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023132               | VDS403A01200 | 1,200       | .0472 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023133               | VDS403A01300 | 1,300       | .0512 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023134               | VDS403A01321 | 1,321       | .0520 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023135               | VDS403A01397 | 1,397       | .0550 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 6023136               | VDS403A01400 | 1,400       | .0551 | 10     | 12 | 0,2 | 58 | 28 | 4 |
| 4143700               | VDS403A01500 | 1,500       | .0591 | 15     | 18 | 0,2 | 58 | 28 | 4 |
| 4143701               | VDS403A01600 | 1,600       | .0630 | 15     | 18 | 0,2 | 58 | 28 | 4 |
| 4143702               | VDS403A01700 | 1,700       | .0669 | 15     | 18 | 0,3 | 58 | 28 | 4 |
| 4143723               | VDS403A01800 | 1,800       | .0709 | 15     | 18 | 0,3 | 58 | 28 | 4 |
| 4143724               | VDS403A01900 | 1,900       | .0748 | 15     | 18 | 0,3 | 58 | 28 | 4 |
| 4143725               | VDS403A01984 | 1,984       | .0781 | 22     | 26 | 0,3 | 66 | 28 | 4 |
| 4143726               | VDS403A02000 | 2,000       | .0787 | 22     | 26 | 0,3 | 66 | 28 | 4 |
| 4143727               | VDS403A02100 | 2,100       | .0827 | 22     | 26 | 0,3 | 66 | 28 | 4 |
| 4143728               | VDS403A02200 | 2,200       | .0866 | 22     | 26 | 0,3 | 66 | 28 | 4 |
| 4143729               | VDS403A02300 | 2,300       | .0906 | 22     | 26 | 0,4 | 66 | 28 | 4 |
| 4143730               | VDS403A02383 | 2,383       | .0938 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143731               | VDS403A02400 | 2,400       | .0945 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143732               | VDS403A02439 | 2,439       | .0960 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143733               | VDS403A02489 | 2,489       | .0980 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143734               | VDS403A02500 | 2,500       | .0984 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143735               | VDS403A02578 | 2,578       | .1015 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143736               | VDS403A02600 | 2,600       | .1024 | 25     | 30 | 0,4 | 66 | 28 | 4 |

(continued)

(VDS403A • 8 x D — continued)


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |    |    |   |
|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|
| order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |
| 4143737               | VDS403A02642 | 2,642       | .1040 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143738               | VDS403A02700 | 2,700       | .1063 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143739               | VDS403A02705 | 2,705       | .1065 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143740               | VDS403A02779 | 2,779       | .1094 | 25     | 30 | 0,4 | 66 | 28 | 4 |
| 4143741               | VDS403A02800 | 2,800       | .1102 | 25     | 30 | 0,5 | 66 | 28 | 4 |
| 4143742               | VDS403A02820 | 2,820       | .1110 | 25     | 30 | 0,5 | 66 | 28 | 4 |
| 4143743               | VDS403A02870 | 2,870       | .1130 | 25     | 30 | 0,5 | 66 | 28 | 4 |
| 4143744               | VDS403A02900 | 2,900       | .1142 | 25     | 30 | 0,5 | 66 | 28 | 4 |
| 4143745               | VDS403A02947 | 2,947       | .1160 | 25     | 30 | 0,5 | 66 | 28 | 4 |
| 4143746               | VDS403A03000 | 3,000       | .1181 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143747               | VDS403A03048 | 3,048       | .1200 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143748               | VDS403A03100 | 3,100       | .1220 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143749               | VDS403A03175 | 3,175       | .1250 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143750               | VDS403A03200 | 3,200       | .1260 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143751               | VDS403A03264 | 3,264       | .1285 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143752               | VDS403A03300 | 3,300       | .1299 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4143753               | VDS403A03400 | 3,400       | .1339 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4143754               | VDS403A03455 | 3,455       | .1360 | 33     | 49 | 0,6 | 78 | 36 | 6 |
| 4143755               | VDS403A03500 | 3,500       | .1378 | 33     | 49 | 0,6 | 78 | 36 | 6 |
| 4143756               | VDS403A03571 | 3,571       | .1406 | 33     | 49 | 0,6 | 78 | 36 | 6 |
| 4143757               | VDS403A03600 | 3,600       | .1417 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4143758               | VDS403A03658 | 3,658       | .1440 | 33     | 49 | 0,6 | 78 | 36 | 6 |
| 4143759               | VDS403A03700 | 3,700       | .1457 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4143760               | VDS403A03734 | 3,734       | .1470 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4143761               | VDS403A03800 | 3,800       | .1496 | 41     | 49 | 0,6 | 87 | 36 | 6 |
| 4143762               | VDS403A03900 | 3,900       | .1535 | 41     | 40 | 0,6 | 87 | 36 | 6 |
| 4143763               | VDS403A03970 | 3,970       | .1563 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143764               | VDS403A04000 | 4,000       | .1575 | 41     | 40 | 0,7 | 87 | 36 | 6 |
| 4143765               | VDS403A04039 | 4,039       | .1590 | 41     | 40 | 0,7 | 87 | 36 | 6 |
| 4143766               | VDS403A04090 | 4,090       | .1610 | 41     | 40 | 0,7 | 87 | 36 | 6 |
| 4143767               | VDS403A04100 | 4,100       | .1614 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143768               | VDS403A04200 | 4,200       | .1654 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143769               | VDS403A04217 | 4,217       | .1660 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143770               | VDS403A04300 | 4,300       | .1693 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143771               | VDS403A04366 | 4,366       | .1719 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143772               | VDS403A04400 | 4,400       | .1732 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143773               | VDS403A04500 | 4,500       | .1772 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4143774               | VDS403A04600 | 4,600       | .1811 | 41     | 49 | 0,8 | 87 | 36 | 6 |
| 4143775               | VDS403A04623 | 4,623       | .1820 | 41     | 49 | 0,8 | 87 | 36 | 6 |
| 4143776               | VDS403A04700 | 4,700       | .1850 | 41     | 56 | 0,8 | 87 | 36 | 6 |

(continued)

(VDS403A • 8 x D — continued)

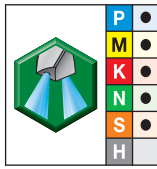


- first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |    |   |
|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|---|
| order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D |
| 4143777               | VDS403A04763 | 4,763       | .1875 | 48     | 49 | 0,8 | 94  | 36 | 6 |
| 4143778               | VDS403A04800 | 4,800       | .1890 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143779               | VDS403A04852 | 4,852       | .1910 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143780               | VDS403A04900 | 4,900       | .1929 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143781               | VDS403A05000 | 5,000       | .1969 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143782               | VDS403A05100 | 5,100       | .2008 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143783               | VDS403A05106 | 5,106       | .2010 | 48     | 56 | 0,8 | 94  | 36 | 6 |
| 4143784               | VDS403A05159 | 5,159       | .2031 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143785               | VDS403A05200 | 5,200       | .2047 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143786               | VDS403A05300 | 5,300       | .2087 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143787               | VDS403A05400 | 5,400       | .2126 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143788               | VDS403A05410 | 5,410       | .2130 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143789               | VDS403A05500 | 5,500       | .2165 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143790               | VDS403A05558 | 5,558       | .2188 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143791               | VDS403A05600 | 5,600       | .2205 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143792               | VDS403A05616 | 5,616       | .2211 | 48     | 56 | 0,9 | 94  | 36 | 6 |
| 4143793               | VDS403A05700 | 5,700       | .2244 | 48     | 56 | 1,0 | 94  | 36 | 6 |
| 4143794               | VDS403A05800 | 5,800       | .2283 | 48     | 67 | 1,0 | 94  | 36 | 6 |
| 4143795               | VDS403A05900 | 5,900       | .2323 | 48     | 67 | 1,0 | 94  | 36 | 6 |
| 4143796               | VDS403A05954 | 5,954       | .2344 | 48     | 56 | 1,0 | 94  | 36 | 6 |
| 4143797               | VDS403A06000 | 6,000       | .2362 | 48     | 67 | 1,0 | 94  | 36 | 6 |
| 4143798               | VDS403A06100 | 6,100       | .2402 | 57     | 67 | 1,0 | 105 | 36 | 8 |
| 4143799               | VDS403A06200 | 6,200       | .2441 | 57     | 67 | 1,0 | 105 | 36 | 8 |
| 4143800               | VDS403A06300 | 6,300       | .2480 | 57     | 56 | 1,1 | 105 | 36 | 8 |
| 4143801               | VDS403A06350 | 6,350       | .2500 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143802               | VDS403A06400 | 6,400       | .2520 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143803               | VDS403A06500 | 6,500       | .2559 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143804               | VDS403A06528 | 6,528       | .2570 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143805               | VDS403A06600 | 6,600       | .2598 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143806               | VDS403A06630 | 6,630       | .2610 | 57     | 56 | 1,1 | 105 | 36 | 8 |
| 4143807               | VDS403A06700 | 6,700       | .2638 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143808               | VDS403A06746 | 6,746       | .2656 | 57     | 56 | 1,1 | 105 | 36 | 8 |
| 4143809               | VDS403A06800 | 6,800       | .2677 | 57     | 67 | 1,1 | 105 | 36 | 8 |
| 4143810               | VDS403A06900 | 6,900       | .2717 | 57     | 67 | 1,2 | 105 | 36 | 8 |
| 4143811               | VDS403A07000 | 7,000       | .2756 | 57     | 72 | 1,2 | 105 | 36 | 8 |
| 4143812               | VDS403A07100 | 7,100       | .2795 | 61     | 72 | 1,2 | 110 | 36 | 8 |
| 4143813               | VDS403A07145 | 7,145       | .2813 | 61     | 67 | 1,2 | 110 | 36 | 8 |
| 4143814               | VDS403A07200 | 7,200       | .2835 | 61     | 72 | 1,2 | 110 | 36 | 8 |
| 4143815               | VDS403A07300 | 7,300       | .2874 | 61     | 72 | 1,2 | 110 | 36 | 8 |
| 4143816               | VDS403A07400 | 7,400       | .2913 | 61     | 72 | 1,3 | 110 | 36 | 8 |

(continued)

(VDS403A • 8 x D — continued)


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4143817               | VDS403A07500 | 7,500       | .2953 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4143818               | VDS403A07541 | 7,541       | .2969 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4143819               | VDS403A07600 | 7,600       | .2992 | 61     | 80 | 1,3 | 110 | 36 | 8  |
| 4143820               | VDS403A07700 | 7,700       | .3031 | 61     | 80 | 1,3 | 110 | 36 | 8  |
| 4143821               | VDS403A07800 | 7,800       | .3071 | 61     | 80 | 1,3 | 110 | 36 | 8  |
| 4143822               | VDS403A07900 | 7,900       | .3110 | 61     | 80 | 1,3 | 110 | 36 | 8  |
| 4143823               | VDS403A07938 | 7,938       | .3125 | 61     | 80 | 1,3 | 110 | 36 | 8  |
| 4143824               | VDS403A08000 | 8,000       | .3150 | 61     | 80 | 1,4 | 110 | 36 | 8  |
| 4143825               | VDS403A08100 | 8,100       | .3189 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143826               | VDS403A08200 | 8,200       | .3228 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143827               | VDS403A08300 | 8,300       | .3268 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143828               | VDS403A08334 | 8,334       | .3281 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143829               | VDS403A08400 | 8,400       | .3307 | 68     | 72 | 1,4 | 122 | 40 | 10 |
| 4143830               | VDS403A08433 | 8,433       | .3320 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143831               | VDS403A08500 | 8,500       | .3346 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4143832               | VDS403A08600 | 8,600       | .3386 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4143833               | VDS403A08700 | 8,700       | .3425 | 68     | 72 | 1,5 | 122 | 40 | 10 |
| 4143834               | VDS403A08733 | 8,733       | .3438 | 68     | 72 | 1,5 | 122 | 40 | 10 |
| 4143835               | VDS403A08800 | 8,800       | .3465 | 68     | 72 | 1,5 | 122 | 40 | 10 |
| 4143836               | VDS403A08900 | 8,900       | .3504 | 68     | 72 | 1,5 | 122 | 40 | 10 |
| 4143837               | VDS403A09000 | 9,000       | .3543 | 68     | 72 | 1,5 | 122 | 40 | 10 |
| 4143838               | VDS403A09100 | 9,100       | .3583 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4143839               | VDS403A09129 | 9,129       | .3594 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143840               | VDS403A09200 | 9,200       | .3622 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143841               | VDS403A09300 | 9,300       | .3661 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143842               | VDS403A09347 | 9,347       | .3680 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143843               | VDS403A09400 | 9,400       | .3701 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143844               | VDS403A09500 | 9,500       | .3740 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143845               | VDS403A09525 | 9,525       | .3750 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143846               | VDS403A09600 | 9,600       | .3780 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4143847               | VDS403A09700 | 9,700       | .3819 | 68     | 80 | 1,7 | 122 | 40 | 10 |
| 4143848               | VDS403A09800 | 9,800       | .3858 | 68     | 80 | 1,7 | 122 | 40 | 10 |
| 4143849               | VDS403A09900 | 9,900       | .3898 | 68     | 80 | 1,7 | 122 | 40 | 10 |
| 4143850               | VDS403A09921 | 9,921       | .3906 | 68     | 80 | 1,7 | 122 | 40 | 10 |
| 4143421               | VDS403A10000 | 10,000      | .3937 | 68     | 80 | 1,7 | 122 | 40 | 10 |
| 4143422               | VDS403A10100 | 10,100      | .3976 | 79     | 94 | 1,7 | 141 | 45 | 12 |
| 4143473               | VDS403A10200 | 10,200      | .4016 | 79     | 94 | 1,7 | 141 | 45 | 12 |
| 4143474               | VDS403A10300 | 10,300      | .4055 | 79     | 94 | 1,8 | 141 | 45 | 12 |
| 4143475               | VDS403A10320 | 10,320      | .4063 | 79     | 94 | 1,8 | 141 | 45 | 12 |
| 4143476               | VDS403A10400 | 10,400      | .4094 | 79     | 94 | 1,8 | 141 | 45 | 12 |

(continued)

(VDS403A • 8 x D — continued)



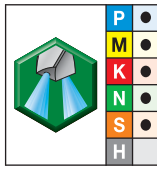
● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4143477               | VDS403A10500 | 10,500      | .4134 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143478               | VDS403A10600 | 10,600      | .4173 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143479               | VDS403A10700 | 10,700      | .4213 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143480               | VDS403A10716 | 10,716      | .4219 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143481               | VDS403A10800 | 10,800      | .4252 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143482               | VDS403A10900 | 10,900      | .4291 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143483               | VDS403A11000 | 11,000      | .4331 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143484               | VDS403A11100 | 11,100      | .4370 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143485               | VDS403A11113 | 11,113      | .4375 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143486               | VDS403A11200 | 11,200      | .4409 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143487               | VDS403A11300 | 11,300      | .4449 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4143488               | VDS403A11400 | 11,400      | .4488 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143489               | VDS403A11500 | 11,500      | .4528 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143490               | VDS403A11509 | 11,509      | .4531 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143491               | VDS403A11600 | 11,600      | .4567 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143492               | VDS403A11700 | 11,700      | .4606 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143493               | VDS403A11800 | 11,800      | .4646 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143494               | VDS403A11900 | 11,900      | .4685 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143495               | VDS403A11908 | 11,908      | .4688 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4143496               | VDS403A12000 | 12,000      | .4724 | 79     | 94  | 2,1 | 141 | 45 | 12 |
| 4143497               | VDS403A12100 | 12,100      | .4764 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143498               | VDS403A12200 | 12,200      | .4803 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143499               | VDS403A12300 | 12,300      | .4843 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143500               | VDS403A12304 | 12,304      | .4844 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143501               | VDS403A12400 | 12,400      | .4882 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143502               | VDS403A12500 | 12,500      | .4921 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4143503               | VDS403A12600 | 12,600      | .4961 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4143504               | VDS403A12700 | 12,700      | .5000 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4143505               | VDS403A12800 | 12,800      | .5039 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4143506               | VDS403A12900 | 12,900      | .5079 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4143507               | VDS403A13000 | 13,000      | .5118 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4143508               | VDS403A13096 | 13,096      | .5156 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143509               | VDS403A13100 | 13,100      | .5157 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143510               | VDS403A13200 | 13,200      | .5197 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143511               | VDS403A13300 | 13,300      | .5236 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143512               | VDS403A13400 | 13,400      | .5276 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143513               | VDS403A13500 | 13,500      | .5315 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143514               | VDS403A13600 | 13,600      | .5354 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4143515               | VDS403A13700 | 13,700      | .5394 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4143516               | VDS403A13800 | 13,800      | .5433 | 91     | 108 | 2,4 | 155 | 45 | 14 |

(continued)



(VDS403A • 8 x D — continued)


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4143517               | VDS403A13891 | 13,891      | .5469 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4143518               | VDS403A13900 | 13,900      | .5472 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4143519               | VDS403A14000 | 14,000      | .5512 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4143520               | VDS403A14100 | 14,100      | .5551 | 101    | 121 | 2,4 | 171 | 48 | 16 |
| 4143521               | VDS403A14200 | 14,200      | .5591 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143522               | VDS403A14288 | 14,288      | .5625 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143523               | VDS403A14300 | 14,300      | .5630 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143524               | VDS403A14400 | 14,400      | .5669 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143525               | VDS403A14500 | 14,500      | .5709 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143526               | VDS403A14600 | 14,600      | .5748 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143527               | VDS403A14684 | 14,684      | .5781 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143528               | VDS403A14700 | 14,700      | .5787 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4143529               | VDS403A14800 | 14,800      | .5827 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143530               | VDS403A14900 | 14,900      | .5866 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143531               | VDS403A15000 | 15,000      | .5906 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143532               | VDS403A15083 | 15,083      | .5938 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143533               | VDS403A15100 | 15,100      | .5945 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143534               | VDS403A15200 | 15,200      | .5984 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143535               | VDS403A15300 | 15,300      | .6024 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4143536               | VDS403A15400 | 15,400      | .6063 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143537               | VDS403A15479 | 15,479      | .6094 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143538               | VDS403A15500 | 15,500      | .6102 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143539               | VDS403A15600 | 15,600      | .6142 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143540               | VDS403A15700 | 15,700      | .6181 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143541               | VDS403A15800 | 15,800      | .6220 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143542               | VDS403A15875 | 15,875      | .6250 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4143543               | VDS403A15900 | 15,900      | .6260 | 101    | 121 | 2,8 | 171 | 48 | 16 |
| 4143544               | VDS403A16000 | 16,000      | .6299 | 101    | 121 | 2,8 | 171 | 48 | 16 |
| 4143545               | VDS403A16100 | 16,100      | .6339 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4143546               | VDS403A16200 | 16,200      | .6378 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4143547               | VDS403A16271 | 16,271      | .6406 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4143548               | VDS403A16300 | 16,300      | .6417 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4143549               | VDS403A16400 | 16,400      | .6457 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4143550               | VDS403A16500 | 16,500      | .6496 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143551               | VDS403A16600 | 16,600      | .6535 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143552               | VDS403A16670 | 16,670      | .6563 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143553               | VDS403A16700 | 16,700      | .6575 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143554               | VDS403A16800 | 16,800      | .6614 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143555               | VDS403A16900 | 16,900      | .6654 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4143556               | VDS403A17000 | 17,000      | .6693 | 113    | 135 | 2,9 | 185 | 48 | 18 |

(continued)

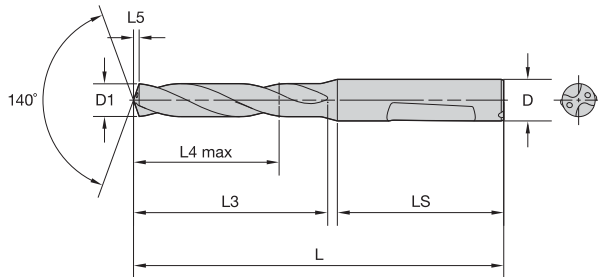


(VDS403A • 8 x D — continued)

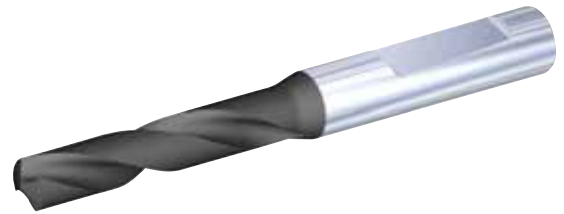


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4143557               | VDS403A17100 | 17,100      | .6732 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143558               | VDS403A17200 | 17,200      | .6772 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143559               | VDS403A17300 | 17,300      | .6811 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143560               | VDS403A17400 | 17,400      | .6850 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143561               | VDS403A17463 | 17,463      | .6875 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143562               | VDS403A17500 | 17,500      | .6890 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4143563               | VDS403A17600 | 17,600      | .6929 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4143564               | VDS403A17700 | 17,700      | .6969 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4143565               | VDS403A17800 | 17,800      | .7008 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4143566               | VDS403A17859 | 17,859      | .7031 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4143567               | VDS403A17900 | 17,900      | .7047 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144209               | VDS403A18000 | 18,000      | .7087 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144211               | VDS403A18100 | 18,100      | .7126 | 124    | 148 | 3,1 | 200 | 50 | 20 |
| 4144212               | VDS403A18200 | 18,200      | .7165 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144244               | VDS403A18258 | 18,258      | .7188 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144246               | VDS403A18300 | 18,300      | .7205 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144248               | VDS403A18400 | 18,400      | .7244 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144250               | VDS403A18500 | 18,500      | .7283 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144252               | VDS403A18600 | 18,600      | .7323 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144254               | VDS403A18654 | 18,654      | .7344 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144256               | VDS403A18700 | 18,700      | .7362 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144258               | VDS403A18800 | 18,800      | .7402 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144260               | VDS403A18900 | 18,900      | .7441 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144262               | VDS403A19000 | 19,000      | .7480 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144275               | VDS403A19050 | 19,050      | .7500 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144277               | VDS403A19100 | 19,100      | .7520 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144279               | VDS403A19200 | 19,200      | .7559 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144281               | VDS403A19300 | 19,300      | .7598 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144283               | VDS403A19400 | 19,400      | .7638 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144285               | VDS403A19500 | 19,500      | .7677 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144287               | VDS403A19600 | 19,600      | .7717 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144289               | VDS403A19700 | 19,700      | .7756 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144291               | VDS403A19800 | 19,800      | .7795 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144303               | VDS403A19900 | 19,900      | .7835 | 124    | 148 | 3,5 | 200 | 50 | 20 |
| 4144305               | VDS403A20000 | 20,000      | .7874 | 124    | 148 | 3,5 | 200 | 50 | 20 |



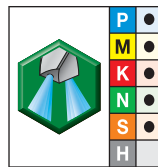
For information on L, L3, and L4 max, see page T143.



### ■ VDS201F • VDS401F • 3 x D



grade WU25PD  
TiAlN



grade WU25PD  
TiAlN

D1 diameter

● first choice  
○ alternate choice

| order # | catalogue #  | order # | catalogue #  | mm    | in    | L4 max | L3 | L5  | L  | LS | D |
|---------|--------------|---------|--------------|-------|-------|--------|----|-----|----|----|---|
| 4147927 | VDS201F03000 | 4140012 | VDS401F03000 | 3,000 | .1181 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4147928 | VDS201F03100 | 4140023 | VDS401F03100 | 3,100 | .1220 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4147929 | VDS201F03200 | 4140024 | VDS401F03200 | 3,200 | .1260 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4147930 | VDS201F03300 | 4140025 | VDS401F03300 | 3,300 | .1299 | 14     | 20 | 0,5 | 62 | 36 | 6 |
| 4147931 | VDS201F03400 | 4140026 | VDS401F03400 | 3,400 | .1339 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4147932 | VDS201F03500 | 4140027 | VDS401F03500 | 3,500 | .1378 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4147933 | VDS201F03600 | 4140028 | VDS401F03600 | 3,600 | .1417 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4147934 | VDS201F03700 | 4140029 | VDS401F03700 | 3,700 | .1457 | 14     | 20 | 0,6 | 62 | 36 | 6 |
| 4147935 | VDS201F03800 | 4140030 | VDS401F03800 | 3,800 | .1496 | 17     | 24 | 0,6 | 66 | 36 | 6 |
| 4147936 | VDS201F03900 | 4140031 | VDS401F03900 | 3,900 | .1535 | 17     | 24 | 0,6 | 66 | 36 | 6 |
| 4147937 | VDS201F04000 | 4140032 | VDS401F04000 | 4,000 | .1575 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147938 | VDS201F04100 | 4140033 | VDS401F04100 | 4,100 | .1614 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147939 | VDS201F04200 | 4140034 | VDS401F04200 | 4,200 | .1654 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147940 | VDS201F04300 | 4140035 | VDS401F04300 | 4,300 | .1693 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147941 | VDS201F04400 | 4140036 | VDS401F04400 | 4,400 | .1732 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147942 | VDS201F04500 | 4140037 | VDS401F04500 | 4,500 | .1772 | 17     | 24 | 0,7 | 66 | 36 | 6 |
| 4147943 | VDS201F04600 | 4140038 | VDS401F04600 | 4,600 | .1811 | 17     | 24 | 0,8 | 66 | 36 | 6 |
| 4147944 | VDS201F04700 | 4140039 | VDS401F04700 | 4,700 | .1850 | 17     | 24 | 0,8 | 66 | 36 | 6 |
| 4147945 | VDS201F04800 | 4140040 | VDS401F04800 | 4,800 | .1890 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4147946 | VDS201F04900 | 4140041 | VDS401F04900 | 4,900 | .1929 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4147947 | VDS201F05000 | 4140042 | VDS401F05000 | 5,000 | .1969 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4147948 | VDS201F05100 | 4140043 | VDS401F05100 | 5,100 | .2008 | 20     | 28 | 0,8 | 66 | 36 | 6 |
| 4147949 | VDS201F05200 | 4140044 | VDS401F05200 | 5,200 | .2047 | 20     | 28 | 0,9 | 66 | 36 | 6 |
| 4147950 | VDS201F05300 | 4140045 | VDS401F05300 | 5,300 | .2087 | 20     | 28 | 0,9 | 66 | 36 | 6 |

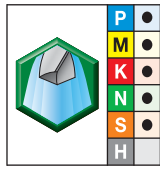
(continued)

# Solid Carbide Drills

VariDrill™ • Steel, Stainless Steel, Cast Iron, Aluminium, and High-Temp Alloys • 3 x D



(VDS201F • VDS401F • 3 x D — continued)

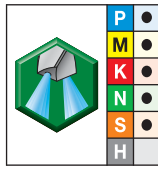
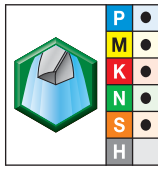


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |    |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |    |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D  |
| 4147951               | VDS201F05400 | 4140046               | VDS401F05400 | 5,400       | .2126 | 20     | 28 | 0,9 | 66 | 36 | 6  |
| 4147952               | VDS201F05500 | 4140047               | VDS401F05500 | 5,500       | .2165 | 20     | 28 | 0,9 | 66 | 36 | 6  |
| 4147953               | VDS201F05600 | 4140048               | VDS401F05600 | 5,600       | .2205 | 20     | 28 | 0,9 | 66 | 36 | 6  |
| 4147954               | VDS201F05700 | 4140049               | VDS401F05700 | 5,700       | .2244 | 20     | 28 | 1,0 | 66 | 36 | 6  |
| 4147955               | VDS201F05800 | 4140050               | VDS401F05800 | 5,800       | .2283 | 20     | 28 | 1,0 | 66 | 36 | 6  |
| 4147956               | VDS201F05900 | 4140051               | VDS401F05900 | 5,900       | .2323 | 20     | 28 | 1,0 | 66 | 36 | 6  |
| 4147957               | VDS201F06000 | 4140052               | VDS401F06000 | 6,000       | .2362 | 20     | 28 | 1,0 | 66 | 36 | 6  |
| 4147958               | VDS201F06100 | 4140053               | VDS401F06100 | 6,100       | .2402 | 24     | 34 | 1,0 | 79 | 36 | 8  |
| 4147959               | VDS201F06200 | 4140054               | VDS401F06200 | 6,200       | .2441 | 24     | 34 | 1,0 | 79 | 36 | 8  |
| 4147960               | VDS201F06300 | 4140055               | VDS401F06300 | 6,300       | .2480 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147961               | VDS201F06400 | 4140056               | VDS401F06400 | 6,400       | .2520 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147962               | VDS201F06500 | 4140057               | VDS401F06500 | 6,500       | .2559 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147963               | VDS201F06600 | 4140058               | VDS401F06600 | 6,600       | .2598 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147964               | VDS201F06700 | 4140059               | VDS401F06700 | 6,700       | .2638 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147965               | VDS201F06800 | 4140060               | VDS401F06800 | 6,800       | .2677 | 24     | 34 | 1,1 | 79 | 36 | 8  |
| 4147966               | VDS201F06900 | 4140061               | VDS401F06900 | 6,900       | .2717 | 24     | 34 | 1,2 | 79 | 36 | 8  |
| 4147967               | VDS201F07000 | 4140062               | VDS401F07000 | 7,000       | .2756 | 24     | 34 | 1,2 | 79 | 36 | 8  |
| 4147968               | VDS201F07100 | 4140063               | VDS401F07100 | 7,100       | .2795 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4147969               | VDS201F07200 | 4140064               | VDS401F07200 | 7,200       | .2835 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4147970               | VDS201F07300 | 4140065               | VDS401F07300 | 7,300       | .2874 | 29     | 41 | 1,2 | 79 | 36 | 8  |
| 4147971               | VDS201F07400 | 4140066               | VDS401F07400 | 7,400       | .2913 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147972               | VDS201F07500 | 4140067               | VDS401F07500 | 7,500       | .2953 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147973               | VDS201F07600 | 4140068               | VDS401F07600 | 7,600       | .2992 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147974               | VDS201F07700 | 4140069               | VDS401F07700 | 7,700       | .3031 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147975               | VDS201F07800 | 4140070               | VDS401F07800 | 7,800       | .3071 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147976               | VDS201F07900 | 4140071               | VDS401F07900 | 7,900       | .3110 | 29     | 41 | 1,3 | 79 | 36 | 8  |
| 4147977               | VDS201F08000 | 4140072               | VDS401F08000 | 8,000       | .3150 | 29     | 41 | 1,4 | 79 | 36 | 8  |
| 4147978               | VDS201F08100 | 4140073               | VDS401F08100 | 8,100       | .3189 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4147979               | VDS201F08200 | 4140074               | VDS401F08200 | 8,200       | .3228 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4147980               | VDS201F08300 | 4140075               | VDS401F08300 | 8,300       | .3268 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4147981               | VDS201F08400 | 4140076               | VDS401F08400 | 8,400       | .3307 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4147982               | VDS201F08500 | 4140077               | VDS401F08500 | 8,500       | .3346 | 35     | 47 | 1,4 | 89 | 40 | 10 |
| 4147983               | VDS201F08600 | 4140078               | VDS401F08600 | 8,600       | .3386 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147984               | VDS201F08700 | 4140079               | VDS401F08700 | 8,700       | .3425 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147985               | VDS201F08800 | 4140080               | VDS401F08800 | 8,800       | .3465 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147986               | VDS201F08900 | 4140081               | VDS401F08900 | 8,900       | .3504 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147987               | VDS201F09000 | 4140082               | VDS401F09000 | 9,000       | .3543 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147988               | VDS201F09100 | 4140083               | VDS401F09100 | 9,100       | .3583 | 35     | 47 | 1,5 | 89 | 40 | 10 |
| 4147989               | VDS201F09200 | 4140084               | VDS401F09200 | 9,200       | .3622 | 35     | 47 | 1,6 | 89 | 40 | 10 |
| 4147990               | VDS201F09300 | 4140085               | VDS401F09300 | 9,300       | .3661 | 35     | 47 | 1,6 | 89 | 40 | 10 |

(continued)

(VDS201F • VDS401F • 3 x D — continued)



● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4147991               | VDS201F09400 | 4140086               | VDS401F09400 | 9,400       | .3701 | 35     | 47 | 1,6 | 89  | 40 | 10 |
| 4147992               | VDS201F09500 | 4140087               | VDS401F09500 | 9,500       | .3740 | 35     | 47 | 1,6 | 89  | 40 | 10 |
| 4147993               | VDS201F09600 | 4140088               | VDS401F09600 | 9,600       | .3780 | 35     | 47 | 1,6 | 89  | 40 | 10 |
| 4147994               | VDS201F09700 | 4140089               | VDS401F09700 | 9,700       | .3819 | 35     | 47 | 1,7 | 89  | 40 | 10 |
| 4147995               | VDS201F09800 | 4140090               | VDS401F09800 | 9,800       | .3858 | 35     | 47 | 1,7 | 89  | 40 | 10 |
| 4147996               | VDS201F09900 | 4140091               | VDS401F09900 | 9,900       | .3898 | 35     | 47 | 1,7 | 89  | 40 | 10 |
| 4148039               | VDS201F10000 | 4140410               | VDS401F10000 | 10,000      | .3937 | 35     | 47 | 1,7 | 89  | 40 | 10 |
| 4148040               | VDS201F10100 | 4140411               | VDS401F10100 | 10,100      | .3976 | 40     | 55 | 1,7 | 102 | 45 | 12 |
| 4148041               | VDS201F10200 | 4140412               | VDS401F10200 | 10,200      | .4016 | 40     | 55 | 1,7 | 102 | 45 | 12 |
| 4148042               | VDS201F10300 | 4140503               | VDS401F10300 | 10,300      | .4055 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148043               | VDS201F10400 | 4140504               | VDS401F10400 | 10,400      | .4094 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148044               | VDS201F10500 | 4140505               | VDS401F10500 | 10,500      | .4134 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148045               | VDS201F10600 | 4140506               | VDS401F10600 | 10,600      | .4173 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148046               | VDS201F10700 | 4140507               | VDS401F10700 | 10,700      | .4213 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148047               | VDS201F10800 | 4140508               | VDS401F10800 | 10,800      | .4252 | 40     | 55 | 1,8 | 102 | 45 | 12 |
| 4148048               | VDS201F10900 | 4140509               | VDS401F10900 | 10,900      | .4291 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4148049               | VDS201F11000 | 4140510               | VDS401F11000 | 11,000      | .4331 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4148050               | VDS201F11100 | 4140511               | VDS401F11100 | 11,100      | .4370 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4148051               | VDS201F11200 | 4140512               | VDS401F11200 | 11,200      | .4409 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4148052               | VDS201F11300 | 4140513               | VDS401F11300 | 11,300      | .4449 | 40     | 55 | 1,9 | 102 | 45 | 12 |
| 4148053               | VDS201F11400 | 4140514               | VDS401F11400 | 11,400      | .4488 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148054               | VDS201F11500 | 4140515               | VDS401F11500 | 11,500      | .4528 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148055               | VDS201F11600 | 4140516               | VDS401F11600 | 11,600      | .4567 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148056               | VDS201F11700 | 4140517               | VDS401F11700 | 11,700      | .4606 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148057               | VDS201F11800 | 4140518               | VDS401F11800 | 11,800      | .4646 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148058               | VDS201F11900 | 4140519               | VDS401F11900 | 11,900      | .4685 | 40     | 55 | 2,0 | 102 | 45 | 12 |
| 4148059               | VDS201F12000 | 4140520               | VDS401F12000 | 12,000      | .4724 | 40     | 55 | 2,1 | 102 | 45 | 12 |
| 4148060               | VDS201F12100 | 4140521               | VDS401F12100 | 12,100      | .4764 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4148061               | VDS201F12200 | 4140522               | VDS401F12200 | 12,200      | .4803 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4148062               | VDS201F12300 | 4140523               | VDS401F12300 | 12,300      | .4843 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4148063               | VDS201F12400 | 4140524               | VDS401F12400 | 12,400      | .4882 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4148064               | VDS201F12500 | 4140525               | VDS401F12500 | 12,500      | .4921 | 43     | 60 | 2,1 | 107 | 45 | 14 |
| 4148065               | VDS201F12600 | 4140526               | VDS401F12600 | 12,600      | .4961 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4148066               | VDS201F12700 | 4140527               | VDS401F12700 | 12,700      | .5000 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4148067               | VDS201F12800 | 4140528               | VDS401F12800 | 12,800      | .5039 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4148068               | VDS201F12900 | 4140529               | VDS401F12900 | 12,900      | .5079 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4148069               | VDS201F13000 | 4140530               | VDS401F13000 | 13,000      | .5118 | 43     | 60 | 2,2 | 107 | 45 | 14 |
| 4148070               | VDS201F13100 | 4140531               | VDS401F13100 | 13,100      | .5157 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4148071               | VDS201F13200 | 4140532               | VDS401F13200 | 13,200      | .5197 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4148072               | VDS201F13300 | 4140533               | VDS401F13300 | 13,300      | .5236 | 43     | 60 | 2,3 | 107 | 45 | 14 |

(continued)

(VDS201F • VDS401F • 3 x D — continued)

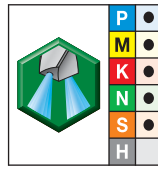
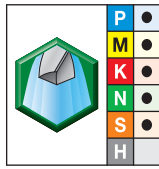


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4148073               | VDS201F13400 | 4140534               | VDS401F13400 | 13,400      | .5276 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4148074               | VDS201F13500 | 4140535               | VDS401F13500 | 13,500      | .5315 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4148075               | VDS201F13600 | 4140536               | VDS401F13600 | 13,600      | .5354 | 43     | 60 | 2,3 | 107 | 45 | 14 |
| 4148076               | VDS201F13700 | 4140537               | VDS401F13700 | 13,700      | .5394 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4148077               | VDS201F13800 | 4140538               | VDS401F13800 | 13,800      | .5433 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4148078               | VDS201F13900 | 4140539               | VDS401F13900 | 13,900      | .5472 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4148079               | VDS201F14000 | 4140540               | VDS401F14000 | 14,000      | .5512 | 43     | 60 | 2,4 | 107 | 45 | 14 |
| 4148080               | VDS201F14100 | 4140541               | VDS401F14100 | 14,100      | .5551 | 45     | 65 | 2,4 | 115 | 48 | 16 |
| 4148081               | VDS201F14200 | 4140542               | VDS401F14200 | 14,200      | .5591 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148082               | VDS201F14300 | 4140543               | VDS401F14300 | 14,300      | .5630 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148083               | VDS201F14400 | 4140544               | VDS401F14400 | 14,400      | .5669 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148084               | VDS201F14500 | 4140545               | VDS401F14500 | 14,500      | .5709 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148085               | VDS201F14600 | 4140546               | VDS401F14600 | 14,600      | .5748 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148086               | VDS201F14700 | 4140547               | VDS401F14700 | 14,700      | .5787 | 45     | 65 | 2,5 | 115 | 48 | 16 |
| 4148087               | VDS201F14800 | 4140548               | VDS401F14800 | 14,800      | .5827 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148088               | VDS201F14900 | 4140549               | VDS401F14900 | 14,900      | .5866 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148089               | VDS201F15000 | 4140550               | VDS401F15000 | 15,000      | .5906 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148090               | VDS201F15100 | 4140551               | VDS401F15100 | 15,100      | .5945 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148091               | VDS201F15200 | 4140552               | VDS401F15200 | 15,200      | .5984 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148092               | VDS201F15300 | 4140553               | VDS401F15300 | 15,300      | .6024 | 45     | 65 | 2,6 | 115 | 48 | 16 |
| 4148093               | VDS201F15400 | 4140554               | VDS401F15400 | 15,400      | .6063 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4148094               | VDS201F15500 | 4140555               | VDS401F15500 | 15,500      | .6102 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4148095               | VDS201F15600 | 4140556               | VDS401F15600 | 15,600      | .6142 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4148096               | VDS201F15700 | 4140557               | VDS401F15700 | 15,700      | .6181 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4148097               | VDS201F15800 | 4140558               | VDS401F15800 | 15,800      | .6220 | 45     | 65 | 2,7 | 115 | 48 | 16 |
| 4148098               | VDS201F15900 | 4140559               | VDS401F15900 | 15,900      | .6260 | 45     | 65 | 2,8 | 115 | 48 | 16 |
| 4148099               | VDS201F16000 | 4140560               | VDS401F16000 | 16,000      | .6299 | 45     | 65 | 2,8 | 115 | 48 | 16 |
| 4148100               | VDS201F16100 | 4140561               | VDS401F16100 | 16,100      | .6339 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4148101               | VDS201F16200 | 4140562               | VDS401F16200 | 16,200      | .6378 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4148102               | VDS201F16300 | 4140563               | VDS401F16300 | 16,300      | .6417 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4148103               | VDS201F16400 | 4140564               | VDS401F16400 | 16,400      | .6457 | 51     | 73 | 2,8 | 123 | 48 | 18 |
| 4148104               | VDS201F16500 | 4140565               | VDS401F16500 | 16,500      | .6496 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148105               | VDS201F16600 | 4140566               | VDS401F16600 | 16,600      | .6535 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148106               | VDS201F16700 | 4140567               | VDS401F16700 | 16,700      | .6575 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148107               | VDS201F16800 | 4140568               | VDS401F16800 | 16,800      | .6614 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148108               | VDS201F16900 | 4140569               | VDS401F16900 | 16,900      | .6654 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148109               | VDS201F17000 | 4140570               | VDS401F17000 | 17,000      | .6693 | 51     | 73 | 2,9 | 123 | 48 | 18 |
| 4148110               | VDS201F17100 | 4140571               | VDS401F17100 | 17,100      | .6732 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4148111               | VDS201F17200 | 4140572               | VDS401F17200 | 17,200      | .6772 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4148112               | VDS201F17300 | 4140573               | VDS401F17300 | 17,300      | .6811 | 51     | 73 | 3,0 | 123 | 48 | 18 |

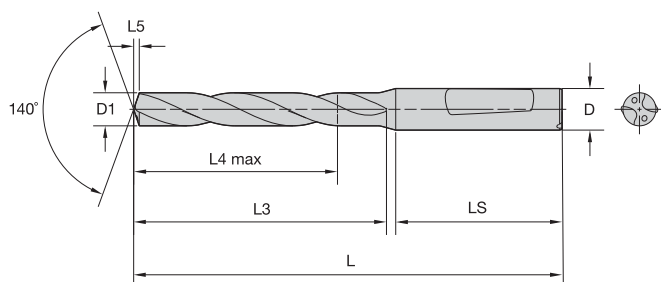
(continued)

(VDS201F • VDS401F • 3 x D — continued)



● first choice  
○ alternate choice

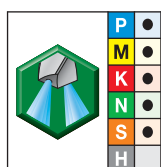
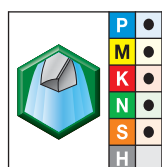
| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4148113               | VDS201F17400 | 4140574               | VDS401F17400 | 17,400      | .6850 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4148114               | VDS201F17500 | 4140575               | VDS401F17500 | 17,500      | .6890 | 51     | 73 | 3,0 | 123 | 48 | 18 |
| 4148115               | VDS201F17600 | 4140576               | VDS401F17600 | 17,600      | .6929 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4148116               | VDS201F17700 | 4140577               | VDS401F17700 | 17,700      | .6969 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4148117               | VDS201F17800 | 4140578               | VDS401F17800 | 17,800      | .7008 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4148118               | VDS201F17900 | 4140579               | VDS401F17900 | 17,900      | .7047 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4148119               | VDS201F18000 | 4140580               | VDS401F18000 | 18,000      | .7087 | 51     | 73 | 3,1 | 123 | 48 | 18 |
| 4148120               | VDS201F18100 | 4140581               | VDS401F18100 | 18,100      | .7126 | 55     | 79 | 3,1 | 131 | 50 | 20 |
| 4148121               | VDS201F18200 | 4140582               | VDS401F18200 | 18,200      | .7165 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148122               | VDS201F18300 | 4140583               | VDS401F18300 | 18,300      | .7205 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148123               | VDS201F18400 | 4140584               | VDS401F18400 | 18,400      | .7244 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148124               | VDS201F18500 | 4140585               | VDS401F18500 | 18,500      | .7283 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148125               | VDS201F18600 | 4140586               | VDS401F18600 | 18,600      | .7323 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148126               | VDS201F18700 | 4140587               | VDS401F18700 | 18,700      | .7362 | 55     | 79 | 3,2 | 131 | 50 | 20 |
| 4148127               | VDS201F18800 | 4140588               | VDS401F18800 | 18,800      | .7402 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4148128               | VDS201F18900 | 4140589               | VDS401F18900 | 18,900      | .7441 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4148129               | VDS201F19000 | 4140590               | VDS401F19000 | 19,000      | .7480 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4148130               | VDS201F19100 | 4140591               | VDS401F19100 | 19,100      | .7520 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4148131               | VDS201F19200 | 4140592               | VDS401F19200 | 19,200      | .7559 | 55     | 79 | 3,3 | 131 | 50 | 20 |
| 4148132               | VDS201F19300 | 4140593               | VDS401F19300 | 19,300      | .7598 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148133               | VDS201F19400 | 4140594               | VDS401F19400 | 19,400      | .7638 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148134               | VDS201F19500 | 4140595               | VDS401F19500 | 19,500      | .7677 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148135               | VDS201F19600 | 4140596               | VDS401F19600 | 19,600      | .7717 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148136               | VDS201F19700 | 4140597               | VDS401F19700 | 19,700      | .7756 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148137               | VDS201F19800 | 4140598               | VDS401F19800 | 19,800      | .7795 | 55     | 79 | 3,4 | 131 | 50 | 20 |
| 4148138               | VDS201F19900 | 4140599               | VDS401F19900 | 19,900      | .7835 | 55     | 79 | 3,5 | 131 | 50 | 20 |
| 4148139               | VDS201F20000 | 4140600               | VDS401F20000 | 20,000      | .7874 | 55     | 79 | 3,5 | 131 | 50 | 20 |



For information on L, L3, and L4 max, see page T143.



### ■ VDS202F • VDS402F • 5 x D



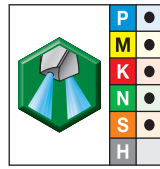
● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |    |    |   |  |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|----|----|---|--|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L  | LS | D |  |
| 4148335               | VDS202F03000 | 4142783               | VDS402F03000 | 3,000       | .1181 | 23     | 28 | 0,5 | 66 | 36 | 6 |  |
| 4148336               | VDS202F03100 | 4142784               | VDS402F03100 | 3,100       | .1220 | 23     | 28 | 0,5 | 66 | 36 | 6 |  |
| 4148337               | VDS202F03200 | 4142785               | VDS402F03200 | 3,200       | .1260 | 23     | 28 | 0,5 | 66 | 36 | 6 |  |
| 4148338               | VDS202F03300 | 4142786               | VDS402F03300 | 3,300       | .1299 | 23     | 28 | 0,5 | 66 | 36 | 6 |  |
| 4148339               | VDS202F03400 | 4142787               | VDS402F03400 | 3,400       | .1339 | 23     | 28 | 0,6 | 66 | 36 | 6 |  |
| 4148340               | VDS202F03500 | 4142788               | VDS402F03500 | 3,500       | .1378 | 23     | 28 | 0,6 | 66 | 36 | 6 |  |
| 4148341               | VDS202F03600 | 4142789               | VDS402F03600 | 3,600       | .1417 | 23     | 28 | 0,6 | 66 | 36 | 6 |  |
| 4148342               | VDS202F03700 | 4142790               | VDS402F03700 | 3,700       | .1457 | 23     | 28 | 0,6 | 66 | 36 | 6 |  |
| 4148413               | VDS202F03800 | 4142791               | VDS402F03800 | 3,800       | .1496 | 29     | 36 | 0,6 | 74 | 36 | 6 |  |
| 4148414               | VDS202F03900 | 4142792               | VDS402F03900 | 3,900       | .1535 | 29     | 36 | 0,6 | 74 | 36 | 6 |  |
| 4148415               | VDS202F04000 | 4142793               | VDS402F04000 | 4,000       | .1575 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148416               | VDS202F04100 | 4142794               | VDS402F04100 | 4,100       | .1614 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148417               | VDS202F04200 | 4142795               | VDS402F04200 | 4,200       | .1654 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148418               | VDS202F04300 | 4142796               | VDS402F04300 | 4,300       | .1693 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148419               | VDS202F04400 | 4142797               | VDS402F04400 | 4,400       | .1732 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148420               | VDS202F04500 | 4142798               | VDS402F04500 | 4,500       | .1772 | 29     | 36 | 0,7 | 74 | 36 | 6 |  |
| 4148421               | VDS202F04600 | 4142799               | VDS402F04600 | 4,600       | .1811 | 29     | 36 | 0,8 | 74 | 36 | 6 |  |
| 4148422               | VDS202F04700 | 4142800               | VDS402F04700 | 4,700       | .1850 | 29     | 36 | 0,8 | 74 | 36 | 6 |  |
| 4148423               | VDS202F04800 | 4142801               | VDS402F04800 | 4,800       | .1890 | 35     | 44 | 0,8 | 82 | 36 | 6 |  |
| 4148424               | VDS202F04900 | 4142802               | VDS402F04900 | 4,900       | .1929 | 35     | 44 | 0,8 | 82 | 36 | 6 |  |
| 4148425               | VDS202F05000 | 4142813               | VDS402F05000 | 5,000       | .1969 | 35     | 44 | 0,8 | 82 | 36 | 6 |  |
| 4148426               | VDS202F05100 | 4142814               | VDS402F05100 | 5,100       | .2008 | 35     | 44 | 0,8 | 82 | 36 | 6 |  |
| 4148427               | VDS202F05200 | 4142815               | VDS402F05200 | 5,200       | .2047 | 35     | 44 | 0,9 | 82 | 36 | 6 |  |
| 4148428               | VDS202F05300 | 4142816               | VDS402F05300 | 5,300       | .2087 | 35     | 44 | 0,9 | 82 | 36 | 6 |  |

(continued)



(VDS202F • VDS402F • 5 x D — continued)



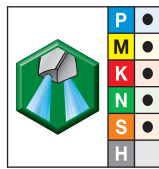
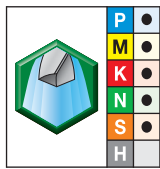
● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4148429               | VDS202F05400 | 4142817               | VDS402F05400 | 5,400       | .2126 | 35     | 44 | 0,9 | 82  | 36 | 6  |
| 4148430               | VDS202F05500 | 4142818               | VDS402F05500 | 5,500       | .2165 | 35     | 44 | 0,9 | 82  | 36 | 6  |
| 4148431               | VDS202F05600 | 4142819               | VDS402F05600 | 5,600       | .2205 | 35     | 44 | 0,9 | 82  | 36 | 6  |
| 4148432               | VDS202F05700 | 4142820               | VDS402F05700 | 5,700       | .2244 | 35     | 44 | 1,0 | 82  | 36 | 6  |
| 4148433               | VDS202F05800 | 4142821               | VDS402F05800 | 5,800       | .2283 | 35     | 44 | 1,0 | 82  | 36 | 6  |
| 4148434               | VDS202F05900 | 4142822               | VDS402F05900 | 5,900       | .2323 | 35     | 44 | 1,0 | 82  | 36 | 6  |
| 4148435               | VDS202F06000 | 4142843               | VDS402F06000 | 6,000       | .2362 | 35     | 44 | 1,0 | 82  | 36 | 6  |
| 4148436               | VDS202F06100 | 4142845               | VDS402F06100 | 6,100       | .2402 | 43     | 53 | 1,0 | 91  | 36 | 8  |
| 4148437               | VDS202F06200 | 4142848               | VDS402F06200 | 6,200       | .2441 | 43     | 53 | 1,0 | 91  | 36 | 8  |
| 4148438               | VDS202F06300 | 4142850               | VDS402F06300 | 6,300       | .2480 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148439               | VDS202F06400 | 4142852               | VDS402F06400 | 6,400       | .2520 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148440               | VDS202F06500 | 4142863               | VDS402F06500 | 6,500       | .2559 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148441               | VDS202F06600 | 4142866               | VDS402F06600 | 6,600       | .2598 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148442               | VDS202F06700 | 4142868               | VDS402F06700 | 6,700       | .2638 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148443               | VDS202F06800 | 4142870               | VDS402F06800 | 6,800       | .2677 | 43     | 53 | 1,1 | 91  | 36 | 8  |
| 4148444               | VDS202F06900 | 4142883               | VDS402F06900 | 6,900       | .2717 | 43     | 53 | 1,2 | 91  | 36 | 8  |
| 4148445               | VDS202F07000 | 4142886               | VDS402F07000 | 7,000       | .2756 | 43     | 53 | 1,2 | 91  | 36 | 8  |
| 4148446               | VDS202F07100 | 4142889               | VDS402F07100 | 7,100       | .2795 | 43     | 53 | 1,2 | 91  | 36 | 8  |
| 4148447               | VDS202F07200 | 4142892               | VDS402F07200 | 7,200       | .2835 | 43     | 53 | 1,2 | 91  | 36 | 8  |
| 4148448               | VDS202F07300 | 4142895               | VDS402F07300 | 7,300       | .2874 | 43     | 53 | 1,2 | 91  | 36 | 8  |
| 4148449               | VDS202F07400 | 4142898               | VDS402F07400 | 7,400       | .2913 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148450               | VDS202F07500 | 4142901               | VDS402F07500 | 7,500       | .2953 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148451               | VDS202F07600 | 4142904               | VDS402F07600 | 7,600       | .2992 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148452               | VDS202F07700 | 4142907               | VDS402F07700 | 7,700       | .3031 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148453               | VDS202F07800 | 4142910               | VDS402F07800 | 7,800       | .3071 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148454               | VDS202F07900 | 4142923               | VDS402F07900 | 7,900       | .3110 | 43     | 53 | 1,3 | 91  | 36 | 8  |
| 4148455               | VDS202F08000 | 4142926               | VDS402F08000 | 8,000       | .3150 | 43     | 53 | 1,4 | 91  | 36 | 8  |
| 4148456               | VDS202F08100 | 4142929               | VDS402F08100 | 8,100       | .3189 | 49     | 61 | 1,4 | 103 | 40 | 10 |
| 4148457               | VDS202F08200 | 4142932               | VDS402F08200 | 8,200       | .3228 | 49     | 61 | 1,4 | 103 | 40 | 10 |
| 4148458               | VDS202F08300 | 4142935               | VDS402F08300 | 8,300       | .3268 | 49     | 61 | 1,4 | 103 | 40 | 10 |
| 4148459               | VDS202F08400 | 4142938               | VDS402F08400 | 8,400       | .3307 | 49     | 61 | 1,4 | 103 | 40 | 10 |
| 4148460               | VDS202F08500 | 4142941               | VDS402F08500 | 8,500       | .3346 | 49     | 61 | 1,4 | 103 | 40 | 10 |
| 4148461               | VDS202F08600 | 4142944               | VDS402F08600 | 8,600       | .3386 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148462               | VDS202F08700 | 4142947               | VDS402F08700 | 8,700       | .3425 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148463               | VDS202F08800 | 4142950               | VDS402F08800 | 8,800       | .3465 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148464               | VDS202F08900 | 4142963               | VDS402F08900 | 8,900       | .3504 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148465               | VDS202F09000 | 4142966               | VDS402F09000 | 9,000       | .3543 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148466               | VDS202F09100 | 4142969               | VDS402F09100 | 9,100       | .3583 | 49     | 61 | 1,5 | 103 | 40 | 10 |
| 4148467               | VDS202F09200 | 4142972               | VDS402F09200 | 9,200       | .3622 | 49     | 61 | 1,6 | 103 | 40 | 10 |
| 4148468               | VDS202F09300 | 4142975               | VDS402F09300 | 9,300       | .3661 | 49     | 61 | 1,6 | 103 | 40 | 10 |

(continued)



(VDS202F • VDS402F • 5 x D — continued)

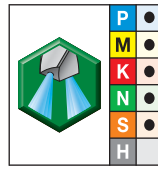
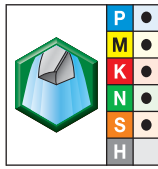


● first choice  
○ alternate choice

| H                     |              | H                     |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |    |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4148469               | VDS202F09400 | 4142978               | VDS402F09400 | 9,400       | .3701 | 49     | 61 | 1,6 | 103 | 40 | 10 |
| 4148470               | VDS202F09500 | 4142980               | VDS402F09500 | 9,500       | .3740 | 49     | 61 | 1,6 | 103 | 40 | 10 |
| 4148471               | VDS202F09600 | 4142982               | VDS402F09600 | 9,600       | .3780 | 49     | 61 | 1,6 | 103 | 40 | 10 |
| 4148472               | VDS202F09700 | 4142993               | VDS402F09700 | 9,700       | .3819 | 49     | 61 | 1,7 | 103 | 40 | 10 |
| 4148473               | VDS202F09800 | 4142995               | VDS402F09800 | 9,800       | .3858 | 49     | 61 | 1,7 | 103 | 40 | 10 |
| 4148474               | VDS202F09900 | 4142998               | VDS402F09900 | 9,900       | .3898 | 49     | 61 | 1,7 | 103 | 40 | 10 |
| 4148405               | VDS202F10000 | 4143569               | VDS402F10000 | 10,000      | .3937 | 49     | 61 | 1,7 | 103 | 40 | 10 |
| 4148406               | VDS202F10100 | 4143570               | VDS402F10100 | 10,100      | .3976 | 56     | 71 | 1,7 | 118 | 45 | 12 |
| 4148407               | VDS202F10200 | 4143571               | VDS402F10200 | 10,200      | .4016 | 56     | 71 | 1,7 | 118 | 45 | 12 |
| 4148408               | VDS202F10300 | 4143572               | VDS402F10300 | 10,300      | .4055 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148409               | VDS202F10400 | 4143583               | VDS402F10400 | 10,400      | .4094 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148410               | VDS202F10500 | 4143584               | VDS402F10500 | 10,500      | .4134 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148411               | VDS202F10600 | 4143585               | VDS402F10600 | 10,600      | .4173 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148412               | VDS202F10700 | 4143586               | VDS402F10700 | 10,700      | .4213 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148483               | VDS202F10800 | 4143587               | VDS402F10800 | 10,800      | .4252 | 56     | 71 | 1,8 | 118 | 45 | 12 |
| 4148484               | VDS202F10900 | 4143588               | VDS402F10900 | 10,900      | .4291 | 56     | 71 | 1,9 | 118 | 45 | 12 |
| 4148485               | VDS202F11000 | 4143589               | VDS402F11000 | 11,000      | .4331 | 56     | 71 | 1,9 | 118 | 45 | 12 |
| 4148486               | VDS202F11100 | 4143590               | VDS402F11100 | 11,100      | .4370 | 56     | 71 | 1,9 | 118 | 45 | 12 |
| 4148487               | VDS202F11200 | 4143591               | VDS402F11200 | 11,200      | .4409 | 56     | 71 | 1,9 | 118 | 45 | 12 |
| 4148488               | VDS202F11300 | 4143592               | VDS402F11300 | 11,300      | .4449 | 56     | 71 | 1,9 | 118 | 45 | 12 |
| 4148489               | VDS202F11400 | 4143593               | VDS402F11400 | 11,400      | .4488 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148490               | VDS202F11500 | 4143594               | VDS402F11500 | 11,500      | .4528 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148491               | VDS202F11600 | 4143595               | VDS402F11600 | 11,600      | .4567 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148492               | VDS202F11700 | 4143596               | VDS402F11700 | 11,700      | .4606 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148493               | VDS202F11800 | 4143597               | VDS402F11800 | 11,800      | .4646 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148494               | VDS202F11900 | 4143598               | VDS402F11900 | 11,900      | .4685 | 56     | 71 | 2,0 | 118 | 45 | 12 |
| 4148495               | VDS202F12000 | 4143599               | VDS402F12000 | 12,000      | .4724 | 56     | 71 | 2,1 | 118 | 45 | 12 |
| 4148496               | VDS202F12100 | 4143600               | VDS402F12100 | 12,100      | .4764 | 60     | 77 | 2,1 | 124 | 45 | 14 |
| 4148497               | VDS202F12200 | 4143601               | VDS402F12200 | 12,200      | .4803 | 60     | 77 | 2,1 | 124 | 45 | 14 |
| 4148498               | VDS202F12300 | 4143602               | VDS402F12300 | 12,300      | .4843 | 60     | 77 | 2,1 | 124 | 45 | 14 |
| 4148499               | VDS202F12400 | 4143603               | VDS402F12400 | 12,400      | .4882 | 60     | 77 | 2,1 | 124 | 45 | 14 |
| 4148500               | VDS202F12500 | 4143604               | VDS402F12500 | 12,500      | .4921 | 60     | 77 | 2,1 | 124 | 45 | 14 |
| 4148501               | VDS202F12600 | 4143605               | VDS402F12600 | 12,600      | .4961 | 60     | 77 | 2,2 | 124 | 45 | 14 |
| 4148502               | VDS202F12700 | 4143606               | VDS402F12700 | 12,700      | .5000 | 60     | 77 | 2,2 | 124 | 45 | 14 |
| 4148503               | VDS202F12800 | 4143607               | VDS402F12800 | 12,800      | .5039 | 60     | 77 | 2,2 | 124 | 45 | 14 |
| 4148504               | VDS202F12900 | 4143608               | VDS402F12900 | 12,900      | .5079 | 60     | 77 | 2,2 | 124 | 45 | 14 |
| 4148505               | VDS202F13000 | 4143609               | VDS402F13000 | 13,000      | .5118 | 60     | 77 | 2,2 | 124 | 45 | 14 |
| 4148506               | VDS202F13100 | 4143610               | VDS402F13100 | 13,100      | .5157 | 60     | 77 | 2,3 | 124 | 45 | 14 |
| 4148507               | VDS202F13200 | 4143611               | VDS402F13200 | 13,200      | .5197 | 60     | 77 | 2,3 | 124 | 45 | 14 |
| 4148508               | VDS202F13300 | 4143612               | VDS402F13300 | 13,300      | .5236 | 60     | 77 | 2,3 | 124 | 45 | 14 |

(continued)

(VDS202F • VDS402F • 5 x D — continued)

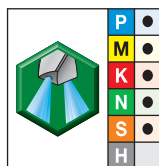


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |       |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|----|-----|-----|-------|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS D  |
| 4148509               | VDS202F13400 | 4143613               | VDS402F13400 | 13,400      | .5276 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148510               | VDS202F13500 | 4143614               | VDS402F13500 | 13,500      | .5315 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148511               | VDS202F13600 | 4143615               | VDS402F13600 | 13,600      | .5354 | 60     | 77 | 2,3 | 124 | 45 14 |
| 4148512               | VDS202F13700 | 4143616               | VDS402F13700 | 13,700      | .5394 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148513               | VDS202F13800 | 4143617               | VDS402F13800 | 13,800      | .5433 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148514               | VDS202F13900 | 4143618               | VDS402F13900 | 13,900      | .5472 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148515               | VDS202F14000 | 4143619               | VDS402F14000 | 14,000      | .5512 | 60     | 77 | 2,4 | 124 | 45 14 |
| 4148516               | VDS202F14100 | 4143620               | VDS402F14100 | 14,100      | .5551 | 63     | 83 | 2,4 | 133 | 48 16 |
| 4148517               | VDS202F14200 | 4143621               | VDS402F14200 | 14,200      | .5591 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148518               | VDS202F14300 | 4143622               | VDS402F14300 | 14,300      | .5630 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148519               | VDS202F14400 | 4143623               | VDS402F14400 | 14,400      | .5669 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148520               | VDS202F14500 | 4143624               | VDS402F14500 | 14,500      | .5709 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148521               | VDS202F14600 | 4143625               | VDS402F14600 | 14,600      | .5748 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148522               | VDS202F14700 | 4143626               | VDS402F14700 | 14,700      | .5787 | 63     | 83 | 2,5 | 133 | 48 16 |
| 4148523               | VDS202F14800 | 4143627               | VDS402F14800 | 14,800      | .5827 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148524               | VDS202F14900 | 4143628               | VDS402F14900 | 14,900      | .5866 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148525               | VDS202F15000 | 4143629               | VDS402F15000 | 15,000      | .5906 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148526               | VDS202F15100 | 4143630               | VDS402F15100 | 15,100      | .5945 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148527               | VDS202F15200 | 4143631               | VDS402F15200 | 15,200      | .5984 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148528               | VDS202F15300 | 4143632               | VDS402F15300 | 15,300      | .6024 | 63     | 83 | 2,6 | 133 | 48 16 |
| 4148529               | VDS202F15400 | 4143633               | VDS402F15400 | 15,400      | .6063 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148530               | VDS202F15500 | 4143634               | VDS402F15500 | 15,500      | .6102 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148531               | VDS202F15600 | 4143635               | VDS402F15600 | 15,600      | .6142 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148532               | VDS202F15700 | 4143636               | VDS402F15700 | 15,700      | .6181 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148533               | VDS202F15800 | 4143637               | VDS402F15800 | 15,800      | .6220 | 63     | 83 | 2,7 | 133 | 48 16 |
| 4148534               | VDS202F15900 | 4143638               | VDS402F15900 | 15,900      | .6260 | 63     | 83 | 2,8 | 133 | 48 16 |
| 4148535               | VDS202F16000 | 4143639               | VDS402F16000 | 16,000      | .6299 | 63     | 83 | 2,8 | 133 | 48 16 |
| 4148536               | VDS202F16100 | 4143640               | VDS402F16100 | 16,100      | .6339 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148537               | VDS202F16200 | 4143641               | VDS402F16200 | 16,200      | .6378 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148538               | VDS202F16300 | 4143642               | VDS402F16300 | 16,300      | .6417 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148539               | VDS202F16400 | 4143643               | VDS402F16400 | 16,400      | .6457 | 71     | 93 | 2,8 | 143 | 48 18 |
| 4148540               | VDS202F16500 | 4143644               | VDS402F16500 | 16,500      | .6496 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148541               | VDS202F16600 | 4143645               | VDS402F16600 | 16,600      | .6535 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148542               | VDS202F16700 | 4143646               | VDS402F16700 | 16,700      | .6575 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148543               | VDS202F16800 | 4143647               | VDS402F16800 | 16,800      | .6614 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148544               | VDS202F16900 | 4143648               | VDS402F16900 | 16,900      | .6654 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148545               | VDS202F17000 | 4143649               | VDS402F17000 | 17,000      | .6693 | 71     | 93 | 2,9 | 143 | 48 18 |
| 4148546               | VDS202F17100 | 4143650               | VDS402F17100 | 17,100      | .6732 | 71     | 93 | 3,0 | 143 | 48 18 |
| 4148547               | VDS202F17200 | 4143651               | VDS402F17200 | 17,200      | .6772 | 71     | 93 | 3,0 | 143 | 48 18 |
| 4148548               | VDS202F17300 | 4143652               | VDS402F17300 | 17,300      | .6811 | 71     | 93 | 3,0 | 143 | 48 18 |

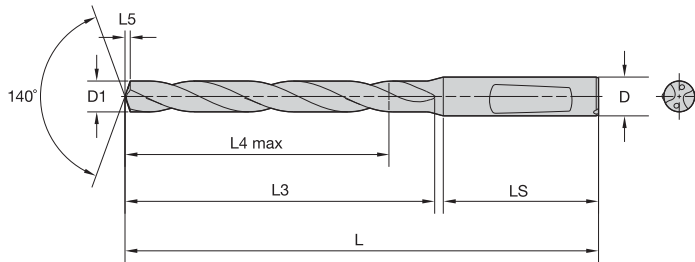
(continued)

(VDS202F • VDS402F • 5 x D — continued)



- first choice  
○ alternate choice

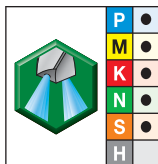
| H                     |              | H                     |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| grade WU25PD<br>TiAlN |              | grade WU25PD<br>TiAlN |              |             |       |        |     |     |     |    |    |
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4148549               | VDS202F17400 | 4143653               | VDS402F17400 | 17,400      | .6850 | 71     | 93  | 3,0 | 143 | 48 | 18 |
| 4148550               | VDS202F17500 | 4143654               | VDS402F17500 | 17,500      | .6890 | 71     | 93  | 3,0 | 143 | 48 | 18 |
| 4148551               | VDS202F17600 | 4143655               | VDS402F17600 | 17,600      | .6929 | 71     | 93  | 3,1 | 143 | 48 | 18 |
| 4148552               | VDS202F17700 | 4143656               | VDS402F17700 | 17,700      | .6969 | 71     | 93  | 3,1 | 143 | 48 | 18 |
| 4148553               | VDS202F17800 | 4143657               | VDS402F17800 | 17,800      | .7008 | 71     | 93  | 3,1 | 143 | 48 | 18 |
| 4148554               | VDS202F17900 | 4143658               | VDS402F17900 | 17,900      | .7047 | 71     | 93  | 3,1 | 143 | 48 | 18 |
| 4148555               | VDS202F18000 | 4143659               | VDS402F18000 | 18,000      | .7087 | 71     | 93  | 3,1 | 143 | 48 | 18 |
| 4148556               | VDS202F18100 | 4143660               | VDS402F18100 | 18,100      | .7126 | 77     | 101 | 3,1 | 153 | 50 | 20 |
| 4148557               | VDS202F18200 | 4143661               | VDS402F18200 | 18,200      | .7165 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148558               | VDS202F18300 | 4143662               | VDS402F18300 | 18,300      | .7205 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148559               | VDS202F18400 | 4143663               | VDS402F18400 | 18,400      | .7244 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148560               | VDS202F18500 | 4143664               | VDS402F18500 | 18,500      | .7283 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148561               | VDS202F18600 | 4143665               | VDS402F18600 | 18,600      | .7323 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148562               | VDS202F18700 | 4143666               | VDS402F18700 | 18,700      | .7362 | 77     | 101 | 3,2 | 153 | 50 | 20 |
| 4148563               | VDS202F18800 | 4143667               | VDS402F18800 | 18,800      | .7402 | 77     | 101 | 3,3 | 153 | 50 | 20 |
| 4148564               | VDS202F18900 | 4143668               | VDS402F18900 | 18,900      | .7441 | 77     | 101 | 3,3 | 153 | 50 | 20 |
| 4148565               | VDS202F19000 | 4143669               | VDS402F19000 | 19,000      | .7480 | 77     | 101 | 3,3 | 153 | 50 | 20 |
| 4148566               | VDS202F19100 | 4143670               | VDS402F19100 | 19,100      | .7520 | 77     | 101 | 3,3 | 153 | 50 | 20 |
| 4148567               | VDS202F19200 | 4143671               | VDS402F19200 | 19,200      | .7559 | 77     | 101 | 3,3 | 153 | 50 | 20 |
| 4148568               | VDS202F19300 | 4143672               | VDS402F19300 | 19,300      | .7598 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148569               | VDS202F19400 | 4143673               | VDS402F19400 | 19,400      | .7638 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148570               | VDS202F19500 | 4143674               | VDS402F19500 | 19,500      | .7677 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148571               | VDS202F19600 | 4143675               | VDS402F19600 | 19,600      | .7717 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148572               | VDS202F19700 | 4143676               | VDS402F19700 | 19,700      | .7756 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148573               | VDS202F19800 | 4143677               | VDS402F19800 | 19,800      | .7795 | 77     | 101 | 3,4 | 153 | 50 | 20 |
| 4148574               | VDS202F19900 | 4143678               | VDS402F19900 | 19,900      | .7835 | 77     | 101 | 3,5 | 153 | 50 | 20 |
| 4148575               | VDS202F20000 | 4143679               | VDS402F20000 | 20,000      | .7874 | 77     | 101 | 3,5 | 153 | 50 | 20 |



For information on L, L3, and L4 max, see page T143.



## ■ VDS403F • 8 x D



grade WU25PD  
TiAlN

D1 diameter

● first choice  
○ alternate choice

| order # | catalogue #  | mm    | in    | L4 max | L3 | L5  | L  | LS | D |
|---------|--------------|-------|-------|--------|----|-----|----|----|---|
| 4144208 | VDS403F03000 | 3,000 | .1181 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4144210 | VDS403F03100 | 3,100 | .1220 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4144243 | VDS403F03200 | 3,200 | .1260 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4144245 | VDS403F03300 | 3,300 | .1299 | 33     | 40 | 0,5 | 78 | 36 | 6 |
| 4144247 | VDS403F03400 | 3,400 | .1339 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4144249 | VDS403F03500 | 3,500 | .1378 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4144251 | VDS403F03600 | 3,600 | .1417 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4144253 | VDS403F03700 | 3,700 | .1457 | 33     | 40 | 0,6 | 78 | 36 | 6 |
| 4144255 | VDS403F03800 | 3,800 | .1496 | 41     | 49 | 0,6 | 87 | 36 | 6 |
| 4144257 | VDS403F03900 | 3,900 | .1535 | 41     | 49 | 0,6 | 87 | 36 | 6 |
| 4144259 | VDS403F04000 | 4,000 | .1575 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144261 | VDS403F04100 | 4,100 | .1614 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144273 | VDS403F04200 | 4,200 | .1654 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144274 | VDS403F04300 | 4,300 | .1693 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144276 | VDS403F04400 | 4,400 | .1732 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144278 | VDS403F04500 | 4,500 | .1772 | 41     | 49 | 0,7 | 87 | 36 | 6 |
| 4144280 | VDS403F04600 | 4,600 | .1811 | 41     | 49 | 0,8 | 87 | 36 | 6 |
| 4144282 | VDS403F04700 | 4,700 | .1850 | 41     | 49 | 0,8 | 87 | 36 | 6 |
| 4144284 | VDS403F04800 | 4,800 | .1890 | 48     | 56 | 0,8 | 94 | 36 | 6 |
| 4144286 | VDS403F04900 | 4,900 | .1929 | 48     | 56 | 0,8 | 94 | 36 | 6 |
| 4144288 | VDS403F05000 | 5,000 | .1969 | 48     | 56 | 0,8 | 94 | 36 | 6 |
| 4144290 | VDS403F05100 | 5,100 | .2008 | 48     | 56 | 0,8 | 94 | 36 | 6 |
| 4144292 | VDS403F05200 | 5,200 | .2047 | 48     | 56 | 0,9 | 94 | 36 | 6 |
| 4144304 | VDS403F05300 | 5,300 | .2087 | 48     | 56 | 0,9 | 94 | 36 | 6 |

(continued)

(VDS403F • 8 x D — continued)



- first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |    |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3 | L5  | L   | LS | D  |
| 4144306               | VDS403F05400 | 5,400       | .2126 | 48     | 56 | 0,9 | 94  | 36 | 6  |
| 4144307               | VDS403F05500 | 5,500       | .2165 | 48     | 56 | 0,9 | 94  | 36 | 6  |
| 4144308               | VDS403F05600 | 5,600       | .2205 | 48     | 56 | 0,9 | 94  | 36 | 6  |
| 4144309               | VDS403F05700 | 5,700       | .2244 | 48     | 56 | 1,0 | 94  | 36 | 6  |
| 4144310               | VDS403F05800 | 5,800       | .2283 | 48     | 56 | 1,0 | 94  | 36 | 6  |
| 4144311               | VDS403F05900 | 5,900       | .2323 | 48     | 56 | 1,0 | 94  | 36 | 6  |
| 4144312               | VDS403F06000 | 6,000       | .2362 | 48     | 56 | 1,0 | 94  | 36 | 6  |
| 4144313               | VDS403F06100 | 6,100       | .2402 | 57     | 67 | 1,0 | 105 | 36 | 8  |
| 4144314               | VDS403F06200 | 6,200       | .2441 | 57     | 67 | 1,0 | 105 | 36 | 8  |
| 4144315               | VDS403F06300 | 6,300       | .2480 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144316               | VDS403F06400 | 6,400       | .2520 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144317               | VDS403F06500 | 6,500       | .2559 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144318               | VDS403F06600 | 6,600       | .2598 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144319               | VDS403F06700 | 6,700       | .2638 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144320               | VDS403F06800 | 6,800       | .2677 | 57     | 67 | 1,1 | 105 | 36 | 8  |
| 4144321               | VDS403F06900 | 6,900       | .2717 | 57     | 67 | 1,2 | 105 | 36 | 8  |
| 4144322               | VDS403F07000 | 7,000       | .2756 | 57     | 67 | 1,2 | 105 | 36 | 8  |
| 4144343               | VDS403F07100 | 7,100       | .2795 | 61     | 72 | 1,2 | 110 | 36 | 8  |
| 4144344               | VDS403F07200 | 7,200       | .2835 | 61     | 72 | 1,2 | 110 | 36 | 8  |
| 4144345               | VDS403F07300 | 7,300       | .2874 | 61     | 72 | 1,2 | 110 | 36 | 8  |
| 4144346               | VDS403F07400 | 7,400       | .2913 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144347               | VDS403F07500 | 7,500       | .2953 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144348               | VDS403F07600 | 7,600       | .2992 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144349               | VDS403F07700 | 7,700       | .3031 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144350               | VDS403F07800 | 7,800       | .3071 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144351               | VDS403F07900 | 7,900       | .3110 | 61     | 72 | 1,3 | 110 | 36 | 8  |
| 4144352               | VDS403F08000 | 8,000       | .3150 | 61     | 72 | 1,4 | 110 | 36 | 8  |
| 4144363               | VDS403F08100 | 8,100       | .3189 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4144364               | VDS403F08200 | 8,200       | .3228 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4144365               | VDS403F08300 | 8,300       | .3268 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4144366               | VDS403F08400 | 8,400       | .3307 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4144367               | VDS403F08500 | 8,500       | .3346 | 68     | 80 | 1,4 | 122 | 40 | 10 |
| 4144368               | VDS403F08600 | 8,600       | .3386 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144369               | VDS403F08700 | 8,700       | .3425 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144370               | VDS403F08800 | 8,800       | .3465 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144371               | VDS403F08900 | 8,900       | .3504 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144372               | VDS403F09000 | 9,000       | .3543 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144373               | VDS403F09100 | 9,100       | .3583 | 68     | 80 | 1,5 | 122 | 40 | 10 |
| 4144374               | VDS403F09200 | 9,200       | .3622 | 68     | 80 | 1,6 | 122 | 40 | 10 |
| 4144375               | VDS403F09300 | 9,300       | .3661 | 68     | 80 | 1,6 | 122 | 40 | 10 |

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(VDS403F • 8 x D — continued)

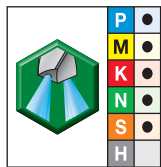


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4144376               | VDS403F09400 | 9,400       | .3701 | 68     | 80  | 1,6 | 122 | 40 | 10 |
| 4144377               | VDS403F09500 | 9,500       | .3740 | 68     | 80  | 1,6 | 122 | 40 | 10 |
| 4144378               | VDS403F09600 | 9,600       | .3780 | 68     | 80  | 1,6 | 122 | 40 | 10 |
| 4144379               | VDS403F09700 | 9,700       | .3819 | 68     | 80  | 1,7 | 122 | 40 | 10 |
| 4144380               | VDS403F09800 | 9,800       | .3858 | 68     | 80  | 1,7 | 122 | 40 | 10 |
| 4144381               | VDS403F09900 | 9,900       | .3898 | 68     | 80  | 1,7 | 122 | 40 | 10 |
| 4144207               | VDS403F10000 | 10,000      | .3937 | 68     | 80  | 1,7 | 122 | 40 | 10 |
| 4143888               | VDS403F10100 | 10,100      | .3976 | 79     | 94  | 1,7 | 141 | 45 | 12 |
| 4143889               | VDS403F10200 | 10,200      | .4016 | 79     | 94  | 1,7 | 141 | 45 | 12 |
| 4143890               | VDS403F10300 | 10,300      | .4055 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143891               | VDS403F10400 | 10,400      | .4094 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4143892               | VDS403F10500 | 10,500      | .4134 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4144223               | VDS403F10600 | 10,600      | .4173 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4144224               | VDS403F10700 | 10,700      | .4213 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4144225               | VDS403F10800 | 10,800      | .4252 | 79     | 94  | 1,8 | 141 | 45 | 12 |
| 4144226               | VDS403F10900 | 10,900      | .4291 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4144227               | VDS403F11000 | 11,000      | .4331 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4144228               | VDS403F11100 | 11,100      | .4370 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4144229               | VDS403F11200 | 11,200      | .4409 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4144230               | VDS403F11300 | 11,300      | .4449 | 79     | 94  | 1,9 | 141 | 45 | 12 |
| 4144231               | VDS403F11400 | 11,400      | .4488 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144232               | VDS403F11500 | 11,500      | .4528 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144233               | VDS403F11600 | 11,600      | .4567 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144234               | VDS403F11700 | 11,700      | .4606 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144235               | VDS403F11800 | 11,800      | .4646 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144236               | VDS403F11900 | 11,900      | .4685 | 79     | 94  | 2,0 | 141 | 45 | 12 |
| 4144237               | VDS403F12000 | 12,000      | .4724 | 79     | 94  | 2,1 | 141 | 45 | 12 |
| 4144238               | VDS403F12100 | 12,100      | .4764 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4144239               | VDS403F12200 | 12,200      | .4803 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4144240               | VDS403F12300 | 12,300      | .4843 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4144241               | VDS403F12400 | 12,400      | .4882 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4144242               | VDS403F12500 | 12,500      | .4921 | 91     | 108 | 2,1 | 155 | 45 | 14 |
| 4144263               | VDS403F12600 | 12,600      | .4961 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4144264               | VDS403F12700 | 12,700      | .5000 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4144265               | VDS403F12800 | 12,800      | .5039 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4144266               | VDS403F12900 | 12,900      | .5079 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4144267               | VDS403F13000 | 13,000      | .5118 | 91     | 108 | 2,2 | 155 | 45 | 14 |
| 4144268               | VDS403F13100 | 13,100      | .5157 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4144269               | VDS403F13200 | 13,200      | .5197 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4144270               | VDS403F13300 | 13,300      | .5236 | 91     | 108 | 2,3 | 155 | 45 | 14 |

(continued)

(VDS403F • 8 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4144271               | VDS403F13400 | 13,400      | .5276 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4144272               | VDS403F13500 | 13,500      | .5315 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4144293               | VDS403F13600 | 13,600      | .5354 | 91     | 108 | 2,3 | 155 | 45 | 14 |
| 4144294               | VDS403F13700 | 13,700      | .5394 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4144295               | VDS403F13800 | 13,800      | .5433 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4144296               | VDS403F13900 | 13,900      | .5472 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4144297               | VDS403F14000 | 14,000      | .5512 | 91     | 108 | 2,4 | 155 | 45 | 14 |
| 4144298               | VDS403F14100 | 14,100      | .5551 | 101    | 121 | 2,4 | 171 | 48 | 16 |
| 4144299               | VDS403F14200 | 14,200      | .5591 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144300               | VDS403F14300 | 14,300      | .5630 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144301               | VDS403F14400 | 14,400      | .5669 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144302               | VDS403F14500 | 14,500      | .5709 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144323               | VDS403F14600 | 14,600      | .5748 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144324               | VDS403F14700 | 14,700      | .5787 | 101    | 121 | 2,5 | 171 | 48 | 16 |
| 4144325               | VDS403F14800 | 14,800      | .5827 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144326               | VDS403F14900 | 14,900      | .5866 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144327               | VDS403F15000 | 15,000      | .5906 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144328               | VDS403F15100 | 15,100      | .5945 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144329               | VDS403F15200 | 15,200      | .5984 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144330               | VDS403F15300 | 15,300      | .6024 | 101    | 121 | 2,6 | 171 | 48 | 16 |
| 4144331               | VDS403F15400 | 15,400      | .6063 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4144332               | VDS403F15500 | 15,500      | .6102 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4144333               | VDS403F15600 | 15,600      | .6142 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4144334               | VDS403F15700 | 15,700      | .6181 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4144335               | VDS403F15800 | 15,800      | .6220 | 101    | 121 | 2,7 | 171 | 48 | 16 |
| 4144336               | VDS403F15900 | 15,900      | .6260 | 101    | 121 | 2,8 | 171 | 48 | 16 |
| 4144337               | VDS403F16000 | 16,000      | .6299 | 101    | 121 | 2,8 | 171 | 48 | 16 |
| 4144338               | VDS403F16100 | 16,100      | .6339 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4144339               | VDS403F16200 | 16,200      | .6378 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4144340               | VDS403F16300 | 16,300      | .6417 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4144341               | VDS403F16400 | 16,400      | .6457 | 113    | 135 | 2,8 | 185 | 48 | 18 |
| 4144342               | VDS403F16500 | 16,500      | .6496 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144353               | VDS403F16600 | 16,600      | .6535 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144354               | VDS403F16700 | 16,700      | .6575 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144355               | VDS403F16800 | 16,800      | .6614 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144356               | VDS403F16900 | 16,900      | .6654 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144357               | VDS403F17000 | 17,000      | .6693 | 113    | 135 | 2,9 | 185 | 48 | 18 |
| 4144358               | VDS403F17100 | 17,100      | .6732 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4144359               | VDS403F17200 | 17,200      | .6772 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4144360               | VDS403F17300 | 17,300      | .6811 | 113    | 135 | 3,0 | 185 | 48 | 18 |

(continued)



(VDS403F • 8 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |        |     |     |     |    |    |
|-----------------------|--------------|-------------|-------|--------|-----|-----|-----|----|----|
| order #               | catalogue #  | mm          | in    | L4 max | L3  | L5  | L   | LS | D  |
| 4144361               | VDS403F17400 | 17,400      | .6850 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4144362               | VDS403F17500 | 17,500      | .6890 | 113    | 135 | 3,0 | 185 | 48 | 18 |
| 4144383               | VDS403F17600 | 17,600      | .6929 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144384               | VDS403F17700 | 17,700      | .6969 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144385               | VDS403F17800 | 17,800      | .7008 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144386               | VDS403F17900 | 17,900      | .7047 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144387               | VDS403F18000 | 18,000      | .7087 | 113    | 135 | 3,1 | 185 | 48 | 18 |
| 4144388               | VDS403F18100 | 18,100      | .7126 | 124    | 148 | 3,1 | 200 | 50 | 20 |
| 4144389               | VDS403F18200 | 18,200      | .7165 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144390               | VDS403F18300 | 18,300      | .7205 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144391               | VDS403F18400 | 18,400      | .7244 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144392               | VDS403F18500 | 18,500      | .7283 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144393               | VDS403F18600 | 18,600      | .7323 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144394               | VDS403F18700 | 18,700      | .7362 | 124    | 148 | 3,2 | 200 | 50 | 20 |
| 4144395               | VDS403F18800 | 18,800      | .7402 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144396               | VDS403F18900 | 18,900      | .7441 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144397               | VDS403F19000 | 19,000      | .7480 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144398               | VDS403F19100 | 19,100      | .7520 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144399               | VDS403F19200 | 19,200      | .7559 | 124    | 148 | 3,3 | 200 | 50 | 20 |
| 4144400               | VDS403F19300 | 19,300      | .7598 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144401               | VDS403F19400 | 19,400      | .7638 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144402               | VDS403F19500 | 19,500      | .7677 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144403               | VDS403F19600 | 19,600      | .7717 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144404               | VDS403F19700 | 19,700      | .7756 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144405               | VDS403F19800 | 19,800      | .7795 | 124    | 148 | 3,4 | 200 | 50 | 20 |
| 4144406               | VDS403F19900 | 19,900      | .7835 | 124    | 148 | 3,5 | 200 | 50 | 20 |
| 4144407               | VDS403F20000 | 20,000      | .7874 | 124    | 148 | 3,5 | 200 | 50 | 20 |

## ■ VariDrill • VDS2\_ Series • WU25PD™ • Flood Coolant • Metric

| Material Group |               |  |   |     |  |           |           |           |           |           |           |           |           |           |           |
|----------------|---------------|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |               | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |           |           |
|                |               | min                                                                               | – | max | Tool Diameter<br>(mm)                                                              | 1,0       | 2,0       | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1             | 60                                                                                | – | 100 | mm/r                                                                               | 0,04–0,09 | 0,05–0,12 | 0,07–0,14 | 0,08–0,16 | 0,11–0,22 | 0,13–0,26 | 0,15–0,31 | 0,18–0,35 | 0,22–0,42 | 0,28–0,54 |
|                | 2, 3, 4, 6, 7 | 50                                                                                | – | 90  | mm/r                                                                               | 0,05–0,10 | 0,06–0,13 | 0,08–0,15 | 0,09–0,17 | 0,13–0,23 | 0,15–0,28 | 0,19–0,33 | 0,22–0,38 | 0,26–0,47 | 0,34–0,59 |
|                | 5, 9, 10, 11  | 50                                                                                | – | 100 | mm/r                                                                               | 0,05–0,10 | 0,06–0,13 | 0,07–0,15 | 0,08–0,17 | 0,12–0,23 | 0,14–0,28 | 0,17–0,33 | 0,19–0,38 | 0,23–0,47 | 0,29–0,59 |
|                | 12, 13        | 30                                                                                | – | 60  | mm/r                                                                               | 0,03–0,05 | 0,04–0,06 | 0,05–0,08 | 0,06–0,10 | 0,08–0,14 | 0,10–0,18 | 0,13–0,22 | 0,14–0,24 | 0,18–0,32 | 0,23–0,41 |
| M              | 14.1          | 30                                                                                | – | 50  | mm/r                                                                               | 0,02–0,05 | 0,03–0,06 | 0,04–0,07 | 0,05–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
|                | 14.3          | 40                                                                                | – | 60  | mm/r                                                                               | 0,02–0,06 | 0,03–0,07 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,14 | 0,10–0,16 | 0,12–0,18 | 0,14–0,20 | 0,16–0,22 |
|                | 14.2, 14.4    | 30                                                                                | – | 50  | mm/r                                                                               | 0,02–0,05 | 0,03–0,06 | 0,04–0,07 | 0,06–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
| K              | 15, 16        | 70                                                                                | – | 150 | mm/r                                                                               | 0,06–0,13 | 0,07–0,14 | 0,09–0,18 | 0,10–0,19 | 0,13–0,25 | 0,16–0,30 | 0,18–0,35 | 0,20–0,39 | 0,25–0,48 | 0,30–0,59 |
|                | 17, 18, 19    | 90                                                                                | – | 120 | mm/r                                                                               | 0,08–0,11 | 0,09–0,12 | 0,10–0,13 | 0,10–0,15 | 0,13–0,20 | 0,16–0,25 | 0,18–0,29 | 0,20–0,32 | 0,25–0,38 | 0,30–0,48 |
|                | 20            | 80                                                                                | – | 120 | mm/r                                                                               | 0,04–0,10 | 0,06–0,12 | 0,06–0,14 | 0,07–0,15 | 0,10–0,20 | 0,11–0,24 | 0,14–0,28 | 0,15–0,32 | 0,19–0,38 | 0,24–0,48 |
| N              | 21            | 90                                                                                | – | 270 | mm/r                                                                               | 0,05–0,12 | 0,06–0,13 | 0,08–0,14 | 0,10–0,16 | 0,12–0,20 | 0,16–0,24 | 0,20–0,28 | 0,24–0,32 | 0,28–0,40 | 0,32–0,48 |
|                | 22, 23, 24    | 90                                                                                | – | 270 | mm/r                                                                               | 0,04–0,08 | 0,06–0,12 | 0,08–0,16 | 0,10–0,20 | 0,12–0,24 | 0,16–0,28 | 0,20–0,32 | 0,24–0,36 | 0,28–0,44 | 0,32–0,52 |
|                | 25            | 90                                                                                | – | 225 | mm/r                                                                               | 0,10–0,13 | 0,11–0,14 | 0,12–0,14 | 0,13–0,16 | 0,14–0,20 | 0,16–0,24 | 0,20–0,28 | 0,24–0,32 | 0,28–0,40 | 0,32–0,44 |
|                | 26, 27, 28    | 90                                                                                | – | 270 | mm/r                                                                               | 0,04–0,08 | 0,06–0,12 | 0,08–0,16 | 0,10–0,20 | 0,12–0,24 | 0,16–0,28 | 0,20–0,32 | 0,24–0,36 | 0,28–0,40 | 0,32–0,48 |
| S              | 31, 32        | 20                                                                                | – | 30  | mm/r                                                                               | 0,01–0,04 | 0,02–0,05 | 0,03–0,06 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,13 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 |
|                | 33, 34, 35    | 10                                                                                | – | 30  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |
|                | 36            | 20                                                                                | – | 40  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,02–0,05 | 0,04–0,07 | 0,06–0,09 | 0,07–0,10 | 0,08–0,11 | 0,09–0,13 | 0,10–0,15 |
|                | 37            | 20                                                                                | – | 50  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |

## Metric

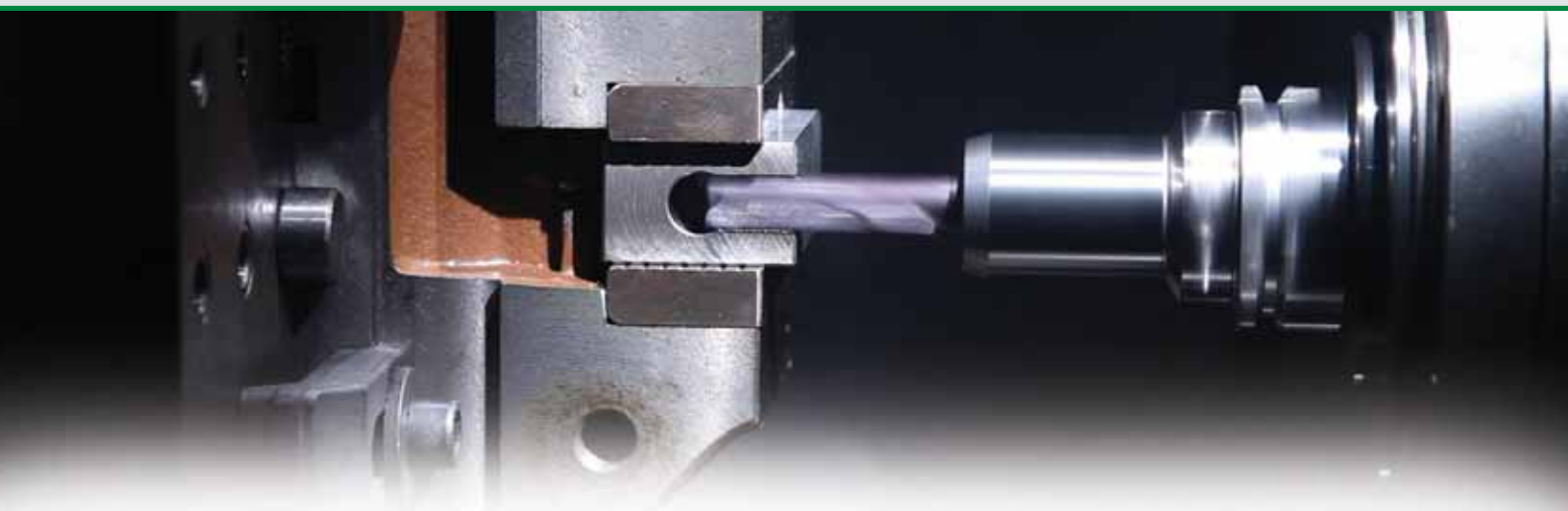
## tolerance

| nominal size range | D1 tolerance      | D tolerance h6 |
|--------------------|-------------------|----------------|
| 1–3                | 0,000/–0,014 (h8) | 0,000/–0,006   |
| >3–6               | 0,000/–0,012 (h7) | 0,000/–0,008   |
| >6–10              | 0,000/–0,015 (h7) | 0,000/–0,009   |
| >10–18             | 0,000/–0,018 (h7) | 0,000/–0,011   |
| >18–20             | 0,000/–0,021 (h7) | 0,000/–0,013   |

## ■ VariDrill • VDS4\_Series • WU25PD™ • Through Coolant • Metric

| Material Group |               |  |   |     |  |           |           |           |           |           |           |           |           |           |           |
|----------------|---------------|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |               | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |           |           |
|                |               | min                                                                               | – | max | Tool Diameter<br>(mm)                                                              | 1,0       | 2,0       | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1             | 70                                                                                | – | 140 | mm/r                                                                               | 0,04–0,09 | 0,05–0,12 | 0,07–0,14 | 0,08–0,16 | 0,11–0,22 | 0,13–0,26 | 0,15–0,31 | 0,18–0,35 | 0,22–0,42 | 0,28–0,54 |
|                | 2, 3, 4, 6, 7 | 60                                                                                | – | 100 | mm/r                                                                               | 0,05–0,10 | 0,06–0,13 | 0,08–0,15 | 0,09–0,17 | 0,13–0,23 | 0,15–0,28 | 0,19–0,33 | 0,22–0,38 | 0,26–0,47 | 0,34–0,59 |
|                | 5, 9, 10, 11  | 50                                                                                | – | 100 | mm/r                                                                               | 0,05–0,10 | 0,06–0,13 | 0,07–0,15 | 0,08–0,17 | 0,12–0,23 | 0,14–0,28 | 0,17–0,33 | 0,19–0,38 | 0,23–0,47 | 0,29–0,59 |
|                | 12, 13        | 40                                                                                | – | 70  | mm/r                                                                               | 0,03–0,05 | 0,04–0,06 | 0,05–0,08 | 0,06–0,10 | 0,08–0,14 | 0,10–0,18 | 0,13–0,22 | 0,14–0,24 | 0,18–0,32 | 0,23–0,41 |
| M              | 14.1          | 30                                                                                | – | 50  | mm/r                                                                               | 0,02–0,05 | 0,03–0,06 | 0,04–0,07 | 0,05–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
|                | 14.3          | 40                                                                                | – | 60  | mm/r                                                                               | 0,02–0,06 | 0,03–0,07 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,14 | 0,10–0,16 | 0,12–0,18 | 0,14–0,20 | 0,16–0,22 |
|                | 14.2, 14.4    | 30                                                                                | – | 50  | mm/r                                                                               | 0,02–0,05 | 0,03–0,06 | 0,04–0,07 | 0,06–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
| K              | 15, 16        | 80                                                                                | – | 160 | mm/r                                                                               | 0,07–0,14 | 0,08–0,15 | 0,10–0,20 | 0,11–0,22 | 0,14–0,28 | 0,18–0,34 | 0,21–0,40 | 0,23–0,44 | 0,28–0,54 | 0,34–0,67 |
|                | 17, 18, 19    | 90                                                                                | – | 140 | mm/r                                                                               | 0,09–0,13 | 0,10–0,14 | 0,11–0,14 | 0,12–0,17 | 0,14–0,23 | 0,18–0,28 | 0,21–0,32 | 0,23–0,36 | 0,28–0,43 | 0,34–0,54 |
|                | 20            | 80                                                                                | – | 130 | mm/r                                                                               | 0,05–0,12 | 0,06–0,14 | 0,07–0,15 | 0,08–0,17 | 0,11–0,23 | 0,13–0,27 | 0,15–0,32 | 0,17–0,36 | 0,22–0,43 | 0,27–0,54 |
| N              | 21            | 90                                                                                | – | 315 | mm/r                                                                               | 0,05–0,12 | 0,06–0,13 | 0,08–0,14 | 0,10–0,16 | 0,12–0,20 | 0,16–0,24 | 0,20–0,28 | 0,24–0,32 | 0,28–0,40 | 0,32–0,48 |
|                | 22, 23, 24    | 90                                                                                | – | 270 | mm/r                                                                               | 0,04–0,08 | 0,06–0,12 | 0,08–0,16 | 0,10–0,20 | 0,12–0,24 | 0,16–0,28 | 0,20–0,32 | 0,24–0,36 | 0,28–0,44 | 0,32–0,52 |
|                | 25            | 90                                                                                | – | 270 | mm/r                                                                               | 0,10–0,13 | 0,11–0,14 | 0,12–0,14 | 0,13–0,16 | 0,14–0,20 | 0,16–0,24 | 0,20–0,28 | 0,24–0,32 | 0,28–0,40 | 0,32–0,44 |
|                | 26, 27, 28    | 90                                                                                | – | 270 | mm/r                                                                               | 0,04–0,08 | 0,06–0,12 | 0,08–0,16 | 0,10–0,20 | 0,12–0,24 | 0,16–0,28 | 0,20–0,32 | 0,24–0,36 | 0,28–0,40 | 0,32–0,48 |
| S              | 31, 32        | 20                                                                                | – | 30  | mm/r                                                                               | 0,01–0,04 | 0,02–0,05 | 0,03–0,06 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,13 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 |
|                | 33, 34, 35    | 10                                                                                | – | 30  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |
|                | 36            | 10                                                                                | – | 40  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,02–0,05 | 0,04–0,07 | 0,06–0,09 | 0,07–0,10 | 0,08–0,11 | 0,09–0,13 | 0,10–0,15 |
|                | 37            | 10                                                                                | – | 40  | mm/r                                                                               | 0,01–0,03 | 0,02–0,03 | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |

| nominal size range | Metric tolerance  |                |
|--------------------|-------------------|----------------|
|                    | D1 tolerance      | D tolerance h6 |
| 1–3                | 0,000/-0,014 (h8) | 0,000/-0,006   |
| >3–6               | 0,000/-0,012 (h7) | 0,000/-0,008   |
| >6–10              | 0,000/-0,015 (h7) | 0,000/-0,009   |
| >10–18             | 0,000/-0,018 (h7) | 0,000/-0,011   |
| >18–20             | 0,000/-0,021 (h7) | 0,000/-0,013   |



# TDF Drills for Flat-Bottom Applications (Available as Semi-Standards)

## Primary Application

Engineered specifically to eliminate the need for a two-part operation when drilling flat-bottom holes or on an inclined surface:

- Drill flat-bottom holes in one step.
- Eliminate the need to use both an end mill and a drill to machine a flat on an inclined surface.
- After full cylindrical engagement, the drills run at normal solid carbide drilling parameters.

## Features and Benefits

- Four-Margin Design
  - Increases contact with material at full diameter.
  - Improves hold quality and drill stability in the cut.
  - Enables interrupted cuts and inclined exits.
- Special Point-Thinning
  - Increases centring capability.
  - Improves chip formation and flow.
  - Reduces cutting forces.

## Product Portfolio

- The Flat-Bottom Drill product series TDF51\* is pre-designed in four lengths and available in two grades, WN15HD for non-ferrous materials, and WU20PD for steel, iron, and stainless steel.
 

|           |         |
|-----------|---------|
| – TDF510* | 1,5 x D |
| – TDF511* | 3 x D   |
| – TDF512* | 5 x D   |
| – TDF513* | 8 x D   |
- Length variations and step drills available as engineered solutions.

## Ordering Process

- Please contact your local Authorised Distributor for a quote.



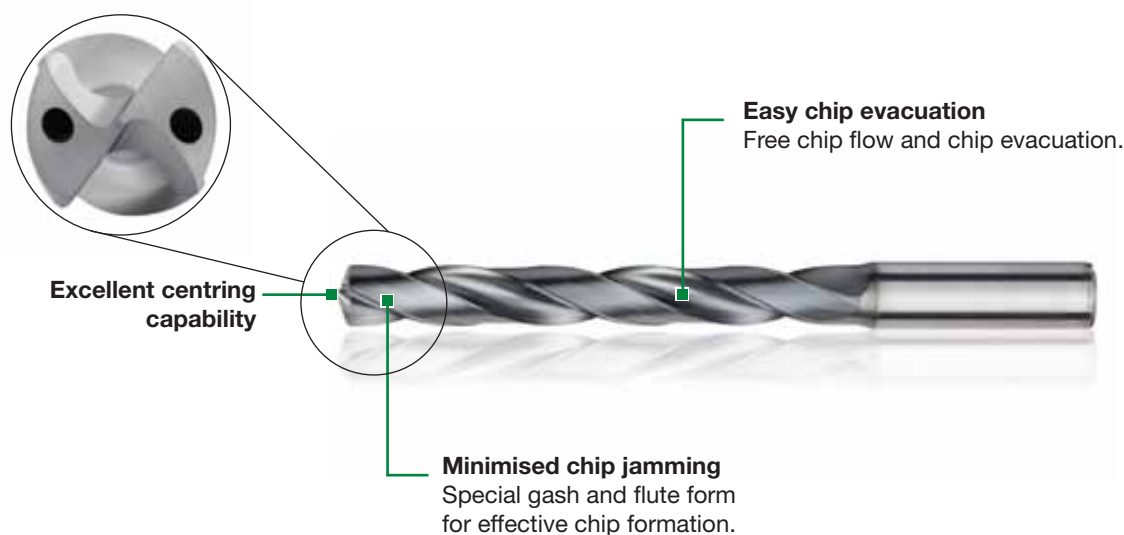
# Application-Specific Drilling • **WIDIA™ TOP DRILL S™** for Steel and Cast Iron

TOP DRILL S is WIDIA's line of solid carbide drills engineered to provide maximum performance and superior finish for application-specific tasks. Available in two material applications, TDS for steel and cast iron are each specially designed and coated to maximise output and increase tool life — offering less cost-per-hole and greater productivity.

- Designed for maximum productivity and longer tool life for steel and cast iron.
- Easy to choose and apply.
- One of the broadest ranges on the market for diameter selection, length series, and coolant options.
- Highest metal removal rates possible without sacrificing tool life.
- Latest Victory™ grades from WIDIA.



## TOP DRILL S™



### **TOP DRILL S™ for Steel**

TOP DRILL S for steel is a high-performance solid carbide drill with an application-specific design. Although the point geometry is strong enough to drill stainless steel and cast iron, it is engineered to maximise performance when drilling steel. The WP20PD™ grade, designed to resist high heat and wear, is the latest in WIDIA™ technology. The two-margin design facilitates excellent hole quality and less friction when drilling steel at high speeds.

### **TOP DRILL S for Cast Iron**

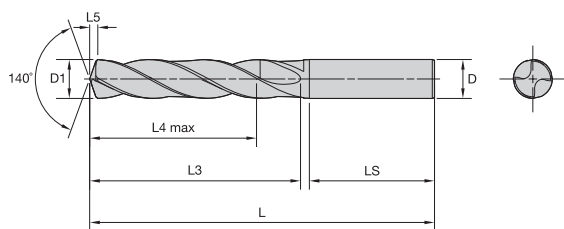
TOP DRILL S for cast iron is designed with application-specific point geometry for maximum performance in cast iron materials. The point features corner chamfers that minimise breakout on exit holes. A four-margin design improves hole straightness, increasing tool life and extending cross-hole and inclined exit capabilities when drilling tough cast iron. The technologically advanced WK15PD™ grade is specially engineered to withstand high wear.

### **WIDIA Advantage**

- Application-specific geometry with the latest WIDIA grade technology.
- Lower cost-per-hole due to high MRR and long tool life.
- Consistent performance from internally controlled supply chain:  
Powder > Rod > Grinding > Coating
- Part of the complete WIDIA holmaking solution.
- Broad range of standard lengths, diameters, and coolant options in one line, including extensive intermediate metric, inch, fraction, and wire sizes.







For information on L, L3, and L4 max, see page T143.



## ■ TDS202A • TDS212A • 5 x D



grade WP20PD  
TiAlN



grade WK15PD  
AlCrN

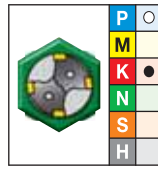
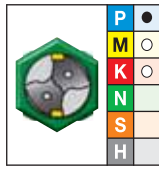
### D1 diameter

- first choice  
○ alternate choice

| order # | catalogue #  | order # | catalogue #  | mm    | in    | L  | L3 | L4 max | L5  | LS | D |
|---------|--------------|---------|--------------|-------|-------|----|----|--------|-----|----|---|
| 4162258 | TDS202A03000 | 4162417 | TDS212A03000 | 3,000 | .1181 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162259 | TDS202A03048 | 4162418 | TDS212A03048 | 3,048 | .1200 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162260 | TDS202A03100 | 4162419 | TDS212A03100 | 3,100 | .1220 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162261 | TDS202A03175 | 4162420 | TDS212A03175 | 3,175 | .1250 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162262 | TDS202A03200 | 4162421 | TDS212A03200 | 3,200 | .1260 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162283 | TDS202A03264 | 4162422 | TDS212A03264 | 3,264 | .1285 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162284 | TDS202A03300 | 4162543 | TDS212A03300 | 3,300 | .1299 | 66 | 28 | 23     | 0,5 | 36 | 6 |
| 4162285 | TDS202A03400 | 4162544 | TDS212A03400 | 3,400 | .1339 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162286 | TDS202A03455 | 4162545 | TDS212A03455 | 3,455 | .1360 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162287 | TDS202A03500 | 4162546 | TDS212A03500 | 3,500 | .1378 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162288 | TDS202A03571 | 4162547 | TDS212A03571 | 3,571 | .1406 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162289 | TDS202A03600 | 4162548 | TDS212A03600 | 3,600 | .1417 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162290 | TDS202A03658 | 4162549 | TDS212A03658 | 3,658 | .1440 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162291 | TDS202A03700 | 4162550 | TDS212A03700 | 3,700 | .1457 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162292 | TDS202A03734 | 4162551 | TDS212A03734 | 3,734 | .1470 | 66 | 28 | 23     | 0,6 | 36 | 6 |
| 4162293 | TDS202A03800 | 4162552 | TDS212A03800 | 3,800 | .1496 | 74 | 36 | 29     | 0,6 | 36 | 6 |
| 4162294 | TDS202A03900 | 4162553 | TDS212A03900 | 3,900 | .1535 | 74 | 36 | 29     | 0,6 | 36 | 6 |
| 4162295 | TDS202A03970 | 4162554 | TDS212A03970 | 3,970 | .1563 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162296 | TDS202A04000 | 4162555 | TDS212A04000 | 4,000 | .1575 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162297 | TDS202A04039 | 4162556 | TDS212A04039 | 4,039 | .1590 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162298 | TDS202A04090 | 4162557 | TDS212A04090 | 4,090 | .1610 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162299 | TDS202A04100 | 4162558 | TDS212A04100 | 4,100 | .1614 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162300 | TDS202A04200 | 4162559 | TDS212A04200 | 4,200 | .1654 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162301 | TDS202A04217 | 4162560 | TDS212A04217 | 4,217 | .1660 | 74 | 36 | 29     | 0,7 | 36 | 6 |

(continued)

(TDS202A • TDS212A • 5 x D — continued)

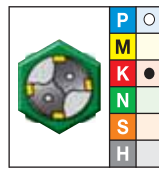


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |
| 4162302               | TDS202A04300 | 4162561               | TDS212A04300 | 4,300       | .1693 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162303               | TDS202A04366 | 4162562               | TDS212A04366 | 4,366       | .1719 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162304               | TDS202A04400 | 4162563               | TDS212A04400 | 4,400       | .1732 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162305               | TDS202A04500 | 4162564               | TDS212A04500 | 4,500       | .1772 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4162306               | TDS202A04600 | 4162565               | TDS212A04600 | 4,600       | .1811 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4162307               | TDS202A04623 | 4162566               | TDS212A04623 | 4,623       | .1820 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4162308               | TDS202A04700 | 4162567               | TDS212A04700 | 4,700       | .1850 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4162309               | TDS202A04763 | 4162568               | TDS212A04763 | 4,763       | .1875 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162310               | TDS202A04800 | 4162569               | TDS212A04800 | 4,800       | .1890 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162311               | TDS202A04852 | 4162570               | TDS212A04852 | 4,852       | .1910 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162312               | TDS202A04900 | 4162571               | TDS212A04900 | 4,900       | .1929 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162313               | TDS202A05000 | 4162572               | TDS212A05000 | 5,000       | .1969 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162314               | TDS202A05100 | 4162573               | TDS212A05100 | 5,100       | .2008 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162315               | TDS202A05106 | 4162574               | TDS212A05106 | 5,106       | .2010 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4162316               | TDS202A05159 | 4162575               | TDS212A05159 | 5,159       | .2031 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162317               | TDS202A05200 | 4162576               | TDS212A05200 | 5,200       | .2047 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162318               | TDS202A05300 | 4162577               | TDS212A05300 | 5,300       | .2087 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162319               | TDS202A05400 | 4162578               | TDS212A05400 | 5,400       | .2126 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162320               | TDS202A05410 | 4162579               | TDS212A05410 | 5,410       | .2130 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162321               | TDS202A05500 | 4162580               | TDS212A05500 | 5,500       | .2165 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162322               | TDS202A05558 | 4162581               | TDS212A05558 | 5,558       | .2188 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162323               | TDS202A05600 | 4162582               | TDS212A05600 | 5,600       | .2205 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162324               | TDS202A05616 | 4162583               | TDS212A05616 | 5,616       | .2211 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4162325               | TDS202A05700 | 4162584               | TDS212A05700 | 5,700       | .2244 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4162326               | TDS202A05800 | 4162585               | TDS212A05800 | 5,800       | .2283 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4162327               | TDS202A05900 | 4162586               | TDS212A05900 | 5,900       | .2323 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4162328               | TDS202A05954 | 4162587               | TDS212A05954 | 5,954       | .2344 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4162329               | TDS202A06000 | 4162588               | TDS212A06000 | 6,000       | .2362 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4162330               | TDS202A06100 | 4162589               | TDS212A06100 | 6,100       | .2402 | 91 | 53 | 43     | 1,0 | 36 | 8 |
| 4162331               | TDS202A06200 | 4162590               | TDS212A06200 | 6,200       | .2441 | 91 | 53 | 43     | 1,0 | 36 | 8 |
| 4162332               | TDS202A06300 | 4162591               | TDS212A06300 | 6,300       | .2480 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162333               | TDS202A06350 | 4162592               | TDS212A06350 | 6,350       | .2500 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162334               | TDS202A06400 | 4162593               | TDS212A06400 | 6,400       | .2520 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162335               | TDS202A06500 | 4162594               | TDS212A06500 | 6,500       | .2559 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162336               | TDS202A06528 | 4162595               | TDS212A06528 | 6,528       | .2570 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162337               | TDS202A06600 | 4162596               | TDS212A06600 | 6,600       | .2598 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162338               | TDS202A06630 | 4162597               | TDS212A06630 | 6,630       | .2610 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162339               | TDS202A06700 | 4162598               | TDS212A06700 | 6,700       | .2638 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4162340               | TDS202A06746 | 4162599               | TDS212A06746 | 6,746       | .2656 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4148908               | TDS202A06800 | 4148983               | TDS212A06800 | 6,800       | .2677 | 91 | 53 | 43     | 1,1 | 36 | 8 |

(continued)

(TDS202A • TDS212A • 5 x D — continued)



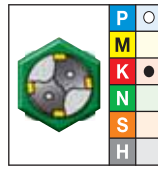
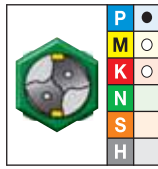
● first choice  
○ alternate choice

D1 diameter

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | mm    |       | L   | L3 | L4 max | L5  | LS | D  |
|-----------------------|--------------|-----------------------|--------------|-------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  |       | in    |     |    |        |     |    |    |
| 4162341               | TDS202A06900 | 4162600               | TDS212A06900 | 6,900 | .2717 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162342               | TDS202A07000 | 4162601               | TDS212A07000 | 7,000 | .2756 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162343               | TDS202A07100 | 4162602               | TDS212A07100 | 7,100 | .2795 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162344               | TDS202A07145 | 4162603               | TDS212A07145 | 7,145 | .2813 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162345               | TDS202A07200 | 4162604               | TDS212A07200 | 7,200 | .2835 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162346               | TDS202A07300 | 4162605               | TDS212A07300 | 7,300 | .2874 | 91  | 53 | 43     | 1,2 | 36 | 8  |
| 4162347               | TDS202A07400 | 4162606               | TDS212A07400 | 7,400 | .2913 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162348               | TDS202A07500 | 4162607               | TDS212A07500 | 7,500 | .2953 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162349               | TDS202A07541 | 4162608               | TDS212A07541 | 7,541 | .2969 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162350               | TDS202A07600 | 4162609               | TDS212A07600 | 7,600 | .2992 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162351               | TDS202A07700 | 4162610               | TDS212A07700 | 7,700 | .3031 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162352               | TDS202A07800 | 4162611               | TDS212A07800 | 7,800 | .3071 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162353               | TDS202A07900 | 4162612               | TDS212A07900 | 7,900 | .3110 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162354               | TDS202A07938 | 4162613               | TDS212A07938 | 7,938 | .3125 | 91  | 53 | 43     | 1,3 | 36 | 8  |
| 4162355               | TDS202A08000 | 4162614               | TDS212A08000 | 8,000 | .3150 | 91  | 53 | 43     | 1,4 | 36 | 8  |
| 4162356               | TDS202A08100 | 4162615               | TDS212A08100 | 8,100 | .3189 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162357               | TDS202A08200 | 4162616               | TDS212A08200 | 8,200 | .3228 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162358               | TDS202A08300 | 4162617               | TDS212A08300 | 8,300 | .3268 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162359               | TDS202A08334 | 4162618               | TDS212A08334 | 8,334 | .3281 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162360               | TDS202A08400 | 4162619               | TDS212A08400 | 8,400 | .3307 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162361               | TDS202A08433 | 4162620               | TDS212A08433 | 8,433 | .3320 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162362               | TDS202A08500 | 4162621               | TDS212A08500 | 8,500 | .3346 | 103 | 61 | 49     | 1,4 | 40 | 10 |
| 4162363               | TDS202A08600 | 4162622               | TDS212A08600 | 8,600 | .3386 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162364               | TDS202A08700 | 4162623               | TDS212A08700 | 8,700 | .3425 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162365               | TDS202A08733 | 4162624               | TDS212A08733 | 8,733 | .3438 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162366               | TDS202A08800 | 4162625               | TDS212A08800 | 8,800 | .3465 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162367               | TDS202A08900 | 4162626               | TDS212A08900 | 8,900 | .3504 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162368               | TDS202A09000 | 4162627               | TDS212A09000 | 9,000 | .3543 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162369               | TDS202A09100 | 4162628               | TDS212A09100 | 9,100 | .3583 | 103 | 61 | 49     | 1,5 | 40 | 10 |
| 4162370               | TDS202A09129 | 4162629               | TDS212A09129 | 9,129 | .3594 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162371               | TDS202A09200 | 4162630               | TDS212A09200 | 9,200 | .3622 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162372               | TDS202A09300 | 4162631               | TDS212A09300 | 9,300 | .3661 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162373               | TDS202A09347 | 4162632               | TDS212A09347 | 9,347 | .3680 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162374               | TDS202A09400 | 4162633               | TDS212A09400 | 9,400 | .3701 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162375               | TDS202A09500 | 4162634               | TDS212A09500 | 9,500 | .3740 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162376               | TDS202A09525 | 4162635               | TDS212A09525 | 9,525 | .3750 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162377               | TDS202A09600 | 4162636               | TDS212A09600 | 9,600 | .3780 | 103 | 61 | 49     | 1,6 | 40 | 10 |
| 4162378               | TDS202A09700 | 4162637               | TDS212A09700 | 9,700 | .3819 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4162379               | TDS202A09800 | 4162638               | TDS212A09800 | 9,800 | .3858 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4162380               | TDS202A09900 | 4162639               | TDS212A09900 | 9,900 | .3898 | 103 | 61 | 49     | 1,7 | 40 | 10 |

(continued)

(TDS202A • TDS212A • 5 x D — continued)

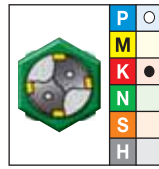
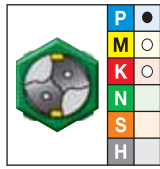


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4162381               | TDS202A09921 | 4162640               | TDS212A09921 | 9,921       | .3906 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4167196               | TDS202A10000 | 4162408               | TDS212A10000 | 10,000      | .3937 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4167198               | TDS202A10100 | 4162409               | TDS212A10100 | 10,100      | .3976 | 118 | 71 | 56     | 1,7 | 45 | 12 |
| 4167199               | TDS202A10200 | 4162410               | TDS212A10200 | 10,200      | .4016 | 118 | 71 | 56     | 1,7 | 45 | 12 |
| 4167200               | TDS202A10300 | 4162411               | TDS212A10300 | 10,300      | .4055 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167201               | TDS202A10320 | 4162412               | TDS212A10320 | 10,320      | .4063 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167202               | TDS202A10400 | 4162423               | TDS212A10400 | 10,400      | .4094 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167203               | TDS202A10500 | 4162424               | TDS212A10500 | 10,500      | .4134 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167204               | TDS202A10600 | 4162425               | TDS212A10600 | 10,600      | .4173 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167205               | TDS202A10700 | 4162426               | TDS212A10700 | 10,700      | .4213 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167206               | TDS202A10716 | 4162427               | TDS212A10716 | 10,716      | .4219 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167207               | TDS202A10800 | 4162428               | TDS212A10800 | 10,800      | .4252 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4167208               | TDS202A10900 | 4162429               | TDS212A10900 | 10,900      | .4291 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167209               | TDS202A11000 | 4162430               | TDS212A11000 | 11,000      | .4331 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167210               | TDS202A11100 | 4162431               | TDS212A11100 | 11,100      | .4370 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167211               | TDS202A11113 | 4162432               | TDS212A11113 | 11,113      | .4375 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167212               | TDS202A11200 | 4162433               | TDS212A11200 | 11,200      | .4409 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167213               | TDS202A11300 | 4162434               | TDS212A11300 | 11,300      | .4449 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4167214               | TDS202A11400 | 4162435               | TDS212A11400 | 11,400      | .4488 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167215               | TDS202A11500 | 4162436               | TDS212A11500 | 11,500      | .4528 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167216               | TDS202A11509 | 4162437               | TDS212A11509 | 11,509      | .4531 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167217               | TDS202A11600 | 4162438               | TDS212A11600 | 11,600      | .4567 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167218               | TDS202A11700 | 4162439               | TDS212A11700 | 11,700      | .4606 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167219               | TDS202A11800 | 4162440               | TDS212A11800 | 11,800      | .4646 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167220               | TDS202A11900 | 4162441               | TDS212A11900 | 11,900      | .4685 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167221               | TDS202A11908 | 4162442               | TDS212A11908 | 11,908      | .4688 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4167222               | TDS202A12000 | 4162443               | TDS212A12000 | 12,000      | .4724 | 118 | 71 | 56     | 2,1 | 45 | 12 |
| 4167223               | TDS202A12100 | 4162444               | TDS212A12100 | 12,100      | .4764 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167224               | TDS202A12200 | 4162445               | TDS212A12200 | 12,200      | .4803 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167225               | TDS202A12300 | 4162446               | TDS212A12300 | 12,300      | .4843 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167226               | TDS202A12304 | 4162447               | TDS212A12304 | 12,304      | .4844 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167227               | TDS202A12400 | 4162448               | TDS212A12400 | 12,400      | .4882 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167228               | TDS202A12500 | 4162449               | TDS212A12500 | 12,500      | .4921 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4167229               | TDS202A12600 | 4162450               | TDS212A12600 | 12,600      | .4961 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4167230               | TDS202A12700 | 4162451               | TDS212A12700 | 12,700      | .5000 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4167231               | TDS202A12800 | 4162452               | TDS212A12800 | 12,800      | .5039 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4167232               | TDS202A12900 | 4162453               | TDS212A12900 | 12,900      | .5079 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4167233               | TDS202A13000 | 4162454               | TDS212A13000 | 13,000      | .5118 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4167234               | TDS202A13096 | 4162455               | TDS212A13096 | 13,096      | .5156 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167235               | TDS202A13100 | 4162456               | TDS212A13100 | 13,100      | .5157 | 124 | 77 | 60     | 2,3 | 45 | 14 |

(continued)

(TDS202A • TDS212A • 5 x D — continued)

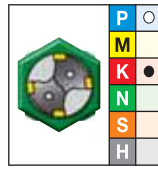
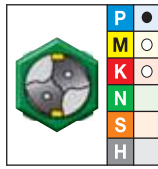


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4167236               | TDS202A13200 | 4162457               | TDS212A13200 | 13,200      | .5197 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167237               | TDS202A13300 | 4162458               | TDS212A13300 | 13,300      | .5236 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167238               | TDS202A13400 | 4162459               | TDS212A13400 | 13,400      | .5276 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167239               | TDS202A13500 | 4162460               | TDS212A13500 | 13,500      | .5315 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167240               | TDS202A13600 | 4162461               | TDS212A13600 | 13,600      | .5354 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4167241               | TDS202A13700 | 4162462               | TDS212A13700 | 13,700      | .5394 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4167242               | TDS202A13800 | 4162463               | TDS212A13800 | 13,800      | .5433 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4167243               | TDS202A13891 | 4162464               | TDS212A13891 | 13,891      | .5469 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4167244               | TDS202A13900 | 4162465               | TDS212A13900 | 13,900      | .5472 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4167245               | TDS202A14000 | 4162466               | TDS212A14000 | 14,000      | .5512 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4167246               | TDS202A14100 | 4162467               | TDS212A14100 | 14,100      | .5551 | 133 | 83 | 63     | 2,4 | 48 | 16 |
| 4167247               | TDS202A14200 | 4162468               | TDS212A14200 | 14,200      | .5591 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167248               | TDS202A14288 | 4162469               | TDS212A14288 | 14,288      | .5625 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167249               | TDS202A14300 | 4162470               | TDS212A14300 | 14,300      | .5630 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167250               | TDS202A14400 | 4162471               | TDS212A14400 | 14,400      | .5669 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167251               | TDS202A14500 | 4162472               | TDS212A14500 | 14,500      | .5709 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167252               | TDS202A14600 | 4162473               | TDS212A14600 | 14,600      | .5748 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167253               | TDS202A14684 | 4162474               | TDS212A14684 | 14,684      | .5781 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167254               | TDS202A14700 | 4162475               | TDS212A14700 | 14,700      | .5787 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4167255               | TDS202A14800 | 4162476               | TDS212A14800 | 14,800      | .5827 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167256               | TDS202A14900 | 4162477               | TDS212A14900 | 14,900      | .5866 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167257               | TDS202A15000 | 4162478               | TDS212A15000 | 15,000      | .5906 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167258               | TDS202A15083 | 4162479               | TDS212A15083 | 15,083      | .5938 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167259               | TDS202A15100 | 4162480               | TDS212A15100 | 15,100      | .5945 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167260               | TDS202A15200 | 4162481               | TDS212A15200 | 15,200      | .5984 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167261               | TDS202A15300 | 4162482               | TDS212A15300 | 15,300      | .6024 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4167262               | TDS202A15400 | 4162483               | TDS212A15400 | 15,400      | .6063 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167263               | TDS202A15479 | 4162484               | TDS212A15479 | 15,479      | .6094 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167264               | TDS202A15500 | 4162485               | TDS212A15500 | 15,500      | .6102 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167265               | TDS202A15600 | 4162486               | TDS212A15600 | 15,600      | .6142 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167266               | TDS202A15700 | 4162487               | TDS212A15700 | 15,700      | .6181 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167267               | TDS202A15800 | 4162488               | TDS212A15800 | 15,800      | .6220 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167268               | TDS202A15875 | 4162489               | TDS212A15875 | 15,875      | .6250 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4167269               | TDS202A15900 | 4162490               | TDS212A15900 | 15,900      | .6260 | 133 | 83 | 63     | 2,8 | 48 | 16 |
| 4167270               | TDS202A16000 | 4162491               | TDS212A16000 | 16,000      | .6299 | 133 | 83 | 63     | 2,8 | 48 | 16 |
| 4167271               | TDS202A16100 | 4162492               | TDS212A16100 | 16,100      | .6339 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4167272               | TDS202A16200 | 4162493               | TDS212A16200 | 16,200      | .6378 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4167273               | TDS202A16271 | 4162494               | TDS212A16271 | 16,271      | .6406 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4167274               | TDS202A16300 | 4162495               | TDS212A16300 | 16,300      | .6417 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4167275               | TDS202A16400 | 4162496               | TDS212A16400 | 16,400      | .6457 | 143 | 93 | 71     | 2,8 | 48 | 18 |

(continued)

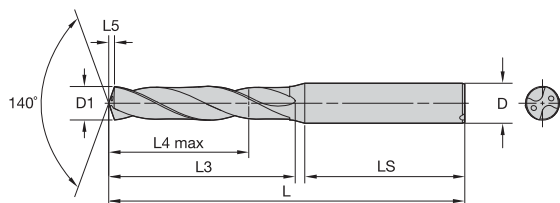
(TDS202A • TDS212A • 5 x D — continued)



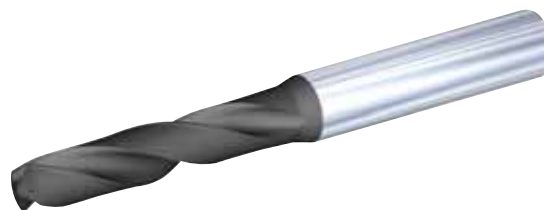
● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |     |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|-----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3  | L4 max | L5  | LS | D  |
| 4167276               | TDS202A16500 | 4162497               | TDS212A16500 | 16,500      | .6496 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167277               | TDS202A16600 | 4162498               | TDS212A16600 | 16,600      | .6535 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167278               | TDS202A16670 | 4162499               | TDS212A16670 | 16,670      | .6563 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167279               | TDS202A16700 | 4162500               | TDS212A16700 | 16,700      | .6575 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167280               | TDS202A16800 | 4162501               | TDS212A16800 | 16,800      | .6614 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167281               | TDS202A16900 | 4162502               | TDS212A16900 | 16,900      | .6654 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167282               | TDS202A17000 | 4162503               | TDS212A17000 | 17,000      | .6693 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4167283               | TDS202A17100 | 4162504               | TDS212A17100 | 17,100      | .6732 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167284               | TDS202A17200 | 4162505               | TDS212A17200 | 17,200      | .6772 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167285               | TDS202A17300 | 4162506               | TDS212A17300 | 17,300      | .6811 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167286               | TDS202A17400 | 4162507               | TDS212A17400 | 17,400      | .6850 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167287               | TDS202A17463 | 4162508               | TDS212A17463 | 17,463      | .6875 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167288               | TDS202A17500 | 4162509               | TDS212A17500 | 17,500      | .6890 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4167289               | TDS202A17600 | 4162510               | TDS212A17600 | 17,600      | .6929 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4167290               | TDS202A17700 | 4162511               | TDS212A17700 | 17,700      | .6969 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4167291               | TDS202A17800 | 4162512               | TDS212A17800 | 17,800      | .7008 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4167292               | TDS202A17859 | 4162513               | TDS212A17859 | 17,859      | .7031 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4167293               | TDS202A17900 | 4162514               | TDS212A17900 | 17,900      | .7047 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4163313               | TDS202A18000 | 4160528               | TDS212A18000 | 18,000      | .7087 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4163314               | TDS202A18100 | 4160464               | TDS212A18100 | 18,100      | .7126 | 153 | 101 | 77     | 3,1 | 50 | 20 |
| 4163305               | TDS202A18200 | 4160465               | TDS212A18200 | 18,200      | .7165 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163306               | TDS202A18258 | 4160466               | TDS212A18258 | 18,258      | .7188 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163307               | TDS202A18300 | 4160467               | TDS212A18300 | 18,300      | .7205 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163308               | TDS202A18400 | 4160468               | TDS212A18400 | 18,400      | .7244 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163309               | TDS202A18500 | 4160469               | TDS212A18500 | 18,500      | .7283 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163310               | TDS202A18600 | 4160470               | TDS212A18600 | 18,600      | .7323 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163311               | TDS202A18654 | 4160471               | TDS212A18654 | 18,654      | .7344 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163312               | TDS202A18700 | 4160472               | TDS212A18700 | 18,700      | .7362 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4163323               | TDS202A18800 | 4160583               | TDS212A18800 | 18,800      | .7402 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163324               | TDS202A18900 | 4160584               | TDS212A18900 | 18,900      | .7441 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163325               | TDS202A19000 | 4160585               | TDS212A19000 | 19,000      | .7480 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163326               | TDS202A19050 | 4160586               | TDS212A19050 | 19,050      | .7500 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163327               | TDS202A19100 | 4160587               | TDS212A19100 | 19,100      | .7520 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163328               | TDS202A19200 | 4160588               | TDS212A19200 | 19,200      | .7559 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4163329               | TDS202A19300 | 4160589               | TDS212A19300 | 19,300      | .7598 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163330               | TDS202A19400 | 4160590               | TDS212A19400 | 19,400      | .7638 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163331               | TDS202A19500 | 4160591               | TDS212A19500 | 19,500      | .7677 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163332               | TDS202A19600 | 4160592               | TDS212A19600 | 19,600      | .7717 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163333               | TDS202A19700 | 4160593               | TDS212A19700 | 19,700      | .7756 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163334               | TDS202A19800 | 4160594               | TDS212A19800 | 19,800      | .7795 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4163335               | TDS202A19900 | 4160595               | TDS212A19900 | 19,900      | .7835 | 153 | 101 | 77     | 3,5 | 50 | 20 |
| 4163336               | TDS202A20000 | 4160596               | TDS212A20000 | 20,000      | .7874 | 153 | 101 | 77     | 3,5 | 50 | 20 |





For information on L, L3, and L4 max, see page T143.



## ■ TDS401A • TDS411A • 3 x D

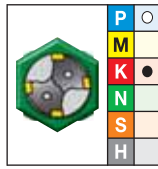
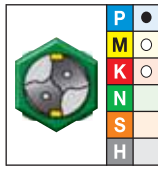


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |
| 4163315               | TDS401A03000 | 4157799               | TDS411A03000 | 3,000       | .1181 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163337               | TDS401A03048 | 4157800               | TDS411A03048 | 3,048       | .1200 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163338               | TDS401A03100 | 4157801               | TDS411A03100 | 3,100       | .1220 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163339               | TDS401A03175 | 4157802               | TDS411A03175 | 3,175       | .1250 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163340               | TDS401A03200 | 4157803               | TDS411A03200 | 3,200       | .1260 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163341               | TDS401A03264 | 4157804               | TDS411A03264 | 3,264       | .1285 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163342               | TDS401A03300 | 4157805               | TDS411A03300 | 3,300       | .1299 | 62 | 20 | 14     | 0,5 | 36 | 6 |
| 4163463               | TDS401A03400 | 4157806               | TDS411A03400 | 3,400       | .1339 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163464               | TDS401A03455 | 4157807               | TDS411A03455 | 3,455       | .1360 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163465               | TDS401A03500 | 4157808               | TDS411A03500 | 3,500       | .1378 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163466               | TDS401A03571 | 4157809               | TDS411A03571 | 3,571       | .1406 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163467               | TDS401A03600 | 4157810               | TDS411A03600 | 3,600       | .1417 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163468               | TDS401A03658 | 4157811               | TDS411A03658 | 3,658       | .1440 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163469               | TDS401A03700 | 4157812               | TDS411A03700 | 3,700       | .1457 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163470               | TDS401A03734 | 4157813               | TDS411A03734 | 3,734       | .1470 | 62 | 20 | 14     | 0,6 | 36 | 6 |
| 4163471               | TDS401A03800 | 4157814               | TDS411A03800 | 3,800       | .1496 | 66 | 24 | 17     | 0,6 | 36 | 6 |
| 4163472               | TDS401A03900 | 4157815               | TDS411A03900 | 3,900       | .1535 | 66 | 24 | 17     | 0,6 | 36 | 6 |
| 4163473               | TDS401A03970 | 4157816               | TDS411A03970 | 3,970       | .1563 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163474               | TDS401A04000 | 4157817               | TDS411A04000 | 4,000       | .1575 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163475               | TDS401A04039 | 4157818               | TDS411A04039 | 4,039       | .1590 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163476               | TDS401A04090 | 4157819               | TDS411A04090 | 4,090       | .1610 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163477               | TDS401A04100 | 4157820               | TDS411A04100 | 4,100       | .1614 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163478               | TDS401A04200 | 4157821               | TDS411A04200 | 4,200       | .1654 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163479               | TDS401A04217 | 4157822               | TDS411A04217 | 4,217       | .1660 | 66 | 24 | 17     | 0,7 | 36 | 6 |

(continued)

(TDS401A • TDS411A • 3 x D — continued)



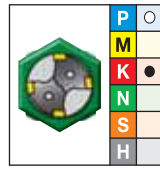
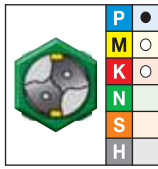
● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |
| 4163480               | TDS401A04300 | 4157823               | TDS411A04300 | 4,300       | .1693 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163481               | TDS401A04366 | 4157824               | TDS411A04366 | 4,366       | .1719 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163482               | TDS401A04400 | 4157825               | TDS411A04400 | 4,400       | .1732 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163483               | TDS401A04500 | 4157826               | TDS411A04500 | 4,500       | .1772 | 66 | 24 | 17     | 0,7 | 36 | 6 |
| 4163484               | TDS401A04600 | 4157827               | TDS411A04600 | 4,600       | .1811 | 66 | 24 | 17     | 0,8 | 36 | 6 |
| 4163485               | TDS401A04623 | 4157828               | TDS411A04623 | 4,623       | .1820 | 66 | 24 | 17     | 0,8 | 36 | 6 |
| 4163486               | TDS401A04700 | 4157829               | TDS411A04700 | 4,700       | .1850 | 66 | 24 | 17     | 0,8 | 36 | 6 |
| 4163487               | TDS401A04763 | 4157830               | TDS411A04763 | 4,763       | .1875 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163488               | TDS401A04800 | 4157831               | TDS411A04800 | 4,800       | .1890 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163489               | TDS401A04852 | 4157832               | TDS411A04852 | 4,852       | .1910 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163490               | TDS401A04900 | 4157833               | TDS411A04900 | 4,900       | .1929 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163491               | TDS401A05000 | 4157834               | TDS411A05000 | 5,000       | .1969 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163492               | TDS401A05100 | 4157835               | TDS411A05100 | 5,100       | .2008 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163493               | TDS401A05106 | 4157836               | TDS411A05106 | 5,106       | .2010 | 66 | 28 | 20     | 0,8 | 36 | 6 |
| 4163494               | TDS401A05159 | 4157837               | TDS411A05159 | 5,159       | .2031 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163495               | TDS401A05200 | 4157838               | TDS411A05200 | 5,200       | .2047 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163496               | TDS401A05300 | 4157839               | TDS411A05300 | 5,300       | .2087 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163497               | TDS401A05400 | 4157840               | TDS411A05400 | 5,400       | .2126 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163498               | TDS401A05410 | 4157841               | TDS411A05410 | 5,410       | .2130 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163499               | TDS401A05500 | 4157842               | TDS411A05500 | 5,500       | .2165 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163500               | TDS401A05558 | 4157843               | TDS411A05558 | 5,558       | .2188 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163501               | TDS401A05600 | 4157844               | TDS411A05600 | 5,600       | .2205 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163502               | TDS401A05616 | 4157845               | TDS411A05616 | 5,616       | .2211 | 66 | 28 | 20     | 0,9 | 36 | 6 |
| 4163503               | TDS401A05700 | 4157846               | TDS411A05700 | 5,700       | .2244 | 66 | 28 | 20     | 1,0 | 36 | 6 |
| 4163504               | TDS401A05800 | 4157847               | TDS411A05800 | 5,800       | .2283 | 66 | 28 | 20     | 1,0 | 36 | 6 |
| 4163505               | TDS401A05900 | 4157848               | TDS411A05900 | 5,900       | .2323 | 66 | 28 | 20     | 1,0 | 36 | 6 |
| 4163506               | TDS401A05954 | 4157849               | TDS411A05954 | 5,954       | .2344 | 66 | 28 | 20     | 1,0 | 36 | 6 |
| 4163507               | TDS401A06000 | 4157850               | TDS411A06000 | 6,000       | .2362 | 66 | 28 | 20     | 1,0 | 36 | 6 |
| 4163508               | TDS401A06100 | 4157851               | TDS411A06100 | 6,100       | .2402 | 79 | 34 | 24     | 1,0 | 36 | 8 |
| 4163509               | TDS401A06200 | 4157852               | TDS411A06200 | 6,200       | .2441 | 79 | 34 | 24     | 1,0 | 36 | 8 |
| 4163510               | TDS401A06300 | 4157853               | TDS411A06300 | 6,300       | .2480 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163511               | TDS401A06350 | 4157854               | TDS411A06350 | 6,350       | .2500 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163512               | TDS401A06400 | 4157855               | TDS411A06400 | 6,400       | .2520 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163513               | TDS401A06500 | 4157856               | TDS411A06500 | 6,500       | .2559 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163514               | TDS401A06528 | 4157857               | TDS411A06528 | 6,528       | .2570 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163515               | TDS401A06600 | 4157858               | TDS411A06600 | 6,600       | .2598 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163516               | TDS401A06630 | 4157859               | TDS411A06630 | 6,630       | .2610 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163517               | TDS401A06700 | 4157860               | TDS411A06700 | 6,700       | .2638 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163518               | TDS401A06746 | 4157861               | TDS411A06746 | 6,746       | .2656 | 79 | 34 | 24     | 1,1 | 36 | 8 |
| 4163519               | TDS401A06800 | 4157862               | TDS411A06800 | 6,800       | .2677 | 79 | 34 | 24     | 1,1 | 36 | 8 |

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(TDS401A • TDS411A • 3 x D — continued)

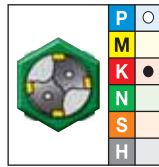
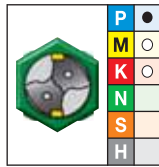


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D  |
| 4163520               | TDS401A06900 | 4157863               | TDS411A06900 | 6,900       | .2717 | 79 | 34 | 24     | 1,2 | 36 | 8  |
| 4163521               | TDS401A07000 | 4157864               | TDS411A07000 | 7,000       | .2756 | 79 | 34 | 24     | 1,2 | 36 | 8  |
| 4163522               | TDS401A07100 | 4157865               | TDS411A07100 | 7,100       | .2795 | 79 | 41 | 29     | 1,2 | 36 | 8  |
| 4163523               | TDS401A07145 | 4157866               | TDS411A07145 | 7,145       | .2813 | 79 | 41 | 29     | 1,2 | 36 | 8  |
| 4163524               | TDS401A07200 | 4157867               | TDS411A07200 | 7,200       | .2835 | 79 | 41 | 29     | 1,2 | 36 | 8  |
| 4163525               | TDS401A07300 | 4157868               | TDS411A07300 | 7,300       | .2874 | 79 | 41 | 29     | 1,2 | 36 | 8  |
| 4163526               | TDS401A07400 | 4157869               | TDS411A07400 | 7,400       | .2913 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163527               | TDS401A07500 | 4157870               | TDS411A07500 | 7,500       | .2953 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163528               | TDS401A07541 | 4157871               | TDS411A07541 | 7,541       | .2969 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163529               | TDS401A07600 | 4157872               | TDS411A07600 | 7,600       | .2992 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163530               | TDS401A07700 | 4157873               | TDS411A07700 | 7,700       | .3031 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163531               | TDS401A07800 | 4157874               | TDS411A07800 | 7,800       | .3071 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163532               | TDS401A07900 | 4157875               | TDS411A07900 | 7,900       | .3110 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163533               | TDS401A07938 | 4157876               | TDS411A07938 | 7,938       | .3125 | 79 | 41 | 29     | 1,3 | 36 | 8  |
| 4163534               | TDS401A08000 | 4157877               | TDS411A08000 | 8,000       | .3150 | 79 | 41 | 29     | 1,4 | 36 | 8  |
| 4163535               | TDS401A08100 | 4157878               | TDS411A08100 | 8,100       | .3189 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163536               | TDS401A08200 | 4157879               | TDS411A08200 | 8,200       | .3228 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163537               | TDS401A08300 | 4157880               | TDS411A08300 | 8,300       | .3268 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163538               | TDS401A08334 | 4157881               | TDS411A08334 | 8,334       | .3281 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163539               | TDS401A08400 | 4157882               | TDS411A08400 | 8,400       | .3307 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163540               | TDS401A08433 | 4157883               | TDS411A08433 | 8,433       | .3320 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163541               | TDS401A08500 | 4157884               | TDS411A08500 | 8,500       | .3346 | 89 | 47 | 35     | 1,4 | 40 | 10 |
| 4163542               | TDS401A08600 | 4157885               | TDS411A08600 | 8,600       | .3386 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163543               | TDS401A08700 | 4157886               | TDS411A08700 | 8,700       | .3425 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163544               | TDS401A08733 | 4157887               | TDS411A08733 | 8,733       | .3438 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163545               | TDS401A08800 | 4157888               | TDS411A08800 | 8,800       | .3465 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163546               | TDS401A08900 | 4157889               | TDS411A08900 | 8,900       | .3504 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163547               | TDS401A09000 | 4157890               | TDS411A09000 | 9,000       | .3543 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163548               | TDS401A09100 | 4157891               | TDS411A09100 | 9,100       | .3583 | 89 | 47 | 35     | 1,5 | 40 | 10 |
| 4163549               | TDS401A09129 | 4157892               | TDS411A09129 | 9,129       | .3594 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163550               | TDS401A09200 | 4157893               | TDS411A09200 | 9,200       | .3622 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163551               | TDS401A09300 | 4157894               | TDS411A09300 | 9,300       | .3661 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163552               | TDS401A09347 | 4157895               | TDS411A09347 | 9,347       | .3680 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163553               | TDS401A09400 | 4157896               | TDS411A09400 | 9,400       | .3701 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163554               | TDS401A09500 | 4157897               | TDS411A09500 | 9,500       | .3740 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163555               | TDS401A09525 | 4157898               | TDS411A09525 | 9,525       | .3750 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163556               | TDS401A09600 | 4157899               | TDS411A09600 | 9,600       | .3780 | 89 | 47 | 35     | 1,6 | 40 | 10 |
| 4163557               | TDS401A09700 | 4157900               | TDS411A09700 | 9,700       | .3819 | 89 | 47 | 35     | 1,7 | 40 | 10 |
| 4163558               | TDS401A09800 | 4157901               | TDS411A09800 | 9,800       | .3858 | 89 | 47 | 35     | 1,7 | 40 | 10 |
| 4163559               | TDS401A09900 | 4157902               | TDS411A09900 | 9,900       | .3898 | 89 | 47 | 35     | 1,7 | 40 | 10 |

(continued)

(TDS401A • TDS411A • 3 x D — continued)

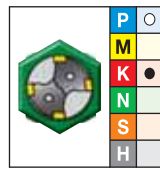
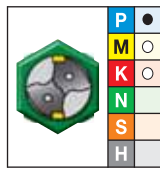


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4163560               | TDS401A09921 | 4157903               | TDS411A09921 | 9,921       | .3906 | 89  | 47 | 35     | 1,7 | 40 | 10 |
| 4162950               | TDS401A10000 | 4156562               | TDS411A10000 | 10,000      | .3937 | 89  | 47 | 35     | 1,7 | 40 | 10 |
| 4162951               | TDS401A10100 | 4156603               | TDS411A10100 | 10,100      | .3976 | 102 | 55 | 40     | 1,7 | 45 | 12 |
| 4162952               | TDS401A10200 | 4156604               | TDS411A10200 | 10,200      | .4016 | 102 | 55 | 40     | 1,7 | 45 | 12 |
| 4163343               | TDS401A10300 | 4156605               | TDS411A10300 | 10,300      | .4055 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163344               | TDS401A10320 | 4156606               | TDS411A10320 | 10,320      | .4063 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163345               | TDS401A10400 | 4156607               | TDS411A10400 | 10,400      | .4094 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163346               | TDS401A10500 | 4156608               | TDS411A10500 | 10,500      | .4134 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163347               | TDS401A10600 | 4156609               | TDS411A10600 | 10,600      | .4173 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163348               | TDS401A10700 | 4156610               | TDS411A10700 | 10,700      | .4213 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163349               | TDS401A10716 | 4156611               | TDS411A10716 | 10,716      | .4219 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163350               | TDS401A10800 | 4156612               | TDS411A10800 | 10,800      | .4252 | 102 | 55 | 40     | 1,8 | 45 | 12 |
| 4163351               | TDS401A10900 | 4156613               | TDS411A10900 | 10,900      | .4291 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163352               | TDS401A11000 | 4156614               | TDS411A11000 | 11,000      | .4331 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163353               | TDS401A11100 | 4156615               | TDS411A11100 | 11,100      | .4370 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163354               | TDS401A11113 | 4156616               | TDS411A11113 | 11,113      | .4375 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163355               | TDS401A11200 | 4156617               | TDS411A11200 | 11,200      | .4409 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163356               | TDS401A11300 | 4156618               | TDS411A11300 | 11,300      | .4449 | 102 | 55 | 40     | 1,9 | 45 | 12 |
| 4163357               | TDS401A11400 | 4156619               | TDS411A11400 | 11,400      | .4488 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163358               | TDS401A11500 | 4156620               | TDS411A11500 | 11,500      | .4528 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163359               | TDS401A11509 | 4156621               | TDS411A11509 | 11,509      | .4531 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163360               | TDS401A11600 | 4156622               | TDS411A11600 | 11,600      | .4567 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163361               | TDS401A11700 | 4156623               | TDS411A11700 | 11,700      | .4606 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163362               | TDS401A11800 | 4156624               | TDS411A11800 | 11,800      | .4646 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163363               | TDS401A11900 | 4156625               | TDS411A11900 | 11,900      | .4685 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163364               | TDS401A11908 | 4156626               | TDS411A11908 | 11,908      | .4688 | 102 | 55 | 40     | 2,0 | 45 | 12 |
| 4163365               | TDS401A12000 | 4156627               | TDS411A12000 | 12,000      | .4724 | 102 | 55 | 40     | 2,1 | 45 | 12 |
| 4163366               | TDS401A12100 | 4156628               | TDS411A12100 | 12,100      | .4764 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163367               | TDS401A12200 | 4156629               | TDS411A12200 | 12,200      | .4803 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163368               | TDS401A12300 | 4156630               | TDS411A12300 | 12,300      | .4843 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163369               | TDS401A12304 | 4156631               | TDS411A12304 | 12,304      | .4844 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163370               | TDS401A12400 | 4156632               | TDS411A12400 | 12,400      | .4882 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163371               | TDS401A12500 | 4156633               | TDS411A12500 | 12,500      | .4921 | 107 | 60 | 43     | 2,1 | 45 | 14 |
| 4163372               | TDS401A12600 | 4156634               | TDS411A12600 | 12,600      | .4961 | 107 | 60 | 43     | 2,2 | 45 | 14 |
| 4163373               | TDS401A12700 | 4156635               | TDS411A12700 | 12,700      | .5000 | 107 | 60 | 43     | 2,2 | 45 | 14 |
| 4163374               | TDS401A12800 | 4156636               | TDS411A12800 | 12,800      | .5039 | 107 | 60 | 43     | 2,2 | 45 | 14 |
| 4163375               | TDS401A12900 | 4156637               | TDS411A12900 | 12,900      | .5079 | 107 | 60 | 43     | 2,2 | 45 | 14 |
| 4163376               | TDS401A13000 | 4156638               | TDS411A13000 | 13,000      | .5118 | 107 | 60 | 43     | 2,2 | 45 | 14 |
| 4163377               | TDS401A13096 | 4156639               | TDS411A13096 | 13,096      | .5156 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163378               | TDS401A13100 | 4156640               | TDS411A13100 | 13,100      | .5157 | 107 | 60 | 43     | 2,3 | 45 | 14 |

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(TDS401A • TDS411A • 3 x D — continued)

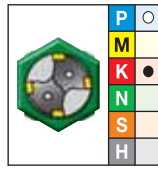
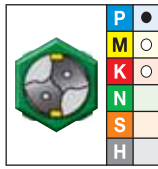


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4163379               | TDS401A13200 | 4156641               | TDS411A13200 | 13,200      | .5197 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163380               | TDS401A13300 | 4156642               | TDS411A13300 | 13,300      | .5236 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163381               | TDS401A13400 | 4156643               | TDS411A13400 | 13,400      | .5276 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163382               | TDS401A13500 | 4156644               | TDS411A13500 | 13,500      | .5315 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163383               | TDS401A13600 | 4156645               | TDS411A13600 | 13,600      | .5354 | 107 | 60 | 43     | 2,3 | 45 | 14 |
| 4163384               | TDS401A13700 | 4156646               | TDS411A13700 | 13,700      | .5394 | 107 | 60 | 43     | 2,4 | 45 | 14 |
| 4163385               | TDS401A13800 | 4156647               | TDS411A13800 | 13,800      | .5433 | 107 | 60 | 43     | 2,4 | 45 | 14 |
| 4163386               | TDS401A13891 | 4156648               | TDS411A13891 | 13,891      | .5469 | 107 | 60 | 43     | 2,4 | 45 | 14 |
| 4163387               | TDS401A13900 | 4156649               | TDS411A13900 | 13,900      | .5472 | 107 | 60 | 43     | 2,4 | 45 | 14 |
| 4163388               | TDS401A14000 | 4156650               | TDS411A14000 | 14,000      | .5512 | 107 | 60 | 43     | 2,4 | 45 | 14 |
| 4163389               | TDS401A14100 | 4156651               | TDS411A14100 | 14,100      | .5551 | 115 | 65 | 45     | 2,4 | 48 | 16 |
| 4163390               | TDS401A14200 | 4156652               | TDS411A14200 | 14,200      | .5591 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163391               | TDS401A14288 | 4156653               | TDS411A14288 | 14,288      | .5625 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163392               | TDS401A14300 | 4156654               | TDS411A14300 | 14,300      | .5630 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163393               | TDS401A14400 | 4156655               | TDS411A14400 | 14,400      | .5669 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163394               | TDS401A14500 | 4156656               | TDS411A14500 | 14,500      | .5709 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163395               | TDS401A14600 | 4156657               | TDS411A14600 | 14,600      | .5748 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163396               | TDS401A14684 | 4156658               | TDS411A14684 | 14,684      | .5781 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163397               | TDS401A14700 | 4156659               | TDS411A14700 | 14,700      | .5787 | 115 | 65 | 45     | 2,5 | 48 | 16 |
| 4163398               | TDS401A14800 | 4156660               | TDS411A14800 | 14,800      | .5827 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163399               | TDS401A14900 | 4156661               | TDS411A14900 | 14,900      | .5866 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163400               | TDS401A15000 | 4156662               | TDS411A15000 | 15,000      | .5906 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163401               | TDS401A15083 | 4156663               | TDS411A15083 | 15,083      | .5938 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163402               | TDS401A15100 | 4156664               | TDS411A15100 | 15,100      | .5945 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163403               | TDS401A15200 | 4156665               | TDS411A15200 | 15,200      | .5984 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163404               | TDS401A15300 | 4156666               | TDS411A15300 | 15,300      | .6024 | 115 | 65 | 45     | 2,6 | 48 | 16 |
| 4163405               | TDS401A15400 | 4156667               | TDS411A15400 | 15,400      | .6063 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163406               | TDS401A15479 | 4156668               | TDS411A15479 | 15,479      | .6094 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163407               | TDS401A15500 | 4156669               | TDS411A15500 | 15,500      | .6102 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163408               | TDS401A15600 | 4156670               | TDS411A15600 | 15,600      | .6142 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163409               | TDS401A15700 | 4156671               | TDS411A15700 | 15,700      | .6181 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163410               | TDS401A15800 | 4156672               | TDS411A15800 | 15,800      | .6220 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163411               | TDS401A15875 | 4156673               | TDS411A15875 | 15,875      | .6250 | 115 | 65 | 45     | 2,7 | 48 | 16 |
| 4163412               | TDS401A15900 | 4156674               | TDS411A15900 | 15,900      | .6260 | 115 | 65 | 45     | 2,8 | 48 | 16 |
| 4163413               | TDS401A16000 | 4156675               | TDS411A16000 | 16,000      | .6299 | 115 | 65 | 45     | 2,8 | 48 | 16 |
| 4163414               | TDS401A16100 | 4156676               | TDS411A16100 | 16,100      | .6339 | 123 | 73 | 51     | 2,8 | 48 | 18 |
| 4163415               | TDS401A16200 | 4156677               | TDS411A16200 | 16,200      | .6378 | 123 | 73 | 51     | 2,8 | 48 | 18 |
| 4163416               | TDS401A16271 | 4156678               | TDS411A16271 | 16,271      | .6406 | 123 | 73 | 51     | 2,8 | 48 | 18 |
| 4163417               | TDS401A16300 | 4156679               | TDS411A16300 | 16,300      | .6417 | 123 | 73 | 51     | 2,8 | 48 | 18 |
| 4163418               | TDS401A16400 | 4156680               | TDS411A16400 | 16,400      | .6457 | 123 | 73 | 51     | 2,8 | 48 | 18 |

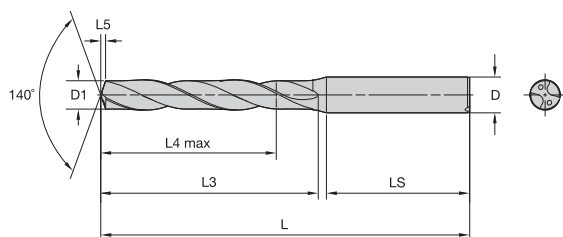
(continued)

(TDS401A • TDS411A • 3 x D — continued)



● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4163419               | TDS401A16500 | 4156681               | TDS411A16500 | 16,500      | .6496 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163420               | TDS401A16600 | 4156682               | TDS411A16600 | 16,600      | .6535 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163421               | TDS401A16670 | 4156683               | TDS411A16670 | 16,670      | .6563 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163422               | TDS401A16700 | 4156684               | TDS411A16700 | 16,700      | .6575 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163423               | TDS401A16800 | 4156685               | TDS411A16800 | 16,800      | .6614 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163424               | TDS401A16900 | 4156686               | TDS411A16900 | 16,900      | .6654 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163425               | TDS401A17000 | 4156687               | TDS411A17000 | 17,000      | .6693 | 123 | 73 | 51     | 2,9 | 48 | 18 |
| 4163426               | TDS401A17100 | 4156688               | TDS411A17100 | 17,100      | .6732 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163427               | TDS401A17200 | 4156689               | TDS411A17200 | 17,200      | .6772 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163428               | TDS401A17300 | 4156690               | TDS411A17300 | 17,300      | .6811 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163429               | TDS401A17400 | 4156691               | TDS411A17400 | 17,400      | .6850 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163430               | TDS401A17463 | 4156692               | TDS411A17463 | 17,463      | .6875 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163431               | TDS401A17500 | 4156693               | TDS411A17500 | 17,500      | .6890 | 123 | 73 | 51     | 3,0 | 48 | 18 |
| 4163432               | TDS401A17600 | 4156694               | TDS411A17600 | 17,600      | .6929 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163433               | TDS401A17700 | 4156695               | TDS411A17700 | 17,700      | .6969 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163434               | TDS401A17800 | 4156696               | TDS411A17800 | 17,800      | .7008 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163435               | TDS401A17859 | 4156697               | TDS411A17859 | 17,859      | .7031 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163436               | TDS401A17900 | 4156698               | TDS411A17900 | 17,900      | .7047 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163271               | TDS401A18000 | 4156699               | TDS411A18000 | 18,000      | .7087 | 123 | 73 | 51     | 3,1 | 48 | 18 |
| 4163272               | TDS401A18100 | 4156700               | TDS411A18100 | 18,100      | .7126 | 131 | 79 | 55     | 3,1 | 50 | 20 |
| 4163283               | TDS401A18200 | 4156701               | TDS411A18200 | 18,200      | .7165 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163284               | TDS401A18258 | 4156702               | TDS411A18258 | 18,258      | .7188 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163285               | TDS401A18300 | 4156713               | TDS411A18300 | 18,300      | .7205 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163286               | TDS401A18400 | 4156714               | TDS411A18400 | 18,400      | .7244 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163287               | TDS401A18500 | 4156715               | TDS411A18500 | 18,500      | .7283 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163288               | TDS401A18600 | 4156716               | TDS411A18600 | 18,600      | .7323 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163289               | TDS401A18654 | 4156717               | TDS411A18654 | 18,654      | .7344 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163290               | TDS401A18700 | 4156718               | TDS411A18700 | 18,700      | .7362 | 131 | 79 | 55     | 3,2 | 50 | 20 |
| 4163291               | TDS401A18800 | 4156719               | TDS411A18800 | 18,800      | .7402 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163292               | TDS401A18900 | 4156720               | TDS411A18900 | 18,900      | .7441 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163293               | TDS401A19000 | 4156721               | TDS411A19000 | 19,000      | .7480 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163294               | TDS401A19050 | 4156722               | TDS411A19050 | 19,050      | .7500 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163295               | TDS401A19100 | 4156723               | TDS411A19100 | 19,100      | .7520 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163296               | TDS401A19200 | 4156724               | TDS411A19200 | 19,200      | .7559 | 131 | 79 | 55     | 3,3 | 50 | 20 |
| 4163297               | TDS401A19300 | 4156725               | TDS411A19300 | 19,300      | .7598 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163298               | TDS401A19400 | 4156726               | TDS411A19400 | 19,400      | .7638 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163299               | TDS401A19500 | 4156727               | TDS411A19500 | 19,500      | .7677 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163300               | TDS401A19600 | 4156728               | TDS411A19600 | 19,600      | .7717 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163301               | TDS401A19700 | 4156729               | TDS411A19700 | 19,700      | .7756 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163302               | TDS401A19800 | 4156730               | TDS411A19800 | 19,800      | .7795 | 131 | 79 | 55     | 3,4 | 50 | 20 |
| 4163303               | TDS401A19900 | 4156731               | TDS411A19900 | 19,900      | .7835 | 131 | 79 | 55     | 3,5 | 50 | 20 |
| 4163304               | TDS401A20000 | 4156732               | TDS411A20000 | 20,000      | .7874 | 131 | 79 | 55     | 3,5 | 50 | 20 |



For information on L, L3, and L4 max, see page T143.



### ■ TDS402A • TDS412A • 5 x D

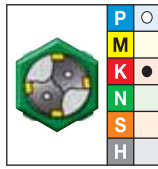
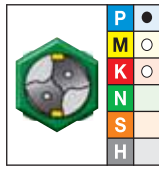


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |  |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|--|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |  |
| 4162967               | TDS402A03000 | 4158757               | TDS412A03000 | 3,000       | .1181 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162968               | TDS402A03048 | 4158758               | TDS412A03048 | 3,048       | .1200 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162969               | TDS402A03100 | 4158759               | TDS412A03100 | 3,100       | .1220 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162970               | TDS402A03175 | 4158760               | TDS412A03175 | 3,175       | .1250 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162972               | TDS402A03200 | 4158761               | TDS412A03200 | 3,200       | .1260 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162983               | TDS402A03264 | 4158762               | TDS412A03264 | 3,264       | .1285 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162984               | TDS402A03300 | 4158793               | TDS412A03300 | 3,300       | .1299 | 66 | 28 | 23     | 0,5 | 36 | 6 |  |
| 4162985               | TDS402A03400 | 4158794               | TDS412A03400 | 3,400       | .1339 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162986               | TDS402A03455 | 4158795               | TDS412A03455 | 3,455       | .1360 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162987               | TDS402A03500 | 4158796               | TDS412A03500 | 3,500       | .1378 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162988               | TDS402A03571 | 4158797               | TDS412A03571 | 3,571       | .1406 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162989               | TDS402A03600 | 4158798               | TDS412A03600 | 3,600       | .1417 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162990               | TDS402A03658 | 4158799               | TDS412A03658 | 3,658       | .1440 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162991               | TDS402A03700 | 4158800               | TDS412A03700 | 3,700       | .1457 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162992               | TDS402A03734 | 4158801               | TDS412A03734 | 3,734       | .1470 | 66 | 28 | 23     | 0,6 | 36 | 6 |  |
| 4162993               | TDS402A03800 | 4158802               | TDS412A03800 | 3,800       | .1496 | 74 | 36 | 29     | 0,6 | 36 | 6 |  |
| 4162994               | TDS402A03900 | 4158803               | TDS412A03900 | 3,900       | .1535 | 74 | 36 | 29     | 0,6 | 36 | 6 |  |
| 4162995               | TDS402A03970 | 4158804               | TDS412A03970 | 3,970       | .1563 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4162996               | TDS402A04000 | 4158805               | TDS412A04000 | 4,000       | .1575 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4162997               | TDS402A04039 | 4158806               | TDS412A04039 | 4,039       | .1590 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4162998               | TDS402A04090 | 4158807               | TDS412A04090 | 4,090       | .1610 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4162999               | TDS402A04100 | 4158808               | TDS412A04100 | 4,100       | .1614 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4163000               | TDS402A04200 | 4158809               | TDS412A04200 | 4,200       | .1654 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |
| 4163001               | TDS402A04217 | 4158810               | TDS412A04217 | 4,217       | .1660 | 74 | 36 | 29     | 0,7 | 36 | 6 |  |

(continued)

(TDS402A • TDS412A • 5 x D — continued)



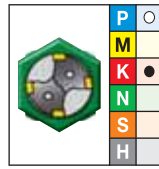
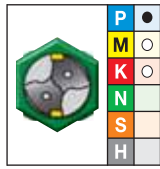
● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |
| 4163002               | TDS402A04300 | 4158811               | TDS412A04300 | 4,300       | .1693 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4163013               | TDS402A04366 | 4158812               | TDS412A04366 | 4,366       | .1719 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4163014               | TDS402A04400 | 4158813               | TDS412A04400 | 4,400       | .1732 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4163015               | TDS402A04500 | 4158814               | TDS412A04500 | 4,500       | .1772 | 74 | 36 | 29     | 0,7 | 36 | 6 |
| 4163016               | TDS402A04600 | 4158815               | TDS412A04600 | 4,600       | .1811 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4163017               | TDS402A04623 | 4158816               | TDS412A04623 | 4,623       | .1820 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4163018               | TDS402A04700 | 4158817               | TDS412A04700 | 4,700       | .1850 | 74 | 36 | 29     | 0,8 | 36 | 6 |
| 4163019               | TDS402A04763 | 4158818               | TDS412A04763 | 4,763       | .1875 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163020               | TDS402A04800 | 4158819               | TDS412A04800 | 4,800       | .1890 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163021               | TDS402A04852 | 4158820               | TDS412A04852 | 4,852       | .1910 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163022               | TDS402A04900 | 4158821               | TDS412A04900 | 4,900       | .1929 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163023               | TDS402A05000 | 4158822               | TDS412A05000 | 5,000       | .1969 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163024               | TDS402A05100 | 4158823               | TDS412A05100 | 5,100       | .2008 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163025               | TDS402A05106 | 4158824               | TDS412A05106 | 5,106       | .2010 | 82 | 44 | 35     | 0,8 | 36 | 6 |
| 4163026               | TDS402A05159 | 4158825               | TDS412A05159 | 5,159       | .2031 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163027               | TDS402A05200 | 4158826               | TDS412A05200 | 5,200       | .2047 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163028               | TDS402A05300 | 4158827               | TDS412A05300 | 5,300       | .2087 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163029               | TDS402A05400 | 4158828               | TDS412A05400 | 5,400       | .2126 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163030               | TDS402A05410 | 4158829               | TDS412A05410 | 5,410       | .2130 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163031               | TDS402A05500 | 4158830               | TDS412A05500 | 5,500       | .2165 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163032               | TDS402A05558 | 4158831               | TDS412A05558 | 5,558       | .2188 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163034               | TDS402A05600 | 4158832               | TDS412A05600 | 5,600       | .2205 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163035               | TDS402A05616 | 4158833               | TDS412A05616 | 5,616       | .2211 | 82 | 44 | 35     | 0,9 | 36 | 6 |
| 4163036               | TDS402A05700 | 4158834               | TDS412A05700 | 5,700       | .2244 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4163037               | TDS402A05800 | 4158835               | TDS412A05800 | 5,800       | .2283 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4163038               | TDS402A05900 | 4158836               | TDS412A05900 | 5,900       | .2323 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4163039               | TDS402A05954 | 4158837               | TDS412A05954 | 5,954       | .2344 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4163040               | TDS402A06000 | 4158838               | TDS412A06000 | 6,000       | .2362 | 82 | 44 | 35     | 1,0 | 36 | 6 |
| 4163041               | TDS402A06100 | 4158839               | TDS412A06100 | 6,100       | .2402 | 91 | 53 | 43     | 1,0 | 36 | 8 |
| 4163042               | TDS402A06200 | 4158840               | TDS412A06200 | 6,200       | .2441 | 91 | 53 | 43     | 1,0 | 36 | 8 |
| 4163043               | TDS402A06300 | 4158841               | TDS412A06300 | 6,300       | .2480 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163044               | TDS402A06350 | 4158842               | TDS412A06350 | 6,350       | .2500 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163045               | TDS402A06400 | 4158843               | TDS412A06400 | 6,400       | .2520 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163046               | TDS402A06500 | 4158844               | TDS412A06500 | 6,500       | .2559 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163047               | TDS402A06528 | 4158845               | TDS412A06528 | 6,528       | .2570 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163048               | TDS402A06600 | 4158846               | TDS412A06600 | 6,600       | .2598 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163049               | TDS402A06630 | 4158847               | TDS412A06630 | 6,630       | .2610 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163050               | TDS402A06700 | 4158848               | TDS412A06700 | 6,700       | .2638 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163051               | TDS402A06746 | 4158849               | TDS412A06746 | 6,746       | .2656 | 91 | 53 | 43     | 1,1 | 36 | 8 |
| 4163052               | TDS402A06800 | 4158850               | TDS412A06800 | 6,800       | .2677 | 91 | 53 | 43     | 1,1 | 36 | 8 |

(continued)



(TDS402A • TDS412A • 5 x D — continued)



● first choice  
○ alternate choice

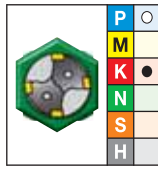
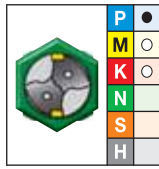
D1 diameter

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |  |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|--|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |  |
| 4163053               | TDS402A06900 | 4158851               | TDS412A06900 | 6,900       | .2717 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163054               | TDS402A07000 | 4158852               | TDS412A07000 | 7,000       | .2756 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163055               | TDS402A07100 | 4158853               | TDS412A07100 | 7,100       | .2795 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163056               | TDS402A07145 | 4158854               | TDS412A07145 | 7,145       | .2813 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163057               | TDS402A07200 | 4158855               | TDS412A07200 | 7,200       | .2835 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163058               | TDS402A07300 | 4158856               | TDS412A07300 | 7,300       | .2874 | 91  | 53 | 43     | 1,2 | 36 | 8  |  |
| 4163059               | TDS402A07400 | 4158857               | TDS412A07400 | 7,400       | .2913 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163060               | TDS402A07500 | 4158858               | TDS412A07500 | 7,500       | .2953 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163061               | TDS402A07541 | 4158859               | TDS412A07541 | 7,541       | .2969 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163062               | TDS402A07600 | 4158860               | TDS412A07600 | 7,600       | .2992 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163063               | TDS402A07700 | 4158861               | TDS412A07700 | 7,700       | .3031 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163064               | TDS402A07800 | 4158862               | TDS412A07800 | 7,800       | .3071 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163065               | TDS402A07900 | 4158863               | TDS412A07900 | 7,900       | .3110 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163066               | TDS402A07938 | 4158864               | TDS412A07938 | 7,938       | .3125 | 91  | 53 | 43     | 1,3 | 36 | 8  |  |
| 4163067               | TDS402A08000 | 4158865               | TDS412A08000 | 8,000       | .3150 | 91  | 53 | 43     | 1,4 | 36 | 8  |  |
| 4163068               | TDS402A08100 | 4158866               | TDS412A08100 | 8,100       | .3189 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163069               | TDS402A08200 | 4158867               | TDS412A08200 | 8,200       | .3228 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163070               | TDS402A08300 | 4158868               | TDS412A08300 | 8,300       | .3268 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163071               | TDS402A08334 | 4158869               | TDS412A08334 | 8,334       | .3281 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163072               | TDS402A08400 | 4158870               | TDS412A08400 | 8,400       | .3307 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163073               | TDS402A08433 | 4158871               | TDS412A08433 | 8,433       | .3320 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163074               | TDS402A08500 | 4158872               | TDS412A08500 | 8,500       | .3346 | 103 | 61 | 49     | 1,4 | 40 | 10 |  |
| 4163075               | TDS402A08600 | 4158873               | TDS412A08600 | 8,600       | .3386 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163077               | TDS402A08700 | 4158874               | TDS412A08700 | 8,700       | .3425 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163078               | TDS402A08733 | 4158875               | TDS412A08733 | 8,733       | .3438 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163079               | TDS402A08800 | 4158876               | TDS412A08800 | 8,800       | .3465 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163080               | TDS402A08900 | 4158877               | TDS412A08900 | 8,900       | .3504 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163081               | TDS402A09000 | 4158878               | TDS412A09000 | 9,000       | .3543 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163082               | TDS402A09100 | 4158879               | TDS412A09100 | 9,100       | .3583 | 103 | 61 | 49     | 1,5 | 40 | 10 |  |
| 4163083               | TDS402A09129 | 4158880               | TDS412A09129 | 9,129       | .3594 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163084               | TDS402A09200 | 4158881               | TDS412A09200 | 9,200       | .3622 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163085               | TDS402A09300 | 4158882               | TDS412A09300 | 9,300       | .3661 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163086               | TDS402A09347 | 4158883               | TDS412A09347 | 9,347       | .3680 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163087               | TDS402A09400 | 4158884               | TDS412A09400 | 9,400       | .3701 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163088               | TDS402A09500 | 4158885               | TDS412A09500 | 9,500       | .3740 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163089               | TDS402A09525 | 4158886               | TDS412A09525 | 9,525       | .3750 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163090               | TDS402A09600 | 4158887               | TDS412A09600 | 9,600       | .3780 | 103 | 61 | 49     | 1,6 | 40 | 10 |  |
| 4163091               | TDS402A09700 | 4158888               | TDS412A09700 | 9,700       | .3819 | 103 | 61 | 49     | 1,7 | 40 | 10 |  |
| 4163092               | TDS402A09800 | 4158889               | TDS412A09800 | 9,800       | .3858 | 103 | 61 | 49     | 1,7 | 40 | 10 |  |
| 4163093               | TDS402A09900 | 4158890               | TDS412A09900 | 9,900       | .3898 | 103 | 61 | 49     | 1,7 | 40 | 10 |  |

(continued)



(TDS402A • TDS412A • 5 x D — continued)

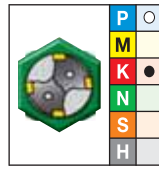
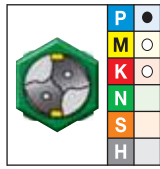


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4163094               | TDS402A09921 | 4158891               | TDS412A09921 | 9,921       | .3906 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4162803               | TDS402A10000 | 4156602               | TDS412A10000 | 10,000      | .3937 | 103 | 61 | 49     | 1,7 | 40 | 10 |
| 4162804               | TDS402A10100 | 4156733               | TDS412A10100 | 10,100      | .3976 | 118 | 71 | 56     | 1,7 | 45 | 12 |
| 4162805               | TDS402A10200 | 4156734               | TDS412A10200 | 10,200      | .4016 | 118 | 71 | 56     | 1,7 | 45 | 12 |
| 4162806               | TDS402A10300 | 4156735               | TDS412A10300 | 10,300      | .4055 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162807               | TDS402A10320 | 4156736               | TDS412A10320 | 10,320      | .4063 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162808               | TDS402A10400 | 4156737               | TDS412A10400 | 10,400      | .4094 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162809               | TDS402A10500 | 4156738               | TDS412A10500 | 10,500      | .4134 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162810               | TDS402A10600 | 4156739               | TDS412A10600 | 10,600      | .4173 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162811               | TDS402A10700 | 4156740               | TDS412A10700 | 10,700      | .4213 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162812               | TDS402A10716 | 4156741               | TDS412A10716 | 10,716      | .4219 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162813               | TDS402A10800 | 4156742               | TDS412A10800 | 10,800      | .4252 | 118 | 71 | 56     | 1,8 | 45 | 12 |
| 4162814               | TDS402A10900 | 4156743               | TDS412A10900 | 10,900      | .4291 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162815               | TDS402A11000 | 4156744               | TDS412A11000 | 11,000      | .4331 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162816               | TDS402A11100 | 4156745               | TDS412A11100 | 11,100      | .4370 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162817               | TDS402A11113 | 4156746               | TDS412A11113 | 11,113      | .4375 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162818               | TDS402A11200 | 4156747               | TDS412A11200 | 11,200      | .4409 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162819               | TDS402A11300 | 4156748               | TDS412A11300 | 11,300      | .4449 | 118 | 71 | 56     | 1,9 | 45 | 12 |
| 4162820               | TDS402A11400 | 4156749               | TDS412A11400 | 11,400      | .4488 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162821               | TDS402A11500 | 4156750               | TDS412A11500 | 11,500      | .4528 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162822               | TDS402A11509 | 4156751               | TDS412A11509 | 11,509      | .4531 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162823               | TDS402A11600 | 4156752               | TDS412A11600 | 11,600      | .4567 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162824               | TDS402A11700 | 4156753               | TDS412A11700 | 11,700      | .4606 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162825               | TDS402A11800 | 4156754               | TDS412A11800 | 11,800      | .4646 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162826               | TDS402A11900 | 4156755               | TDS412A11900 | 11,900      | .4685 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162827               | TDS402A11908 | 4156756               | TDS412A11908 | 11,908      | .4688 | 118 | 71 | 56     | 2,0 | 45 | 12 |
| 4162828               | TDS402A12000 | 4156757               | TDS412A12000 | 12,000      | .4724 | 118 | 71 | 56     | 2,1 | 45 | 12 |
| 4162829               | TDS402A12100 | 4156758               | TDS412A12100 | 12,100      | .4764 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162830               | TDS402A12200 | 4156759               | TDS412A12200 | 12,200      | .4803 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162831               | TDS402A12300 | 4156760               | TDS412A12300 | 12,300      | .4843 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162832               | TDS402A12304 | 4156761               | TDS412A12304 | 12,304      | .4844 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162833               | TDS402A12400 | 4156762               | TDS412A12400 | 12,400      | .4882 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162834               | TDS402A12500 | 4156763               | TDS412A12500 | 12,500      | .4921 | 124 | 77 | 60     | 2,1 | 45 | 14 |
| 4162835               | TDS402A12600 | 4156764               | TDS412A12600 | 12,600      | .4961 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4162836               | TDS402A12700 | 4156765               | TDS412A12700 | 12,700      | .5000 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4162837               | TDS402A12800 | 4156766               | TDS412A12800 | 12,800      | .5039 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4162838               | TDS402A12900 | 4156767               | TDS412A12900 | 12,900      | .5079 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4162839               | TDS402A13000 | 4156768               | TDS412A13000 | 13,000      | .5118 | 124 | 77 | 60     | 2,2 | 45 | 14 |
| 4162840               | TDS402A13096 | 4156769               | TDS412A13096 | 13,096      | .5156 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162841               | TDS402A13100 | 4156770               | TDS412A13100 | 13,100      | .5157 | 124 | 77 | 60     | 2,3 | 45 | 14 |

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(TDS402A • TDS412A • 5 x D — continued)



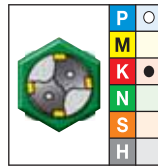
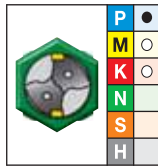
● first choice  
○ alternate choice

D1 diameter

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       | L   | L3 | L4 max | L5  | LS | D  |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    |     |    |        |     |    |    |
| 4162842               | TDS402A13200 | 4156771               | TDS412A13200 | 13,200      | .5197 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162843               | TDS402A13300 | 4156772               | TDS412A13300 | 13,300      | .5236 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162844               | TDS402A13400 | 4156773               | TDS412A13400 | 13,400      | .5276 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162845               | TDS402A13500 | 4156774               | TDS412A13500 | 13,500      | .5315 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162846               | TDS402A13600 | 4156775               | TDS412A13600 | 13,600      | .5354 | 124 | 77 | 60     | 2,3 | 45 | 14 |
| 4162847               | TDS402A13700 | 4156776               | TDS412A13700 | 13,700      | .5394 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4162848               | TDS402A13800 | 4156777               | TDS412A13800 | 13,800      | .5433 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4162849               | TDS402A13891 | 4156778               | TDS412A13891 | 13,891      | .5469 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4162850               | TDS402A13900 | 4156779               | TDS412A13900 | 13,900      | .5472 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4162851               | TDS402A14000 | 4156780               | TDS412A14000 | 14,000      | .5512 | 124 | 77 | 60     | 2,4 | 45 | 14 |
| 4162852               | TDS402A14100 | 4156781               | TDS412A14100 | 14,100      | .5551 | 133 | 83 | 63     | 2,4 | 48 | 16 |
| 4162853               | TDS402A14200 | 4156782               | TDS412A14200 | 14,200      | .5591 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162854               | TDS402A14288 | 4156783               | TDS412A14288 | 14,288      | .5625 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162855               | TDS402A14300 | 4156784               | TDS412A14300 | 14,300      | .5630 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162856               | TDS402A14400 | 4156785               | TDS412A14400 | 14,400      | .5669 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162857               | TDS402A14500 | 4156786               | TDS412A14500 | 14,500      | .5709 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162858               | TDS402A14600 | 4156787               | TDS412A14600 | 14,600      | .5748 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162859               | TDS402A14684 | 4156788               | TDS412A14684 | 14,684      | .5781 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162860               | TDS402A14700 | 4156789               | TDS412A14700 | 14,700      | .5787 | 133 | 83 | 63     | 2,5 | 48 | 16 |
| 4162861               | TDS402A14800 | 4156790               | TDS412A14800 | 14,800      | .5827 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162862               | TDS402A14900 | 4156791               | TDS412A14900 | 14,900      | .5866 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162863               | TDS402A15000 | 4156792               | TDS412A15000 | 15,000      | .5906 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162864               | TDS402A15083 | 4156793               | TDS412A15083 | 15,083      | .5938 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162865               | TDS402A15100 | 4156794               | TDS412A15100 | 15,100      | .5945 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162866               | TDS402A15200 | 4156795               | TDS412A15200 | 15,200      | .5984 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162867               | TDS402A15300 | 4156796               | TDS412A15300 | 15,300      | .6024 | 133 | 83 | 63     | 2,6 | 48 | 16 |
| 4162868               | TDS402A15400 | 4156797               | TDS412A15400 | 15,400      | .6063 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162869               | TDS402A15479 | 4156798               | TDS412A15479 | 15,479      | .6094 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162870               | TDS402A15500 | 4156799               | TDS412A15500 | 15,500      | .6102 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162871               | TDS402A15600 | 4156800               | TDS412A15600 | 15,600      | .6142 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162872               | TDS402A15700 | 4156801               | TDS412A15700 | 15,700      | .6181 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162873               | TDS402A15800 | 4156802               | TDS412A15800 | 15,800      | .6220 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162874               | TDS402A15875 | 4156803               | TDS412A15875 | 15,875      | .6250 | 133 | 83 | 63     | 2,7 | 48 | 16 |
| 4162875               | TDS402A15900 | 4156804               | TDS412A15900 | 15,900      | .6260 | 133 | 83 | 63     | 2,8 | 48 | 16 |
| 4162876               | TDS402A16000 | 4156805               | TDS412A16000 | 16,000      | .6299 | 133 | 83 | 63     | 2,8 | 48 | 16 |
| 4162877               | TDS402A16100 | 4156806               | TDS412A16100 | 16,100      | .6339 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4162878               | TDS402A16200 | 4156807               | TDS412A16200 | 16,200      | .6378 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4162879               | TDS402A16271 | 4156808               | TDS412A16271 | 16,271      | .6406 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4162880               | TDS402A16300 | 4156809               | TDS412A16300 | 16,300      | .6417 | 143 | 93 | 71     | 2,8 | 48 | 18 |
| 4162881               | TDS402A16400 | 4156810               | TDS412A16400 | 16,400      | .6457 | 143 | 93 | 71     | 2,8 | 48 | 18 |

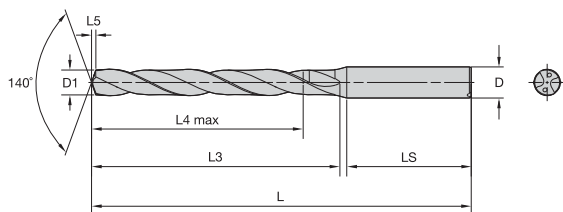
(continued)

(TDS402A • TDS412A • 5 x D — continued)

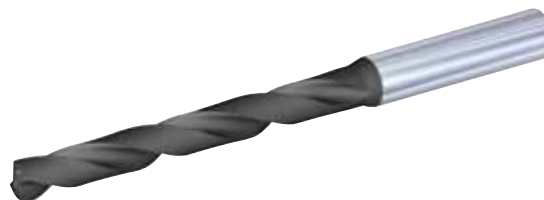


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |     |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|-----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3  | L4 max | L5  | LS | D  |
| 4162882               | TDS402A16500 | 4156811               | TDS412A16500 | 16,500      | .6496 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162883               | TDS402A16600 | 4156812               | TDS412A16600 | 16,600      | .6535 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162884               | TDS402A16670 | 4156813               | TDS412A16670 | 16,670      | .6563 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162885               | TDS402A16700 | 4156814               | TDS412A16700 | 16,700      | .6575 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162886               | TDS402A16800 | 4156815               | TDS412A16800 | 16,800      | .6614 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162887               | TDS402A16900 | 4156816               | TDS412A16900 | 16,900      | .6654 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162888               | TDS402A17000 | 4156817               | TDS412A17000 | 17,000      | .6693 | 143 | 93  | 71     | 2,9 | 48 | 18 |
| 4162889               | TDS402A17100 | 4156818               | TDS412A17100 | 17,100      | .6732 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162890               | TDS402A17200 | 4156819               | TDS412A17200 | 17,200      | .6772 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162891               | TDS402A17300 | 4156820               | TDS412A17300 | 17,300      | .6811 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162892               | TDS402A17400 | 4156821               | TDS412A17400 | 17,400      | .6850 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162893               | TDS402A17463 | 4156822               | TDS412A17463 | 17,463      | .6875 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162894               | TDS402A17500 | 4156823               | TDS412A17500 | 17,500      | .6890 | 143 | 93  | 71     | 3,0 | 48 | 18 |
| 4162895               | TDS402A17600 | 4156824               | TDS412A17600 | 17,600      | .6929 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162896               | TDS402A17700 | 4156825               | TDS412A17700 | 17,700      | .6969 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162897               | TDS402A17800 | 4156826               | TDS412A17800 | 17,800      | .7008 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162898               | TDS402A17859 | 4156827               | TDS412A17859 | 17,859      | .7031 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162899               | TDS402A17900 | 4156828               | TDS412A17900 | 17,900      | .7047 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162274               | TDS402A18000 | 4156853               | TDS412A18000 | 18,000      | .7087 | 143 | 93  | 71     | 3,1 | 48 | 18 |
| 4162275               | TDS402A18100 | 4156854               | TDS412A18100 | 18,100      | .7126 | 153 | 101 | 77     | 3,1 | 50 | 20 |
| 4162276               | TDS402A18200 | 4156855               | TDS412A18200 | 18,200      | .7165 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162277               | TDS402A18258 | 4156856               | TDS412A18258 | 18,258      | .7188 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162278               | TDS402A18300 | 4156857               | TDS412A18300 | 18,300      | .7205 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162279               | TDS402A18400 | 4156858               | TDS412A18400 | 18,400      | .7244 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162280               | TDS402A18500 | 4156859               | TDS412A18500 | 18,500      | .7283 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162281               | TDS402A18600 | 4156860               | TDS412A18600 | 18,600      | .7323 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162282               | TDS402A18654 | 4156861               | TDS412A18654 | 18,654      | .7344 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162393               | TDS402A18700 | 4156862               | TDS412A18700 | 18,700      | .7362 | 153 | 101 | 77     | 3,2 | 50 | 20 |
| 4162394               | TDS402A18800 | 4156863               | TDS412A18800 | 18,800      | .7402 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162395               | TDS402A18900 | 4156864               | TDS412A18900 | 18,900      | .7441 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162396               | TDS402A19000 | 4156865               | TDS412A19000 | 19,000      | .7480 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162397               | TDS402A19050 | 4156866               | TDS412A19050 | 19,050      | .7500 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162398               | TDS402A19100 | 4156867               | TDS412A19100 | 19,100      | .7520 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162399               | TDS402A19200 | 4156868               | TDS412A19200 | 19,200      | .7559 | 153 | 101 | 77     | 3,3 | 50 | 20 |
| 4162400               | TDS402A19300 | 4156869               | TDS412A19300 | 19,300      | .7598 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162401               | TDS402A19400 | 4156870               | TDS412A19400 | 19,400      | .7638 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162402               | TDS402A19500 | 4156871               | TDS412A19500 | 19,500      | .7677 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162403               | TDS402A19600 | 4156872               | TDS412A19600 | 19,600      | .7717 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162404               | TDS402A19700 | 4156873               | TDS412A19700 | 19,700      | .7756 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162405               | TDS402A19800 | 4156874               | TDS412A19800 | 19,800      | .7795 | 153 | 101 | 77     | 3,4 | 50 | 20 |
| 4162406               | TDS402A19900 | 4156875               | TDS412A19900 | 19,900      | .7835 | 153 | 101 | 77     | 3,5 | 50 | 20 |
| 4162407               | TDS402A20000 | 4156876               | TDS412A20000 | 20,000      | .7874 | 153 | 101 | 77     | 3,5 | 50 | 20 |



For information on L, L3, and L4 max, see page T143.



## ■ TDS403A • TDS413A • 8 x D

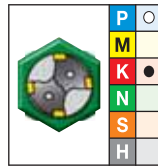
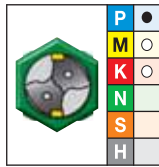


- first choice
- alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |    |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L  | L3 | L4 max | L5  | LS | D |
| 4162796               | TDS403A03000 | 4156972               | TDS413A03000 | 3,000       | .1181 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162797               | TDS403A03048 | 4156993               | TDS413A03048 | 3,048       | .1200 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162798               | TDS403A03100 | 4156994               | TDS413A03100 | 3,100       | .1220 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162799               | TDS403A03175 | 4156995               | TDS413A03175 | 3,175       | .1250 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162800               | TDS403A03200 | 4156996               | TDS413A03200 | 3,200       | .1260 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162801               | TDS403A03264 | 4156997               | TDS413A03264 | 3,264       | .1285 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4162802               | TDS403A03300 | 4156998               | TDS413A03300 | 3,300       | .1299 | 78 | 40 | 33     | 0,5 | 36 | 6 |
| 4163163               | TDS403A03400 | 4156999               | TDS413A03400 | 3,400       | .1339 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163164               | TDS403A03455 | 4157000               | TDS413A03455 | 3,455       | .1360 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163165               | TDS403A03500 | 4157001               | TDS413A03500 | 3,500       | .1378 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163166               | TDS403A03571 | 4157002               | TDS413A03571 | 3,571       | .1406 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163167               | TDS403A03600 | 4157003               | TDS413A03600 | 3,600       | .1417 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163168               | TDS403A03658 | 4157004               | TDS413A03658 | 3,658       | .1440 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163169               | TDS403A03700 | 4157005               | TDS413A03700 | 3,700       | .1457 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163170               | TDS403A03734 | 4157006               | TDS413A03734 | 3,734       | .1470 | 78 | 40 | 33     | 0,6 | 36 | 6 |
| 4163171               | TDS403A03800 | 4157007               | TDS413A03800 | 3,800       | .1496 | 87 | 49 | 41     | 0,6 | 36 | 6 |
| 4163172               | TDS403A03900 | 4157008               | TDS413A03900 | 3,900       | .1535 | 87 | 49 | 41     | 0,6 | 36 | 6 |
| 4163173               | TDS403A03970 | 4157009               | TDS413A03970 | 3,970       | .1563 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163174               | TDS403A04000 | 4157010               | TDS413A04000 | 4,000       | .1575 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163175               | TDS403A04039 | 4157011               | TDS413A04039 | 4,039       | .1590 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163176               | TDS403A04090 | 4157012               | TDS413A04090 | 4,090       | .1610 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163177               | TDS403A04100 | 4157013               | TDS413A04100 | 4,100       | .1614 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163178               | TDS403A04200 | 4157014               | TDS413A04200 | 4,200       | .1654 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163179               | TDS403A04217 | 4157015               | TDS413A04217 | 4,217       | .1660 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163180               | TDS403A04300 | 4157016               | TDS413A04300 | 4,300       | .1693 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163181               | TDS403A04366 | 4157017               | TDS413A04366 | 4,366       | .1719 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163182               | TDS403A04400 | 4157018               | TDS413A04400 | 4,400       | .1732 | 87 | 49 | 41     | 0,7 | 36 | 6 |
| 4163193               | TDS403A04500 | 4157019               | TDS413A04500 | 4,500       | .1772 | 87 | 49 | 41     | 0,7 | 36 | 6 |

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(TDS403A • TDS413A • 8 x D — continued)



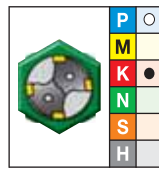
● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |   |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|---|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D |
| 4163194               | TDS403A04600 | 4157020               | TDS413A04600 | 4,600       | .1811 | 87  | 49 | 41     | 0,8 | 36 | 6 |
| 4163195               | TDS403A04623 | 4157021               | TDS413A04623 | 4,623       | .1820 | 87  | 49 | 41     | 0,8 | 36 | 6 |
| 4163196               | TDS403A04700 | 4157022               | TDS413A04700 | 4,700       | .1850 | 87  | 49 | 41     | 0,8 | 36 | 6 |
| 4163197               | TDS403A04763 | 4157023               | TDS413A04763 | 4,763       | .1875 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163198               | TDS403A04800 | 4157024               | TDS413A04800 | 4,800       | .1890 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163199               | TDS403A04852 | 4157025               | TDS413A04852 | 4,852       | .1910 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163200               | TDS403A04900 | 4157026               | TDS413A04900 | 4,900       | .1929 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163201               | TDS403A05000 | 4157027               | TDS413A05000 | 5,000       | .1969 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163202               | TDS403A05100 | 4157028               | TDS413A05100 | 5,100       | .2008 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163203               | TDS403A05106 | 4157029               | TDS413A05106 | 5,106       | .2010 | 94  | 56 | 48     | 0,8 | 36 | 6 |
| 4163204               | TDS403A05159 | 4157030               | TDS413A05159 | 5,159       | .2031 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163205               | TDS403A05200 | 4157031               | TDS413A05200 | 5,200       | .2047 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163206               | TDS403A05300 | 4157032               | TDS413A05300 | 5,300       | .2087 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163207               | TDS403A05400 | 4157033               | TDS413A05400 | 5,400       | .2126 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163208               | TDS403A05410 | 4157034               | TDS413A05410 | 5,410       | .2130 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163209               | TDS403A05500 | 4157035               | TDS413A05500 | 5,500       | .2165 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163210               | TDS403A05558 | 4157036               | TDS413A05558 | 5,558       | .2188 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163211               | TDS403A05600 | 4157037               | TDS413A05600 | 5,600       | .2205 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163212               | TDS403A05616 | 4157038               | TDS413A05616 | 5,616       | .2211 | 94  | 56 | 48     | 0,9 | 36 | 6 |
| 4163213               | TDS403A05700 | 4157039               | TDS413A05700 | 5,700       | .2244 | 94  | 56 | 48     | 1,0 | 36 | 6 |
| 4163214               | TDS403A05800 | 4157040               | TDS413A05800 | 5,800       | .2283 | 94  | 56 | 48     | 1,0 | 36 | 6 |
| 4163215               | TDS403A05900 | 4157041               | TDS413A05900 | 5,900       | .2323 | 94  | 56 | 48     | 1,0 | 36 | 6 |
| 4163216               | TDS403A05954 | 4157042               | TDS413A05954 | 5,954       | .2344 | 94  | 56 | 48     | 1,0 | 36 | 6 |
| 4163217               | TDS403A06000 | 4157043               | TDS413A06000 | 6,000       | .2362 | 94  | 56 | 48     | 1,0 | 36 | 6 |
| 4163218               | TDS403A06100 | 4157044               | TDS413A06100 | 6,100       | .2402 | 105 | 67 | 57     | 1,0 | 36 | 8 |
| 4163219               | TDS403A06200 | 4157045               | TDS413A06200 | 6,200       | .2441 | 105 | 67 | 57     | 1,0 | 36 | 8 |
| 4163220               | TDS403A06300 | 4157046               | TDS413A06300 | 6,300       | .2480 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163221               | TDS403A06350 | 4157047               | TDS413A06350 | 6,350       | .2500 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163222               | TDS403A06400 | 4157048               | TDS413A06400 | 6,400       | .2520 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163223               | TDS403A06500 | 4157049               | TDS413A06500 | 6,500       | .2559 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163224               | TDS403A06528 | 4157050               | TDS413A06528 | 6,528       | .2570 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163225               | TDS403A06600 | 4157051               | TDS413A06600 | 6,600       | .2598 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163226               | TDS403A06630 | 4157052               | TDS413A06630 | 6,630       | .2610 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163227               | TDS403A06700 | 4157053               | TDS413A06700 | 6,700       | .2638 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163228               | TDS403A06746 | 4157054               | TDS413A06746 | 6,746       | .2656 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163229               | TDS403A06800 | 4157055               | TDS413A06800 | 6,800       | .2677 | 105 | 67 | 57     | 1,1 | 36 | 8 |
| 4163230               | TDS403A06900 | 4157056               | TDS413A06900 | 6,900       | .2717 | 105 | 67 | 57     | 1,2 | 36 | 8 |
| 4163231               | TDS403A07000 | 4157057               | TDS413A07000 | 7,000       | .2756 | 105 | 67 | 57     | 1,2 | 36 | 8 |
| 4163232               | TDS403A07100 | 4157058               | TDS413A07100 | 7,100       | .2795 | 110 | 72 | 61     | 1,2 | 36 | 8 |
| 4163233               | TDS403A07145 | 4157059               | TDS413A07145 | 7,145       | .2813 | 110 | 72 | 61     | 1,2 | 36 | 8 |

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(TDS403A • TDS413A • 8 x D — continued)

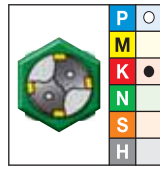
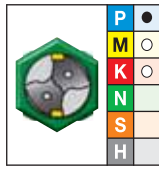


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |    |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3 | L4 max | L5  | LS | D  |
| 4163234               | TDS403A07200 | 4157060               | TDS413A07200 | 7,200       | .2835 | 110 | 72 | 61     | 1,2 | 36 | 8  |
| 4163235               | TDS403A07300 | 4157061               | TDS413A07300 | 7,300       | .2874 | 110 | 72 | 61     | 1,2 | 36 | 8  |
| 4163236               | TDS403A07400 | 4157062               | TDS413A07400 | 7,400       | .2913 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163237               | TDS403A07500 | 4157063               | TDS413A07500 | 7,500       | .2953 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163238               | TDS403A07541 | 4157064               | TDS413A07541 | 7,541       | .2969 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163239               | TDS403A07600 | 4157065               | TDS413A07600 | 7,600       | .2992 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163240               | TDS403A07700 | 4157066               | TDS413A07700 | 7,700       | .3031 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163241               | TDS403A07800 | 4157067               | TDS413A07800 | 7,800       | .3071 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163242               | TDS403A07900 | 4157068               | TDS413A07900 | 7,900       | .3110 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163243               | TDS403A07938 | 4157069               | TDS413A07938 | 7,938       | .3125 | 110 | 72 | 61     | 1,3 | 36 | 8  |
| 4163244               | TDS403A08000 | 4157070               | TDS413A08000 | 8,000       | .3150 | 110 | 72 | 61     | 1,4 | 36 | 8  |
| 4163245               | TDS403A08100 | 4157071               | TDS413A08100 | 8,100       | .3189 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163246               | TDS403A08200 | 4157072               | TDS413A08200 | 8,200       | .3228 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163247               | TDS403A08300 | 4157073               | TDS413A08300 | 8,300       | .3268 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163248               | TDS403A08334 | 4157074               | TDS413A08334 | 8,334       | .3281 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163249               | TDS403A08400 | 4157075               | TDS413A08400 | 8,400       | .3307 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163250               | TDS403A08433 | 4157076               | TDS413A08433 | 8,433       | .3320 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163251               | TDS403A08500 | 4157077               | TDS413A08500 | 8,500       | .3346 | 122 | 80 | 68     | 1,4 | 40 | 10 |
| 4163252               | TDS403A08600 | 4157078               | TDS413A08600 | 8,600       | .3386 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163253               | TDS403A08700 | 4157079               | TDS413A08700 | 8,700       | .3425 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163254               | TDS403A08733 | 4157080               | TDS413A08733 | 8,733       | .3438 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163255               | TDS403A08800 | 4157081               | TDS413A08800 | 8,800       | .3465 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163256               | TDS403A08900 | 4157082               | TDS413A08900 | 8,900       | .3504 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163257               | TDS403A09000 | 4157083               | TDS413A09000 | 9,000       | .3543 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163258               | TDS403A09100 | 4157084               | TDS413A09100 | 9,100       | .3583 | 122 | 80 | 68     | 1,5 | 40 | 10 |
| 4163259               | TDS403A09129 | 4157085               | TDS413A09129 | 9,129       | .3594 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163260               | TDS403A09200 | 4157086               | TDS413A09200 | 9,200       | .3622 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163261               | TDS403A09300 | 4157087               | TDS413A09300 | 9,300       | .3661 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163262               | TDS403A09347 | 4157088               | TDS413A09347 | 9,347       | .3680 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163263               | TDS403A09400 | 4157089               | TDS413A09400 | 9,400       | .3701 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163264               | TDS403A09500 | 4157090               | TDS413A09500 | 9,500       | .3740 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163265               | TDS403A09525 | 4157091               | TDS413A09525 | 9,525       | .3750 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163266               | TDS403A09600 | 4157092               | TDS413A09600 | 9,600       | .3780 | 122 | 80 | 68     | 1,6 | 40 | 10 |
| 4163267               | TDS403A09700 | 4157093               | TDS413A09700 | 9,700       | .3819 | 122 | 80 | 68     | 1,7 | 40 | 10 |
| 4163268               | TDS403A09800 | 4157094               | TDS413A09800 | 9,800       | .3858 | 122 | 80 | 68     | 1,7 | 40 | 10 |
| 4163269               | TDS403A09900 | 4157095               | TDS413A09900 | 9,900       | .3898 | 122 | 80 | 68     | 1,7 | 40 | 10 |
| 4163270               | TDS403A09921 | 4157096               | TDS413A09921 | 9,921       | .3906 | 122 | 80 | 68     | 1,7 | 40 | 10 |
| 4162679               | TDS403A10000 | 4156836               | TDS413A10000 | 10,000      | .3937 | 122 | 80 | 68     | 1,7 | 40 | 10 |
| 4162680               | TDS403A10100 | 4156837               | TDS413A10100 | 10,100      | .3976 | 141 | 94 | 79     | 1,7 | 45 | 12 |
| 4162382               | TDS403A10200 | 4156838               | TDS413A10200 | 10,200      | .4016 | 141 | 94 | 79     | 1,7 | 45 | 12 |

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(TDS403A • TDS413A • 8 x D — continued)



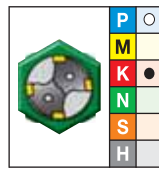
● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |     |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|-----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3  | L4 max | L5  | LS | D  |
| 4162703               | TDS403A10300 | 4156839               | TDS413A10300 | 10,300      | .4055 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162704               | TDS403A10320 | 4156840               | TDS413A10320 | 10,320      | .4063 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162705               | TDS403A10400 | 4156841               | TDS413A10400 | 10,400      | .4094 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162706               | TDS403A10500 | 4156842               | TDS413A10500 | 10,500      | .4134 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162707               | TDS403A10600 | 4156883               | TDS413A10600 | 10,600      | .4173 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162708               | TDS403A10700 | 4156884               | TDS413A10700 | 10,700      | .4213 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162709               | TDS403A10716 | 4156885               | TDS413A10716 | 10,716      | .4219 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162710               | TDS403A10800 | 4156886               | TDS413A10800 | 10,800      | .4252 | 141 | 94  | 79     | 1,8 | 45 | 12 |
| 4162711               | TDS403A10900 | 4156887               | TDS413A10900 | 10,900      | .4291 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162712               | TDS403A11000 | 4156888               | TDS413A11000 | 11,000      | .4331 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162713               | TDS403A11100 | 4156889               | TDS413A11100 | 11,100      | .4370 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162714               | TDS403A11113 | 4156890               | TDS413A11113 | 11,113      | .4375 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162715               | TDS403A11200 | 4156891               | TDS413A11200 | 11,200      | .4409 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162716               | TDS403A11300 | 4156892               | TDS413A11300 | 11,300      | .4449 | 141 | 94  | 79     | 1,9 | 45 | 12 |
| 4162717               | TDS403A11400 | 4156893               | TDS413A11400 | 11,400      | .4488 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162718               | TDS403A11500 | 4156894               | TDS413A11500 | 11,500      | .4528 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162719               | TDS403A11509 | 4156895               | TDS413A11509 | 11,509      | .4531 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162720               | TDS403A11600 | 4156896               | TDS413A11600 | 11,600      | .4567 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162721               | TDS403A11700 | 4156897               | TDS413A11700 | 11,700      | .4606 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162722               | TDS403A11800 | 4156898               | TDS413A11800 | 11,800      | .4646 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162723               | TDS403A11900 | 4156899               | TDS413A11900 | 11,900      | .4685 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162724               | TDS403A11908 | 4156900               | TDS413A11908 | 11,908      | .4688 | 141 | 94  | 79     | 2,0 | 45 | 12 |
| 4162725               | TDS403A12000 | 4156901               | TDS413A12000 | 12,000      | .4724 | 141 | 94  | 79     | 2,1 | 45 | 12 |
| 4162726               | TDS403A12100 | 4156902               | TDS413A12100 | 12,100      | .4764 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162727               | TDS403A12200 | 4156903               | TDS413A12200 | 12,200      | .4803 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162728               | TDS403A12300 | 4156904               | TDS413A12300 | 12,300      | .4843 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162729               | TDS403A12304 | 4156905               | TDS413A12304 | 12,304      | .4844 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162730               | TDS403A12400 | 4156906               | TDS413A12400 | 12,400      | .4882 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162681               | TDS403A12500 | 4148984               | TDS413A12500 | 12,500      | .4921 | 155 | 108 | 91     | 2,1 | 45 | 14 |
| 4162731               | TDS403A12600 | 4156907               | TDS413A12600 | 12,600      | .4961 | 155 | 108 | 91     | 2,2 | 45 | 14 |
| 4162732               | TDS403A12700 | 4156908               | TDS413A12700 | 12,700      | .5000 | 155 | 108 | 91     | 2,2 | 45 | 14 |
| 4162733               | TDS403A12800 | 4156909               | TDS413A12800 | 12,800      | .5039 | 155 | 108 | 91     | 2,2 | 45 | 14 |
| 4162734               | TDS403A12900 | 4156910               | TDS413A12900 | 12,900      | .5079 | 155 | 108 | 91     | 2,2 | 45 | 14 |
| 4162735               | TDS403A13000 | 4156911               | TDS413A13000 | 13,000      | .5118 | 155 | 108 | 91     | 2,2 | 45 | 14 |
| 4162736               | TDS403A13096 | 4156912               | TDS413A13096 | 13,096      | .5156 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162737               | TDS403A13100 | 4156913               | TDS413A13100 | 13,100      | .5157 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162738               | TDS403A13200 | 4156914               | TDS413A13200 | 13,200      | .5197 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162739               | TDS403A13300 | 4156915               | TDS413A13300 | 13,300      | .5236 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162740               | TDS403A13400 | 4156916               | TDS413A13400 | 13,400      | .5276 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162741               | TDS403A13500 | 4156917               | TDS413A13500 | 13,500      | .5315 | 155 | 108 | 91     | 2,3 | 45 | 14 |

(continued)



(TDS403A • TDS413A • 8 x D — continued)

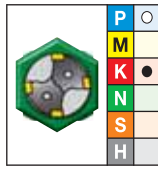
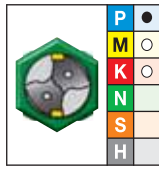


● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |     |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|-----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3  | L4 max | L5  | LS | D  |
| 4162742               | TDS403A13600 | 4156918               | TDS413A13600 | 13,600      | .5354 | 155 | 108 | 91     | 2,3 | 45 | 14 |
| 4162743               | TDS403A13700 | 4156919               | TDS413A13700 | 13,700      | .5394 | 155 | 108 | 91     | 2,4 | 45 | 14 |
| 4162744               | TDS403A13800 | 4156920               | TDS413A13800 | 13,800      | .5433 | 155 | 108 | 91     | 2,4 | 45 | 14 |
| 4162745               | TDS403A13891 | 4156921               | TDS413A13891 | 13,891      | .5469 | 155 | 108 | 91     | 2,4 | 45 | 14 |
| 4162746               | TDS403A13900 | 4156922               | TDS413A13900 | 13,900      | .5472 | 155 | 108 | 91     | 2,4 | 45 | 14 |
| 4162747               | TDS403A14000 | 4156923               | TDS413A14000 | 14,000      | .5512 | 155 | 108 | 91     | 2,4 | 45 | 14 |
| 4162748               | TDS403A14100 | 4156924               | TDS413A14100 | 14,100      | .5551 | 171 | 121 | 101    | 2,4 | 48 | 16 |
| 4162749               | TDS403A14200 | 4156925               | TDS413A14200 | 14,200      | .5591 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162750               | TDS403A14288 | 4156926               | TDS413A14288 | 14,288      | .5625 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162751               | TDS403A14300 | 4156927               | TDS413A14300 | 14,300      | .5630 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162752               | TDS403A14400 | 4156928               | TDS413A14400 | 14,400      | .5669 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162753               | TDS403A14500 | 4156929               | TDS413A14500 | 14,500      | .5709 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162754               | TDS403A14600 | 4156930               | TDS413A14600 | 14,600      | .5748 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162755               | TDS403A14684 | 4156931               | TDS413A14684 | 14,684      | .5781 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162756               | TDS403A14700 | 4156932               | TDS413A14700 | 14,700      | .5787 | 171 | 121 | 101    | 2,5 | 48 | 16 |
| 4162757               | TDS403A14800 | 4156933               | TDS413A14800 | 14,800      | .5827 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162758               | TDS403A14900 | 4156934               | TDS413A14900 | 14,900      | .5866 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162759               | TDS403A15000 | 4156935               | TDS413A15000 | 15,000      | .5906 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162760               | TDS403A15083 | 4156936               | TDS413A15083 | 15,083      | .5938 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162761               | TDS403A15100 | 4156937               | TDS413A15100 | 15,100      | .5945 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162762               | TDS403A15200 | 4156938               | TDS413A15200 | 15,200      | .5984 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162763               | TDS403A15300 | 4156939               | TDS413A15300 | 15,300      | .6024 | 171 | 121 | 101    | 2,6 | 48 | 16 |
| 4162764               | TDS403A15400 | 4156940               | TDS413A15400 | 15,400      | .6063 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162765               | TDS403A15479 | 4156941               | TDS413A15479 | 15,479      | .6094 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162766               | TDS403A15500 | 4156942               | TDS413A15500 | 15,500      | .6102 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162767               | TDS403A15600 | 4156943               | TDS413A15600 | 15,600      | .6142 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162768               | TDS403A15700 | 4156944               | TDS413A15700 | 15,700      | .6181 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162769               | TDS403A15800 | 4156945               | TDS413A15800 | 15,800      | .6220 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162770               | TDS403A15875 | 4156946               | TDS413A15875 | 15,875      | .6250 | 171 | 121 | 101    | 2,7 | 48 | 16 |
| 4162771               | TDS403A15900 | 4156947               | TDS413A15900 | 15,900      | .6260 | 171 | 121 | 101    | 2,8 | 48 | 16 |
| 4162772               | TDS403A16000 | 4156948               | TDS413A16000 | 16,000      | .6299 | 171 | 121 | 101    | 2,8 | 48 | 16 |
| 4162773               | TDS403A16100 | 4156949               | TDS413A16100 | 16,100      | .6339 | 185 | 135 | 113    | 2,8 | 48 | 18 |
| 4162774               | TDS403A16200 | 4156950               | TDS413A16200 | 16,200      | .6378 | 185 | 135 | 113    | 2,8 | 48 | 18 |
| 4162775               | TDS403A16271 | 4156951               | TDS413A16271 | 16,271      | .6406 | 185 | 135 | 113    | 2,8 | 48 | 18 |
| 4162776               | TDS403A16300 | 4156952               | TDS413A16300 | 16,300      | .6417 | 185 | 135 | 113    | 2,8 | 48 | 18 |
| 4162777               | TDS403A16400 | 4156953               | TDS413A16400 | 16,400      | .6457 | 185 | 135 | 113    | 2,8 | 48 | 18 |
| 4162778               | TDS403A16500 | 4156954               | TDS413A16500 | 16,500      | .6496 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162779               | TDS403A16600 | 4156955               | TDS413A16600 | 16,600      | .6535 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162780               | TDS403A16670 | 4156956               | TDS413A16670 | 16,670      | .6563 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162781               | TDS403A16700 | 4156957               | TDS413A16700 | 16,700      | .6575 | 185 | 135 | 113    | 2,9 | 48 | 18 |

(continued)

(TDS403A • TDS413A • 8 x D — continued)



● first choice  
○ alternate choice

| grade WP20PD<br>TiAlN |              | grade WK15PD<br>AlCrN |              | D1 diameter |       |     |     |        |     |    |    |
|-----------------------|--------------|-----------------------|--------------|-------------|-------|-----|-----|--------|-----|----|----|
| order #               | catalogue #  | order #               | catalogue #  | mm          | in    | L   | L3  | L4 max | L5  | LS | D  |
| 4162782               | TDS403A16800 | 4156958               | TDS413A16800 | 16,800      | .6614 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162783               | TDS403A16900 | 4156959               | TDS413A16900 | 16,900      | .6654 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162784               | TDS403A17000 | 4156960               | TDS413A17000 | 17,000      | .6693 | 185 | 135 | 113    | 2,9 | 48 | 18 |
| 4162785               | TDS403A17100 | 4156961               | TDS413A17100 | 17,100      | .6732 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162786               | TDS403A17200 | 4156962               | TDS413A17200 | 17,200      | .6772 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162787               | TDS403A17300 | 4156963               | TDS413A17300 | 17,300      | .6811 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162788               | TDS403A17400 | 4156964               | TDS413A17400 | 17,400      | .6850 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162789               | TDS403A17463 | 4156965               | TDS413A17463 | 17,463      | .6875 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162790               | TDS403A17500 | 4156966               | TDS413A17500 | 17,500      | .6890 | 185 | 135 | 113    | 3,0 | 48 | 18 |
| 4162791               | TDS403A17600 | 4156967               | TDS413A17600 | 17,600      | .6929 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162792               | TDS403A17700 | 4156968               | TDS413A17700 | 17,700      | .6969 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162793               | TDS403A17800 | 4156969               | TDS413A17800 | 17,800      | .7008 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162794               | TDS403A17859 | 4156970               | TDS413A17859 | 17,859      | .7031 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162795               | TDS403A17900 | 4156971               | TDS413A17900 | 17,900      | .7047 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162515               | TDS403A18000 | 4157206               | TDS413A18000 | 18,000      | .7087 | 185 | 135 | 113    | 3,1 | 48 | 18 |
| 4162516               | TDS403A18100 | 4157207               | TDS413A18100 | 18,100      | .7126 | 200 | 148 | 124    | 3,1 | 50 | 20 |
| 4162517               | TDS403A18200 | 4157208               | TDS413A18200 | 18,200      | .7165 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162518               | TDS403A18258 | 4157209               | TDS413A18258 | 18,258      | .7188 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162519               | TDS403A18300 | 4157210               | TDS413A18300 | 18,300      | .7205 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162520               | TDS403A18400 | 4157211               | TDS413A18400 | 18,400      | .7244 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162521               | TDS403A18500 | 4157212               | TDS413A18500 | 18,500      | .7283 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162522               | TDS403A18600 | 4157253               | TDS413A18600 | 18,600      | .7323 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162663               | TDS403A18654 | 4157254               | TDS413A18654 | 18,654      | .7344 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162664               | TDS403A18700 | 4157255               | TDS413A18700 | 18,700      | .7362 | 200 | 148 | 124    | 3,2 | 50 | 20 |
| 4162665               | TDS403A18800 | 4157256               | TDS413A18800 | 18,800      | .7402 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162666               | TDS403A18900 | 4157257               | TDS413A18900 | 18,900      | .7441 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162667               | TDS403A19000 | 4157258               | TDS413A19000 | 19,000      | .7480 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162668               | TDS403A19050 | 4157259               | TDS413A19050 | 19,050      | .7500 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162669               | TDS403A19100 | 4157260               | TDS413A19100 | 19,100      | .7520 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162670               | TDS403A19200 | 4157261               | TDS413A19200 | 19,200      | .7559 | 200 | 148 | 124    | 3,3 | 50 | 20 |
| 4162671               | TDS403A19300 | 4157262               | TDS413A19300 | 19,300      | .7598 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162672               | TDS403A19400 | 4157263               | TDS413A19400 | 19,400      | .7638 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162673               | TDS403A19500 | 4157264               | TDS413A19500 | 19,500      | .7677 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162674               | TDS403A19600 | 4157265               | TDS413A19600 | 19,600      | .7717 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162675               | TDS403A19700 | 4157266               | TDS413A19700 | 19,700      | .7756 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162676               | TDS403A19800 | 4157267               | TDS413A19800 | 19,800      | .7795 | 200 | 148 | 124    | 3,4 | 50 | 20 |
| 4162677               | TDS403A19900 | 4157268               | TDS413A19900 | 19,900      | .7835 | 200 | 148 | 124    | 3,5 | 50 | 20 |
| 4162678               | TDS403A20000 | 4157269               | TDS413A20000 | 20,000      | .7874 | 200 | 148 | 124    | 3,5 | 50 | 20 |

■ TOP DRILL S • TDS202 • WP20PD™ • Flood Coolant • Metric

| Material Group |                |  |       |  |           |           |           |           |           |           |           |           |
|----------------|----------------|-----------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |                | Cutting Speed – vc                                                                |       | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |
|                |                | min                                                                               | – max | Tool Diameter (mm)                                                                 | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1              | 70                                                                                | – 140 | mm/r                                                                               | 0,08–0,15 | 0,10–0,18 | 0,12–0,25 | 0,15–0,30 | 0,15–0,34 | 0,20–0,38 | 0,23–0,45 | 0,28–0,55 |
|                | 2, 3, 4, 6, 7  | 70                                                                                | – 140 | mm/r                                                                               | 0,08–0,16 | 0,10–0,19 | 0,12–0,25 | 0,15–0,30 | 0,19–0,34 | 0,22–0,38 | 0,28–0,48 | 0,34–0,60 |
|                | 5, 9, 10, 11   | 60                                                                                | – 120 | mm/r                                                                               | 0,08–0,16 | 0,10–0,19 | 0,12–0,25 | 0,14–0,30 | 0,17–0,33 | 0,20–0,38 | 0,24–0,48 | 0,29–0,60 |
|                | 12, 13.1, 13.2 | 40                                                                                | – 60  | mm/r                                                                               | 0,06–0,10 | 0,08–0,12 | 0,10–0,20 | 0,10–0,22 | 0,13–0,24 | 0,14–0,27 | 0,18–0,32 | 0,24–0,42 |
| M              | 14.1           | 30                                                                                | – 50  | mm/r                                                                               | 0,05–0,09 | 0,06–0,11 | 0,08–0,13 | 0,09–0,15 | 0,10–0,17 | 0,12–0,20 | 0,14–0,22 | 0,16–0,25 |
|                | 14.3           | 40                                                                                | – 60  | mm/r                                                                               | 0,05–0,10 | 0,07–0,12 | 0,09–0,13 | 0,10–0,18 | 0,10–0,20 | 0,12–0,22 | 0,14–0,25 | 0,16–0,28 |
|                | 14.2, 14.4     | 30                                                                                | – 50  | mm/r                                                                               | 0,05–0,09 | 0,07–0,11 | 0,08–0,12 | 0,09–0,15 | 0,10–0,17 | 0,12–0,19 | 0,14–0,21 | 0,16–0,25 |

■ TOP DRILL S • TDS401/TDS402/TDS403 • WP20PD • Through Coolant • Metric

| Material Group |                |  |       |  |           |           |           |           |           |           |           |           |
|----------------|----------------|-------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |                | Cutting Speed – vc                                                                  |       | Recommended Feed Rate (f) by Diameter                                                |           |           |           |           |           |           |           |           |
|                |                | min                                                                                 | – max | Tool Diameter (mm)                                                                   | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1              | 80                                                                                  | – 180 | mm/r                                                                                 | 0,08–0,16 | 0,11–0,19 | 0,13–0,26 | 0,16–0,32 | 0,16–0,36 | 0,21–0,40 | 0,24–0,47 | 0,29–0,58 |
|                | 2, 3, 4, 6, 7  | 80                                                                                  | – 160 | mm/r                                                                                 | 0,09–0,17 | 0,11–0,20 | 0,13–0,26 | 0,16–0,32 | 0,20–0,36 | 0,23–0,40 | 0,29–0,50 | 0,36–0,63 |
|                | 5, 9, 10, 11   | 80                                                                                  | – 140 | mm/r                                                                                 | 0,08–0,17 | 0,11–0,20 | 0,12–0,26 | 0,15–0,32 | 0,18–0,35 | 0,21–0,40 | 0,25–0,50 | 0,30–0,63 |
|                | 12, 13.1, 13.2 | 50                                                                                  | – 80  | mm/r                                                                                 | 0,06–0,11 | 0,08–0,13 | 0,11–0,21 | 0,10–0,23 | 0,13–0,25 | 0,14–0,28 | 0,29–0,33 | 0,25–0,44 |
| M              | 14.1           | 40                                                                                  | – 60  | mm/r                                                                                 | 0,05–0,09 | 0,06–0,12 | 0,08–0,14 | 0,09–0,16 | 0,11–0,18 | 0,13–0,21 | 0,15–0,23 | 0,17–0,26 |
|                | 14.3           | 40                                                                                  | – 70  | mm/r                                                                                 | 0,05–0,11 | 0,07–0,13 | 0,09–0,14 | 0,11–0,19 | 0,11–0,21 | 0,13–0,23 | 0,15–0,26 | 0,17–0,29 |
|                | 14.2, 14.4     | 35                                                                                  | – 50  | mm/r                                                                                 | 0,05–0,09 | 0,07–0,12 | 0,08–0,13 | 0,09–0,16 | 0,11–0,18 | 0,13–0,20 | 0,15–0,22 | 0,17–0,26 |

## Metric

## tolerance

| nominal size range | D1 tolerance m7 | D tolerance h6 |
|--------------------|-----------------|----------------|
| >3–6               | 0,004/0,016     | 0,000/-0,008   |
| >6–10              | 0,006/0,021     | 0,000/-0,009   |
| >10–18             | 0,007/0,025     | 0,000/-0,011   |
| >18–25,4           | 0,008/0,029     | 0,000/-0,013   |

■ TOP DRILL S • TDS212 • WK15PD™ • Flood Coolant • Metric

| Material Group |            | Cutting Speed<br>— vc<br>Range — m/min | Recommended Feed Rate (f) by Diameter |           |           |           |           |           |           |           |           |
|----------------|------------|----------------------------------------|---------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |            |                                        | Tool Diameter<br>(mm)                 | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
|                |            |                                        |                                       |           |           |           |           |           |           |           |           |
| K              | 15, 16     | 70 – 170                               | mm/r                                  | 0,16–0,31 | 0,20–0,38 | 0,23–0,44 | 0,25–0,49 | 0,31–0,60 | 0,38–0,74 | 0,31–0,60 | 0,38–0,74 |
|                | 17, 18, 19 | 80 – 140                               | mm/r                                  | 0,16–0,25 | 0,20–0,31 | 0,23–0,36 | 0,25–0,40 | 0,31–0,48 | 0,38–0,60 | 0,31–0,48 | 0,38–0,60 |
|                | 20         | 70 – 130                               | mm/r                                  | 0,12–0,25 | 0,14–0,30 | 0,17–0,35 | 0,19–0,40 | 0,24–0,48 | 0,30–0,60 | 0,24–0,48 | 0,30–0,60 |

■ TOP DRILL S • TDS411/TDS412/TDS413 • WK15PD • Through Coolant • Metric

| Material Group |            | Cutting Speed<br>— vc<br>Range — m/min | Recommended Feed Rate (f) by Diameter |           |           |           |           |           |           |           |           |
|----------------|------------|----------------------------------------|---------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |            |                                        | Tool Diameter<br>(mm)                 | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
|                |            |                                        |                                       |           |           |           |           |           |           |           |           |
| K              | 15, 16     | 80 – 190                               | mm/r                                  | 0,11–0,22 | 0,12–0,24 | 0,16–0,31 | 0,20–0,38 | 0,23–0,44 | 0,25–0,49 | 0,31–0,60 | 0,38–0,74 |
|                | 17, 18, 19 | 90 – 170                               | mm/r                                  | 0,12–0,16 | 0,13–0,19 | 0,16–0,25 | 0,20–0,31 | 0,23–0,36 | 0,25–0,40 | 0,31–0,48 | 0,38–0,60 |
|                | 20         | 80 – 150                               | mm/r                                  | 0,08–0,17 | 0,09–0,19 | 0,12–0,25 | 0,14–0,30 | 0,17–0,35 | 0,19–0,40 | 0,24–0,48 | 0,30–0,60 |

| Metric tolerance   |                 |                |
|--------------------|-----------------|----------------|
| nominal size range | D1 tolerance m7 | D tolerance h6 |
| >3–6               | 0,004/0,016     | 0,000/-0,008   |
| >6–10              | 0,006/0,021     | 0,000/-0,009   |
| >10–18             | 0,007/0,025     | 0,000/-0,011   |
| >18–25,4           | 0,008/0,029     | 0,000/-0,013   |

## Multiple-Application Drilling • **Top Drill S+™**

The WIDIA™ line of Top Drill S+ enables superior performance across a wide variety of even the most complex and challenging applications, such as drilling through inclined entries, x-holes, and exits. Proprietary technology ensures the highest speed and feed rates available. Most advanced grade and geometry features define the Top Drill S+ as a true troubleshooter.

- Suitable for a broad range of materials and applications.
- Ensures increased tool life and enhanced wear resistance.
- Facilitates consistent chip forming and breaking.



# TOP DRILL S+™

The versatile TOP DRILL S+ provides reliable performance across a broad scope of applications, including alloyed and unalloyed steel, cast iron, and some stainless steels and high-temperature alloys.

- Four-margin design ensures stability, consistency, and improved hole quality.
- PVD coating provides increased tool life and wear resistance.
- Through tool coolant and solid versions available standard.

### **Use as Pilot Drill**

- Ideal point angle and tolerance make the TOP DRILL S+™ drill the preferred pilot drill for TDD Series solid carbide deep-hole drills.

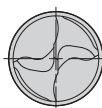
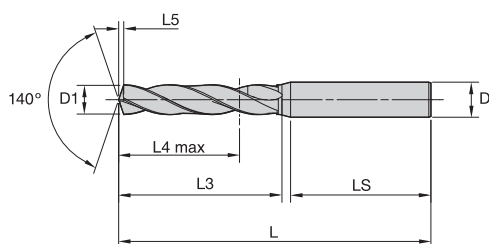
### **TOP DRILL S+ Drill-Point Design**

- Low thrust. Works well on a variety of machines.
- Excellent centring capabilities.
- Easy to regrind.

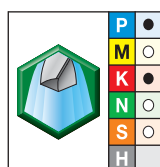
### **Four-Margin Land Design**

- Improves hole straightness and roundness.
- Provides good alignment and stability in tough drilling applications — even when drilling through cross holes.





## ■ TDS301A • 3 x D



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |    |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L  |
| 2964222               | TDS301A03000 | 3,000       | .1181 | 6 | 20 | 14     | 0,48 | 36 | 62 |
| 2964233               | TDS301A03100 | 3,100       | .1220 | 6 | 20 | 14     | 0,50 | 36 | 62 |
| 2964234               | TDS301A03200 | 3,200       | .1260 | 6 | 20 | 14     | 0,52 | 36 | 62 |
| 2964235               | TDS301A03250 | 3,250       | .1280 | 6 | 20 | 14     | 0,53 | 36 | 62 |
| 2964236               | TDS301A03300 | 3,300       | .1299 | 6 | 20 | 14     | 0,54 | 36 | 62 |
| 2964237               | TDS301A03400 | 3,400       | .1339 | 6 | 20 | 14     | 0,55 | 36 | 62 |
| 2964238               | TDS301A03500 | 3,500       | .1378 | 6 | 20 | 14     | 0,57 | 36 | 62 |
| 2964239               | TDS301A03600 | 3,600       | .1417 | 6 | 20 | 14     | 0,59 | 36 | 62 |
| 2964240               | TDS301A03700 | 3,700       | .1457 | 6 | 20 | 14     | 0,61 | 36 | 62 |
| 2964241               | TDS301A03800 | 3,800       | .1496 | 6 | 24 | 17     | 0,62 | 36 | 66 |
| 2964242               | TDS301A03900 | 3,900       | .1535 | 6 | 24 | 17     | 0,64 | 36 | 66 |
| 2964243               | TDS301A04000 | 4,000       | .1575 | 6 | 24 | 17     | 0,66 | 36 | 66 |
| 2964244               | TDS301A04100 | 4,100       | .1614 | 6 | 24 | 17     | 0,67 | 36 | 66 |
| 2964245               | TDS301A04200 | 4,200       | .1654 | 6 | 24 | 17     | 0,69 | 36 | 66 |
| 2964246               | TDS301A04300 | 4,300       | .1693 | 6 | 24 | 17     | 0,71 | 36 | 66 |
| 2964247               | TDS301A04370 | 4,370       | .1720 | 6 | 24 | 17     | 0,72 | 36 | 66 |
| 2964248               | TDS301A04400 | 4,400       | .1732 | 6 | 24 | 17     | 0,73 | 36 | 66 |
| 2964249               | TDS301A04500 | 4,500       | .1772 | 6 | 24 | 17     | 0,74 | 36 | 66 |
| 2964250               | TDS301A04600 | 4,600       | .1811 | 6 | 24 | 17     | 0,76 | 36 | 66 |
| 2964251               | TDS301A04650 | 4,650       | .1831 | 6 | 24 | 17     | 0,77 | 36 | 66 |
| 2964252               | TDS301A04700 | 4,700       | .1850 | 6 | 24 | 17     | 0,78 | 36 | 66 |
| 2964273               | TDS301A04760 | 4,760       | .1874 | 6 | 28 | 20     | 0,79 | 36 | 66 |
| 2964274               | TDS301A04800 | 4,800       | .1890 | 6 | 28 | 20     | 0,80 | 36 | 66 |
| 2964275               | TDS301A04900 | 4,900       | .1929 | 6 | 28 | 20     | 0,81 | 36 | 66 |

(continued)



(TDS301A • 3 x D — continued)

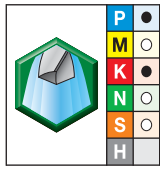


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |    |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L  |
| 2964276               | TDS301A05000 | 5,000       | .1969 | 6 | 28 | 20     | 0,83 | 36 | 66 |
| 2964277               | TDS301A05100 | 5,100       | .2008 | 6 | 28 | 20     | 0,85 | 36 | 66 |
| 2964278               | TDS301A05160 | 5,160       | .2031 | 6 | 28 | 20     | 0,86 | 36 | 66 |
| 2964279               | TDS301A05200 | 5,200       | .2047 | 6 | 28 | 20     | 0,87 | 36 | 66 |
| 2964280               | TDS301A05300 | 5,300       | .2087 | 6 | 28 | 20     | 0,88 | 36 | 66 |
| 2964281               | TDS301A05400 | 5,400       | .2126 | 6 | 28 | 20     | 0,90 | 36 | 66 |
| 2964282               | TDS301A05500 | 5,500       | .2165 | 6 | 28 | 20     | 0,92 | 36 | 66 |
| 2964293               | TDS301A05550 | 5,550       | .2185 | 6 | 28 | 20     | 0,93 | 36 | 66 |
| 2964294               | TDS301A05560 | 5,560       | .2189 | 6 | 28 | 20     | 0,93 | 36 | 66 |
| 2964295               | TDS301A05600 | 5,600       | .2205 | 6 | 28 | 20     | 0,94 | 36 | 66 |
| 2964296               | TDS301A05700 | 5,700       | .2244 | 6 | 28 | 20     | 0,95 | 36 | 66 |
| 2964297               | TDS301A05800 | 5,800       | .2283 | 6 | 28 | 20     | 0,97 | 36 | 66 |
| 2964298               | TDS301A05900 | 5,900       | .2323 | 6 | 28 | 20     | 0,99 | 36 | 66 |
| 2964299               | TDS301A05950 | 5,950       | .2343 | 6 | 28 | 20     | 1,00 | 36 | 66 |
| 2964300               | TDS301A06000 | 6,000       | .2362 | 6 | 28 | 20     | 1,00 | 36 | 66 |
| 2964301               | TDS301A06100 | 6,100       | .2402 | 8 | 34 | 24     | 1,02 | 36 | 79 |
| 2964302               | TDS301A06200 | 6,200       | .2441 | 8 | 34 | 24     | 1,04 | 36 | 79 |
| 2964313               | TDS301A06300 | 6,300       | .2480 | 8 | 34 | 24     | 1,06 | 36 | 79 |
| 2964314               | TDS301A06350 | 6,350       | .2500 | 8 | 34 | 24     | 1,07 | 36 | 79 |
| 2964315               | TDS301A06400 | 6,400       | .2520 | 8 | 34 | 24     | 1,07 | 36 | 79 |
| 2964316               | TDS301A06500 | 6,500       | .2559 | 8 | 34 | 24     | 1,09 | 36 | 79 |
| 2964317               | TDS301A06600 | 6,600       | .2598 | 8 | 34 | 24     | 1,11 | 36 | 79 |
| 2964318               | TDS301A06700 | 6,700       | .2638 | 8 | 34 | 24     | 1,13 | 36 | 79 |
| 2964319               | TDS301A06750 | 6,750       | .2657 | 8 | 34 | 24     | 1,14 | 36 | 79 |
| 2964320               | TDS301A06800 | 6,800       | .2677 | 8 | 34 | 24     | 1,14 | 36 | 79 |
| 2964321               | TDS301A06900 | 6,900       | .2717 | 8 | 34 | 24     | 1,16 | 36 | 79 |
| 2964322               | TDS301A07000 | 7,000       | .2756 | 8 | 34 | 24     | 1,18 | 36 | 79 |
| 2964333               | TDS301A07100 | 7,100       | .2795 | 8 | 41 | 29     | 1,20 | 36 | 79 |
| 2964334               | TDS301A07140 | 7,140       | .2811 | 8 | 41 | 29     | 1,20 | 36 | 79 |
| 2964335               | TDS301A07200 | 7,200       | .2835 | 8 | 41 | 29     | 1,21 | 36 | 79 |
| 2964336               | TDS301A07300 | 7,300       | .2874 | 8 | 41 | 29     | 1,23 | 36 | 79 |
| 2964337               | TDS301A07400 | 7,400       | .2913 | 8 | 41 | 29     | 1,25 | 36 | 79 |
| 2964338               | TDS301A07500 | 7,500       | .2953 | 8 | 41 | 29     | 1,27 | 36 | 79 |
| 2964339               | TDS301A07540 | 7,540       | .2969 | 8 | 41 | 29     | 1,27 | 36 | 79 |
| 2964340               | TDS301A07600 | 7,600       | .2992 | 8 | 41 | 29     | 1,29 | 36 | 79 |
| 2964341               | TDS301A07700 | 7,700       | .3031 | 8 | 41 | 29     | 1,30 | 36 | 79 |
| 2964342               | TDS301A07800 | 7,800       | .3071 | 8 | 41 | 29     | 1,32 | 36 | 79 |
| 2964353               | TDS301A07900 | 7,900       | .3110 | 8 | 41 | 29     | 1,34 | 36 | 79 |
| 2964354               | TDS301A07940 | 7,940       | .3126 | 8 | 41 | 29     | 1,34 | 36 | 79 |
| 2964355               | TDS301A08000 | 8,000       | .3150 | 8 | 41 | 29     | 1,36 | 36 | 79 |

(continued)

(TDS301A • 3 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2964356               | TDS301A08100 | 8,100       | .3189 | 10 | 47 | 35     | 1,37 | 40 | 89  |
| 2964357               | TDS301A08200 | 8,200       | .3228 | 10 | 47 | 35     | 1,39 | 40 | 89  |
| 2964358               | TDS301A08300 | 8,300       | .3268 | 10 | 47 | 35     | 1,41 | 40 | 89  |
| 2964359               | TDS301A08330 | 8,330       | .3280 | 10 | 47 | 35     | 1,41 | 40 | 89  |
| 2964360               | TDS301A08400 | 8,400       | .3307 | 10 | 47 | 35     | 1,43 | 40 | 89  |
| 2964361               | TDS301A08500 | 8,500       | .3346 | 10 | 47 | 35     | 1,44 | 40 | 89  |
| 2964362               | TDS301A08600 | 8,600       | .3386 | 10 | 47 | 35     | 1,46 | 40 | 89  |
| 2964373               | TDS301A08700 | 8,700       | .3425 | 10 | 47 | 35     | 1,48 | 40 | 89  |
| 2964374               | TDS301A08800 | 8,800       | .3465 | 10 | 47 | 35     | 1,50 | 40 | 89  |
| 2964375               | TDS301A08900 | 8,900       | .3504 | 10 | 47 | 35     | 1,51 | 40 | 89  |
| 2964376               | TDS301A09000 | 9,000       | .3543 | 10 | 47 | 35     | 1,53 | 40 | 89  |
| 2964377               | TDS301A09100 | 9,100       | .3583 | 10 | 47 | 35     | 1,55 | 40 | 89  |
| 2964378               | TDS301A09130 | 9,130       | .3594 | 10 | 47 | 35     | 1,55 | 40 | 89  |
| 2964379               | TDS301A09200 | 9,200       | .3622 | 10 | 47 | 35     | 1,57 | 40 | 89  |
| 2964380               | TDS301A09300 | 9,300       | .3661 | 10 | 47 | 35     | 1,58 | 40 | 89  |
| 2964381               | TDS301A09400 | 9,400       | .3701 | 10 | 47 | 35     | 1,60 | 40 | 89  |
| 2964382               | TDS301A09500 | 9,500       | .3740 | 10 | 47 | 35     | 1,62 | 40 | 89  |
| 2964393               | TDS301A09520 | 9,520       | .3748 | 10 | 47 | 35     | 1,62 | 40 | 89  |
| 2964394               | TDS301A09600 | 9,600       | .3780 | 10 | 47 | 35     | 1,64 | 40 | 89  |
| 2964395               | TDS301A09700 | 9,700       | .3819 | 10 | 47 | 35     | 1,65 | 40 | 89  |
| 2964396               | TDS301A09800 | 9,800       | .3858 | 10 | 47 | 35     | 1,67 | 40 | 89  |
| 2964397               | TDS301A09900 | 9,900       | .3898 | 10 | 47 | 35     | 1,69 | 40 | 89  |
| 2964398               | TDS301A09920 | 9,920       | .3906 | 10 | 47 | 35     | 1,69 | 40 | 89  |
| 2964399               | TDS301A10000 | 10,000      | .3937 | 10 | 47 | 35     | 1,71 | 40 | 89  |
| 2964400               | TDS301A10100 | 10,100      | .3976 | 12 | 55 | 40     | 1,73 | 45 | 102 |
| 2964401               | TDS301A10200 | 10,200      | .4016 | 12 | 55 | 40     | 1,74 | 45 | 102 |
| 2964402               | TDS301A10300 | 10,300      | .4055 | 12 | 55 | 40     | 1,76 | 45 | 102 |
| 2964413               | TDS301A10320 | 10,320      | .4063 | 12 | 55 | 40     | 1,76 | 45 | 102 |
| 2964414               | TDS301A10400 | 10,400      | .4094 | 12 | 55 | 40     | 1,78 | 45 | 102 |
| 2964415               | TDS301A10500 | 10,500      | .4134 | 12 | 55 | 40     | 1,80 | 45 | 102 |
| 2964416               | TDS301A10600 | 10,600      | .4173 | 12 | 55 | 40     | 1,81 | 45 | 102 |
| 2964417               | TDS301A10700 | 10,700      | .4213 | 12 | 55 | 40     | 1,83 | 45 | 102 |
| 2964418               | TDS301A10720 | 10,720      | .4220 | 12 | 55 | 40     | 1,83 | 45 | 102 |
| 2964419               | TDS301A10800 | 10,800      | .4252 | 12 | 55 | 40     | 1,85 | 45 | 102 |
| 2964420               | TDS301A10900 | 10,900      | .4291 | 12 | 55 | 40     | 1,87 | 45 | 102 |
| 2964421               | TDS301A11000 | 11,000      | .4331 | 12 | 55 | 40     | 1,88 | 45 | 102 |
| 2964423               | TDS301A11100 | 11,100      | .4370 | 12 | 55 | 40     | 1,90 | 45 | 102 |
| 2964424               | TDS301A11110 | 11,110      | .4374 | 12 | 55 | 40     | 1,90 | 45 | 102 |
| 2964425               | TDS301A11200 | 11,200      | .4409 | 12 | 55 | 40     | 1,92 | 45 | 102 |
| 2964426               | TDS301A11300 | 11,300      | .4449 | 12 | 55 | 40     | 1,94 | 45 | 102 |

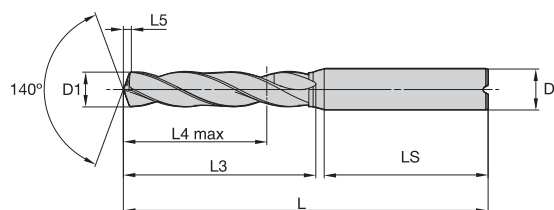
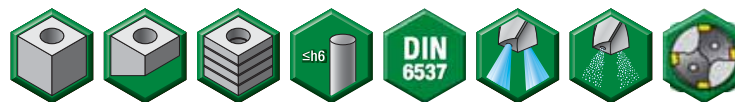
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(TDS301A • 3 x D — continued)

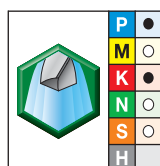


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2964427               | TDS301A11400 | 11,400      | .4488 | 12 | 55 | 40     | 1,95 | 45 | 102 |
| 2964428               | TDS301A11500 | 11,500      | .4528 | 12 | 55 | 40     | 1,97 | 45 | 102 |
| 2964429               | TDS301A11600 | 11,600      | .4567 | 12 | 55 | 40     | 1,99 | 45 | 102 |
| 2964430               | TDS301A11700 | 11,700      | .4606 | 12 | 55 | 40     | 2,01 | 45 | 102 |
| 2964431               | TDS301A11800 | 11,800      | .4646 | 12 | 55 | 40     | 2,03 | 45 | 102 |
| 2964432               | TDS301A11900 | 11,900      | .4685 | 12 | 55 | 40     | 2,04 | 45 | 102 |
| 2964433               | TDS301A11910 | 11,910      | .4689 | 12 | 55 | 40     | 2,04 | 45 | 102 |
| 2964434               | TDS301A12000 | 12,000      | .4724 | 12 | 55 | 40     | 2,06 | 45 | 102 |
| 2964435               | TDS301A12300 | 12,300      | .4843 | 14 | 60 | 43     | 2,11 | 45 | 107 |
| 2964436               | TDS301A12500 | 12,500      | .4921 | 14 | 60 | 43     | 2,15 | 45 | 107 |
| 2964437               | TDS301A12700 | 12,700      | .5000 | 14 | 60 | 43     | 2,18 | 45 | 107 |
| 2964438               | TDS301A12800 | 12,800      | .5039 | 14 | 60 | 43     | 2,20 | 45 | 107 |
| 2964439               | TDS301A13000 | 13,000      | .5118 | 14 | 60 | 43     | 2,24 | 45 | 107 |
| 2964440               | TDS301A13500 | 13,500      | .5315 | 14 | 60 | 43     | 2,33 | 45 | 107 |
| 2964441               | TDS301A13800 | 13,800      | .5433 | 14 | 60 | 43     | 2,38 | 45 | 107 |
| 2964442               | TDS301A14000 | 14,000      | .5512 | 14 | 60 | 43     | 2,41 | 45 | 107 |
| 2964443               | TDS301A14290 | 14,290      | .5626 | 16 | 65 | 45     | 2,47 | 48 | 115 |
| 2964444               | TDS301A14500 | 14,500      | .5709 | 16 | 65 | 45     | 2,50 | 48 | 115 |
| 2964445               | TDS301A14800 | 14,800      | .5827 | 16 | 65 | 45     | 2,56 | 48 | 115 |
| 2964446               | TDS301A15000 | 15,000      | .5906 | 16 | 65 | 45     | 2,59 | 48 | 115 |
| 2964447               | TDS301A15500 | 15,500      | .6102 | 16 | 65 | 45     | 2,68 | 48 | 115 |
| 2964448               | TDS301A15800 | 15,800      | .6220 | 16 | 65 | 45     | 2,73 | 48 | 115 |
| 2964449               | TDS301A15870 | 15,870      | .6248 | 16 | 65 | 45     | 2,75 | 48 | 115 |
| 2964450               | TDS301A16000 | 16,000      | .6299 | 16 | 65 | 45     | 2,77 | 48 | 115 |
| 2964451               | TDS301A16500 | 16,500      | .6496 | 18 | 73 | 51     | 2,86 | 48 | 123 |
| 2964452               | TDS301A16670 | 16,670      | .6563 | 18 | 73 | 51     | 2,89 | 48 | 123 |
| 2964453               | TDS301A16800 | 16,800      | .6614 | 18 | 73 | 51     | 2,91 | 48 | 123 |
| 2964454               | TDS301A17000 | 17,000      | .6693 | 18 | 73 | 51     | 2,95 | 48 | 123 |
| 2964455               | TDS301A17500 | 17,500      | .6890 | 18 | 73 | 51     | 3,04 | 48 | 123 |
| 2964456               | TDS301A17800 | 17,800      | .7008 | 18 | 73 | 51     | 3,09 | 48 | 123 |
| 2964457               | TDS301A18000 | 18,000      | .7087 | 18 | 73 | 51     | 3,12 | 48 | 123 |
| 2964458               | TDS301A18500 | 18,500      | .7283 | 20 | 79 | 55     | 3,21 | 50 | 131 |
| 2964459               | TDS301A18800 | 18,800      | .7402 | 20 | 79 | 55     | 3,27 | 50 | 131 |
| 2964460               | TDS301A19000 | 19,000      | .7480 | 20 | 79 | 55     | 3,30 | 50 | 131 |
| 2964461               | TDS301A19050 | 19,050      | .7500 | 20 | 79 | 55     | 3,31 | 50 | 131 |
| 2964462               | TDS301A19500 | 19,500      | .7677 | 20 | 79 | 55     | 3,39 | 50 | 131 |
| 2964463               | TDS301A19800 | 19,800      | .7795 | 20 | 79 | 55     | 3,44 | 50 | 131 |
| 2964464               | TDS301A20000 | 20,000      | .7874 | 20 | 79 | 55     | 3,48 | 50 | 131 |



## ■ TDS501A • 3 x D



D1 diameter

● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       | D | L3 | L4 max | L5   | LS | L  |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    |   |    |        |      |    |    |
| 2964947               | TDS501A03000 | 3,000       | .1181 | 6 | 20 | 14     | 0,48 | 36 | 62 |
| 2964948               | TDS501A03100 | 3,100       | .1220 | 6 | 20 | 14     | 0,50 | 36 | 62 |
| 4051234               | TDS501A03175 | 3,175       | .1250 | 6 | 20 | 14     | 0,64 | 36 | 62 |
| 2964949               | TDS501A03200 | 3,200       | .1260 | 6 | 20 | 14     | 0,52 | 36 | 62 |
| 2964950               | TDS501A03250 | 3,250       | .1280 | 6 | 20 | 14     | 0,53 | 36 | 62 |
| 2964951               | TDS501A03300 | 3,300       | .1299 | 6 | 20 | 14     | 0,54 | 36 | 62 |
| 2964952               | TDS501A03400 | 3,400       | .1339 | 6 | 20 | 14     | 0,55 | 36 | 62 |
| 4051233               | TDS501A03455 | 3,450       | .1358 | 6 | 20 | 14     | 0,56 | 36 | 62 |
| 2964953               | TDS501A03500 | 3,500       | .1378 | 6 | 20 | 14     | 0,57 | 36 | 62 |
| 5661464               | TDS501A03571 | 3,571       | .1406 | 6 | 20 | 14     | 0,58 | 36 | 62 |
| 2964954               | TDS501A03600 | 3,600       | .1417 | 6 | 20 | 14     | 0,59 | 36 | 62 |
| 2964955               | TDS501A03700 | 3,700       | .1457 | 6 | 20 | 14     | 0,61 | 36 | 62 |
| 2964956               | TDS501A03800 | 3,800       | .1496 | 6 | 24 | 17     | 0,62 | 36 | 66 |
| 2964957               | TDS501A03900 | 3,900       | .1535 | 6 | 24 | 17     | 0,64 | 36 | 66 |
| 2964958               | TDS501A04000 | 4,000       | .1575 | 6 | 24 | 17     | 0,66 | 36 | 66 |
| 2964959               | TDS501A04100 | 4,100       | .1614 | 6 | 24 | 17     | 0,67 | 36 | 66 |
| 2964960               | TDS501A04200 | 4,200       | .1654 | 6 | 24 | 17     | 0,69 | 36 | 66 |
| 2964961               | TDS501A04300 | 4,300       | .1693 | 6 | 24 | 17     | 0,71 | 36 | 66 |
| 2964962               | TDS501A04370 | 4,370       | .1720 | 6 | 24 | 17     | 0,72 | 36 | 66 |
| 2964963               | TDS501A04400 | 4,400       | .1732 | 6 | 24 | 17     | 0,73 | 36 | 66 |
| 2964964               | TDS501A04500 | 4,500       | .1772 | 6 | 24 | 17     | 0,74 | 36 | 66 |
| 2964965               | TDS501A04600 | 4,600       | .1811 | 6 | 24 | 17     | 0,76 | 36 | 66 |
| 5661502               | TDS501A04623 | 4,623       | .1820 | 6 | 24 | 17     | 0,77 | 36 | 66 |
| 2964966               | TDS501A04650 | 4,650       | .1831 | 6 | 24 | 17     | 0,77 | 36 | 66 |

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(TDS501A • 3 x D — continued)

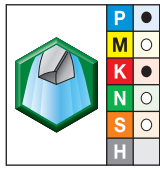


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |    |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L  |
| 2964967               | TDS501A04700 | 4,700       | .1850 | 6 | 24 | 17     | 0,78 | 36 | 66 |
| 5661503               | TDS501A04763 | 4,763       | .1875 | 6 | 28 | 20     | 0,79 | 36 | 66 |
| 2964969               | TDS501A04800 | 4,800       | .1890 | 6 | 28 | 20     | 0,80 | 36 | 66 |
| 2964970               | TDS501A04900 | 4,900       | .1929 | 6 | 28 | 20     | 0,81 | 36 | 66 |
| 2964971               | TDS501A05000 | 5,000       | .1969 | 6 | 28 | 20     | 0,83 | 36 | 66 |
| 2964972               | TDS501A05100 | 5,100       | .2008 | 6 | 28 | 20     | 0,85 | 36 | 66 |
| 2964973               | TDS501A05160 | 5,160       | .2031 | 6 | 28 | 20     | 0,86 | 36 | 66 |
| 2964974               | TDS501A05200 | 5,200       | .2047 | 6 | 28 | 20     | 0,87 | 36 | 66 |
| 2964975               | TDS501A05300 | 5,300       | .2087 | 6 | 28 | 20     | 0,88 | 36 | 66 |
| 2964976               | TDS501A05400 | 5,400       | .2126 | 6 | 28 | 20     | 0,90 | 36 | 66 |
| 5661504               | TDS501A05410 | 5,410       | .2130 | 6 | 28 | 20     | 0,90 | 36 | 66 |
| 2964977               | TDS501A05500 | 5,500       | .2165 | 6 | 28 | 20     | 0,92 | 36 | 66 |
| 2964978               | TDS501A05550 | 5,550       | .2185 | 6 | 28 | 20     | 0,93 | 36 | 66 |
| 5661505               | TDS501A05558 | 5,558       | .2188 | 6 | 28 | 20     | 0,93 | 36 | 66 |
| 2964980               | TDS501A05600 | 5,600       | .2205 | 6 | 28 | 20     | 0,94 | 36 | 66 |
| 2964981               | TDS501A05700 | 5,700       | .2244 | 6 | 28 | 20     | 0,95 | 36 | 66 |
| 2964982               | TDS501A05800 | 5,800       | .2283 | 6 | 28 | 20     | 0,97 | 36 | 66 |
| 2964983               | TDS501A05900 | 5,900       | .2323 | 6 | 28 | 20     | 0,99 | 36 | 66 |
| 2964984               | TDS501A05950 | 5,950       | .2343 | 6 | 28 | 20     | 1,00 | 36 | 66 |
| 2964985               | TDS501A06000 | 6,000       | .2362 | 6 | 28 | 20     | 1,00 | 36 | 66 |
| 2964986               | TDS501A06100 | 6,100       | .2402 | 8 | 34 | 24     | 1,02 | 36 | 79 |
| 2964987               | TDS501A06200 | 6,200       | .2441 | 8 | 34 | 24     | 1,04 | 36 | 79 |
| 2964988               | TDS501A06300 | 6,300       | .2480 | 8 | 34 | 24     | 1,06 | 36 | 79 |
| 2964989               | TDS501A06350 | 6,350       | .2500 | 8 | 34 | 24     | 1,07 | 36 | 79 |
| 2964990               | TDS501A06400 | 6,400       | .2520 | 8 | 34 | 24     | 1,07 | 36 | 79 |
| 2964991               | TDS501A06500 | 6,500       | .2559 | 8 | 34 | 24     | 1,09 | 36 | 79 |
| 5661506               | TDS501A06528 | 6,528       | .2570 | 8 | 34 | 24     | 1,10 | 36 | 79 |
| 2964992               | TDS501A06600 | 6,600       | .2598 | 8 | 34 | 24     | 1,11 | 36 | 79 |
| 2964993               | TDS501A06700 | 6,700       | .2638 | 8 | 34 | 24     | 1,13 | 36 | 79 |
| 5661507               | TDS501A06746 | 6,746       | .2656 | 8 | 34 | 24     | 1,14 | 36 | 79 |
| 2964995               | TDS501A06800 | 6,800       | .2677 | 8 | 34 | 24     | 1,14 | 36 | 79 |
| 2964996               | TDS501A06900 | 6,900       | .2717 | 8 | 34 | 24     | 1,16 | 36 | 79 |
| 2964997               | TDS501A07000 | 7,000       | .2756 | 8 | 34 | 24     | 1,18 | 36 | 79 |
| 2964998               | TDS501A07100 | 7,100       | .2795 | 8 | 41 | 29     | 1,20 | 36 | 79 |
| 5661509               | TDS501A07145 | 7,145       | .2813 | 8 | 41 | 29     | 1,21 | 36 | 79 |
| 2965000               | TDS501A07200 | 7,200       | .2835 | 8 | 41 | 29     | 1,21 | 36 | 79 |
| 2965001               | TDS501A07300 | 7,300       | .2874 | 8 | 41 | 29     | 1,23 | 36 | 79 |
| 2965002               | TDS501A07400 | 7,400       | .2913 | 8 | 41 | 29     | 1,25 | 36 | 79 |
| 2965003               | TDS501A07500 | 7,500       | .2953 | 8 | 41 | 29     | 1,27 | 36 | 79 |
| 2965004               | TDS501A07541 | 7,540       | .2969 | 8 | 41 | 29     | 1,27 | 36 | 79 |

(continued)

(TDS501A • 3 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2965005               | TDS501A07600 | 7,600       | .2992 | 8  | 41 | 29     | 1,29 | 36 | 79  |
| 2965006               | TDS501A07700 | 7,700       | .3031 | 8  | 41 | 29     | 1,30 | 36 | 79  |
| 2965007               | TDS501A07800 | 7,800       | .3071 | 8  | 41 | 29     | 1,32 | 36 | 79  |
| 2965008               | TDS501A07900 | 7,900       | .3110 | 8  | 41 | 29     | 1,34 | 36 | 79  |
| 5661540               | TDS501A07938 | 7,938       | .3125 | 8  | 41 | 29     | 1,34 | 36 | 79  |
| 2965010               | TDS501A08000 | 8,000       | .3150 | 8  | 41 | 29     | 1,36 | 36 | 79  |
| 2965011               | TDS501A08100 | 8,100       | .3189 | 10 | 47 | 35     | 1,37 | 40 | 89  |
| 2965012               | TDS501A08200 | 8,200       | .3228 | 10 | 47 | 35     | 1,39 | 40 | 89  |
| 2965013               | TDS501A08300 | 8,300       | .3268 | 10 | 47 | 35     | 1,41 | 40 | 89  |
| 5661541               | TDS501A08334 | 8,334       | .3281 | 10 | 47 | 35     | 1,41 | 40 | 89  |
| 2965015               | TDS501A08400 | 8,400       | .3307 | 10 | 47 | 35     | 1,43 | 40 | 89  |
| 5661542               | TDS501A08433 | 8,433       | .3320 | 10 | 47 | 35     | 1,43 | 40 | 89  |
| 2965016               | TDS501A08500 | 8,500       | .3346 | 10 | 47 | 35     | 1,44 | 40 | 89  |
| 2965017               | TDS501A08600 | 8,600       | .3386 | 10 | 47 | 35     | 1,46 | 40 | 89  |
| 2965018               | TDS501A08700 | 8,700       | .3425 | 10 | 47 | 35     | 1,48 | 40 | 89  |
| 5661543               | TDS501A08733 | 8,733       | .3438 | 10 | 47 | 35     | 1,48 | 40 | 89  |
| 2965019               | TDS501A08800 | 8,800       | .3465 | 10 | 47 | 35     | 1,50 | 40 | 89  |
| 2965020               | TDS501A08900 | 8,900       | .3504 | 10 | 47 | 35     | 1,51 | 40 | 89  |
| 2965021               | TDS501A09000 | 9,000       | .3543 | 10 | 47 | 35     | 1,53 | 40 | 89  |
| 2965022               | TDS501A09100 | 9,100       | .3583 | 10 | 47 | 35     | 1,55 | 40 | 89  |
| 2965023               | TDS501A09129 | 9,130       | .3594 | 10 | 47 | 35     | 1,55 | 40 | 89  |
| 2965024               | TDS501A09200 | 9,200       | .3622 | 10 | 47 | 35     | 1,57 | 40 | 89  |
| 2965025               | TDS501A09300 | 9,300       | .3661 | 10 | 47 | 35     | 1,58 | 40 | 89  |
| 5661544               | TDS501A09347 | 9,347       | .3680 | 10 | 47 | 35     | 1,59 | 40 | 89  |
| 2965026               | TDS501A09400 | 9,400       | .3701 | 10 | 47 | 35     | 1,60 | 40 | 89  |
| 2965027               | TDS501A09500 | 9,500       | .3740 | 10 | 47 | 35     | 1,62 | 40 | 89  |
| 2965029               | TDS501A09600 | 9,600       | .3780 | 10 | 47 | 35     | 1,64 | 40 | 89  |
| 2965030               | TDS501A09700 | 9,700       | .3819 | 10 | 47 | 35     | 1,65 | 40 | 89  |
| 5661546               | TDS501A09750 | 9,750       | .3839 | 10 | 47 | 35     | 1,66 | 40 | 89  |
| 2965031               | TDS501A09800 | 9,800       | .3858 | 10 | 47 | 35     | 1,67 | 40 | 89  |
| 2965032               | TDS501A09900 | 9,900       | .3898 | 10 | 47 | 35     | 1,69 | 40 | 89  |
| 2965033               | TDS501A09921 | 9,920       | .3906 | 10 | 47 | 35     | 1,69 | 40 | 89  |
| 2965034               | TDS501A10000 | 10,000      | .3937 | 10 | 47 | 35     | 1,71 | 40 | 89  |
| 2965035               | TDS501A10100 | 10,100      | .3976 | 12 | 55 | 40     | 1,73 | 45 | 102 |
| 2965036               | TDS501A10200 | 10,200      | .4016 | 12 | 55 | 40     | 1,74 | 45 | 102 |
| 2965037               | TDS501A10300 | 10,300      | .4055 | 12 | 55 | 40     | 1,76 | 45 | 102 |
| 2965038               | TDS501A10320 | 10,320      | .4063 | 12 | 55 | 40     | 1,76 | 45 | 102 |
| 2965039               | TDS501A10400 | 10,400      | .4094 | 12 | 55 | 40     | 1,78 | 45 | 102 |
| 2965040               | TDS501A10500 | 10,500      | .4134 | 12 | 55 | 40     | 1,80 | 45 | 102 |
| 2965041               | TDS501A10600 | 10,600      | .4173 | 12 | 55 | 40     | 1,81 | 45 | 102 |

(continued)

(TDS501A • 3 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2965042               | TDS501A10700 | 10,700      | .4213 | 12 | 55 | 40     | 1,83 | 45 | 102 |
| 5661547               | TDS501A10716 | 10,716      | .4219 | 12 | 55 | 40     | 1,83 | 45 | 102 |
| 2965044               | TDS501A10800 | 10,800      | .4252 | 12 | 55 | 40     | 1,85 | 45 | 102 |
| 2965045               | TDS501A10900 | 10,900      | .4291 | 12 | 55 | 40     | 1,87 | 45 | 102 |
| 2965046               | TDS501A11000 | 11,000      | .4331 | 12 | 55 | 40     | 1,88 | 45 | 102 |
| 2965047               | TDS501A11100 | 11,100      | .4370 | 12 | 55 | 40     | 1,90 | 45 | 102 |
| 2965048               | TDS501A11113 | 11,113      | .4375 | 12 | 55 | 40     | 1,90 | 45 | 102 |
| 2964736               | TDS501A11200 | 11,200      | .4409 | 12 | 55 | 40     | 1,92 | 45 | 102 |
| 2964737               | TDS501A11300 | 11,300      | .4449 | 12 | 55 | 40     | 1,94 | 45 | 102 |
| 2964738               | TDS501A11400 | 11,400      | .4488 | 12 | 55 | 40     | 1,95 | 45 | 102 |
| 2964739               | TDS501A11500 | 11,500      | .4528 | 12 | 55 | 40     | 1,97 | 45 | 102 |
| 2964740               | TDS501A11600 | 11,600      | .4567 | 12 | 55 | 40     | 1,99 | 45 | 102 |
| 2964741               | TDS501A11700 | 11,700      | .4606 | 12 | 55 | 40     | 2,01 | 45 | 102 |
| 2964742               | TDS501A11800 | 11,800      | .4646 | 12 | 55 | 40     | 2,03 | 45 | 102 |
| 2965053               | TDS501A11900 | 11,900      | .4685 | 12 | 55 | 40     | 2,04 | 45 | 102 |
| 2965054               | TDS501A11910 | 11,910      | .4689 | 12 | 55 | 40     | 2,04 | 45 | 102 |
| 2965055               | TDS501A12000 | 12,000      | .4724 | 12 | 55 | 40     | 2,06 | 45 | 102 |
| 2965056               | TDS501A12300 | 12,300      | .4843 | 14 | 60 | 43     | 2,11 | 45 | 107 |
| 5661548               | TDS501A12304 | 12,304      | .4844 | 14 | 60 | 43     | 2,11 | 45 | 107 |
| 2965057               | TDS501A12500 | 12,500      | .4921 | 14 | 60 | 43     | 2,15 | 45 | 107 |
| 2965058               | TDS501A12700 | 12,700      | .5000 | 14 | 60 | 43     | 2,18 | 45 | 107 |
| 2965059               | TDS501A12800 | 12,800      | .5039 | 14 | 60 | 43     | 2,20 | 45 | 107 |
| 2965060               | TDS501A13000 | 13,000      | .5118 | 14 | 60 | 43     | 2,24 | 45 | 107 |
| 4051235               | TDS501A13100 | 13,100      | .5157 | 14 | 60 | 43     | 2,29 | 45 | 107 |
| 2965061               | TDS501A13500 | 13,500      | .5315 | 14 | 60 | 43     | 2,33 | 45 | 107 |
| 2965062               | TDS501A13800 | 13,800      | .5433 | 14 | 60 | 43     | 2,38 | 45 | 107 |
| 2965063               | TDS501A14000 | 14,000      | .5512 | 14 | 60 | 43     | 2,41 | 45 | 107 |
| 2965064               | TDS501A14290 | 14,290      | .5626 | 16 | 65 | 45     | 2,47 | 48 | 115 |
| 2965065               | TDS501A14500 | 14,500      | .5709 | 16 | 65 | 45     | 2,50 | 48 | 115 |
| 2965066               | TDS501A14800 | 14,800      | .5827 | 16 | 65 | 45     | 2,56 | 48 | 115 |
| 2965067               | TDS501A15000 | 15,000      | .5906 | 16 | 65 | 45     | 2,59 | 48 | 115 |
| 2965068               | TDS501A15500 | 15,500      | .6102 | 16 | 65 | 45     | 2,68 | 48 | 115 |
| 2965069               | TDS501A15800 | 15,800      | .6220 | 16 | 65 | 45     | 2,73 | 48 | 115 |
| 2965070               | TDS501A15870 | 15,870      | .6248 | 16 | 65 | 45     | 2,75 | 48 | 115 |
| 2965071               | TDS501A16000 | 16,000      | .6299 | 16 | 65 | 45     | 2,77 | 48 | 115 |
| 2965072               | TDS501A16500 | 16,500      | .6496 | 18 | 73 | 51     | 2,86 | 48 | 123 |
| 2965073               | TDS501A16670 | 16,670      | .6563 | 18 | 73 | 51     | 2,89 | 48 | 123 |
| 2965074               | TDS501A16800 | 16,800      | .6614 | 18 | 73 | 51     | 2,91 | 48 | 123 |
| 2965075               | TDS501A17000 | 17,000      | .6693 | 18 | 73 | 51     | 2,95 | 48 | 123 |
| 2965076               | TDS501A17500 | 17,500      | .6890 | 18 | 73 | 51     | 3,04 | 48 | 123 |

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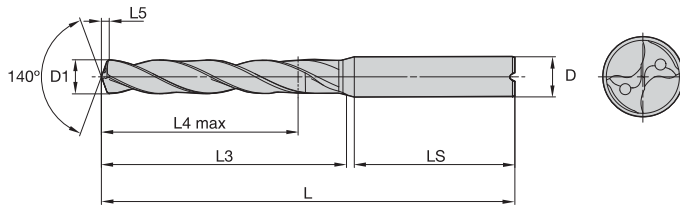


(TDS501A • 3 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
|                       |              | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2965077               | TDS501A17800 | 17,800      | .7008 | 18 | 73 | 51     | 3,09 | 48 | 123 |
| 2965078               | TDS501A18000 | 18,000      | .7087 | 18 | 73 | 51     | 3,12 | 48 | 123 |
| 2965079               | TDS501A18500 | 18,500      | .7283 | 20 | 79 | 55     | 3,21 | 50 | 131 |
| 2965080               | TDS501A18800 | 18,800      | .7402 | 20 | 79 | 55     | 3,27 | 50 | 131 |
| 2965081               | TDS501A19000 | 19,000      | .7480 | 20 | 79 | 55     | 3,30 | 50 | 131 |
| 2965082               | TDS501A19050 | 19,050      | .7500 | 20 | 79 | 55     | 3,31 | 50 | 131 |
| 2965083               | TDS501A19500 | 19,500      | .7677 | 20 | 79 | 55     | 3,39 | 50 | 131 |
| 2965084               | TDS501A19800 | 19,800      | .7795 | 20 | 79 | 55     | 3,44 | 50 | 131 |
| 2965085               | TDS501A20000 | 20,000      | .7874 | 20 | 79 | 55     | 3,48 | 50 | 131 |



### ■ TDS502A • 5 x D



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |    |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L  |
| 2964803               | TDS502A03000 | 3,000       | .1181 | 6 | 28 | 23     | 0,48 | 36 | 66 |
| 2964804               | TDS502A03100 | 3,100       | .1220 | 6 | 28 | 23     | 0,50 | 36 | 66 |
| 4051237               | TDS502A03175 | 3,175       | .1250 | 6 | 28 | 23     | 0,64 | 36 | 66 |
| 2964805               | TDS502A03200 | 3,200       | .1260 | 6 | 28 | 23     | 0,52 | 36 | 66 |
| 2964806               | TDS502A03250 | 3,250       | .1280 | 6 | 28 | 23     | 0,53 | 36 | 66 |
| 2964807               | TDS502A03300 | 3,300       | .1299 | 6 | 28 | 23     | 0,54 | 36 | 66 |
| 2964808               | TDS502A03400 | 3,400       | .1339 | 6 | 28 | 23     | 0,55 | 36 | 66 |
| 4051236               | TDS502A03455 | 3,455       | .1360 | 6 | 28 | 23     | 0,70 | 36 | 66 |
| 2964809               | TDS502A03500 | 3,500       | .1378 | 6 | 28 | 23     | 0,57 | 36 | 66 |
| 2964810               | TDS502A03600 | 3,600       | .1417 | 6 | 28 | 23     | 0,59 | 36 | 66 |
| 2964811               | TDS502A03700 | 3,700       | .1457 | 6 | 28 | 23     | 0,61 | 36 | 66 |
| 2964812               | TDS502A03800 | 3,800       | .1496 | 6 | 36 | 29     | 0,62 | 36 | 74 |
| 2964813               | TDS502A03900 | 3,900       | .1535 | 6 | 36 | 29     | 0,64 | 36 | 74 |
| 2964814               | TDS502A04000 | 4,000       | .1575 | 6 | 36 | 29     | 0,66 | 36 | 74 |
| 2964815               | TDS502A04100 | 4,100       | .1614 | 6 | 36 | 29     | 0,67 | 36 | 74 |
| 2964816               | TDS502A04200 | 4,200       | .1654 | 6 | 36 | 29     | 0,69 | 36 | 74 |
| 2964817               | TDS502A04300 | 4,300       | .1693 | 6 | 36 | 29     | 0,71 | 36 | 74 |
| 2964818               | TDS502A04370 | 4,370       | .1720 | 6 | 36 | 29     | 0,72 | 36 | 74 |
| 2964819               | TDS502A04400 | 4,400       | .1732 | 6 | 36 | 29     | 0,73 | 36 | 74 |
| 2964820               | TDS502A04500 | 4,500       | .1772 | 6 | 36 | 29     | 0,74 | 36 | 74 |
| 2964821               | TDS502A04600 | 4,600       | .1811 | 6 | 36 | 29     | 0,76 | 36 | 74 |
| 2964822               | TDS502A04650 | 4,650       | .1831 | 6 | 36 | 29     | 0,77 | 36 | 74 |
| 2964823               | TDS502A04700 | 4,700       | .1850 | 6 | 36 | 29     | 0,78 | 36 | 74 |
| 2964824               | TDS502A04760 | 4,760       | .1874 | 6 | 44 | 35     | 0,79 | 36 | 82 |

(continued)

(TDS502A • 5 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |    |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L  |
| 2964825               | TDS502A04800 | 4,800       | .1890 | 6 | 44 | 35     | 0,80 | 36 | 82 |
| 2964826               | TDS502A04900 | 4,900       | .1929 | 6 | 44 | 35     | 0,81 | 36 | 82 |
| 2964827               | TDS502A05000 | 5,000       | .1969 | 6 | 44 | 35     | 0,83 | 36 | 82 |
| 2964828               | TDS502A05100 | 5,100       | .2008 | 6 | 44 | 35     | 0,85 | 36 | 82 |
| 2964829               | TDS502A05160 | 5,160       | .2031 | 6 | 44 | 35     | 0,86 | 36 | 82 |
| 2964830               | TDS502A05200 | 5,200       | .2047 | 6 | 44 | 35     | 0,87 | 36 | 82 |
| 2964831               | TDS502A05300 | 5,300       | .2087 | 6 | 44 | 35     | 0,88 | 36 | 82 |
| 2964832               | TDS502A05400 | 5,400       | .2126 | 6 | 44 | 35     | 0,90 | 36 | 82 |
| 2964833               | TDS502A05500 | 5,500       | .2165 | 6 | 44 | 35     | 0,92 | 36 | 82 |
| 2964834               | TDS502A05550 | 5,550       | .2185 | 6 | 44 | 35     | 0,93 | 36 | 82 |
| 2964835               | TDS502A05560 | 5,560       | .2189 | 6 | 44 | 35     | 0,93 | 36 | 82 |
| 2964836               | TDS502A05600 | 5,600       | .2205 | 6 | 44 | 35     | 0,94 | 36 | 82 |
| 2964837               | TDS502A05700 | 5,700       | .2244 | 6 | 44 | 35     | 0,95 | 36 | 82 |
| 2964838               | TDS502A05800 | 5,800       | .2283 | 6 | 44 | 35     | 0,97 | 36 | 82 |
| 2964839               | TDS502A05900 | 5,900       | .2323 | 6 | 44 | 35     | 0,99 | 36 | 82 |
| 2964840               | TDS502A05950 | 5,950       | .2343 | 6 | 44 | 35     | 1,00 | 36 | 82 |
| 2964841               | TDS502A06000 | 6,000       | .2362 | 6 | 44 | 35     | 1,00 | 36 | 82 |
| 2964842               | TDS502A06100 | 6,100       | .2402 | 8 | 53 | 43     | 1,02 | 36 | 91 |
| 2964843               | TDS502A06200 | 6,200       | .2441 | 8 | 53 | 43     | 1,04 | 36 | 91 |
| 2964844               | TDS502A06300 | 6,300       | .2480 | 8 | 53 | 43     | 1,06 | 36 | 91 |
| 2964845               | TDS502A06350 | 6,350       | .2500 | 8 | 53 | 43     | 1,07 | 36 | 91 |
| 2964846               | TDS502A06400 | 6,400       | .2520 | 8 | 53 | 43     | 1,07 | 36 | 91 |
| 2964847               | TDS502A06500 | 6,500       | .2559 | 8 | 53 | 43     | 1,09 | 36 | 91 |
| 2964848               | TDS502A06600 | 6,600       | .2598 | 8 | 53 | 43     | 1,11 | 36 | 91 |
| 2964849               | TDS502A06700 | 6,700       | .2638 | 8 | 53 | 43     | 1,13 | 36 | 91 |
| 2964850               | TDS502A06750 | 6,750       | .2657 | 8 | 53 | 43     | 1,14 | 36 | 91 |
| 2964851               | TDS502A06800 | 6,800       | .2677 | 8 | 53 | 43     | 1,14 | 36 | 91 |
| 2964852               | TDS502A06900 | 6,900       | .2717 | 8 | 53 | 43     | 1,16 | 36 | 91 |
| 2964853               | TDS502A07000 | 7,000       | .2756 | 8 | 53 | 43     | 1,18 | 36 | 91 |
| 2964854               | TDS502A07100 | 7,100       | .2795 | 8 | 53 | 43     | 1,20 | 36 | 91 |
| 2964855               | TDS502A07140 | 7,140       | .2811 | 8 | 53 | 43     | 1,20 | 36 | 91 |
| 2964856               | TDS502A07200 | 7,200       | .2835 | 8 | 53 | 43     | 1,21 | 36 | 91 |
| 2964857               | TDS502A07300 | 7,300       | .2874 | 8 | 53 | 43     | 1,23 | 36 | 91 |
| 2964858               | TDS502A07400 | 7,400       | .2913 | 8 | 53 | 43     | 1,25 | 36 | 91 |
| 2964859               | TDS502A07500 | 7,500       | .2953 | 8 | 53 | 43     | 1,27 | 36 | 91 |
| 2964860               | TDS502A07540 | 7,540       | .2969 | 8 | 53 | 43     | 1,27 | 36 | 91 |
| 2964861               | TDS502A07600 | 7,600       | .2992 | 8 | 53 | 43     | 1,29 | 36 | 91 |
| 2964862               | TDS502A07700 | 7,700       | .3031 | 8 | 53 | 43     | 1,30 | 36 | 91 |
| 2964863               | TDS502A07800 | 7,800       | .3071 | 8 | 53 | 43     | 1,32 | 36 | 91 |
| 2964864               | TDS502A07900 | 7,900       | .3110 | 8 | 53 | 43     | 1,34 | 36 | 91 |

(continued)

(TDS502A • 5 x D — continued)

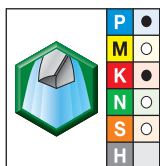


● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2964865               | TDS502A07940 | 7,940       | .3126 | 8  | 53 | 43     | 1,34 | 36 | 91  |
| 2964866               | TDS502A08000 | 8,000       | .3150 | 8  | 53 | 43     | 1,36 | 36 | 91  |
| 2964867               | TDS502A08100 | 8,100       | .3189 | 10 | 61 | 49     | 1,37 | 40 | 103 |
| 2964868               | TDS502A08200 | 8,200       | .3228 | 10 | 61 | 49     | 1,39 | 40 | 103 |
| 2964869               | TDS502A08300 | 8,300       | .3268 | 10 | 61 | 49     | 1,41 | 40 | 103 |
| 2964870               | TDS502A08330 | 8,330       | .3280 | 10 | 61 | 49     | 1,41 | 40 | 103 |
| 2964871               | TDS502A08400 | 8,400       | .3307 | 10 | 61 | 49     | 1,43 | 40 | 103 |
| 2964872               | TDS502A08500 | 8,500       | .3346 | 10 | 61 | 49     | 1,44 | 40 | 103 |
| 2964873               | TDS502A08600 | 8,600       | .3386 | 10 | 61 | 49     | 1,46 | 40 | 103 |
| 2964874               | TDS502A08700 | 8,700       | .3425 | 10 | 61 | 49     | 1,48 | 40 | 103 |
| 2964875               | TDS502A08800 | 8,800       | .3465 | 10 | 61 | 49     | 1,50 | 40 | 103 |
| 2964876               | TDS502A08900 | 8,900       | .3504 | 10 | 61 | 49     | 1,51 | 40 | 103 |
| 2964877               | TDS502A09000 | 9,000       | .3543 | 10 | 61 | 49     | 1,53 | 40 | 103 |
| 2964878               | TDS502A09100 | 9,100       | .3583 | 10 | 61 | 49     | 1,55 | 40 | 103 |
| 2964879               | TDS502A09130 | 9,130       | .3594 | 10 | 61 | 49     | 1,55 | 40 | 103 |
| 2964880               | TDS502A09200 | 9,200       | .3622 | 10 | 61 | 49     | 1,57 | 40 | 103 |
| 2964881               | TDS502A09300 | 9,300       | .3661 | 10 | 61 | 49     | 1,58 | 40 | 103 |
| 2964882               | TDS502A09400 | 9,400       | .3701 | 10 | 61 | 49     | 1,60 | 40 | 103 |
| 2964883               | TDS502A09500 | 9,500       | .3740 | 10 | 61 | 49     | 1,62 | 40 | 103 |
| 2964884               | TDS502A09520 | 9,520       | .3748 | 10 | 61 | 49     | 1,62 | 40 | 103 |
| 2964885               | TDS502A09600 | 9,600       | .3780 | 10 | 61 | 49     | 1,64 | 40 | 103 |
| 2964886               | TDS502A09700 | 9,700       | .3819 | 10 | 61 | 49     | 1,65 | 40 | 103 |
| 2964887               | TDS502A09800 | 9,800       | .3858 | 10 | 61 | 49     | 1,67 | 40 | 103 |
| 2964888               | TDS502A09900 | 9,900       | .3898 | 10 | 61 | 49     | 1,69 | 40 | 103 |
| 2964889               | TDS502A09920 | 9,920       | .3906 | 10 | 61 | 49     | 1,69 | 40 | 103 |
| 2964890               | TDS502A10000 | 10,000      | .3937 | 10 | 61 | 49     | 1,71 | 40 | 103 |
| 2964891               | TDS502A10100 | 10,100      | .3976 | 12 | 71 | 56     | 1,73 | 45 | 118 |
| 2964892               | TDS502A10200 | 10,200      | .4016 | 12 | 71 | 56     | 1,74 | 45 | 118 |
| 2964893               | TDS502A10300 | 10,300      | .4055 | 12 | 71 | 56     | 1,76 | 45 | 118 |
| 2964894               | TDS502A10320 | 10,320      | .4063 | 12 | 71 | 56     | 1,76 | 45 | 118 |
| 2964895               | TDS502A10400 | 10,400      | .4094 | 12 | 71 | 56     | 1,78 | 45 | 118 |
| 2964896               | TDS502A10500 | 10,500      | .4134 | 12 | 71 | 56     | 1,80 | 45 | 118 |
| 2964897               | TDS502A10600 | 10,600      | .4173 | 12 | 71 | 56     | 1,81 | 45 | 118 |
| 2964898               | TDS502A10700 | 10,700      | .4213 | 12 | 71 | 56     | 1,83 | 45 | 118 |
| 2964899               | TDS502A10720 | 10,720      | .4220 | 12 | 71 | 56     | 1,83 | 45 | 118 |
| 2964900               | TDS502A10800 | 10,800      | .4252 | 12 | 71 | 56     | 1,85 | 45 | 118 |
| 2964901               | TDS502A10900 | 10,900      | .4291 | 12 | 71 | 56     | 1,87 | 45 | 118 |
| 2964902               | TDS502A11000 | 11,000      | .4331 | 12 | 71 | 56     | 1,88 | 45 | 118 |
| 2964903               | TDS502A11100 | 11,100      | .4370 | 12 | 71 | 56     | 1,90 | 45 | 118 |
| 2964904               | TDS502A11110 | 11,110      | .4374 | 12 | 71 | 56     | 1,90 | 45 | 118 |

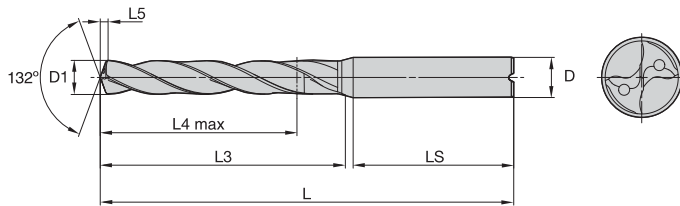
(continued)

(TDS502A • 5 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |     |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|-----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3  | L4 max | L5   | LS | L   |
| 2964905               | TDS502A11200 | 11,200      | .4409 | 12 | 71  | 56     | 1,92 | 45 | 118 |
| 2964906               | TDS502A11300 | 11,300      | .4449 | 12 | 71  | 56     | 1,94 | 45 | 118 |
| 2968374               | TDS502A11400 | 11,400      | .4488 | 12 | 71  | 56     | 1,95 | 45 | 118 |
| 2968375               | TDS502A11500 | 11,500      | .4528 | 12 | 71  | 56     | 1,97 | 45 | 118 |
| 2968376               | TDS502A11600 | 11,600      | .4567 | 12 | 71  | 56     | 1,99 | 45 | 118 |
| 2968377               | TDS502A11700 | 11,700      | .4606 | 12 | 71  | 56     | 2,01 | 45 | 118 |
| 2968378               | TDS502A11800 | 11,800      | .4646 | 12 | 71  | 56     | 2,03 | 45 | 118 |
| 2968379               | TDS502A11900 | 11,900      | .4685 | 12 | 71  | 56     | 2,04 | 45 | 118 |
| 2968380               | TDS502A11910 | 11,910      | .4689 | 12 | 71  | 56     | 2,04 | 45 | 118 |
| 2968381               | TDS502A12000 | 12,000      | .4724 | 12 | 71  | 56     | 2,06 | 45 | 118 |
| 2968382               | TDS502A12300 | 12,300      | .4843 | 14 | 77  | 60     | 2,11 | 45 | 124 |
| 2968393               | TDS502A12500 | 12,500      | .4921 | 14 | 77  | 60     | 2,15 | 45 | 124 |
| 2968394               | TDS502A12700 | 12,700      | .5000 | 14 | 77  | 60     | 2,18 | 45 | 124 |
| 2968395               | TDS502A12800 | 12,800      | .5039 | 14 | 77  | 60     | 2,20 | 45 | 124 |
| 2968396               | TDS502A13000 | 13,000      | .5118 | 14 | 77  | 60     | 2,24 | 45 | 124 |
| 4051238               | TDS502A13100 | 13,100      | .5157 | 14 | 77  | 60     | 2,79 | 45 | 124 |
| 2968397               | TDS502A13500 | 13,500      | .5315 | 14 | 77  | 60     | 2,33 | 45 | 124 |
| 2968398               | TDS502A13800 | 13,800      | .5433 | 14 | 77  | 60     | 2,38 | 45 | 124 |
| 2968399               | TDS502A14000 | 14,000      | .5512 | 14 | 77  | 60     | 2,41 | 45 | 124 |
| 2968400               | TDS502A14290 | 14,290      | .5626 | 16 | 83  | 63     | 2,47 | 48 | 133 |
| 2968401               | TDS502A14500 | 14,500      | .5709 | 16 | 83  | 63     | 2,50 | 48 | 133 |
| 2968402               | TDS502A14800 | 14,800      | .5827 | 16 | 83  | 63     | 2,56 | 48 | 133 |
| 2968403               | TDS502A15000 | 15,000      | .5906 | 16 | 83  | 63     | 2,59 | 48 | 133 |
| 2968404               | TDS502A15500 | 15,500      | .6102 | 16 | 83  | 63     | 2,68 | 48 | 133 |
| 2968405               | TDS502A15800 | 15,800      | .6220 | 16 | 83  | 63     | 2,73 | 48 | 133 |
| 2968406               | TDS502A15870 | 15,870      | .6248 | 16 | 83  | 63     | 2,75 | 48 | 133 |
| 2968407               | TDS502A16000 | 16,000      | .6299 | 16 | 83  | 63     | 2,77 | 48 | 133 |
| 2968408               | TDS502A16500 | 16,500      | .6496 | 18 | 93  | 71     | 2,86 | 48 | 143 |
| 2968409               | TDS502A16670 | 16,670      | .6563 | 18 | 93  | 71     | 2,89 | 48 | 143 |
| 2968410               | TDS502A16800 | 16,800      | .6614 | 18 | 93  | 71     | 2,91 | 48 | 143 |
| 2968411               | TDS502A17000 | 17,000      | .6693 | 18 | 93  | 71     | 2,95 | 48 | 143 |
| 2968412               | TDS502A17500 | 17,500      | .6890 | 18 | 93  | 71     | 3,04 | 48 | 143 |
| 2968413               | TDS502A17800 | 17,800      | .7008 | 18 | 93  | 71     | 3,09 | 48 | 143 |
| 2968414               | TDS502A18000 | 18,000      | .7087 | 18 | 93  | 71     | 3,12 | 48 | 143 |
| 2968415               | TDS502A18500 | 18,500      | .7283 | 20 | 101 | 77     | 3,21 | 50 | 153 |
| 2968416               | TDS502A18800 | 18,800      | .7402 | 20 | 101 | 77     | 3,27 | 50 | 153 |
| 2968417               | TDS502A19000 | 19,000      | .7480 | 20 | 101 | 77     | 3,30 | 50 | 153 |
| 2968418               | TDS502A19050 | 19,050      | .7500 | 20 | 101 | 77     | 3,31 | 50 | 153 |
| 2968419               | TDS502A19500 | 19,500      | .7677 | 20 | 101 | 77     | 3,39 | 50 | 153 |
| 2968420               | TDS502A19800 | 19,800      | .7795 | 20 | 101 | 77     | 3,44 | 50 | 153 |
| 2968421               | TDS502A20000 | 20,000      | .7874 | 20 | 101 | 77     | 3,48 | 50 | 153 |



### ■ TDS503A • 8 x D



grade WU25PD  
TiAlN

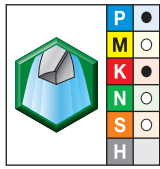
D1 diameter

● first choice  
○ alternate choice

| order # | catalogue #  | mm    | in    | D | L3 | L4 max | L5   | LS | L  |
|---------|--------------|-------|-------|---|----|--------|------|----|----|
| 2968422 | TDS503A03000 | 3,000 | .1181 | 6 | 40 | 33     | 0,61 | 36 | 78 |
| 4051239 | TDS503A03100 | 3,100 | .1220 | 6 | 40 | 33     | 0,63 | 36 | 78 |
| 4051240 | TDS503A03175 | 3,175 | .1250 | 6 | 40 | 33     | 0,64 | 36 | 78 |
| 4051241 | TDS503A03200 | 3,200 | .1260 | 6 | 40 | 33     | 0,65 | 36 | 78 |
| 4051242 | TDS503A03250 | 3,250 | .1280 | 6 | 40 | 33     | 0,66 | 36 | 78 |
| 2968503 | TDS503A03300 | 3,300 | .1299 | 6 | 40 | 33     | 0,67 | 36 | 78 |
| 4051243 | TDS503A03400 | 3,400 | .1339 | 6 | 40 | 33     | 0,69 | 36 | 78 |
| 4051244 | TDS503A03455 | 3,455 | .1360 | 6 | 40 | 33     | 0,70 | 36 | 78 |
| 2968504 | TDS503A03500 | 3,500 | .1378 | 6 | 40 | 33     | 0,71 | 36 | 78 |
| 2968505 | TDS503A03700 | 3,700 | .1457 | 6 | 40 | 33     | 0,76 | 36 | 78 |
| 2968506 | TDS503A03800 | 3,800 | .1496 | 6 | 49 | 41     | 0,78 | 36 | 87 |
| 4051245 | TDS503A03900 | 3,900 | .1535 | 6 | 49 | 41     | 0,80 | 36 | 87 |
| 2968507 | TDS503A04000 | 4,000 | .1575 | 6 | 49 | 41     | 0,82 | 36 | 87 |
| 4051246 | TDS503A04100 | 4,100 | .1614 | 6 | 49 | 41     | 0,84 | 36 | 87 |
| 2968508 | TDS503A04200 | 4,200 | .1654 | 6 | 49 | 41     | 0,86 | 36 | 87 |
| 4051247 | TDS503A04300 | 4,300 | .1693 | 6 | 49 | 41     | 0,88 | 36 | 87 |
| 2968509 | TDS503A04370 | 4,370 | .1720 | 6 | 49 | 41     | 0,90 | 36 | 87 |
| 4051248 | TDS503A04400 | 4,400 | .1732 | 6 | 49 | 41     | 0,91 | 36 | 87 |
| 2968510 | TDS503A04500 | 4,500 | .1772 | 6 | 49 | 41     | 0,93 | 36 | 87 |
| 4051249 | TDS503A04600 | 4,600 | .1811 | 6 | 49 | 41     | 0,95 | 36 | 87 |
| 4051250 | TDS503A04650 | 4,650 | .1831 | 6 | 49 | 41     | 0,96 | 36 | 87 |
| 2968511 | TDS503A04700 | 4,700 | .1850 | 6 | 49 | 41     | 0,97 | 36 | 87 |
| 2968512 | TDS503A04760 | 4,760 | .1874 | 6 | 56 | 48     | 0,98 | 36 | 94 |
| 2968513 | TDS503A04800 | 4,800 | .1890 | 6 | 56 | 48     | 0,99 | 36 | 94 |

(continued)

(TDS503A • 8 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |   |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|---|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D | L3 | L4 max | L5   | LS | L   |
| 4051251               | TDS503A04900 | 4,900       | .1929 | 6 | 56 | 48     | 1,01 | 36 | 94  |
| 2968514               | TDS503A05000 | 5,000       | .1969 | 6 | 56 | 48     | 1,03 | 36 | 94  |
| 4051252               | TDS503A05100 | 5,100       | .2008 | 6 | 56 | 48     | 1,06 | 36 | 94  |
| 2968515               | TDS503A05160 | 5,160       | .2031 | 6 | 56 | 48     | 1,07 | 36 | 94  |
| 4051253               | TDS503A05200 | 5,200       | .2047 | 6 | 56 | 48     | 1,08 | 36 | 94  |
| 4051254               | TDS503A05300 | 5,300       | .2087 | 6 | 56 | 48     | 1,10 | 36 | 94  |
| 4051255               | TDS503A05400 | 5,400       | .2126 | 6 | 56 | 48     | 1,12 | 36 | 94  |
| 2968516               | TDS503A05500 | 5,500       | .2165 | 6 | 56 | 48     | 1,14 | 36 | 94  |
| 4051256               | TDS503A05550 | 5,550       | .2185 | 6 | 56 | 48     | 1,15 | 36 | 94  |
| 2968517               | TDS503A05560 | 5,560       | .2189 | 6 | 56 | 48     | 1,15 | 36 | 94  |
| 4051257               | TDS503A05600 | 5,600       | .2205 | 6 | 56 | 48     | 1,16 | 36 | 94  |
| 4051258               | TDS503A05700 | 5,700       | .2244 | 6 | 56 | 48     | 1,18 | 36 | 94  |
| 2968518               | TDS503A05800 | 5,800       | .2283 | 6 | 56 | 48     | 1,21 | 36 | 94  |
| 4051259               | TDS503A05900 | 5,900       | .2323 | 6 | 56 | 48     | 1,23 | 36 | 94  |
| 2968519               | TDS503A05950 | 5,950       | .2343 | 6 | 56 | 48     | 1,24 | 36 | 94  |
| 2968520               | TDS503A06000 | 6,000       | .2362 | 6 | 56 | 48     | 1,25 | 36 | 94  |
| 4051260               | TDS503A06100 | 6,100       | .2402 | 8 | 67 | 57     | 1,27 | 36 | 105 |
| 4051261               | TDS503A06200 | 6,200       | .2441 | 8 | 67 | 57     | 1,29 | 36 | 105 |
| 4051262               | TDS503A06300 | 6,300       | .2480 | 8 | 67 | 57     | 1,31 | 36 | 105 |
| 2968521               | TDS503A06350 | 6,350       | .2500 | 8 | 67 | 57     | 1,32 | 36 | 105 |
| 4051263               | TDS503A06400 | 6,400       | .2520 | 8 | 67 | 57     | 1,33 | 36 | 105 |
| 2968522               | TDS503A06500 | 6,500       | .2559 | 8 | 67 | 57     | 1,36 | 36 | 105 |
| 4051264               | TDS503A06600 | 6,600       | .2598 | 8 | 67 | 57     | 1,38 | 36 | 105 |
| 4051265               | TDS503A06700 | 6,700       | .2638 | 8 | 67 | 57     | 1,40 | 36 | 105 |
| 2968523               | TDS503A06750 | 6,750       | .2657 | 8 | 67 | 57     | 1,41 | 36 | 105 |
| 2968524               | TDS503A06800 | 6,800       | .2677 | 8 | 67 | 57     | 1,42 | 36 | 105 |
| 4051266               | TDS503A06900 | 6,900       | .2717 | 8 | 67 | 57     | 1,44 | 36 | 105 |
| 2968525               | TDS503A07000 | 7,000       | .2756 | 8 | 67 | 57     | 1,46 | 36 | 105 |
| 4051267               | TDS503A07100 | 7,100       | .2795 | 8 | 72 | 61     | 1,49 | 36 | 110 |
| 2968526               | TDS503A07140 | 7,140       | .2811 | 8 | 72 | 61     | 1,49 | 36 | 110 |
| 4051268               | TDS503A07200 | 7,200       | .2835 | 8 | 72 | 61     | 1,51 | 36 | 110 |
| 4051269               | TDS503A07300 | 7,300       | .2874 | 8 | 72 | 61     | 1,53 | 36 | 110 |
| 4051270               | TDS503A07400 | 7,400       | .2913 | 8 | 72 | 61     | 1,55 | 36 | 110 |
| 2968527               | TDS503A07500 | 7,500       | .2953 | 8 | 72 | 61     | 1,57 | 36 | 110 |
| 2968528               | TDS503A07540 | 7,540       | .2969 | 8 | 72 | 61     | 1,58 | 36 | 110 |
| 3998454               | TDS503A07600 | 7,600       | .2992 | 8 | 72 | 61     | 1,59 | 36 | 110 |
| 4051271               | TDS503A07700 | 7,700       | .3031 | 8 | 72 | 61     | 1,62 | 36 | 110 |
| 2968529               | TDS503A07800 | 7,800       | .3071 | 8 | 72 | 61     | 1,64 | 36 | 110 |
| 4051272               | TDS503A07900 | 7,900       | .3110 | 8 | 72 | 61     | 1,66 | 36 | 110 |
| 2968530               | TDS503A07940 | 7,940       | .3126 | 8 | 72 | 61     | 1,67 | 36 | 110 |

(continued)



(TDS503A • 8 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |    |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3 | L4 max | L5   | LS | L   |
| 2968531               | TDS503A08000 | 8,000       | .3150 | 8  | 72 | 61     | 1,68 | 36 | 110 |
| 4051273               | TDS503A08100 | 8,100       | .3189 | 10 | 80 | 68     | 1,70 | 40 | 122 |
| 4051274               | TDS503A08200 | 8,200       | .3228 | 10 | 80 | 68     | 1,72 | 40 | 122 |
| 4051275               | TDS503A08300 | 8,300       | .3268 | 10 | 80 | 68     | 1,75 | 40 | 122 |
| 2968532               | TDS503A08330 | 8,330       | .3280 | 10 | 80 | 68     | 1,75 | 40 | 122 |
| 4051276               | TDS503A08400 | 8,400       | .3307 | 10 | 80 | 68     | 1,77 | 40 | 122 |
| 2968533               | TDS503A08500 | 8,500       | .3346 | 10 | 80 | 68     | 1,79 | 40 | 122 |
| 4051277               | TDS503A08600 | 8,600       | .3386 | 10 | 80 | 68     | 1,81 | 40 | 122 |
| 4051278               | TDS503A08700 | 8,700       | .3425 | 10 | 80 | 68     | 1,83 | 40 | 122 |
| 4051279               | TDS503A08800 | 8,800       | .3465 | 10 | 80 | 68     | 1,85 | 40 | 122 |
| 4051280               | TDS503A08900 | 8,900       | .3504 | 10 | 80 | 68     | 1,88 | 40 | 122 |
| 2968534               | TDS503A09000 | 9,000       | .3543 | 10 | 80 | 68     | 1,90 | 40 | 122 |
| 4051281               | TDS503A09100 | 9,100       | .3583 | 10 | 80 | 68     | 1,92 | 40 | 122 |
| 2968535               | TDS503A09130 | 9,130       | .3594 | 10 | 80 | 68     | 1,93 | 40 | 122 |
| 4051282               | TDS503A09200 | 9,200       | .3622 | 10 | 80 | 68     | 1,94 | 40 | 122 |
| 4051283               | TDS503A09300 | 9,300       | .3661 | 10 | 80 | 68     | 1,96 | 40 | 122 |
| 4051284               | TDS503A09400 | 9,400       | .3701 | 10 | 80 | 68     | 1,98 | 40 | 122 |
| 2968536               | TDS503A09500 | 9,500       | .3740 | 10 | 80 | 68     | 2,01 | 40 | 122 |
| 2968537               | TDS503A09520 | 9,520       | .3748 | 10 | 80 | 68     | 2,01 | 40 | 122 |
| 4051285               | TDS503A09600 | 9,600       | .3780 | 10 | 80 | 68     | 2,03 | 40 | 122 |
| 4051286               | TDS503A09700 | 9,700       | .3819 | 10 | 80 | 68     | 2,05 | 40 | 122 |
| 2968538               | TDS503A09800 | 9,800       | .3858 | 10 | 80 | 68     | 2,07 | 40 | 122 |
| 4051287               | TDS503A09900 | 9,900       | .3898 | 10 | 80 | 68     | 2,09 | 40 | 122 |
| 2968539               | TDS503A09920 | 9,920       | .3906 | 10 | 80 | 68     | 2,10 | 40 | 122 |
| 2968540               | TDS503A10000 | 10,000      | .3937 | 10 | 80 | 68     | 2,11 | 40 | 122 |
| 4051288               | TDS503A10100 | 10,100      | .3976 | 12 | 94 | 79     | 2,14 | 45 | 141 |
| 2968541               | TDS503A10200 | 10,200      | .4016 | 12 | 94 | 79     | 2,16 | 45 | 141 |
| 4051289               | TDS503A10300 | 10,300      | .4055 | 12 | 94 | 79     | 2,18 | 45 | 141 |
| 2968542               | TDS503A10320 | 10,320      | .4063 | 12 | 94 | 79     | 2,18 | 45 | 141 |
| 4051290               | TDS503A10400 | 10,400      | .4094 | 12 | 94 | 79     | 2,20 | 45 | 141 |
| 2968543               | TDS503A10500 | 10,500      | .4134 | 12 | 94 | 79     | 2,22 | 45 | 141 |
| 4051291               | TDS503A10600 | 10,600      | .4173 | 12 | 94 | 79     | 2,24 | 45 | 141 |
| 4051292               | TDS503A10700 | 10,700      | .4213 | 12 | 94 | 79     | 2,27 | 45 | 141 |
| 2968544               | TDS503A10720 | 10,720      | .4220 | 12 | 94 | 79     | 2,27 | 45 | 141 |
| 2968545               | TDS503A10800 | 10,800      | .4252 | 12 | 94 | 79     | 2,29 | 45 | 141 |
| 4051293               | TDS503A10900 | 10,900      | .4291 | 12 | 94 | 79     | 2,31 | 45 | 141 |
| 2968546               | TDS503A11000 | 11,000      | .4331 | 12 | 94 | 79     | 2,33 | 45 | 141 |
| 4051294               | TDS503A11100 | 11,100      | .4370 | 12 | 94 | 79     | 2,35 | 45 | 141 |
| 3998456               | TDS503A11110 | 11,110      | .4374 | 12 | 94 | 79     | 2,35 | 45 | 141 |
| 4051295               | TDS503A11200 | 11,200      | .4409 | 12 | 94 | 79     | 2,37 | 45 | 141 |

(continued)

(TDS503A • 8 x D — continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |              | D1 diameter |       |    |     |        |      |    |     |
|-----------------------|--------------|-------------|-------|----|-----|--------|------|----|-----|
| order #               | catalogue #  | mm          | in    | D  | L3  | L4 max | L5   | LS | L   |
| 4051296               | TDS503A11300 | 11,300      | .4449 | 12 | 94  | 79     | 2,40 | 45 | 141 |
| 4051297               | TDS503A11400 | 11,400      | .4488 | 12 | 94  | 79     | 2,42 | 45 | 141 |
| 2968547               | TDS503A11500 | 11,500      | .4528 | 12 | 94  | 79     | 2,44 | 45 | 141 |
| 4051298               | TDS503A11600 | 11,600      | .4567 | 12 | 94  | 79     | 2,46 | 45 | 141 |
| 4051299               | TDS503A11700 | 11,700      | .4606 | 12 | 94  | 79     | 2,48 | 45 | 141 |
| 2968548               | TDS503A11800 | 11,800      | .4646 | 12 | 94  | 79     | 2,50 | 45 | 141 |
| 4051300               | TDS503A11900 | 11,900      | .4685 | 12 | 94  | 79     | 2,53 | 45 | 141 |
| 2968549               | TDS503A11910 | 11,910      | .4689 | 12 | 94  | 79     | 2,53 | 45 | 141 |
| 2968550               | TDS503A12000 | 12,000      | .4724 | 12 | 94  | 79     | 2,55 | 45 | 141 |
| 2968551               | TDS503A12300 | 12,300      | .4843 | 14 | 108 | 91     | 2,61 | 45 | 155 |
| 2968552               | TDS503A12500 | 12,500      | .4921 | 14 | 108 | 91     | 2,66 | 45 | 155 |
| 2968553               | TDS503A12700 | 12,700      | .5000 | 14 | 108 | 91     | 2,70 | 45 | 155 |
| 2968554               | TDS503A12800 | 12,800      | .5039 | 14 | 108 | 91     | 2,72 | 45 | 155 |
| 2968555               | TDS503A13000 | 13,000      | .5118 | 14 | 108 | 91     | 2,77 | 45 | 155 |
| 4051301               | TDS503A13100 | 13,100      | .5157 | 14 | 108 | 91     | 2,79 | 45 | 155 |
| 2968556               | TDS503A13500 | 13,500      | .5315 | 14 | 108 | 91     | 2,87 | 45 | 155 |
| 2968557               | TDS503A13800 | 13,800      | .5433 | 14 | 108 | 91     | 2,94 | 45 | 155 |
| 2968558               | TDS503A14000 | 14,000      | .5512 | 14 | 108 | 91     | 2,98 | 45 | 155 |
| 2968559               | TDS503A14290 | 14,290      | .5626 | 16 | 121 | 101    | 3,05 | 48 | 171 |
| 2968560               | TDS503A14500 | 14,500      | .5709 | 16 | 121 | 101    | 3,09 | 48 | 171 |
| 2968561               | TDS503A14800 | 14,800      | .5827 | 16 | 121 | 101    | 3,16 | 48 | 171 |
| 2968562               | TDS503A15000 | 15,000      | .5906 | 16 | 121 | 101    | 3,20 | 48 | 171 |
| 2968563               | TDS503A15500 | 15,500      | .6102 | 16 | 121 | 101    | 3,31 | 48 | 171 |
| 2968564               | TDS503A15800 | 15,800      | .6220 | 16 | 121 | 101    | 3,38 | 48 | 171 |
| 2968565               | TDS503A15870 | 15,870      | .6248 | 16 | 121 | 101    | 3,39 | 48 | 171 |
| 2968566               | TDS503A16000 | 16,000      | .6299 | 16 | 121 | 101    | 3,42 | 48 | 171 |
| 4051302               | TDS503A16500 | 16,500      | .6496 | 18 | 135 | 113    | 3,53 | 48 | 185 |
| 4051303               | TDS503A16670 | 16,670      | .6563 | 18 | 135 | 113    | 3,57 | 48 | 185 |
| 4051304               | TDS503A16800 | 16,800      | .6614 | 18 | 135 | 113    | 3,59 | 48 | 185 |
| 4051305               | TDS503A17000 | 17,000      | .6693 | 18 | 135 | 113    | 3,64 | 48 | 185 |
| 4051306               | TDS503A17500 | 17,500      | .6890 | 18 | 135 | 113    | 3,75 | 48 | 185 |
| 4051307               | TDS503A17800 | 17,800      | .7008 | 18 | 135 | 113    | 3,81 | 48 | 185 |
| 4051308               | TDS503A18000 | 18,000      | .7087 | 18 | 135 | 113    | 3,86 | 48 | 185 |
| 4051309               | TDS503A18500 | 18,500      | .7283 | 20 | 148 | 124    | 3,97 | 50 | 200 |
| 4051310               | TDS503A18800 | 18,800      | .7402 | 20 | 148 | 124    | 4,03 | 50 | 200 |
| 4051311               | TDS503A19000 | 19,000      | .7480 | 20 | 148 | 124    | 4,07 | 50 | 200 |
| 4051312               | TDS503A19050 | 19,050      | .7500 | 20 | 148 | 124    | 4,09 | 50 | 200 |
| 4051313               | TDS503A19500 | 19,500      | .7677 | 20 | 148 | 124    | 4,18 | 50 | 200 |
| 4051314               | TDS503A19800 | 19,800      | .7795 | 20 | 148 | 124    | 4,25 | 50 | 200 |
| 4051315               | TDS503A20000 | 20,000      | .7874 | 20 | 148 | 124    | 4,29 | 50 | 200 |

■ TOP DRILL S+ • TDS301 • WU25PD™ • Flood Coolant • Metric

| Material Group |                |                    |       |                                       |           |           |           |           |           |           |           |           |
|----------------|----------------|--------------------|-------|---------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |                | Cutting Speed – vc |       | Recommended Feed Rate (f) by Diameter |           |           |           |           |           |           |           |           |
|                |                | min                | – max | Tool Diameter (mm)                    | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1              | 80                 | – 130 | mm/r                                  | 0,06–0,12 | 0,10–0,18 | 0,12–0,24 | 0,14–0,29 | 0,17–0,34 | 0,20–0,39 | 0,24–0,47 | 0,31–0,60 |
|                | 2, 3, 4, 6, 7  | 60                 | – 120 | mm/r                                  | 0,07–0,13 | 0,10–0,19 | 0,14–0,25 | 0,17–0,31 | 0,21–0,37 | 0,24–0,42 | 0,29–0,52 | 0,38–0,65 |
|                | 5, 9, 10, 11   | 60                 | – 120 | mm/r                                  | 0,07–0,13 | 0,09–0,19 | 0,13–0,25 | 0,16–0,31 | 0,19–0,37 | 0,21–0,42 | 0,26–0,52 | 0,32–0,65 |
|                | 12, 13.1, 13.2 | 40                 | – 70  | mm/r                                  | 0,05–0,08 | 0,06–0,11 | 0,09–0,16 | 0,11–0,20 | 0,13–0,24 | 0,15–0,27 | 0,20–0,35 | 0,26–0,45 |
| M              | 14.1           | 30                 | – 50  | mm/r                                  | 0,04–0,07 | 0,05–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
|                | 14.3           | 30                 | – 60  | mm/r                                  | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,14 | 0,10–0,16 | 0,12–0,18 | 0,14–0,20 | 0,16–0,22 |
|                | 14.2, 14.4     | 30                 | – 50  | mm/r                                  | 0,04–0,07 | 0,06–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
| K              | 15, 16         | 100                | – 210 | mm/r                                  | 0,08–0,16 | 0,12–0,24 | 0,16–0,31 | 0,20–0,38 | 0,23–0,44 | 0,25–0,49 | 0,31–0,06 | 0,38–0,74 |
|                | 17, 18, 19     | 130                | – 160 | mm/r                                  | 0,08–0,13 | 0,12–0,19 | 0,16–0,25 | 0,20–0,31 | 0,23–0,36 | 0,25–0,40 | 0,31–0,48 | 0,38–0,60 |
|                | 20             | 100                | – 170 | mm/r                                  | 0,06–0,13 | 0,09–0,19 | 0,12–0,25 | 0,14–0,30 | 0,17–0,35 | 0,19–0,40 | 0,25–0,48 | 0,30–0,60 |
| N              | 21             | 100                | – 300 | mm/r                                  | 0,10–0,18 | 0,12–0,20 | 0,15–0,25 | 0,20–0,30 | 0,25–0,35 | 0,30–0,40 | 0,35–0,50 | 0,40–0,60 |
|                | 22, 23, 24     | 100                | – 300 | mm/r                                  | 0,10–0,20 | 0,12–0,25 | 0,15–0,30 | 0,20–0,35 | 0,25–0,40 | 0,30–0,45 | 0,35–0,55 | 0,40–0,65 |
|                | 25             | 100                | – 300 | mm/r                                  | 0,15–0,18 | 0,16–0,20 | 0,18–0,25 | 0,20–0,30 | 0,25–0,35 | 0,30–0,40 | 0,35–0,50 | 0,40–0,55 |
|                | 26, 27, 28     | 100                | – 250 | mm/r                                  | 0,10–0,20 | 0,12–0,25 | 0,15–0,30 | 0,20–0,35 | 0,25–0,40 | 0,30–0,45 | 0,35–0,50 | 0,40–0,60 |
| S              | 31, 32         | 20                 | – 30  | mm/r                                  | 0,03–0,06 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,13 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 |
|                | 33, 34, 35     | 10                 | – 30  | mm/r                                  | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |
|                | 36             | 20                 | – 40  | mm/r                                  | 0,02–0,04 | 0,02–0,05 | 0,04–0,07 | 0,06–0,09 | 0,07–0,10 | 0,08–0,11 | 0,09–0,13 | 0,10–0,15 |
|                | 37             | 20                 | – 50  | mm/r                                  | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |

| nominal size range | Metric tolerance |                |
|--------------------|------------------|----------------|
|                    | D1 tolerance     | D tolerance h6 |
| >3–6               | 0,004/0,016      | 0,000/–0,008   |
| >6–10              | 0,006/0,021      | 0,000/–0,009   |
| >10–18             | 0,007/0,025      | 0,000/–0,011   |
| >18–21             | 0,008/0,029      | 0,000/–0,013   |

**■ TOP DRILL S+ • TDS501 TDS502 TDS503 • WU25PD™ • Through Coolant • Metric**

| Material Group |                   |  |   |     |  |           |           |           |           |           |           |           |           |
|----------------|-------------------|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |                   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |
|                |                   | min                                                                               | – | max | Tool Diameter<br>(mm)                                                              | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1                 | 90                                                                                | – | 180 | mm/r                                                                               | 0,08–0,16 | 0,09–0,18 | 0,12–0,24 | 0,14–0,29 | 0,17–0,34 | 0,20–0,39 | 0,24–0,47 | 0,31–0,60 |
|                | 2, 3, 4,<br>6, 7  | 80                                                                                | – | 120 | mm/r                                                                               | 0,09–0,17 | 0,10–0,19 | 0,14–0,25 | 0,17–0,31 | 0,21–0,37 | 0,24–0,42 | 0,29–0,52 | 0,38–0,65 |
|                | 5, 9, 10,<br>11   | 70                                                                                | – | 120 | mm/r                                                                               | 0,08–0,17 | 0,09–0,19 | 0,13–0,25 | 0,16–0,31 | 0,19–0,37 | 0,21–0,42 | 0,26–0,52 | 0,32–0,65 |
|                | 12, 13.1,<br>13.2 | 50                                                                                | – | 80  | mm/r                                                                               | 0,05–0,09 | 0,06–0,11 | 0,09–0,16 | 0,11–0,20 | 0,14–0,24 | 0,15–0,27 | 0,20–0,35 | 0,26–0,45 |
| M              | 14.1              | 30                                                                                | – | 50  | mm/r                                                                               | 0,04–0,07 | 0,05–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
|                | 14.3              | 30                                                                                | – | 60  | mm/r                                                                               | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,14 | 0,10–0,16 | 0,12–0,18 | 0,14–0,20 | 0,16–0,22 |
|                | 14.2,<br>14.4     | 30                                                                                | – | 50  | mm/r                                                                               | 0,04–0,07 | 0,06–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
| K              | 15, 16            | 100                                                                               | – | 210 | mm/r                                                                               | 0,11–0,22 | 0,12–0,24 | 0,16–0,31 | 0,20–0,38 | 0,23–0,44 | 0,25–0,49 | 0,31–0,60 | 0,38–0,74 |
|                | 17, 18,<br>19     | 130                                                                               | – | 160 | mm/r                                                                               | 0,11–0,17 | 0,12–0,19 | 0,16–0,25 | 0,20–0,31 | 0,23–0,36 | 0,25–0,40 | 0,31–0,48 | 0,38–0,60 |
|                | 20                | 100                                                                               | – | 170 | mm/r                                                                               | 0,08–0,17 | 0,09–0,19 | 0,12–0,25 | 0,14–0,30 | 0,17–0,35 | 0,19–0,40 | 0,24–0,48 | 0,30–0,60 |
| N              | 21                | 100                                                                               | – | 350 | mm/r                                                                               | 0,10–0,18 | 0,12–0,20 | 0,15–0,25 | 0,20–0,30 | 0,25–0,35 | 0,30–0,40 | 0,35–0,50 | 0,40–0,60 |
|                | 22, 23,<br>24     | 100                                                                               | – | 300 | mm/r                                                                               | 0,10–0,20 | 0,12–0,25 | 0,15–0,30 | 0,20–0,35 | 0,25–0,40 | 0,30–0,45 | 0,35–0,55 | 0,40–0,65 |
|                | 25                | 100                                                                               | – | 300 | mm/r                                                                               | 0,15–0,18 | 0,16–0,20 | 0,18–0,25 | 0,20–0,30 | 0,25–0,35 | 0,30–0,40 | 0,35–0,50 | 0,40–0,55 |
|                | 26, 27,<br>28     | 100                                                                               | – | 250 | mm/r                                                                               | 0,10–0,20 | 0,12–0,25 | 0,15–0,30 | 0,20–0,35 | 0,25–0,40 | 0,30–0,45 | 0,35–0,50 | 0,40–0,60 |
| S              | 31, 32            | 20                                                                                | – | 30  | mm/r                                                                               | 0,03–0,06 | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,13 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 |
|                | 33, 34,<br>35     | 10                                                                                | – | 30  | mm/r                                                                               | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |
|                | 36                | 20                                                                                | – | 40  | mm/r                                                                               | 0,02–0,04 | 0,02–0,05 | 0,04–0,07 | 0,06–0,09 | 0,07–0,10 | 0,08–0,11 | 0,09–0,13 | 0,10–0,15 |
|                | 37                | 20                                                                                | – | 50  | mm/r                                                                               | 0,02–0,04 | 0,03–0,06 | 0,05–0,08 | 0,07–0,10 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,11–0,16 |

**Metric  
tolerance**

| nominal size range | D1 tolerance | D tolerance h6 |
|--------------------|--------------|----------------|
| >3–6               | 0,004/0,016  | 0,000/–0,008   |
| >6–10              | 0,006/0,021  | 0,000/–0,009   |
| >10–18             | 0,007/0,025  | 0,000/–0,011   |
| >18–21             | 0,008/0,029  | 0,000/–0,013   |



## Deep-Hole Drilling without Piloting •

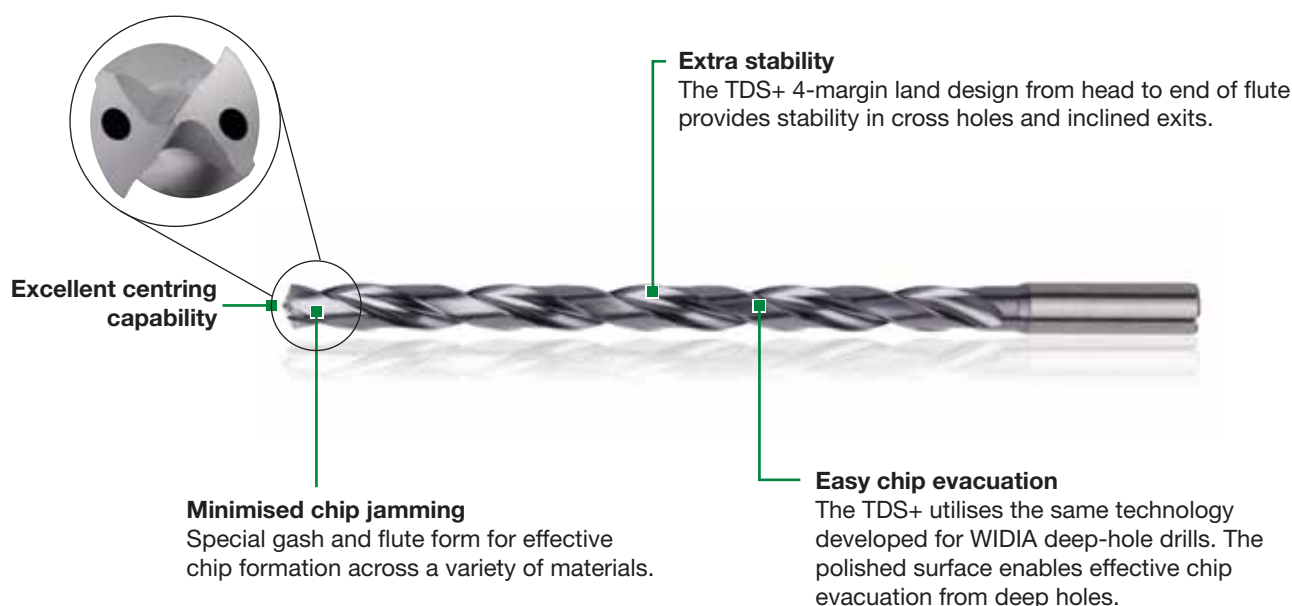
### WIDIA™ TOP DRILL S+™ 12 x D

The versatile TOP DRILL S+ provides reliable performance across a broad scope of applications, including alloyed and unalloyed steel, cast iron, and some stainless steels and high-temperature alloys. TDS+ is now available in 12 x D, adding to its already wide range of options from 3–8 x D.

TDS+ 12 x D is capable of drilling an array of materials. The 4-margin land configuration offers stability, minimises chipping and jamming, and promotes chip evacuation. Because TDS+ 12 x D does not require a pilot drill, it increases efficiency by reducing the number of steps required for basic applications.

- 12 x D fits the gap between 8 x D and 15 x D.
- One drill that covers all materials.
- Can be used without a pilot.

# TOP DRILL S+™ 12 x D



### Improved Productivity

- Excellent centring capability — the new TDS+ 12 x D point is engineered to provide excellent centring capability.
- No pilot drill required — save time and money by reducing the number of steps required for your 12 x D application.

### Increased Tool Life

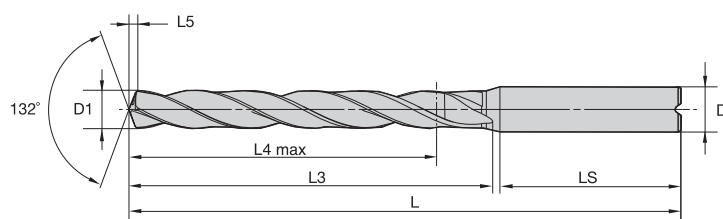
- Minimised runout — cylindrical body design provides guidance, and precision h6 shank is standard for better runout and less breakage.
- New WU20PD™ grade — designed specifically for long tool life.
- Factory regrind service — available through your WIDIA™ reconditioning service.

### WIDIA™ Advantage

- Lower cost-per-hole due to high MRR and long tool life.
- Consistent performance from internally controlled supply chain:  
Powder > Rod > Grinding > Coating
- Part of the complete WIDIA holemaking solution.
- Get more predictable results from local regrind services using OEM standards to recondition, ensuring value throughout the entire life of the drill.
- Broad range of standard lengths, diameters, and coolant options in one line. Includes extensive intermediate metric, inch, fraction, and wire size, including tap drill sizes.



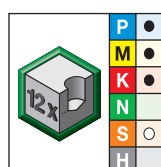




For information on L, L3, and L4 max, see page T143.



### ■ TDS504A • 12 x D



grade WU20PD  
TiAlN

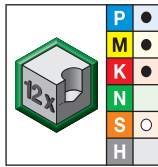
D1 diameter

● first choice  
○ alternate choice

| order # | catalogue #  | mm    | in    | L   | L4 max | L3   | L5  | LS | D |
|---------|--------------|-------|-------|-----|--------|------|-----|----|---|
| 4173459 | TDS504A03000 | 3,000 | .1181 | 93  | 44     | 52,0 | 0,6 | 36 | 6 |
| 4173460 | TDS504A03175 | 3,175 | .1250 | 93  | 44     | 52,0 | 0,7 | 36 | 6 |
| 4173461 | TDS504A03264 | 3,264 | .1285 | 93  | 44     | 53,0 | 0,7 | 36 | 6 |
| 4173545 | TDS504A03455 | 3,455 | .1360 | 93  | 44     | 53,0 | 0,7 | 36 | 6 |
| 4173462 | TDS504A03500 | 3,500 | .1378 | 93  | 44     | 53,0 | 0,7 | 36 | 6 |
| 4173546 | TDS504A03734 | 3,734 | .1470 | 93  | 45     | 54,0 | 0,8 | 36 | 6 |
| 4173463 | TDS504A03970 | 3,970 | .1563 | 107 | 56     | 66,0 | 0,8 | 36 | 6 |
| 4173464 | TDS504A04000 | 4,000 | .1575 | 107 | 56     | 66,0 | 0,8 | 36 | 6 |
| 4173465 | TDS504A04500 | 4,500 | .1772 | 107 | 56     | 67,0 | 0,9 | 36 | 6 |
| 4173466 | TDS504A04600 | 4,600 | .1811 | 107 | 57     | 68,0 | 1,0 | 36 | 6 |
| 4173467 | TDS504A04763 | 4,763 | .1875 | 125 | 69     | 82,0 | 1,0 | 36 | 6 |
| 4173468 | TDS504A04800 | 4,800 | .1890 | 125 | 69     | 82,0 | 1,0 | 36 | 6 |
| 4173469 | TDS504A05000 | 5,000 | .1969 | 125 | 70     | 83,0 | 1,1 | 36 | 6 |
| 4173470 | TDS504A05100 | 5,100 | .2008 | 125 | 70     | 83,0 | 1,1 | 36 | 6 |
| 4173471 | TDS504A05200 | 5,200 | .2047 | 125 | 70     | 83,0 | 1,1 | 36 | 6 |
| 4173472 | TDS504A05300 | 5,300 | .2087 | 125 | 71     | 84,0 | 1,1 | 36 | 6 |
| 4173473 | TDS504A05410 | 5,410 | .2130 | 125 | 71     | 84,0 | 1,1 | 36 | 6 |
| 4173474 | TDS504A05500 | 5,500 | .2165 | 125 | 71     | 84,0 | 1,2 | 36 | 6 |
| 4173475 | TDS504A05558 | 5,558 | .2188 | 125 | 71     | 84,0 | 1,2 | 36 | 6 |
| 4173476 | TDS504A05600 | 5,600 | .2205 | 125 | 72     | 85,0 | 1,2 | 36 | 6 |
| 4173477 | TDS504A05700 | 5,700 | .2244 | 125 | 72     | 85,0 | 1,2 | 36 | 6 |
| 4173478 | TDS504A05800 | 5,800 | .2283 | 125 | 71     | 85,0 | 1,2 | 36 | 6 |
| 4173479 | TDS504A06000 | 6,000 | .2362 | 125 | 72     | 86,0 | 1,3 | 36 | 6 |
| 4173480 | TDS504A06200 | 6,200 | .2441 | 139 | 82     | 97,0 | 1,3 | 36 | 8 |

(continued)

(TDS504A • 12 x D — continued)

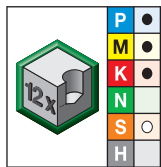


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |     |        |       |     |    |    |
|-----------------------|--------------|-------------|-------|-----|--------|-------|-----|----|----|
| order #               | catalogue #  | mm          | in    | L   | L4 max | L3    | L5  | LS | D  |
| 4173481               | TDS504A06350 | 6,350       | .2500 | 139 | 83     | 98,0  | 1,3 | 36 | 8  |
| 4173482               | TDS504A06500 | 6,500       | .2559 | 139 | 83     | 98,0  | 1,4 | 36 | 8  |
| 4173483               | TDS504A06528 | 6,528       | .2570 | 139 | 83     | 98,0  | 1,4 | 36 | 8  |
| 4173484               | TDS504A06600 | 6,600       | .2598 | 139 | 84     | 99,0  | 1,4 | 36 | 8  |
| 4173485               | TDS504A06746 | 6,746       | .2656 | 139 | 83     | 99,0  | 1,4 | 36 | 8  |
| 4173486               | TDS504A06800 | 6,800       | .2677 | 139 | 83     | 99,0  | 1,4 | 36 | 8  |
| 4173487               | TDS504A06909 | 6,909       | .2720 | 139 | 84     | 100,0 | 1,5 | 36 | 8  |
| 4173488               | TDS504A07000 | 7,000       | .2756 | 139 | 84     | 100,0 | 1,5 | 36 | 8  |
| 4173489               | TDS504A07145 | 7,145       | .2813 | 153 | 94     | 111,0 | 1,5 | 36 | 8  |
| 4173490               | TDS504A07500 | 7,500       | .2953 | 153 | 95     | 112,0 | 1,6 | 36 | 8  |
| 4173491               | TDS504A07541 | 7,541       | .2969 | 153 | 95     | 112,0 | 1,6 | 36 | 8  |
| 4173492               | TDS504A07700 | 7,700       | .3031 | 153 | 96     | 113,0 | 1,6 | 36 | 8  |
| 4173493               | TDS504A07800 | 7,800       | .3071 | 153 | 95     | 113,0 | 1,7 | 36 | 8  |
| 4173494               | TDS504A07938 | 7,938       | .3125 | 153 | 96     | 114,0 | 1,7 | 36 | 8  |
| 4173495               | TDS504A08000 | 8,000       | .3150 | 153 | 96     | 114,0 | 1,7 | 36 | 8  |
| 4173496               | TDS504A08100 | 8,100       | .3189 | 185 | 116    | 136,0 | 1,7 | 40 | 10 |
| 4173497               | TDS504A08334 | 8,334       | .3281 | 185 | 117    | 137,0 | 1,8 | 40 | 10 |
| 4173498               | TDS504A08433 | 8,433       | .3320 | 185 | 117    | 137,0 | 1,8 | 40 | 10 |
| 4173499               | TDS504A08500 | 8,500       | .3346 | 185 | 117    | 137,0 | 1,8 | 40 | 10 |
| 4173500               | TDS504A08700 | 8,700       | .3425 | 185 | 118    | 138,0 | 1,9 | 40 | 10 |
| 4173501               | TDS504A08733 | 8,733       | .3438 | 185 | 117    | 138,0 | 1,9 | 40 | 10 |
| 4173502               | TDS504A09000 | 9,000       | .3543 | 185 | 118    | 139,0 | 1,9 | 40 | 10 |
| 4173503               | TDS504A09100 | 9,100       | .3583 | 185 | 118    | 139,0 | 1,9 | 40 | 10 |
| 4173504               | TDS504A09129 | 9,129       | .3594 | 185 | 118    | 139,0 | 1,9 | 40 | 10 |
| 4173547               | TDS504A09347 | 9,347       | .3680 | 185 | 119    | 140,0 | 2,0 | 40 | 10 |
| 4173505               | TDS504A09500 | 9,500       | .3740 | 185 | 119    | 140,0 | 2,0 | 40 | 10 |
| 4173506               | TDS504A09525 | 9,525       | .3750 | 185 | 119    | 140,0 | 2,0 | 40 | 10 |
| 4173507               | TDS504A09921 | 9,921       | .3906 | 185 | 120    | 142,0 | 2,1 | 40 | 10 |
| 4173508               | TDS504A10000 | 10,000      | .3937 | 185 | 120    | 142,0 | 2,1 | 40 | 10 |
| 4173509               | TDS504A10200 | 10,200      | .4016 | 218 | 140    | 164,0 | 2,2 | 45 | 12 |
| 4173510               | TDS504A10300 | 10,300      | .4055 | 218 | 141    | 165,0 | 2,2 | 45 | 12 |
| 4173511               | TDS504A10320 | 10,320      | .4063 | 218 | 141    | 165,0 | 2,2 | 45 | 12 |
| 4173512               | TDS504A10500 | 10,500      | .4134 | 218 | 141    | 165,0 | 2,2 | 45 | 12 |
| 4173513               | TDS504A10716 | 10,716      | .4219 | 218 | 142    | 166,0 | 2,3 | 45 | 12 |
| 4173514               | TDS504A10800 | 10,800      | .4252 | 218 | 141    | 166,0 | 2,3 | 45 | 12 |
| 4173515               | TDS504A11000 | 11,000      | .4331 | 218 | 142    | 167,0 | 2,4 | 45 | 12 |
| 4173516               | TDS504A11113 | 11,113      | .4375 | 218 | 142    | 167,0 | 2,4 | 45 | 12 |
| 4173517               | TDS504A11500 | 11,500      | .4528 | 218 | 143    | 168,0 | 2,5 | 45 | 12 |
| 4173518               | TDS504A11800 | 11,800      | .4646 | 218 | 143    | 169,0 | 2,5 | 45 | 12 |
| 4173519               | TDS504A12000 | 12,000      | .4724 | 218 | 144    | 170,0 | 2,6 | 45 | 12 |

(continued)

(TDS504A • 12 x D — continued)



● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |     |        |       |     |    |    |
|-----------------------|--------------|-------------|-------|-----|--------|-------|-----|----|----|
| order #               | catalogue #  | mm          | in    | L   | L4 max | L3    | L5  | LS | D  |
| 4173520               | TDS504A12100 | 12,100      | .4764 | 246 | 164    | 192,0 | 2,6 | 45 | 14 |
| 4173521               | TDS504A12304 | 12,304      | .4844 | 246 | 165    | 193,0 | 2,6 | 45 | 14 |
| 4148906               | TDS504A12500 | 12,500      | .4921 | 246 | 165    | 193,0 | 2,7 | 45 | 14 |
| 4173522               | TDS504A12700 | 12,700      | .5000 | 246 | 166    | 194,0 | 2,7 | 45 | 14 |
| 4173523               | TDS504A13000 | 13,000      | .5118 | 246 | 166    | 195,0 | 2,8 | 45 | 14 |
| 4173524               | TDS504A13100 | 13,100      | .5157 | 246 | 166    | 195,0 | 2,8 | 45 | 14 |
| 4173525               | TDS504A13500 | 13,500      | .5315 | 246 | 167    | 196,0 | 2,9 | 45 | 14 |
| 4173526               | TDS504A14000 | 14,000      | .5512 | 246 | 168    | 198,0 | 3,0 | 45 | 14 |
| 4173527               | TDS504A14100 | 14,100      | .5551 | 277 | 188    | 220,0 | 3,0 | 48 | 16 |
| 4173528               | TDS504A14288 | 14,288      | .5625 | 277 | 188    | 220,0 | 3,1 | 48 | 16 |
| 4173529               | TDS504A14500 | 14,500      | .5709 | 277 | 189    | 221,0 | 3,1 | 48 | 16 |
| 4173530               | TDS504A14684 | 14,684      | .5781 | 277 | 190    | 222,0 | 3,2 | 48 | 16 |
| 4173531               | TDS504A15000 | 15,000      | .5906 | 277 | 190    | 223,0 | 3,2 | 48 | 16 |
| 4173532               | TDS504A15500 | 15,500      | .6102 | 277 | 191    | 224,0 | 3,3 | 48 | 16 |
| 4173533               | TDS504A15875 | 15,875      | .6250 | 277 | 192    | 225,0 | 3,4 | 48 | 16 |
| 4173534               | TDS504A16000 | 16,000      | .6299 | 277 | 192    | 226,0 | 3,4 | 48 | 16 |
| 4173535               | TDS504A16500 | 16,500      | .6496 | 305 | 213    | 249,0 | 3,6 | 48 | 18 |
| 4173536               | TDS504A17000 | 17,000      | .6693 | 305 | 214    | 250,0 | 3,7 | 48 | 18 |
| 4173537               | TDS504A17463 | 17,463      | .6875 | 305 | 215    | 252,0 | 3,8 | 48 | 18 |
| 4173538               | TDS504A17500 | 17,500      | .6890 | 305 | 215    | 252,0 | 3,8 | 48 | 18 |
| 4173539               | TDS504A18000 | 18,000      | .7087 | 305 | 216    | 253,0 | 3,9 | 48 | 18 |
| 4173540               | TDS504A18500 | 18,500      | .7283 | 334 | 237    | 277,0 | 4,0 | 50 | 20 |
| 4173541               | TDS504A19000 | 19,000      | .7480 | 334 | 238    | 278,0 | 4,1 | 50 | 20 |
| 4173542               | TDS504A19050 | 19,050      | .7500 | 334 | 239    | 279,0 | 4,1 | 50 | 20 |
| 4173543               | TDS504A19500 | 19,500      | .7677 | 334 | 239    | 280,0 | 4,2 | 50 | 20 |
| 4173544               | TDS504A20000 | 20,000      | .7874 | 334 | 240    | 281,0 | 4,3 | 50 | 20 |

**■ TOP DRILL S+ • TDS504 • WU20PD™ • Through Coolant • Metric**

| Material Group |               |  |       |  |           |           |           |           |           |           |           |           |
|----------------|---------------|-----------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |               | Cutting Speed<br>— vc                                                             |       | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |
|                |               | Range — m/min                                                                     |       | Tool Diameter (mm)                                                                 | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| <b>P</b>       | 1             | 90                                                                                | – 180 | mm/r                                                                               | 0,08–0,16 | 0,09–0,18 | 0,12–0,24 | 0,14–0,29 | 0,17–0,34 | 0,20–0,39 | 0,24–0,47 | 0,31–0,60 |
|                | 2, 3, 4, 6, 7 | 80                                                                                | – 120 | mm/r                                                                               | 0,09–0,17 | 0,10–0,19 | 0,14–0,25 | 0,17–0,31 | 0,21–0,37 | 0,24–0,42 | 0,29–0,52 | 0,38–0,65 |
|                | 5, 9, 10, 11  | 70                                                                                | – 120 | mm/r                                                                               | 0,08–0,17 | 0,09–0,19 | 0,13–0,25 | 0,16–0,31 | 0,19–0,37 | 0,21–0,42 | 0,26–0,52 | 0,32–0,65 |
|                | 12, 13        | 50                                                                                | – 80  | mm/r                                                                               | 0,05–0,09 | 0,06–0,11 | 0,09–0,16 | 0,11–0,20 | 0,14–0,24 | 0,15–0,27 | 0,20–0,35 | 0,26–0,45 |
| <b>M</b>       | 14,1          | 30                                                                                | – 50  | mm/r                                                                               | 0,04–0,07 | 0,05–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
|                | 14,3          | 30                                                                                | – 60  | mm/r                                                                               | 0,04–0,08 | 0,06–0,10 | 0,08–0,12 | 0,09–0,14 | 0,10–0,16 | 0,12–0,18 | 0,14–0,20 | 0,16–0,22 |
|                | 14,2, 14,4    | 30                                                                                | – 50  | mm/r                                                                               | 0,04–0,07 | 0,06–0,09 | 0,08–0,11 | 0,09–0,12 | 0,10–0,14 | 0,12–0,16 | 0,14–0,18 | 0,16–0,20 |
| <b>K</b>       | 15, 16        | 100                                                                               | – 210 | mm/r                                                                               | 0,11–0,22 | 0,12–0,24 | 0,16–0,31 | 0,20–0,38 | 0,23–0,44 | 0,25–0,49 | 0,31–0,60 | 0,38–0,74 |
|                | 17, 18, 19    | 130                                                                               | – 160 | mm/r                                                                               | 0,11–0,17 | 0,12–0,19 | 0,16–0,25 | 0,20–0,31 | 0,23–0,36 | 0,25–0,40 | 0,31–0,48 | 0,38–0,60 |
|                | 20            | 100                                                                               | – 170 | mm/r                                                                               | 0,08–0,17 | 0,09–0,19 | 0,12–0,25 | 0,14–0,30 | 0,17–0,35 | 0,19–0,40 | 0,24–0,48 | 0,30–0,60 |

**Metric**
**tolerance**

| nominal size range | D1 tolerance m7 | D tolerance h6 |
|--------------------|-----------------|----------------|
| >3–6               | 0,004/0,016     | 0,000/-0,008   |
| >6–10              | 0,006/0,021     | 0,000/-0,009   |
| >10–18             | 0,007/0,025     | 0,000/-0,011   |
| >18–25,4           | 0,008/0,029     | 0,000/-0,013   |

## Superior Deep-Hole Drilling •

# **WIDIA™ TOP DRILL™ Deep-Hole Drills for Steel and Cast Iron**

Solid carbide deep-hole drills outperform gun drills and HSS deep-hole drills in deep-hole applications up to 30 x D by increasing metal removal rates by 3–4 times. Increased MRR equals bottom-line savings to customers in throughput, machine time, and personnel hours.

The TDD1\*Z\* Series in the WU20PD™ grade offers secure and consistent performance, excellent hole quality, and reduced cycle times. The standard lines are available from 3–13mm and lengths of 15, 20, 25, and 30 x D. It eliminates the traditional HSS or gun drilling without pecking, at up to 100% increased penetration rates.

# TOP DRILL DEEP-HOLE DRILLS

### **132° TDS Point Geometry**

- Low thrust.
- Excellent centring capabilities.
- Easy to regrind.

### **30° Helix with Optimised Flute Profile**

- Reduces risk of chip jamming and catastrophic failure.

### **Four-Margin Lands**

- Improves hole straightness.
- Improves hole alignment when drilling through cross holes and inclined exits.

### Highly Polished Surfaces

- Reduction of friction in the chip flute and on the lands, resulting in superior chip evacuation.
- Shorter drilling time through omission of reversing cycles.

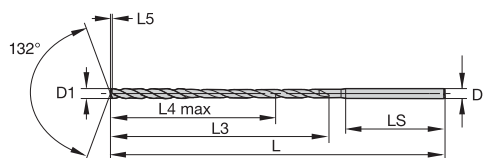
### WU20PD™ Grade

- Advanced TiAlN multilayer PVD coating for steel and cast iron.
- Ultra-fine-grain carbide ensures process reliability at high feed rates.

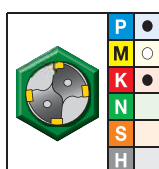
### Customisation

- Intermediate sizes, even up to 16mm diameter, available as semi-standards.
- Length variations, including longer versions up to 550mm, available as custom solutions.
- For drilling non-ferrous and uncoated materials, sharp versions are recommended and available as custom solutions.
- Excellent surface finish and concentricity.





### ■ Deep Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 15 x D • Z Shank



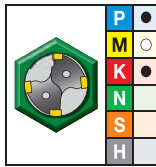
● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |   |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|---|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D | L3  | L4 max | L5  | LS | L   |                |
| 3899626               | TDD105Z03000 | 3,000       | .1181 | 3 | 53  | 45     | 0,6 | 30 | 86  | TDS501A03000   |
| 3899627               | TDD105Z03175 | 3,175       | .1250 | 4 | 67  | 58     | 0,6 | 32 | 105 | TDS501A03175   |
| 3899628               | TDD105Z03500 | 3,500       | .1378 | 4 | 68  | 59     | 0,7 | 32 | 105 | TDS501A03500   |
| 3899629               | TDD105Z03571 | 3,571       | .1406 | 4 | 68  | 59     | 0,7 | 32 | 105 | TDS501A03571   |
| 3899630               | TDD105Z03800 | 3,800       | .1496 | 4 | 69  | 60     | 0,8 | 32 | 105 | TDS501A03800   |
| 3899631               | TDD105Z03970 | 3,970       | .1563 | 4 | 70  | 60     | 0,8 | 32 | 105 | TDS501A03970   |
| 3899632               | TDD105Z04000 | 4,000       | .1575 | 4 | 70  | 60     | 0,8 | 32 | 105 | TDS501A04000   |
| 3899683               | TDD105Z04039 | 4,039       | .1590 | 5 | 84  | 73     | 0,8 | 34 | 124 | TDS501A04039   |
| 3899684               | TDD105Z04300 | 4,300       | .1693 | 5 | 85  | 74     | 0,9 | 34 | 124 | TDS501A04300   |
| 3899685               | TDD105Z04500 | 4,500       | .1772 | 5 | 85  | 74     | 0,9 | 34 | 124 | TDS501A04500   |
| 3899686               | TDD105Z04623 | 4,623       | .1820 | 5 | 86  | 74     | 1,0 | 34 | 124 | TDS501A04623   |
| 3899687               | TDD105Z04763 | 4,763       | .1875 | 5 | 86  | 75     | 1,0 | 34 | 124 | TDS501A04763   |
| 3899688               | TDD105Z05000 | 5,000       | .1969 | 5 | 87  | 75     | 1,0 | 34 | 124 | TDS501A05000   |
| 3899689               | TDD105Z05159 | 5,159       | .2031 | 6 | 102 | 88     | 1,1 | 36 | 143 | TDS501A05160   |
| 3899690               | TDD105Z05410 | 5,410       | .2130 | 6 | 102 | 89     | 1,1 | 36 | 143 | TDS501A05410   |
| 3899691               | TDD105Z05500 | 5,500       | .2165 | 6 | 102 | 89     | 1,1 | 36 | 143 | TDS501A05500   |
| 3899692               | TDD105Z05558 | 5,558       | .2188 | 6 | 102 | 89     | 1,2 | 36 | 143 | TDS501A05558   |
| 3899693               | TDD105Z05800 | 5,800       | .2283 | 6 | 103 | 90     | 1,2 | 36 | 143 | TDS501A05800   |
| 3899694               | TDD105Z06000 | 6,000       | .2362 | 6 | 104 | 90     | 1,2 | 36 | 143 | TDS501A06000   |
| 3899695               | TDD105Z06200 | 6,200       | .2441 | 7 | 118 | 103    | 1,3 | 38 | 162 | TDS501A06200   |
| 3899696               | TDD105Z06350 | 6,350       | .2500 | 7 | 119 | 104    | 1,3 | 38 | 162 | TDS501A06350   |
| 3899697               | TDD105Z06500 | 6,500       | .2559 | 7 | 119 | 104    | 1,4 | 38 | 162 | TDS501A06500   |
| 3899698               | TDD105Z06528 | 6,528       | .2570 | 7 | 119 | 104    | 1,4 | 38 | 162 | TDS501A06528   |
| 3899699               | TDD105Z06746 | 6,746       | .2656 | 7 | 120 | 105    | 1,4 | 38 | 162 | TDS501A06746   |

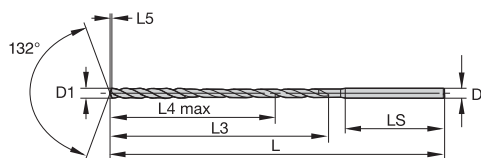
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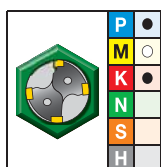
(Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 15 x D • Z Shank — continued)


 ● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |    |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|----|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D  | L3  | L4 max | L5  | LS | L   |                |
| 3899700               | TDD105Z06800 | 6,800       | .2677 | 7  | 120 | 105    | 1,4 | 38 | 162 | TDS501A06800   |
| 3899701               | TDD105Z06909 | 6,909       | .2720 | 7  | 121 | 105    | 1,4 | 38 | 162 | TDS501A06909   |
| 3899702               | TDD105Z07000 | 7,000       | .2756 | 7  | 121 | 105    | 1,5 | 38 | 162 | TDS501A07000   |
| 3900612               | TDD105Z07145 | 7,145       | .2813 | 8  | 135 | 118    | 1,5 | 40 | 181 | TDS501A07145   |
| 3900633               | TDD105Z07500 | 7,500       | .2953 | 8  | 136 | 119    | 1,6 | 40 | 181 | TDS501A07500   |
| 3899764               | TDD106Z07500 | 7,500       | .2953 | 8  | 174 | 157    | 1,6 | 40 | 221 | TDS501A07500   |
| 3900634               | TDD105Z07541 | 7,541       | .2969 | 8  | 136 | 119    | 1,6 | 40 | 181 | TDS501A07541   |
| 3900635               | TDD105Z07938 | 7,938       | .3125 | 8  | 138 | 120    | 1,7 | 40 | 181 | TDS501A07938   |
| 3900636               | TDD105Z08000 | 8,000       | .3150 | 8  | 138 | 120    | 1,7 | 40 | 181 | TDS501A08000   |
| 3900637               | TDD105Z08334 | 8,334       | .3281 | 9  | 153 | 134    | 1,8 | 42 | 200 | TDS501A08334   |
| 3900638               | TDD105Z08433 | 8,433       | .3320 | 9  | 153 | 134    | 1,8 | 42 | 200 | TDS501A08433   |
| 3900639               | TDD105Z08500 | 8,500       | .3346 | 9  | 153 | 134    | 1,8 | 42 | 200 | TDS501A08500   |
| 3900640               | TDD105Z08733 | 8,733       | .3438 | 9  | 154 | 135    | 1,8 | 42 | 200 | TDS501A08733   |
| 3900641               | TDD105Z09000 | 9,000       | .3543 | 9  | 155 | 135    | 1,9 | 42 | 200 | TDS501A09000   |
| 3900642               | TDD105Z09347 | 9,347       | .3680 | 10 | 170 | 149    | 2,0 | 44 | 219 | TDS501A09347   |
| 3900643               | TDD105Z09500 | 9,500       | .3740 | 10 | 170 | 149    | 2,0 | 44 | 219 | TDS501A09500   |
| 3900644               | TDD105Z09525 | 9,525       | .3750 | 10 | 170 | 149    | 2,0 | 44 | 219 | TDS501A09525   |
| 3900645               | TDD105Z09750 | 9,750       | .3839 | 10 | 171 | 150    | 2,1 | 44 | 219 | TDS501A09750   |
| 3900647               | TDD105Z10000 | 10,000      | .3937 | 10 | 172 | 150    | 2,1 | 44 | 219 | TDS501A10000   |
| 3900648               | TDD105Z10200 | 10,200      | .4016 | 11 | 186 | 163    | 2,2 | 46 | 238 | TDS501A10200   |
| 3900649               | TDD105Z10320 | 10,317      | .4062 | 11 | 187 | 164    | 2,2 | 46 | 238 | TDS501A10317   |
| 3900650               | TDD105Z10500 | 10,500      | .4134 | 11 | 187 | 164    | 2,2 | 46 | 238 | TDS501A10500   |
| 3900651               | TDD105Z10716 | 10,716      | .4219 | 11 | 188 | 164    | 2,3 | 46 | 238 | TDS501A10716   |
| 3900652               | TDD105Z11000 | 11,000      | .4331 | 11 | 203 | 178    | 2,3 | 46 | 238 | TDS501A11000   |
| 3900653               | TDD105Z11113 | 11,113      | .4375 | 12 | 203 | 178    | 2,4 | 48 | 257 | TDS501A11113   |
| 3900654               | TDD105Z11500 | 11,500      | .4528 | 12 | 204 | 179    | 2,4 | 48 | 257 | TDS501A11500   |
| 3900656               | TDD105Z12000 | 12,000      | .4724 | 12 | 206 | 180    | 2,5 | 48 | 257 | TDS501A12000   |
| 3900657               | TDD105Z12304 | 12,304      | .4844 | 13 | 221 | 194    | 2,6 | 50 | 276 | TDS501A12304   |
| 3900658               | TDD105Z12500 | 12,500      | .4921 | 13 | 221 | 194    | 2,7 | 50 | 276 | TDS501A12500   |
| 3900659               | TDD105Z12700 | 12,700      | .5000 | 13 | 222 | 194    | 2,7 | 50 | 276 | TDS501A12700   |
| 3900660               | TDD105Z13000 | 13,000      | .5118 | 13 | 223 | 195    | 2,8 | 50 | 276 | TDS501A13000   |



### ■ Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 20 x D • Z Shank

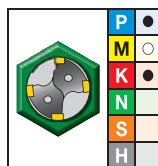


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |   |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|---|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D | L3  | L4 max | L5  | LS | L   |                |
| 3899782               | TDD106Z03000 | 3,000       | .1181 | 3 | 68  | 60     | 0,6 | 30 | 101 | TDS501A03000   |
| 3899803               | TDD106Z03175 | 3,175       | .1250 | 4 | 83  | 74     | 0,6 | 32 | 125 | TDS501A03175   |
| 3899804               | TDD106Z03500 | 3,500       | .1378 | 4 | 86  | 77     | 0,7 | 32 | 125 | TDS501A03500   |
| 3899805               | TDD106Z03571 | 3,571       | .1406 | 4 | 86  | 77     | 0,7 | 32 | 125 | TDS501A03571   |
| 3899806               | TDD106Z03800 | 3,800       | .1496 | 4 | 88  | 79     | 0,8 | 32 | 125 | TDS501A03800   |
| 3899807               | TDD106Z03970 | 3,970       | .1563 | 4 | 89  | 80     | 0,8 | 32 | 125 | TDS501A03970   |
| 3899808               | TDD106Z04000 | 4,000       | .1575 | 4 | 90  | 80     | 0,8 | 32 | 125 | TDS501A04000   |
| 3899809               | TDD106Z04039 | 4,039       | .1590 | 5 | 104 | 93     | 0,8 | 34 | 149 | TDS501A04039   |
| 3899810               | TDD106Z04300 | 4,300       | .1693 | 5 | 106 | 95     | 0,9 | 34 | 149 | TDS501A04300   |
| 3899811               | TDD106Z04500 | 4,500       | .1772 | 5 | 108 | 97     | 0,9 | 34 | 149 | TDS501A04500   |
| 3899812               | TDD106Z04623 | 4,623       | .1820 | 5 | 109 | 97     | 1,0 | 34 | 149 | TDS501A04623   |
| 3899813               | TDD106Z04763 | 4,763       | .1875 | 5 | 110 | 98     | 1,0 | 34 | 149 | TDS501A04763   |
| 3899814               | TDD106Z05000 | 5,000       | .1969 | 5 | 112 | 100    | 1,0 | 34 | 149 | TDS501A05000   |
| 3899815               | TDD106Z05159 | 5,159       | .2031 | 6 | 128 | 114    | 1,1 | 36 | 173 | TDS501A05160   |
| 3899816               | TDD106Z05410 | 5,410       | .2130 | 6 | 129 | 116    | 1,1 | 36 | 173 | TDS501A05410   |
| 3899818               | TDD106Z05500 | 5,500       | .2165 | 6 | 130 | 117    | 1,1 | 36 | 173 | TDS501A05500   |
| 3899819               | TDD106Z05558 | 5,558       | .2188 | 6 | 130 | 117    | 1,2 | 36 | 173 | TDS501A05558   |
| 3899820               | TDD106Z05800 | 5,800       | .2283 | 6 | 132 | 119    | 1,2 | 36 | 173 | TDS501A05800   |
| 3899821               | TDD106Z06000 | 6,000       | .2362 | 6 | 134 | 120    | 1,2 | 36 | 173 | TDS501A06000   |
| 3899822               | TDD106Z06200 | 6,200       | .2441 | 7 | 149 | 134    | 1,3 | 38 | 197 | TDS501A06200   |
| 3899823               | TDD106Z06350 | 6,350       | .2500 | 7 | 151 | 136    | 1,3 | 38 | 197 | TDS501A06350   |
| 3899824               | TDD106Z06500 | 6,500       | .2559 | 7 | 152 | 137    | 1,4 | 38 | 197 | TDS501A06500   |
| 3899825               | TDD106Z06528 | 6,528       | .2570 | 7 | 152 | 137    | 1,4 | 38 | 197 | TDS501A06528   |
| 3899826               | TDD106Z06746 | 6,746       | .2656 | 7 | 154 | 138    | 1,4 | 38 | 197 | TDS501A06746   |

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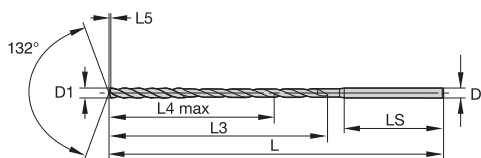
(Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 20 x D • Z Shank — continued)



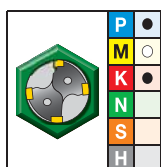
● first choice

○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |    |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|----|-----|--------|-----|----|-----|----------------|
|                       |              | mm          | in    | D  | L3  | L4 max | L5  | LS | L   |                |
| order #               | catalogue #  |             |       |    |     |        |     |    |     |                |
| 3899827               | TDD106Z06800 | 6,800       | .2677 | 7  | 154 | 139    | 1,4 | 38 | 197 | TDS501A06800   |
| 3899828               | TDD106Z06909 | 6,909       | .2720 | 7  | 155 | 139    | 1,4 | 38 | 197 | TDS501A06909   |
| 3899829               | TDD106Z07000 | 7,000       | .2756 | 7  | 156 | 140    | 1,5 | 38 | 197 | TDS501A07000   |
| 3899763               | TDD106Z07145 | 7,145       | .2813 | 8  | 171 | 154    | 1,5 | 40 | 221 | TDS501A07145   |
| 3899765               | TDD106Z07541 | 7,541       | .2969 | 8  | 174 | 157    | 1,6 | 40 | 221 | TDS501A07541   |
| 3899766               | TDD106Z07938 | 7,938       | .3125 | 8  | 177 | 160    | 1,7 | 40 | 221 | TDS501A07938   |
| 3899767               | TDD106Z08000 | 8,000       | .3150 | 8  | 178 | 160    | 1,7 | 40 | 221 | TDS501A08000   |
| 3899768               | TDD106Z08334 | 8,334       | .3281 | 9  | 195 | 175    | 1,8 | 42 | 245 | TDS501A08334   |
| 3899769               | TDD106Z08433 | 8,433       | .3320 | 9  | 195 | 176    | 1,8 | 42 | 245 | TDS501A08433   |
| 3899770               | TDD106Z08500 | 8,500       | .3346 | 9  | 196 | 177    | 1,8 | 42 | 245 | TDS501A08500   |
| 3899771               | TDD106Z08733 | 8,733       | .3438 | 9  | 198 | 178    | 1,8 | 42 | 245 | TDS501A08733   |
| 3899772               | TDD106Z09000 | 9,000       | .3543 | 9  | 200 | 180    | 1,9 | 42 | 245 | TDS501A09000   |
| 3899783               | TDD106Z09347 | 9,347       | .3680 | 10 | 217 | 195    | 2,0 | 44 | 269 | TDS501A09347   |
| 3899784               | TDD106Z09500 | 9,500       | .3740 | 10 | 218 | 197    | 2,0 | 44 | 269 | TDS501A09500   |
| 3899785               | TDD106Z09525 | 9,525       | .3750 | 10 | 218 | 197    | 2,0 | 44 | 269 | TDS501A09525   |
| 3899786               | TDD106Z09750 | 9,750       | .3839 | 10 | 220 | 198    | 2,1 | 44 | 269 | TDS501A09750   |
| 3899787               | TDD106Z09921 | 9,921       | .3906 | 10 | 221 | 199    | 2,1 | 44 | 269 | TDS501A09921   |
| 3899788               | TDD106Z10000 | 10,000      | .3937 | 10 | 222 | 200    | 2,1 | 44 | 269 | TDS501A10000   |
| 3899789               | TDD106Z10200 | 10,200      | .4016 | 11 | 237 | 214    | 2,2 | 46 | 293 | TDS501A10200   |
| 3899790               | TDD106Z10320 | 10,317      | .4062 | 11 | 238 | 215    | 2,2 | 46 | 293 | TDS501A10317   |
| 3899791               | TDD106Z10500 | 10,500      | .4134 | 11 | 240 | 217    | 2,2 | 46 | 293 | TDS501A10500   |
| 3899792               | TDD106Z10716 | 10,716      | .4219 | 11 | 242 | 218    | 2,3 | 46 | 293 | TDS501A10716   |
| 3899793               | TDD106Z11000 | 11,000      | .4331 | 11 | 258 | 233    | 2,3 | 46 | 317 | TDS501A11000   |
| 3899794               | TDD106Z11113 | 11,113      | .4375 | 12 | 259 | 234    | 2,4 | 48 | 317 | TDS501A11113   |
| 3899795               | TDD106Z11500 | 11,500      | .4528 | 12 | 262 | 237    | 2,4 | 48 | 317 | TDS501A11500   |
| 3899797               | TDD106Z12000 | 12,000      | .4724 | 12 | 266 | 240    | 2,5 | 48 | 317 | TDS501A12000   |
| 3899799               | TDD106Z12500 | 12,500      | .4921 | 13 | 284 | 257    | 2,7 | 50 | 341 | TDS501A12500   |
| 3899800               | TDD106Z12700 | 12,700      | .5000 | 13 | 285 | 258    | 2,7 | 50 | 341 | TDS501A12700   |
| 3899801               | TDD106Z13000 | 13,000      | .5118 | 13 | 288 | 260    | 2,8 | 50 | 341 | TDS501A13000   |



### ■ Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 25 x D • Z Shank

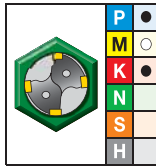


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |   |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|---|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D | L3  | L4 max | L5  | LS | L   |                |
| 3899708               | TDD107Z03000 | 3,000       | .1181 | 3 | 83  | 75     | 0,6 | 30 | 116 | TDS501A03000   |
| 3899709               | TDD107Z03175 | 3,175       | .1250 | 4 | 99  | 90     | 0,6 | 32 | 145 | TDS501A03175   |
| 3899710               | TDD107Z03500 | 3,500       | .1378 | 4 | 103 | 94     | 0,7 | 32 | 145 | TDS501A03500   |
| 3899712               | TDD107Z03800 | 3,800       | .1496 | 4 | 107 | 98     | 0,8 | 32 | 145 | TDS501A03800   |
| 3899733               | TDD107Z03970 | 3,970       | .1563 | 4 | 109 | 100    | 0,8 | 32 | 145 | TDS501A03970   |
| 3899734               | TDD107Z04000 | 4,000       | .1575 | 4 | 110 | 100    | 0,8 | 32 | 145 | TDS501A04000   |
| 3899735               | TDD107Z04039 | 4,039       | .1590 | 5 | 124 | 113    | 0,8 | 34 | 174 | TDS501A04039   |
| 3899737               | TDD107Z04500 | 4,500       | .1772 | 5 | 130 | 119    | 0,9 | 34 | 174 | TDS501A04500   |
| 3899739               | TDD107Z04763 | 4,763       | .1875 | 5 | 134 | 122    | 1,0 | 34 | 174 | TDS501A04763   |
| 3899740               | TDD107Z05000 | 5,000       | .1969 | 5 | 137 | 125    | 1,0 | 34 | 174 | TDS501A05000   |
| 3899743               | TDD107Z05500 | 5,500       | .2165 | 6 | 157 | 144    | 1,1 | 36 | 203 | TDS501A05500   |
| 3899744               | TDD107Z05558 | 5,558       | .2188 | 6 | 158 | 145    | 1,2 | 36 | 203 | TDS501A05558   |
| 3899745               | TDD107Z05800 | 5,800       | .2283 | 6 | 161 | 148    | 1,2 | 36 | 203 | TDS501A05800   |
| 3899746               | TDD107Z06000 | 6,000       | .2362 | 6 | 164 | 150    | 1,2 | 36 | 203 | TDS501A06000   |
| 3899748               | TDD107Z06350 | 6,350       | .2500 | 7 | 182 | 167    | 1,3 | 38 | 232 | TDS501A06350   |
| 3899749               | TDD107Z06500 | 6,500       | .2559 | 7 | 184 | 169    | 1,4 | 38 | 232 | TDS501A06500   |
| 3899750               | TDD107Z06528 | 6,528       | .2570 | 7 | 185 | 169    | 1,4 | 38 | 232 | TDS501A06528   |
| 3899751               | TDD107Z06746 | 6,746       | .2656 | 7 | 188 | 172    | 1,4 | 38 | 232 | TDS501A06746   |
| 3899753               | TDD107Z06909 | 6,909       | .2720 | 7 | 190 | 174    | 1,4 | 38 | 232 | TDS501A06909   |
| 3899754               | TDD107Z07000 | 7,000       | .2756 | 7 | 191 | 175    | 1,5 | 38 | 232 | TDS501A07000   |
| 3899567               | TDD107Z07541 | 7,541       | .2969 | 8 | 212 | 194    | 1,6 | 40 | 261 | TDS501A07541   |
| 3899568               | TDD107Z07938 | 7,938       | .3125 | 8 | 217 | 199    | 1,7 | 40 | 261 | TDS501A07938   |
| 3899569               | TDD107Z08000 | 8,000       | .3150 | 8 | 218 | 200    | 1,7 | 40 | 261 | TDS501A08000   |
| 3899571               | TDD107Z08433 | 8,433       | .3320 | 9 | 237 | 218    | 1,8 | 42 | 290 | TDS501A08433   |

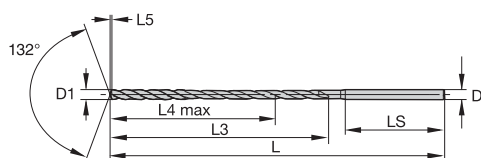
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(Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 25 x D • Z Shank — continued)

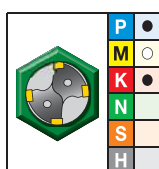


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |    |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|----|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D  | L3  | L4 max | L5  | LS | L   |                |
| 3899572               | TDD107Z08500 | 8,500       | .3346 | 9  | 238 | 219    | 1,8 | 42 | 290 | TDS501A08500   |
| 3899603               | TDD107Z08733 | 8,733       | .3438 | 9  | 241 | 222    | 1,8 | 42 | 290 | TDS501A08733   |
| 3899604               | TDD107Z09000 | 9,000       | .3543 | 9  | 245 | 225    | 1,9 | 42 | 290 | TDS501A09000   |
| 3899605               | TDD107Z09347 | 9,347       | .3680 | 10 | 263 | 242    | 2,0 | 44 | 319 | TDS501A09347   |
| 3899606               | TDD107Z09500 | 9,500       | .3740 | 10 | 265 | 244    | 2,0 | 44 | 319 | TDS501A09500   |
| 3899607               | TDD107Z09525 | 9,525       | .3750 | 10 | 266 | 244    | 2,0 | 44 | 319 | TDS501A09525   |
| 3899610               | TDD107Z10000 | 10,000      | .3937 | 10 | 272 | 250    | 2,1 | 44 | 319 | TDS501A10000   |
| 3899611               | TDD107Z10300 | 10,200      | .4016 | 11 | 288 | 265    | 2,2 | 46 | 348 | TDS501A10300   |
| 3899612               | TDD107Z10320 | 10,317      | .4062 | 11 | 290 | 267    | 2,2 | 46 | 348 | TDS501A10317   |
| 3899613               | TDD107Z10500 | 10,500      | .4134 | 11 | 292 | 269    | 2,2 | 46 | 348 | TDS501A10500   |
| 3899614               | TDD107Z10716 | 10,716      | .4219 | 11 | 295 | 272    | 2,3 | 46 | 348 | TDS501A10716   |
| 3899615               | TDD107Z11000 | 11,000      | .4331 | 11 | 313 | 288    | 2,3 | 46 | 377 | TDS501A11000   |
| 3899616               | TDD107Z11113 | 11,113      | .4375 | 12 | 314 | 289    | 2,4 | 48 | 377 | TDS501A11113   |
| 3899617               | TDD107Z11500 | 11,500      | .4528 | 12 | 319 | 294    | 2,4 | 48 | 377 | TDS501A11500   |
| 3899619               | TDD107Z12000 | 12,000      | .4724 | 12 | 326 | 300    | 2,5 | 48 | 377 | TDS501A12000   |
| 3899621               | TDD107Z12500 | 12,500      | .4921 | 13 | 346 | 319    | 2,7 | 50 | 406 | TDS501A12500   |
| 3899622               | TDD107Z12700 | 12,700      | .5000 | 13 | 349 | 321    | 2,7 | 50 | 406 | TDS501A12700   |
| 3899623               | TDD107Z13000 | 13,000      | .5118 | 13 | 353 | 325    | 2,8 | 50 | 406 | TDS501A13000   |



### ■ Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 30 x D • Z Shank

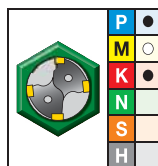


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |   |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|---|-----|--------|-----|----|-----|----------------|
| order #               | catalogue #  | mm          | in    | D | L3  | L4 max | L5  | LS | L   |                |
| 3899539               | TDD108Z03000 | 3,000       | .1181 | 3 | 98  | 90     | 0,6 | 30 | 131 | TDS501A03000   |
| 3899540               | TDD108Z03175 | 3,175       | .1250 | 4 | 115 | 106    | 0,6 | 32 | 165 | TDS501A03175   |
| 3899541               | TDD108Z03500 | 3,500       | .1378 | 4 | 121 | 112    | 0,7 | 32 | 165 | TDS501A03500   |
| 3899542               | TDD108Z03571 | 3,571       | .1406 | 4 | 122 | 113    | 0,7 | 32 | 165 | TDS501A03571   |
| 3899573               | TDD108Z03800 | 3,800       | .1496 | 4 | 126 | 117    | 0,8 | 32 | 165 | TDS501A03800   |
| 3899574               | TDD108Z03970 | 3,970       | .1563 | 4 | 129 | 119    | 0,8 | 32 | 165 | TDS501A03970   |
| 3899575               | TDD108Z04000 | 4,000       | .1575 | 4 | 130 | 120    | 0,8 | 32 | 165 | TDS501A04000   |
| 3899576               | TDD108Z04039 | 4,039       | .1590 | 5 | 144 | 134    | 0,8 | 34 | 199 | TDS501A04039   |
| 3899577               | TDD108Z04300 | 4,300       | .1693 | 5 | 149 | 138    | 0,9 | 34 | 199 | TDS501A04300   |
| 3899578               | TDD108Z04500 | 4,500       | .1772 | 5 | 153 | 142    | 0,9 | 34 | 199 | TDS501A04500   |
| 3899579               | TDD108Z04623 | 4,623       | .1820 | 5 | 155 | 144    | 1,0 | 34 | 199 | TDS501A04623   |
| 3899580               | TDD108Z04763 | 4,763       | .1875 | 5 | 157 | 146    | 1,0 | 34 | 199 | TDS501A04763   |
| 3899581               | TDD108Z05000 | 5,000       | .1969 | 5 | 162 | 150    | 1,0 | 34 | 199 | TDS501A05000   |
| 3899582               | TDD108Z05159 | 5,159       | .2031 | 6 | 180 | 166    | 1,1 | 36 | 233 | TDS501A05160   |
| 3899583               | TDD108Z05410 | 5,410       | .2130 | 6 | 183 | 170    | 1,1 | 36 | 233 | TDS501A05410   |
| 3899584               | TDD108Z05500 | 5,500       | .2165 | 6 | 185 | 172    | 1,1 | 36 | 233 | TDS501A05500   |
| 3899585               | TDD108Z05558 | 5,558       | .2188 | 6 | 186 | 172    | 1,2 | 36 | 233 | TDS501A05558   |
| 3899586               | TDD108Z05800 | 5,800       | .2283 | 6 | 190 | 177    | 1,2 | 36 | 233 | TDS501A05800   |
| 3899587               | TDD108Z06000 | 6,000       | .2362 | 6 | 194 | 180    | 1,2 | 36 | 233 | TDS501A06000   |
| 3899588               | TDD108Z06200 | 6,200       | .2441 | 7 | 211 | 196    | 1,3 | 38 | 267 | TDS501A06200   |
| 3899589               | TDD108Z06350 | 6,350       | .2500 | 7 | 214 | 199    | 1,3 | 38 | 267 | TDS501A06350   |
| 3899590               | TDD108Z06500 | 6,500       | .2559 | 7 | 217 | 202    | 1,4 | 38 | 267 | TDS501A06500   |
| 3899591               | TDD108Z06528 | 6,528       | .2570 | 7 | 217 | 202    | 1,4 | 38 | 267 | TDS501A06528   |
| 3899592               | TDD108Z06746 | 6,746       | .2656 | 7 | 221 | 206    | 1,4 | 38 | 267 | TDS501A06746   |

(continued)

(Deep-Hole Drills for Steel and Cast Iron • 2 Flute • WU20PD™ • 30 x D • Z Shank — continued)

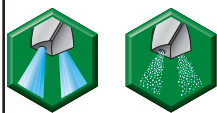


● first choice  
○ alternate choice

| grade WU20PD<br>TiAlN |              | D1 diameter |       |    |     |        |     |    |     | pilot<br>drill |
|-----------------------|--------------|-------------|-------|----|-----|--------|-----|----|-----|----------------|
|                       |              | mm          | in    | D  | L3  | L4 max | L5  | LS | L   |                |
| order #               | catalogue #  |             |       |    |     |        |     |    |     |                |
| 3899593               | TDD108Z06800 | 6,800       | .2677 | 7  | 222 | 207    | 1,4 | 38 | 267 | TDS501A06800   |
| 3899594               | TDD108Z06909 | 6,909       | .2720 | 7  | 224 | 208    | 1,4 | 38 | 267 | TDS501A06909   |
| 3899595               | TDD108Z07000 | 7,000       | .2756 | 7  | 226 | 210    | 1,5 | 38 | 267 | TDS501A07000   |
| 3899600               | TDD108Z07145 | 7,145       | .2813 | 8  | 242 | 225    | 1,5 | 40 | 301 | TDS501A07145   |
| 3899601               | TDD108Z07500 | 7,500       | .2953 | 8  | 249 | 232    | 1,6 | 40 | 301 | TDS501A07500   |
| 3899653               | TDD108Z07938 | 7,938       | .3125 | 8  | 257 | 239    | 1,7 | 40 | 301 | TDS501A07938   |
| 3899654               | TDD108Z08000 | 8,000       | .3150 | 8  | 258 | 240    | 1,7 | 40 | 301 | TDS501A08000   |
| 3899655               | TDD108Z08334 | 8,334       | .3281 | 9  | 278 | 259    | 1,8 | 42 | 335 | TDS501A08334   |
| 3899657               | TDD108Z08500 | 8,500       | .3346 | 9  | 281 | 262    | 1,8 | 42 | 335 | TDS501A08500   |
| 3899658               | TDD108Z08733 | 8,733       | .3438 | 9  | 285 | 265    | 1,8 | 42 | 335 | TDS501A08733   |
| 3899659               | TDD108Z09000 | 9,000       | .3543 | 9  | 290 | 270    | 1,9 | 42 | 335 | TDS501A09000   |
| 3899661               | TDD108Z09500 | 9,500       | .3740 | 10 | 313 | 292    | 2,0 | 44 | 369 | TDS501A09500   |
| 3899662               | TDD108Z09525 | 9,525       | .3750 | 10 | 313 | 292    | 2,0 | 44 | 369 | TDS501A09525   |
| 3899663               | TDD108Z09750 | 9,750       | .3839 | 10 | 317 | 296    | 2,1 | 44 | 369 | TDS501A09750   |
| 3899665               | TDD108Z10000 | 10,000      | .3937 | 10 | 322 | 300    | 2,1 | 44 | 369 | TDS501A10000   |
| 3899666               | TDD108Z10200 | 10,200      | .4016 | 11 | 339 | 316    | 2,2 | 46 | 403 | TDS501A10200   |
| 3899667               | TDD108Z10320 | 10,317      | .4062 | 11 | 342 | 318    | 2,2 | 46 | 403 | TDS501A10317   |
| 3899668               | TDD108Z10500 | 10,500      | .4134 | 11 | 345 | 322    | 2,2 | 46 | 403 | TDS501A10500   |
| 3899670               | TDD108Z11000 | 11,000      | .4331 | 11 | 368 | 343    | 2,3 | 46 | 437 | TDS501A11000   |
| 3899671               | TDD108Z11113 | 11,113      | .4375 | 12 | 370 | 345    | 2,4 | 48 | 437 | TDS501A11113   |
| 3899672               | TDD108Z11500 | 11,500      | .4528 | 12 | 377 | 352    | 2,4 | 48 | 437 | TDS501A11500   |
| 3899674               | TDD108Z12000 | 12,000      | .4724 | 12 | 386 | 360    | 2,5 | 48 | 437 | TDS501A12000   |
| 3899675               | TDD108Z12304 | 12,304      | .4844 | 13 | 405 | 378    | 2,6 | 50 | 471 | TDS501A12304   |
| 3899676               | TDD108Z12500 | 12,500      | .4921 | 13 | 409 | 382    | 2,7 | 50 | 471 | TDS501A12500   |
| 3899677               | TDD108Z12700 | 12,700      | .5000 | 13 | 412 | 385    | 2,7 | 50 | 471 | TDS501A12700   |
| 3899678               | TDD108Z13000 | 13,000      | .5118 | 13 | 418 | 390    | 2,8 | 50 | 471 | TDS501A13000   |



## ■ Series TDD • Deep-Hole SC Drills • Through Coolant Applications • Metric

| Material Group |   |  |       |  |           |           |           |           |           |           |           |           |
|----------------|---|-----------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |       | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |
|                |   | min                                                                               | – max | Tool Diameter (mm)                                                                 | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |
| P              | 1 | 90                                                                                | – 130 | mm/r                                                                               | 0,08–0,12 | 0,12–0,18 | 0,18–0,20 | 0,20–0,22 | 0,22–0,25 | 0,25–0,28 | 0,28–0,30 | 0,30–0,34 |
|                | 2 | 80                                                                                | – 115 | mm/r                                                                               | 0,08–0,12 | 0,12–0,18 | 0,18–0,20 | 0,20–0,22 | 0,22–0,25 | 0,25–0,28 | 0,28–0,30 | 0,30–0,34 |
|                | 3 | 70                                                                                | – 110 | mm/r                                                                               | 0,05–0,10 | 0,10–0,16 | 0,16–0,18 | 0,18–0,20 | 0,20–0,22 | 0,22–0,24 | 0,24–0,26 | 0,26–0,28 |
|                | 4 | 65                                                                                | – 95  | mm/r                                                                               | 0,05–0,10 | 0,10–0,16 | 0,16–0,18 | 0,18–0,20 | 0,20–0,22 | 0,22–0,24 | 0,24–0,26 | 0,26–0,28 |
| K              | 1 | 105                                                                               | – 145 | mm/r                                                                               | 0,10–0,15 | 0,15–0,20 | 0,20–0,25 | 0,25–0,28 | 0,28–0,30 | 0,30–0,33 | 0,33–0,36 | 0,36–0,38 |
|                | 2 | 85                                                                                | – 120 | mm/r                                                                               | 0,10–0,15 | 0,15–0,20 | 0,20–0,25 | 0,25–0,28 | 0,28–0,30 | 0,30–0,33 | 0,33–0,36 | 0,36–0,38 |
|                | 3 | 100                                                                               | – 140 | mm/r                                                                               | 0,10–0,15 | 0,15–0,20 | 0,20–0,25 | 0,25–0,28 | 0,28–0,30 | 0,30–0,33 | 0,33–0,36 | 0,36–0,38 |

Metric  
tolerance

| nominal size range | D1 tolerance | D1 tolerance | D tolerance h6 |
|--------------------|--------------|--------------|----------------|
| >3–6               | 0,000/-0,012 | >3–6         | 0,000/-0,008   |
| >6–10              | 0,000/-0,015 | >6–10        | 0,000/-0,009   |
| >10–13             | 0,000/-0,018 | >10–13       | 0,000/-0,011   |



## WIDIA™ TOP DRILL™ Deep-Hole Drills Customisation

### Diameters

- Intermediate sizes, even up to 16mm (.6299") diameter, available as semi-standards.

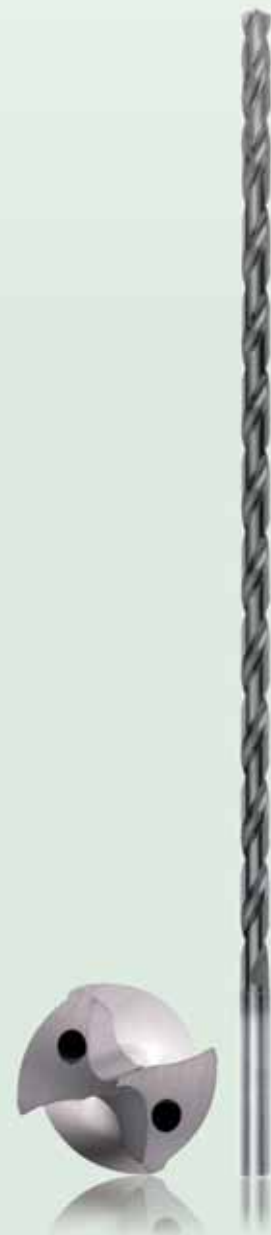
### Lengths

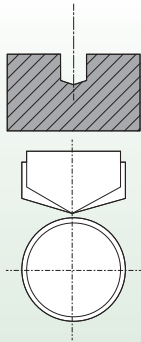
- Length variations, including longer versions up to 550mm (21.65") depending on diameter, available as custom solutions.

### Material-Specific

- For drilling non-ferrous materials, sharp and uncoated versions are recommended and available as custom solutions.

Consult the custom solutions department for specific applications.



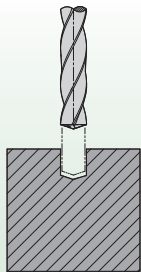


## 1) Pilot Drill Hole — IMPORTANT!

- The point angle of the pilot drill must be greater than one of the following deep-hole drills to protect its cutting corners.
- The diameter size of the pilot drill must be greater than one of the deep-hole drills to enable easy fit and protect margin lands. The required difference in diameter is covered by design with the different position of tolerance.
- Drill  $\varnothing$  = nominal  $\varnothing$  up to nominal +0,010mm.
- Depth of pilot hole: minimum 2 x D.
- Deeper pilot holes are preferable.

### Recommendations:

- Use a conical (TDS\*) or split-point drill to pilot (do not use a TDG, VariDrill™, or TDS 12 x D or any competitive drill).
- Check the pilot drill for wear, which can lead to premature wear on the TDD10\* cutting edge and possibly catastrophic failure.
- TOP DRILL S™ for steel or cast iron (TDS4\* series) and TOP DRILL S +™ for multiple applications (TDS501\* series 3 x D and TD502\* series 5 x D) with a 140° point angle are recommended.
- TDS503\* series 8 x D and TDS504\* series 12 x D is not recommended as the point angle is 132°!

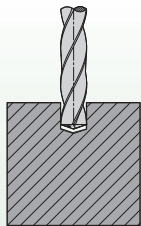


## 2) Feed TDD10\* into Pilot Hole

- Max 500 RPM and recommended feed rate; no rapid traverse.
- Run counter-clockwise, especially in horizontal applications to protect the cutting edge, when entering the pilot hole.
- Depth: 1mm above the bottom of pilot hole.
- Feed TDD10\* into pilot hole

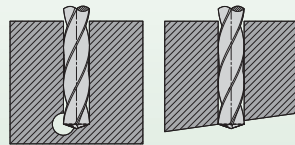
### Recommendations:

- Reduce cutting speed to minimise imbalances in machine spindle/adaptor!



## 3) Drill Hole

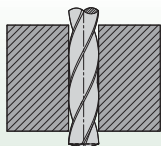
Cutting Parameters: Start recommended speed and feed rate at 1mm from the bottom of the pilot hole, clockwise.



### Recommendations:

- DO NOT PECK OR DWELL up to 30 x D!
- With long-chipping steel materials, it may be necessary to increase feed rate by 10–20% to provide optimal chip control.
- For long-chipping aluminium materials, it may be necessary to decrease feed rate and increase speed.
- Reduce feed rate on angled exits and crossholes by 50–60%.

*HP feed recommendations are usually higher than with competitive SC drills!*



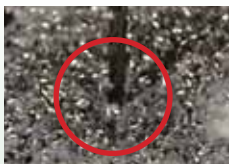
## 4) Drill Retraction

Cutting Parameters: 50–500 RPM and feed rate 2–6 m/min.

### Recommendations:

To achieve the best tool performance, we recommend using the deep-hole drill with a hydraulic chuck.

*Reduce cutting speed to minimise imbalances in machine spindle/adaptor!*



## 5) Vertical Applications

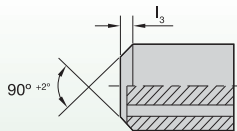
- If the pilot holes are close to each other, chips can fall into the neighbouring hole.
- Do not enter a pilot hole that might contain chips with a deep hole drill to avoid chip jamming, wear, or breakage.
- If required holes are close to each other, use smart drilling strategies, make sure the pilot holes are getting properly cleaned, or switch to horizontal drilling.

*Horizontal drilling process preferred for optimum chip evacuation.*



### 6) Coolant

- For increased stability, the coolant channels of the TDD10\* are smaller than on typical WIDIA™ drills.
- Steady supply of coolant delivered to the cutting edges necessary. If coolant supply is not steady or is unequal through both channels, check:
  - Coolant filtering system.
  - Sealing of adaptor/spindle.
  - Chips blocking the coolant hole on the drill shank.
- Make sure that the coolant supply reaches the cutting edge before drilling begins.
- Pressure by diameter: <5mm 40–50 bar maximum; >5mm 25 bar minimum.



MQL back end according to DIN 69090-3

### 7) Minimal Quantity Lubrication

- On MQL applications, make sure that the coolant is directly supplied from the chuck into the back end of the drill shank (without gap) to avoid leakage.
- Pressure should be between 1–10 bar depending on coolant hole size.
- Spray contains an amount of oil less than 50 ml/h.
- If required, the shank can be evenly optimised for MQL applications with enlarged 90° chamfer instead of 40°.



### 8) Shanks

- Other than normal SC Drills, TDD10\* series have a “Z” shank, increasing with 1mm-steps.
- For drills with uneven shank size, use reduction sleeves to adapt the shank to the customer’s toolholder.
- The clamping force is better with increasing diameter.
- If required, DIN-shanks (even, 2mm steps) are available as custom solutions.

*Achieve the best tool performance with hydraulic chucks.*

| D1 | 12mm hydraulic reducer sleeve |                  | 20mm hydraulic reducer sleeve |                  | 25mm hydraulic reducer sleeve |                  | 32mm hydraulic reducer sleeve |                  | .500" hydraulic reducer sleeve |                  | .750" hydraulic reducer sleeve |                  |
|----|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|-------------------------------|------------------|--------------------------------|------------------|--------------------------------|------------------|
|    | order number                  | catalogue number | order number                  | catalogue number | order number                  | catalogue number | order number                  | catalogue number | order number                   | catalogue number | order number                   | catalogue number |
| 3  | 3026450                       | 12MHC030M        | 3026648                       | 20MHC030M        | 3026662                       | 25MHC030M        | –                             | –                | 2248993                        | 50HC030M         | 2248995                        | 75HC030M         |
| 4  | 3026451                       | 12MHC040M        | 3026649                       | 20MHC040M        | 3026663                       | 25MHC040M        | –                             | –                | 1606050                        | 50HC040M         | 2248996                        | 75HC040M         |
| 5  | 3026452                       | 12MHC050M        | 3026650                       | 20MHC050M        | 3026664                       | 25MHC050M        | –                             | –                | 2248994                        | 50HC050M         | 2248997                        | 75HC050M         |
| 6  | 3026643                       | 12MHC060M        | 3026651                       | 20MHC060M        | 3026665                       | 25MHC060M        | 3026675                       | 32MHC060M        | 1606061                        | 50HC060M         | 1093271                        | 75HC060M         |
| 7  | 3026644                       | 12MHC070M        | 3026652                       | 20MHC070M        | 3026666                       | 25MHC070M        | 3026676                       | 32MHC070M        | –                              | –                | –                              | –                |
| 8  | 3026645                       | 12MHC080M        | 3026653                       | 20MHC080M        | 3026667                       | 25MHC080M        | 3026677                       | 32MHC080M        | 1606062                        | 50HC080M         | 1093272                        | 75HC080M         |
| 9  | 3026646                       | 12MHC090M        | 3026654                       | 20MHC090M        | 3026668                       | 25MHC090M        | 3026678                       | 32MHC090M        | –                              | –                | –                              | –                |
| 10 | 3026647                       | 12MHC100M        | 3026655                       | 20MHC100M        | 3026669                       | 25MHC100M        | 3026679                       | 32MHC100M        | 1606064                        | 50HC100M         | 1093273                        | 75HC100M         |
| 11 | –                             | –                | 3026656                       | 20MHC110M        | –                             | –                | 3026680                       | 32MHC110M        | –                              | –                | –                              | –                |
| 12 | –                             | –                | 3026657                       | 20MHC120M        | 3026669                       | 25MHC120M        | 3026681                       | 32MHC120M        | –                              | –                | 1093524                        | 75HC120M         |
| 13 | –                             | –                | 3026658                       | 20MHC130M        | –                             | –                | 3026682                       | 32MHC130M        | –                              | –                | –                              | –                |
| 14 | –                             | –                | 3026659                       | 20MHC140M        | 3026671                       | 25MHC140M        | 3026683                       | 32MHC140M        | –                              | –                | 1093525                        | 75HC140M         |
| 15 | –                             | –                | 3026660                       | 20MHC150M        | –                             | –                | 3026684                       | 32MHC150M        | –                              | –                | –                              | –                |
| 16 | –                             | –                | 3026661                       | 20MHC160M        | 3026672                       | 25MHC160M        | 3026685                       | 32MHC160M        | –                              | –                | 1093526                        | 75HC160M         |

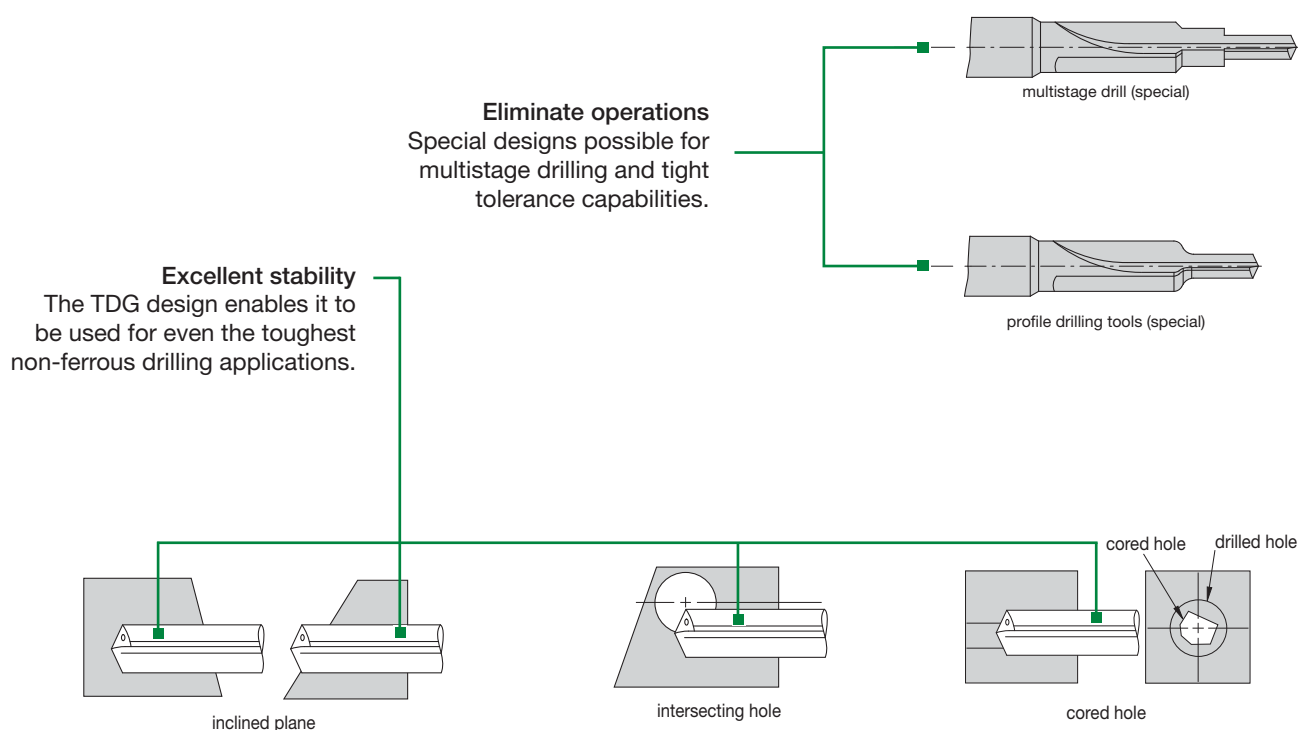
## Difficult Drilling Applications •

# WIDIA™ TOP DRILL G™ for Non-Ferrous Materials

TOP DRILL G is WIDIA's solution for difficult drilling applications. Designed specifically for non-ferrous materials, TDG can be used on challenging applications with tighter hole tolerance, inclined planes, intersecting holes, and cored holes. The design of these drills also makes them appropriate for drilling custom aluminium applications.

- Next generation of GGX WIDIA-Rübig™ series.
- Targeted for aluminium and non-ferrous materials.
- Can be used in challenging conditions.
- Good for multi-step drills.

# TOP DRILL G™



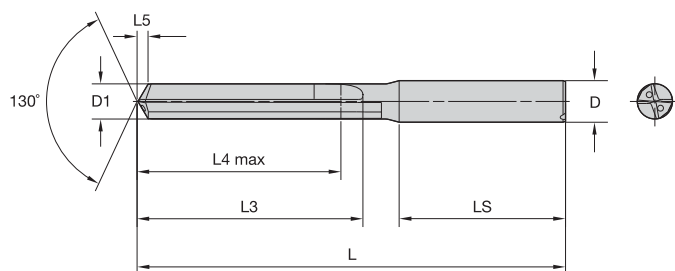
### **TOP DRILL G™ Design**

TDG is designed to handle the toughest non-ferrous drilling applications. The WN10HD™ grade is the latest in application-specific technology. This advanced grade, combined with the TDG's optimal concentricity and safe transmission of torque, gives it long tool life and extreme repeatability. The design of TDG is optimised to evacuate “sticky” chips that result from drilling non-ferrous materials. Easily evacuating these difficult-to-remove chips results in better hole quality due to less heat and friction while drilling.

### **WIDIA™ Advantage**

- Lower cost-per-hole due to high MRR and long tool life.
- Consistent performance from internally controlled supply chain:  
Powder > Rod > Grinding > Coating
- Part of the complete WIDIA™ holmaking solution.
- Get more predictable results from local regrind services using OEM standards to recondition, ensuring value throughout the entire life of the drill.
- Broad range of standard lengths, diameters, and coolant options in one line. Includes extensive intermediate metric, inch, fraction, and wire sizes, including tap drill sizes.

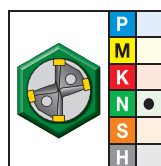




For information on L, L3, and L4 max, see page T143.



### TDG532A • 5 x D



grade WN10HD

D1 diameter

● first choice

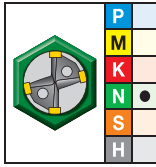
○ alternate choice

| order # | catalogue #  | mm    | in    | L  | L4 max | L3 | L5  | LS | D |
|---------|--------------|-------|-------|----|--------|----|-----|----|---|
| 4157950 | TDG532A03000 | 3,000 | .1181 | 66 | 23     | 28 | 0,7 | 36 | 6 |
| 4157951 | TDG532A03048 | 3,048 | .1200 | 66 | 23     | 28 | 0,7 | 36 | 6 |
| 4157952 | TDG532A03100 | 3,100 | .1220 | 66 | 23     | 28 | 0,7 | 36 | 6 |
| 4157973 | TDG532A03175 | 3,175 | .1250 | 66 | 23     | 28 | 0,7 | 36 | 6 |
| 4157974 | TDG532A03200 | 3,200 | .1260 | 66 | 23     | 28 | 0,7 | 36 | 6 |
| 4157975 | TDG532A03264 | 3,264 | .1285 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157976 | TDG532A03300 | 3,300 | .1299 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157977 | TDG532A03400 | 3,400 | .1339 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157978 | TDG532A03455 | 3,455 | .1360 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157979 | TDG532A03500 | 3,500 | .1378 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157980 | TDG532A03571 | 3,571 | .1406 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157981 | TDG532A03600 | 3,600 | .1417 | 66 | 23     | 28 | 0,8 | 36 | 6 |
| 4157982 | TDG532A03658 | 3,658 | .1440 | 66 | 23     | 28 | 0,9 | 36 | 6 |
| 4157983 | TDG532A03700 | 3,700 | .1457 | 66 | 23     | 28 | 0,9 | 36 | 6 |
| 4157984 | TDG532A03734 | 3,734 | .1470 | 66 | 23     | 28 | 0,9 | 36 | 6 |
| 4157985 | TDG532A03800 | 3,800 | .1496 | 74 | 29     | 36 | 0,9 | 36 | 6 |
| 4157986 | TDG532A03900 | 3,900 | .1535 | 74 | 29     | 36 | 0,9 | 36 | 6 |
| 4157987 | TDG532A03970 | 3,970 | .1563 | 74 | 29     | 36 | 0,9 | 36 | 6 |
| 4157988 | TDG532A04000 | 4,000 | .1575 | 74 | 29     | 36 | 0,9 | 36 | 6 |
| 4157989 | TDG532A04039 | 4,039 | .1590 | 74 | 29     | 36 | 0,9 | 36 | 6 |
| 4157990 | TDG532A04090 | 4,090 | .1610 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157991 | TDG532A04100 | 4,100 | .1614 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157992 | TDG532A04200 | 4,200 | .1654 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157993 | TDG532A04217 | 4,217 | .1660 | 74 | 29     | 36 | 1,0 | 36 | 6 |

(continued)



(TDG532A • 5 x D — continued)

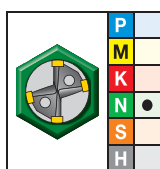


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |    |        |    |     |    |   |
|--------------|--------------|-------------|-------|----|--------|----|-----|----|---|
| order #      | catalogue #  | mm          | in    | L  | L4 max | L3 | L5  | LS | D |
| 4157994      | TDG532A04300 | 4,300       | .1693 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157995      | TDG532A04366 | 4,366       | .1719 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157996      | TDG532A04400 | 4,400       | .1732 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157997      | TDG532A04500 | 4,500       | .1772 | 74 | 29     | 36 | 1,0 | 36 | 6 |
| 4157998      | TDG532A04600 | 4,600       | .1811 | 74 | 29     | 36 | 1,1 | 36 | 6 |
| 4157999      | TDG532A04623 | 4,623       | .1820 | 74 | 29     | 36 | 1,1 | 36 | 6 |
| 4158000      | TDG532A04700 | 4,700       | .1850 | 74 | 29     | 36 | 1,1 | 36 | 6 |
| 4158001      | TDG532A04763 | 4,763       | .1875 | 82 | 35     | 44 | 1,1 | 36 | 6 |
| 4158002      | TDG532A04800 | 4,800       | .1890 | 82 | 35     | 44 | 1,1 | 36 | 6 |
| 4158003      | TDG532A04852 | 4,852       | .1910 | 82 | 35     | 44 | 1,1 | 36 | 6 |
| 4158004      | TDG532A04900 | 4,900       | .1929 | 82 | 35     | 44 | 1,1 | 36 | 6 |
| 4158005      | TDG532A05000 | 5,000       | .1969 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158006      | TDG532A05100 | 5,100       | .2008 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158007      | TDG532A05106 | 5,106       | .2010 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158008      | TDG532A05159 | 5,159       | .2031 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158009      | TDG532A05200 | 5,200       | .2047 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158010      | TDG532A05300 | 5,300       | .2087 | 82 | 35     | 44 | 1,2 | 36 | 6 |
| 4158011      | TDG532A05400 | 5,400       | .2126 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158012      | TDG532A05410 | 5,410       | .2130 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158013      | TDG532A05500 | 5,500       | .2165 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158014      | TDG532A05558 | 5,558       | .2188 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158015      | TDG532A05600 | 5,600       | .2205 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158016      | TDG532A05616 | 5,616       | .2211 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158017      | TDG532A05700 | 5,700       | .2244 | 82 | 35     | 44 | 1,3 | 36 | 6 |
| 4158018      | TDG532A05800 | 5,800       | .2283 | 82 | 35     | 44 | 1,4 | 36 | 6 |
| 4158019      | TDG532A05900 | 5,900       | .2323 | 82 | 35     | 44 | 1,4 | 36 | 6 |
| 4158020      | TDG532A05954 | 5,954       | .2344 | 82 | 35     | 44 | 1,4 | 36 | 6 |
| 4158021      | TDG532A06000 | 6,000       | .2362 | 82 | 35     | 44 | 1,4 | 36 | 6 |
| 4158022      | TDG532A06100 | 6,100       | .2402 | 91 | 43     | 53 | 1,4 | 36 | 8 |
| 4158023      | TDG532A06200 | 6,200       | .2441 | 91 | 43     | 53 | 1,4 | 36 | 8 |
| 4158024      | TDG532A06300 | 6,300       | .2480 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158025      | TDG532A06350 | 6,350       | .2500 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158026      | TDG532A06400 | 6,400       | .2520 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158027      | TDG532A06500 | 6,500       | .2559 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158028      | TDG532A06528 | 6,528       | .2570 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158029      | TDG532A06600 | 6,600       | .2598 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158030      | TDG532A06630 | 6,630       | .2610 | 91 | 43     | 53 | 1,5 | 36 | 8 |
| 4158031      | TDG532A06700 | 6,700       | .2638 | 91 | 43     | 53 | 1,6 | 36 | 8 |
| 4158032      | TDG532A06746 | 6,746       | .2656 | 91 | 43     | 53 | 1,6 | 36 | 8 |
| 4158033      | TDG532A06800 | 6,800       | .2677 | 91 | 43     | 53 | 1,6 | 36 | 8 |

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(TDG532A • 5 x D — continued)

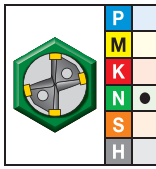


- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |    |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3 | L5  | LS | D  |
| 4158034      | TDG532A06900 | 6,900       | .2717 | 91  | 43     | 53 | 1,6 | 36 | 8  |
| 4158035      | TDG532A07000 | 7,000       | .2756 | 91  | 43     | 53 | 1,6 | 36 | 8  |
| 4158036      | TDG532A07100 | 7,100       | .2795 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158037      | TDG532A07145 | 7,145       | .2813 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158038      | TDG532A07200 | 7,200       | .2835 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158039      | TDG532A07300 | 7,300       | .2874 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158040      | TDG532A07400 | 7,400       | .2913 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158041      | TDG532A07500 | 7,500       | .2953 | 91  | 43     | 53 | 1,7 | 36 | 8  |
| 4158042      | TDG532A07541 | 7,541       | .2969 | 91  | 43     | 53 | 1,8 | 36 | 8  |
| 4158043      | TDG532A07600 | 7,600       | .2992 | 91  | 43     | 53 | 1,8 | 36 | 8  |
| 4158044      | TDG532A07700 | 7,700       | .3031 | 91  | 43     | 53 | 1,8 | 36 | 8  |
| 4158045      | TDG532A07800 | 7,800       | .3071 | 91  | 43     | 53 | 1,8 | 36 | 8  |
| 4158046      | TDG532A07900 | 7,900       | .3110 | 91  | 43     | 53 | 1,8 | 36 | 8  |
| 4158047      | TDG532A07938 | 7,938       | .3125 | 91  | 43     | 53 | 1,9 | 36 | 8  |
| 4158048      | TDG532A08000 | 8,000       | .3150 | 91  | 43     | 53 | 1,9 | 36 | 8  |
| 4158049      | TDG532A08100 | 8,100       | .3189 | 103 | 49     | 61 | 1,9 | 40 | 10 |
| 4158050      | TDG532A08200 | 8,200       | .3228 | 103 | 49     | 61 | 1,9 | 40 | 10 |
| 4158051      | TDG532A08300 | 8,300       | .3268 | 103 | 49     | 61 | 1,9 | 40 | 10 |
| 4158052      | TDG532A08334 | 8,334       | .3281 | 103 | 49     | 61 | 1,9 | 40 | 10 |
| 4158053      | TDG532A08400 | 8,400       | .3307 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158054      | TDG532A08433 | 8,433       | .3320 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158055      | TDG532A08500 | 8,500       | .3346 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158056      | TDG532A08600 | 8,600       | .3386 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158057      | TDG532A08700 | 8,700       | .3425 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158058      | TDG532A08733 | 8,733       | .3438 | 103 | 49     | 61 | 2,0 | 40 | 10 |
| 4158059      | TDG532A08800 | 8,800       | .3465 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158060      | TDG532A08900 | 8,900       | .3504 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158061      | TDG532A09000 | 9,000       | .3543 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158062      | TDG532A09100 | 9,100       | .3583 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158063      | TDG532A09129 | 9,129       | .3594 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158064      | TDG532A09200 | 9,200       | .3622 | 103 | 49     | 61 | 2,1 | 40 | 10 |
| 4158065      | TDG532A09300 | 9,300       | .3661 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158066      | TDG532A09347 | 9,347       | .3680 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158067      | TDG532A09400 | 9,400       | .3701 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158068      | TDG532A09500 | 9,500       | .3740 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158069      | TDG532A09525 | 9,525       | .3750 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158070      | TDG532A09600 | 9,600       | .3780 | 103 | 49     | 61 | 2,2 | 40 | 10 |
| 4158071      | TDG532A09700 | 9,700       | .3819 | 103 | 49     | 61 | 2,3 | 40 | 10 |
| 4158072      | TDG532A09800 | 9,800       | .3858 | 103 | 49     | 61 | 2,3 | 40 | 10 |
| 4158073      | TDG532A09900 | 9,900       | .3898 | 103 | 49     | 61 | 2,3 | 40 | 10 |

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(TDG532A • 5 x D — continued)

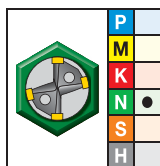


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |    |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3 | L5  | LS | D  |
| 4158074      | TDG532A09921 | 9,921       | .3906 | 103 | 49     | 61 | 2,3 | 40 | 10 |
| 4158081      | TDG532A10000 | 10,000      | .3937 | 103 | 49     | 61 | 2,3 | 40 | 10 |
| 4158082      | TDG532A10100 | 10,100      | .3976 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158353      | TDG532A10200 | 10,200      | .4016 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158354      | TDG532A10300 | 10,300      | .4055 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158355      | TDG532A10320 | 10,320      | .4063 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158356      | TDG532A10400 | 10,400      | .4094 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158357      | TDG532A10500 | 10,500      | .4134 | 118 | 56     | 71 | 2,4 | 45 | 12 |
| 4158358      | TDG532A10600 | 10,600      | .4173 | 118 | 56     | 71 | 2,5 | 45 | 12 |
| 4158359      | TDG532A10700 | 10,700      | .4213 | 118 | 56     | 71 | 2,5 | 45 | 12 |
| 4158360      | TDG532A10716 | 10,716      | .4219 | 118 | 56     | 71 | 2,5 | 45 | 12 |
| 4158361      | TDG532A10800 | 10,800      | .4252 | 118 | 56     | 71 | 2,5 | 45 | 12 |
| 4158362      | TDG532A10900 | 10,900      | .4291 | 118 | 56     | 71 | 2,5 | 45 | 12 |
| 4158363      | TDG532A11000 | 11,000      | .4331 | 118 | 56     | 71 | 2,6 | 45 | 12 |
| 4158364      | TDG532A11100 | 11,100      | .4370 | 118 | 56     | 71 | 2,6 | 45 | 12 |
| 4158365      | TDG532A11113 | 11,113      | .4375 | 118 | 56     | 71 | 2,6 | 45 | 12 |
| 4158366      | TDG532A11200 | 11,200      | .4409 | 118 | 56     | 71 | 2,6 | 45 | 12 |
| 4158367      | TDG532A11300 | 11,300      | .4449 | 118 | 56     | 71 | 2,6 | 45 | 12 |
| 4158368      | TDG532A11400 | 11,400      | .4488 | 118 | 56     | 71 | 2,7 | 45 | 12 |
| 4158369      | TDG532A11500 | 11,500      | .4528 | 118 | 56     | 71 | 2,7 | 45 | 12 |
| 4158370      | TDG532A11509 | 11,509      | .4531 | 118 | 56     | 71 | 2,7 | 45 | 12 |
| 4158371      | TDG532A11600 | 11,600      | .4567 | 118 | 56     | 71 | 2,7 | 45 | 12 |
| 4158372      | TDG532A11700 | 11,700      | .4606 | 118 | 56     | 71 | 2,7 | 45 | 12 |
| 4158373      | TDG532A11800 | 11,800      | .4646 | 118 | 56     | 71 | 2,8 | 45 | 12 |
| 4158374      | TDG532A11900 | 11,900      | .4685 | 118 | 56     | 71 | 2,8 | 45 | 12 |
| 4158375      | TDG532A11908 | 11,908      | .4688 | 118 | 56     | 71 | 2,8 | 45 | 12 |
| 4158376      | TDG532A12000 | 12,000      | .4724 | 118 | 56     | 71 | 2,8 | 45 | 12 |
| 4158377      | TDG532A12100 | 12,100      | .4764 | 124 | 60     | 77 | 2,8 | 45 | 14 |
| 4158378      | TDG532A12200 | 12,200      | .4803 | 124 | 60     | 77 | 2,8 | 45 | 14 |
| 4158379      | TDG532A12300 | 12,300      | .4843 | 124 | 60     | 77 | 2,9 | 45 | 14 |
| 4158380      | TDG532A12304 | 12,304      | .4844 | 124 | 60     | 77 | 2,9 | 45 | 14 |
| 4158381      | TDG532A12400 | 12,400      | .4882 | 124 | 60     | 77 | 2,9 | 45 | 14 |
| 4158382      | TDG532A12500 | 12,500      | .4921 | 124 | 60     | 77 | 2,9 | 45 | 14 |
| 4158383      | TDG532A12600 | 12,600      | .4961 | 124 | 60     | 77 | 2,9 | 45 | 14 |
| 4158384      | TDG532A12700 | 12,700      | .5000 | 124 | 60     | 77 | 3,0 | 45 | 14 |
| 4158385      | TDG532A12800 | 12,800      | .5039 | 124 | 60     | 77 | 3,0 | 45 | 14 |
| 4158386      | TDG532A12900 | 12,900      | .5079 | 124 | 60     | 77 | 3,0 | 45 | 14 |
| 4158387      | TDG532A13000 | 13,000      | .5118 | 124 | 60     | 77 | 3,0 | 45 | 14 |
| 4158388      | TDG532A13096 | 13,096      | .5156 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158389      | TDG532A13100 | 13,100      | .5157 | 124 | 60     | 77 | 3,1 | 45 | 14 |

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(TDG532A • 5 x D — continued)

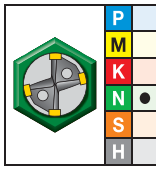


- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |    |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3 | L5  | LS | D  |
| 4158390      | TDG532A13200 | 13,200      | .5197 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158391      | TDG532A13300 | 13,300      | .5236 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158392      | TDG532A13400 | 13,400      | .5276 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158448      | TDG532A13490 | 13,490      | .5311 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158393      | TDG532A13500 | 13,500      | .5315 | 124 | 60     | 77 | 3,1 | 45 | 14 |
| 4158394      | TDG532A13600 | 13,600      | .5354 | 124 | 60     | 77 | 3,2 | 45 | 14 |
| 4158395      | TDG532A13700 | 13,700      | .5394 | 124 | 60     | 77 | 3,2 | 45 | 14 |
| 4158396      | TDG532A13800 | 13,800      | .5433 | 124 | 60     | 77 | 3,2 | 45 | 14 |
| 4158397      | TDG532A13891 | 13,891      | .5469 | 124 | 60     | 77 | 3,2 | 45 | 14 |
| 4158398      | TDG532A13900 | 13,900      | .5472 | 124 | 60     | 77 | 3,2 | 45 | 14 |
| 4158399      | TDG532A14000 | 14,000      | .5512 | 124 | 60     | 77 | 3,3 | 45 | 14 |
| 4158400      | TDG532A14100 | 14,100      | .5551 | 133 | 63     | 83 | 3,3 | 48 | 16 |
| 4158401      | TDG532A14200 | 14,200      | .5591 | 133 | 63     | 83 | 3,3 | 48 | 16 |
| 4158402      | TDG532A14288 | 14,288      | .5625 | 133 | 63     | 83 | 3,3 | 48 | 16 |
| 4158403      | TDG532A14300 | 14,300      | .5630 | 133 | 63     | 83 | 3,3 | 48 | 16 |
| 4158404      | TDG532A14400 | 14,400      | .5669 | 133 | 63     | 83 | 3,4 | 48 | 16 |
| 4158405      | TDG532A14500 | 14,500      | .5709 | 133 | 63     | 83 | 3,4 | 48 | 16 |
| 4158406      | TDG532A14600 | 14,600      | .5748 | 133 | 63     | 83 | 3,4 | 48 | 16 |
| 4158407      | TDG532A14684 | 14,684      | .5781 | 133 | 63     | 83 | 3,4 | 48 | 16 |
| 4158408      | TDG532A14700 | 14,700      | .5787 | 133 | 63     | 83 | 3,4 | 48 | 16 |
| 4158409      | TDG532A14800 | 14,800      | .5827 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158410      | TDG532A14900 | 14,900      | .5866 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158411      | TDG532A15000 | 15,000      | .5906 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158412      | TDG532A15083 | 15,083      | .5938 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158413      | TDG532A15100 | 15,100      | .5945 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158414      | TDG532A15200 | 15,200      | .5984 | 133 | 63     | 83 | 3,5 | 48 | 16 |
| 4158415      | TDG532A15300 | 15,300      | .6024 | 133 | 63     | 83 | 3,6 | 48 | 16 |
| 4158416      | TDG532A15400 | 15,400      | .6063 | 133 | 63     | 83 | 3,6 | 48 | 16 |
| 4158417      | TDG532A15479 | 15,479      | .6094 | 133 | 63     | 83 | 3,6 | 48 | 16 |
| 4158418      | TDG532A15500 | 15,500      | .6102 | 133 | 63     | 83 | 3,6 | 48 | 16 |
| 4158419      | TDG532A15600 | 15,600      | .6142 | 133 | 63     | 83 | 3,6 | 48 | 16 |
| 4158420      | TDG532A15700 | 15,700      | .6181 | 133 | 63     | 83 | 3,7 | 48 | 16 |
| 4158421      | TDG532A15800 | 15,800      | .6220 | 133 | 63     | 83 | 3,7 | 48 | 16 |
| 4158422      | TDG532A15875 | 15,875      | .6250 | 133 | 63     | 83 | 3,7 | 48 | 16 |
| 4158423      | TDG532A15900 | 15,900      | .6260 | 133 | 63     | 83 | 3,7 | 48 | 16 |
| 4158424      | TDG532A16000 | 16,000      | .6299 | 133 | 63     | 83 | 3,7 | 48 | 16 |
| 4158425      | TDG532A16100 | 16,100      | .6339 | 143 | 71     | 93 | 3,8 | 48 | 18 |
| 4158426      | TDG532A16200 | 16,200      | .6378 | 143 | 71     | 93 | 3,8 | 48 | 18 |
| 4158427      | TDG532A16271 | 16,271      | .6406 | 143 | 71     | 93 | 3,8 | 48 | 18 |
| 4158428      | TDG532A16300 | 16,300      | .6417 | 143 | 71     | 93 | 3,8 | 48 | 18 |

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(TDG532A • 5 x D — continued)

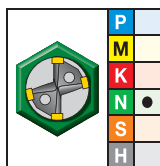


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4158429      | TDG532A16400 | 16,400      | .6457 | 143 | 71     | 93  | 3,8 | 48 | 18 |
| 4158430      | TDG532A16500 | 16,500      | .6496 | 143 | 71     | 93  | 3,8 | 48 | 18 |
| 4158431      | TDG532A16600 | 16,600      | .6535 | 143 | 71     | 93  | 3,9 | 48 | 18 |
| 4158432      | TDG532A16670 | 16,670      | .6563 | 143 | 71     | 93  | 3,9 | 48 | 18 |
| 4158433      | TDG532A16700 | 16,700      | .6575 | 143 | 71     | 93  | 3,9 | 48 | 18 |
| 4158434      | TDG532A16800 | 16,800      | .6614 | 143 | 71     | 93  | 3,9 | 48 | 18 |
| 4158435      | TDG532A16900 | 16,900      | .6654 | 143 | 71     | 93  | 3,9 | 48 | 18 |
| 4158436      | TDG532A17000 | 17,000      | .6693 | 143 | 71     | 93  | 4,0 | 48 | 18 |
| 4158437      | TDG532A17100 | 17,100      | .6732 | 143 | 71     | 93  | 4,0 | 48 | 18 |
| 4158438      | TDG532A17200 | 17,200      | .6772 | 143 | 71     | 93  | 4,0 | 48 | 18 |
| 4158439      | TDG532A17300 | 17,300      | .6811 | 143 | 71     | 93  | 4,0 | 48 | 18 |
| 4158440      | TDG532A17400 | 17,400      | .6850 | 143 | 71     | 93  | 4,1 | 48 | 18 |
| 4158441      | TDG532A17463 | 17,463      | .6875 | 143 | 71     | 93  | 4,1 | 48 | 18 |
| 4158442      | TDG532A17500 | 17,500      | .6890 | 143 | 71     | 93  | 4,1 | 48 | 18 |
| 4158443      | TDG532A17600 | 17,600      | .6929 | 143 | 71     | 93  | 4,1 | 48 | 18 |
| 4158444      | TDG532A17700 | 17,700      | .6969 | 143 | 71     | 93  | 4,1 | 48 | 18 |
| 4158445      | TDG532A17800 | 17,800      | .7008 | 143 | 71     | 93  | 4,2 | 48 | 18 |
| 4158446      | TDG532A17859 | 17,859      | .7031 | 143 | 71     | 93  | 4,2 | 48 | 18 |
| 4158447      | TDG532A17900 | 17,900      | .7047 | 143 | 71     | 93  | 4,2 | 48 | 18 |
| 4158555      | TDG532A18000 | 18,000      | .7087 | 143 | 71     | 93  | 4,2 | 48 | 18 |
| 4158557      | TDG532A18100 | 18,100      | .7126 | 153 | 77     | 101 | 4,2 | 50 | 20 |
| 4158559      | TDG532A18200 | 18,200      | .7165 | 153 | 77     | 101 | 4,2 | 50 | 20 |
| 4158561      | TDG532A18258 | 18,258      | .7188 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158573      | TDG532A18300 | 18,300      | .7205 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158575      | TDG532A18400 | 18,400      | .7244 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158577      | TDG532A18500 | 18,500      | .7283 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158579      | TDG532A18600 | 18,600      | .7323 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158581      | TDG532A18654 | 18,654      | .7344 | 153 | 77     | 101 | 4,3 | 50 | 20 |
| 4158584      | TDG532A18700 | 18,700      | .7362 | 153 | 77     | 101 | 4,4 | 50 | 20 |
| 4158585      | TDG532A18800 | 18,800      | .7402 | 153 | 77     | 101 | 4,4 | 50 | 20 |
| 4158587      | TDG532A18900 | 18,900      | .7441 | 153 | 77     | 101 | 4,4 | 50 | 20 |
| 4158589      | TDG532A19000 | 19,000      | .7480 | 153 | 77     | 101 | 4,4 | 50 | 20 |
| 4158591      | TDG532A19050 | 19,050      | .7500 | 153 | 77     | 101 | 4,4 | 50 | 20 |
| 4158603      | TDG532A19100 | 19,100      | .7520 | 153 | 77     | 101 | 4,5 | 50 | 20 |
| 4158605      | TDG532A19200 | 19,200      | .7559 | 153 | 77     | 101 | 4,5 | 50 | 20 |
| 4158607      | TDG532A19300 | 19,300      | .7598 | 153 | 77     | 101 | 4,5 | 50 | 20 |
| 4158609      | TDG532A19400 | 19,400      | .7638 | 153 | 77     | 101 | 4,5 | 50 | 20 |
| 4158611      | TDG532A19500 | 19,500      | .7677 | 153 | 77     | 101 | 4,5 | 50 | 20 |
| 4158613      | TDG532A19600 | 19,600      | .7717 | 153 | 77     | 101 | 4,6 | 50 | 20 |
| 4158616      | TDG532A19700 | 19,700      | .7756 | 153 | 77     | 101 | 4,6 | 50 | 20 |

(continued)

(TDG532A • 5 x D — continued)

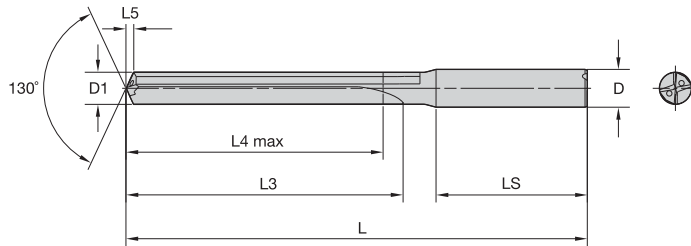
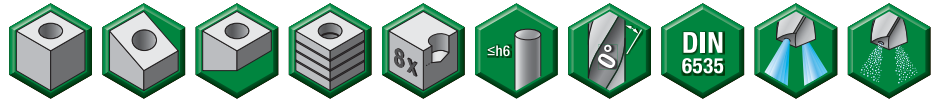


grade WN10HD

D1 diameter

- first choice  
○ alternate choice

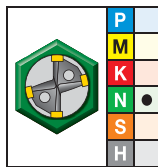
| order # | catalogue #  | mm     | in    | L   | L4 max | L3  | L5  | LS | D  |
|---------|--------------|--------|-------|-----|--------|-----|-----|----|----|
| 4158618 | TDG532A19800 | 19,800 | .7795 | 153 | 77     | 101 | 4,6 | 50 | 20 |
| 4158620 | TDG532A19900 | 19,900 | .7835 | 153 | 77     | 101 | 4,6 | 50 | 20 |
| 4158622 | TDG532A20000 | 20,000 | .7874 | 153 | 77     | 101 | 4,7 | 50 | 20 |
| 4158634 | TDG532A21000 | 21,000 | .8268 | 167 | 85     | 114 | 4,9 | 50 | 20 |
| 4158636 | TDG532A22000 | 22,000 | .8661 | 167 | 85     | 114 | 5,1 | 50 | 20 |
| 4158637 | TDG532A23000 | 23,000 | .9055 | 184 | 98     | 126 | 5,4 | 56 | 25 |



For information on L, L3, and L4 max, see page T143.



■ TDG533A • 8 x D



grade WN10HD

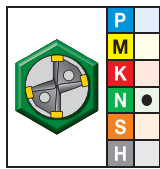
- first choice
- alternate choice

| order # | catalogue #  | D1 diameter |       | L  | L4 max | L3 | L5  | LS | D |
|---------|--------------|-------------|-------|----|--------|----|-----|----|---|
|         |              | mm          | in    |    |        |    |     |    |   |
| 4158475 | TDG533A03000 | 3,000       | .1181 | 78 | 33     | 40 | 0,7 | 36 | 6 |
| 4158476 | TDG533A03048 | 3,048       | .1200 | 78 | 33     | 40 | 0,7 | 36 | 6 |
| 4158477 | TDG533A03100 | 3,100       | .1220 | 78 | 33     | 40 | 0,7 | 36 | 6 |
| 4158478 | TDG533A03175 | 3,175       | .1250 | 78 | 33     | 40 | 0,7 | 36 | 6 |
| 4158479 | TDG533A03200 | 3,200       | .1260 | 78 | 33     | 40 | 0,7 | 36 | 6 |
| 4158480 | TDG533A03264 | 3,264       | .1285 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158481 | TDG533A03300 | 3,300       | .1299 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158482 | TDG533A03400 | 3,400       | .1339 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158553 | TDG533A03455 | 3,455       | .1360 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158554 | TDG533A03500 | 3,500       | .1378 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158556 | TDG533A03571 | 3,571       | .1406 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158558 | TDG533A03600 | 3,600       | .1417 | 78 | 33     | 40 | 0,8 | 36 | 6 |
| 4158560 | TDG533A03658 | 3,658       | .1440 | 78 | 33     | 40 | 0,9 | 36 | 6 |
| 4158562 | TDG533A03700 | 3,700       | .1457 | 78 | 33     | 40 | 0,9 | 36 | 6 |
| 4158574 | TDG533A03734 | 3,734       | .1470 | 78 | 33     | 40 | 0,9 | 36 | 6 |
| 4158576 | TDG533A03800 | 3,800       | .1496 | 87 | 41     | 49 | 0,9 | 36 | 6 |
| 4158578 | TDG533A03900 | 3,900       | .1535 | 87 | 41     | 49 | 0,9 | 36 | 6 |
| 4158580 | TDG533A03970 | 3,970       | .1563 | 87 | 41     | 49 | 0,9 | 36 | 6 |
| 4158582 | TDG533A04000 | 4,000       | .1575 | 87 | 41     | 49 | 0,9 | 36 | 6 |
| 4158583 | TDG533A04039 | 4,039       | .1590 | 87 | 41     | 49 | 0,9 | 36 | 6 |
| 4158586 | TDG533A04090 | 4,090       | .1610 | 87 | 41     | 49 | 1,0 | 36 | 6 |
| 4158588 | TDG533A04100 | 4,100       | .1614 | 87 | 41     | 49 | 1,0 | 36 | 6 |
| 4158590 | TDG533A04200 | 4,200       | .1654 | 87 | 41     | 49 | 1,0 | 36 | 6 |
| 4158592 | TDG533A04217 | 4,217       | .1660 | 87 | 41     | 49 | 1,0 | 36 | 6 |

(continued)



(TDG533A • 8 x D — continued)

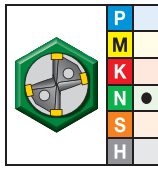


- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |    |     |    |   |
|--------------|--------------|-------------|-------|-----|--------|----|-----|----|---|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3 | L5  | LS | D |
| 4158604      | TDG533A04300 | 4,300       | .1693 | 87  | 41     | 49 | 1,0 | 36 | 6 |
| 4158606      | TDG533A04366 | 4,366       | .1719 | 87  | 41     | 49 | 1,0 | 36 | 6 |
| 4158608      | TDG533A04400 | 4,400       | .1732 | 87  | 41     | 49 | 1,0 | 36 | 6 |
| 4158610      | TDG533A04500 | 4,500       | .1772 | 87  | 41     | 49 | 1,0 | 36 | 6 |
| 4158612      | TDG533A04600 | 4,600       | .1811 | 87  | 41     | 49 | 1,1 | 36 | 6 |
| 4158614      | TDG533A04623 | 4,623       | .1820 | 87  | 41     | 49 | 1,1 | 36 | 6 |
| 4158615      | TDG533A04700 | 4,700       | .1850 | 87  | 41     | 49 | 1,1 | 36 | 6 |
| 4158617      | TDG533A04763 | 4,763       | .1875 | 94  | 48     | 56 | 1,1 | 36 | 6 |
| 4158619      | TDG533A04800 | 4,800       | .1890 | 94  | 48     | 56 | 1,1 | 36 | 6 |
| 4158621      | TDG533A04852 | 4,852       | .1910 | 94  | 48     | 56 | 1,1 | 36 | 6 |
| 4158633      | TDG533A04900 | 4,900       | .1929 | 94  | 48     | 56 | 1,1 | 36 | 6 |
| 4158635      | TDG533A05000 | 5,000       | .1969 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158638      | TDG533A05100 | 5,100       | .2008 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158639      | TDG533A05106 | 5,106       | .2010 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158640      | TDG533A05159 | 5,159       | .2031 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158641      | TDG533A05200 | 5,200       | .2047 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158642      | TDG533A05300 | 5,300       | .2087 | 94  | 48     | 56 | 1,2 | 36 | 6 |
| 4158653      | TDG533A05400 | 5,400       | .2126 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158654      | TDG533A05410 | 5,410       | .2130 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158655      | TDG533A05500 | 5,500       | .2165 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158656      | TDG533A05558 | 5,558       | .2188 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158657      | TDG533A05600 | 5,600       | .2205 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158658      | TDG533A05616 | 5,616       | .2211 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158659      | TDG533A05700 | 5,700       | .2244 | 94  | 48     | 56 | 1,3 | 36 | 6 |
| 4158660      | TDG533A05800 | 5,800       | .2283 | 94  | 48     | 56 | 1,4 | 36 | 6 |
| 4158661      | TDG533A05900 | 5,900       | .2323 | 94  | 48     | 56 | 1,4 | 36 | 6 |
| 4158662      | TDG533A05954 | 5,954       | .2344 | 94  | 48     | 56 | 1,4 | 36 | 6 |
| 4158673      | TDG533A06000 | 6,000       | .2362 | 94  | 48     | 56 | 1,4 | 36 | 6 |
| 4158674      | TDG533A06100 | 6,100       | .2402 | 105 | 57     | 67 | 1,4 | 36 | 8 |
| 4158675      | TDG533A06200 | 6,200       | .2441 | 105 | 57     | 67 | 1,4 | 36 | 8 |
| 4158676      | TDG533A06300 | 6,300       | .2480 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158677      | TDG533A06350 | 6,350       | .2500 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158678      | TDG533A06400 | 6,400       | .2520 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158679      | TDG533A06500 | 6,500       | .2559 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158680      | TDG533A06528 | 6,528       | .2570 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158681      | TDG533A06600 | 6,600       | .2598 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158682      | TDG533A06630 | 6,630       | .2610 | 105 | 57     | 67 | 1,5 | 36 | 8 |
| 4158693      | TDG533A06700 | 6,700       | .2638 | 105 | 57     | 67 | 1,6 | 36 | 8 |
| 4158694      | TDG533A06746 | 6,746       | .2656 | 105 | 57     | 67 | 1,6 | 36 | 8 |
| 4158695      | TDG533A06800 | 6,800       | .2677 | 105 | 57     | 67 | 1,6 | 36 | 8 |

(continued)

(TDG533A • 8 x D — continued)

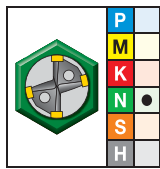


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |    |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3 | L5  | LS | D  |
| 4158696      | TDG533A06900 | 6,900       | .2717 | 105 | 57     | 67 | 1,6 | 36 | 8  |
| 4158697      | TDG533A07000 | 7,000       | .2756 | 105 | 57     | 67 | 1,6 | 36 | 8  |
| 4158698      | TDG533A07100 | 7,100       | .2795 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158699      | TDG533A07145 | 7,145       | .2813 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158700      | TDG533A07200 | 7,200       | .2835 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158701      | TDG533A07300 | 7,300       | .2874 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158702      | TDG533A07400 | 7,400       | .2913 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158713      | TDG533A07500 | 7,500       | .2953 | 110 | 61     | 72 | 1,7 | 36 | 8  |
| 4158714      | TDG533A07541 | 7,541       | .2969 | 110 | 61     | 72 | 1,8 | 36 | 8  |
| 4158715      | TDG533A07600 | 7,600       | .2992 | 110 | 61     | 72 | 1,8 | 36 | 8  |
| 4158716      | TDG533A07700 | 7,700       | .3031 | 110 | 61     | 72 | 1,8 | 36 | 8  |
| 4158717      | TDG533A07800 | 7,800       | .3071 | 110 | 61     | 72 | 1,8 | 36 | 8  |
| 4158718      | TDG533A07900 | 7,900       | .3110 | 110 | 61     | 72 | 1,8 | 36 | 8  |
| 4158719      | TDG533A07938 | 7,938       | .3125 | 110 | 61     | 72 | 1,9 | 36 | 8  |
| 4158720      | TDG533A08000 | 8,000       | .3150 | 110 | 61     | 72 | 1,9 | 36 | 8  |
| 4158721      | TDG533A08100 | 8,100       | .3189 | 122 | 68     | 80 | 1,9 | 40 | 10 |
| 4158722      | TDG533A08200 | 8,200       | .3228 | 122 | 68     | 80 | 1,9 | 40 | 10 |
| 4158733      | TDG533A08300 | 8,300       | .3268 | 122 | 68     | 80 | 1,9 | 40 | 10 |
| 4158734      | TDG533A08334 | 8,334       | .3281 | 122 | 68     | 80 | 1,9 | 40 | 10 |
| 4158735      | TDG533A08400 | 8,400       | .3307 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158736      | TDG533A08433 | 8,433       | .3320 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158737      | TDG533A08500 | 8,500       | .3346 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158738      | TDG533A08600 | 8,600       | .3386 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158739      | TDG533A08700 | 8,700       | .3425 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158740      | TDG533A08733 | 8,733       | .3438 | 122 | 68     | 80 | 2,0 | 40 | 10 |
| 4158741      | TDG533A08800 | 8,800       | .3465 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158742      | TDG533A08900 | 8,900       | .3504 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158743      | TDG533A09000 | 9,000       | .3543 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158744      | TDG533A09100 | 9,100       | .3583 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158745      | TDG533A09129 | 9,129       | .3594 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158746      | TDG533A09200 | 9,200       | .3622 | 122 | 68     | 80 | 2,1 | 40 | 10 |
| 4158747      | TDG533A09300 | 9,300       | .3661 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158748      | TDG533A09347 | 9,347       | .3680 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158749      | TDG533A09400 | 9,400       | .3701 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158750      | TDG533A09500 | 9,500       | .3740 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158751      | TDG533A09525 | 9,525       | .3750 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158752      | TDG533A09600 | 9,600       | .3780 | 122 | 68     | 80 | 2,2 | 40 | 10 |
| 4158753      | TDG533A09700 | 9,700       | .3819 | 122 | 68     | 80 | 2,3 | 40 | 10 |
| 4158754      | TDG533A09800 | 9,800       | .3858 | 122 | 68     | 80 | 2,3 | 40 | 10 |
| 4158755      | TDG533A09900 | 9,900       | .3898 | 122 | 68     | 80 | 2,3 | 40 | 10 |

(continued)

(TDG533A • 8 x D — continued)

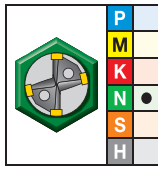


- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4158756      | TDG533A09921 | 9,921       | .3906 | 122 | 68     | 80  | 2,3 | 40 | 10 |
| 4158520      | TDG533A10000 | 10,000      | .3937 | 122 | 68     | 80  | 2,3 | 40 | 10 |
| 4158521      | TDG533A10100 | 10,100      | .3976 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158522      | TDG533A10200 | 10,200      | .4016 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158533      | TDG533A10300 | 10,300      | .4055 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158534      | TDG533A10320 | 10,320      | .4063 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158535      | TDG533A10400 | 10,400      | .4094 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158536      | TDG533A10500 | 10,500      | .4134 | 141 | 79     | 94  | 2,4 | 45 | 12 |
| 4158537      | TDG533A10600 | 10,600      | .4173 | 141 | 79     | 94  | 2,5 | 45 | 12 |
| 4158538      | TDG533A10700 | 10,700      | .4213 | 141 | 79     | 94  | 2,5 | 45 | 12 |
| 4158539      | TDG533A10716 | 10,716      | .4219 | 141 | 79     | 94  | 2,5 | 45 | 12 |
| 4158540      | TDG533A10800 | 10,800      | .4252 | 141 | 79     | 94  | 2,5 | 45 | 12 |
| 4158541      | TDG533A10900 | 10,900      | .4291 | 141 | 79     | 94  | 2,5 | 45 | 12 |
| 4158542      | TDG533A11000 | 11,000      | .4331 | 141 | 79     | 94  | 2,6 | 45 | 12 |
| 4158543      | TDG533A11100 | 11,100      | .4370 | 141 | 79     | 94  | 2,6 | 45 | 12 |
| 4158544      | TDG533A11113 | 11,113      | .4375 | 141 | 79     | 94  | 2,6 | 45 | 12 |
| 4158545      | TDG533A11200 | 11,200      | .4409 | 141 | 79     | 94  | 2,6 | 45 | 12 |
| 4158546      | TDG533A11300 | 11,300      | .4449 | 141 | 79     | 94  | 2,6 | 45 | 12 |
| 4158547      | TDG533A11400 | 11,400      | .4488 | 141 | 79     | 94  | 2,7 | 45 | 12 |
| 4158548      | TDG533A11500 | 11,500      | .4528 | 141 | 79     | 94  | 2,7 | 45 | 12 |
| 4158549      | TDG533A11509 | 11,509      | .4531 | 141 | 79     | 94  | 2,7 | 45 | 12 |
| 4158550      | TDG533A11600 | 11,600      | .4567 | 141 | 79     | 94  | 2,7 | 45 | 12 |
| 4158551      | TDG533A11700 | 11,700      | .4606 | 141 | 79     | 94  | 2,7 | 45 | 12 |
| 4158552      | TDG533A11800 | 11,800      | .4646 | 141 | 79     | 94  | 2,8 | 45 | 12 |
| 4158563      | TDG533A11900 | 11,900      | .4685 | 141 | 79     | 94  | 2,8 | 45 | 12 |
| 4158564      | TDG533A11908 | 11,908      | .4688 | 141 | 79     | 94  | 2,8 | 45 | 12 |
| 4158565      | TDG533A12000 | 12,000      | .4724 | 141 | 79     | 94  | 2,8 | 45 | 12 |
| 4158566      | TDG533A12100 | 12,100      | .4764 | 155 | 91     | 108 | 2,8 | 45 | 14 |
| 4158567      | TDG533A12200 | 12,200      | .4803 | 155 | 91     | 108 | 2,8 | 45 | 14 |
| 4158568      | TDG533A12300 | 12,300      | .4843 | 155 | 91     | 108 | 2,9 | 45 | 14 |
| 4158569      | TDG533A12304 | 12,304      | .4844 | 155 | 91     | 108 | 2,9 | 45 | 14 |
| 4158570      | TDG533A12400 | 12,400      | .4882 | 155 | 91     | 108 | 2,9 | 45 | 14 |
| 4158571      | TDG533A12500 | 12,500      | .4921 | 155 | 91     | 108 | 2,9 | 45 | 14 |
| 4158572      | TDG533A12600 | 12,600      | .4961 | 155 | 91     | 108 | 2,9 | 45 | 14 |
| 4158593      | TDG533A12700 | 12,700      | .5000 | 155 | 91     | 108 | 3,0 | 45 | 14 |
| 4158594      | TDG533A12800 | 12,800      | .5039 | 155 | 91     | 108 | 3,0 | 45 | 14 |
| 4158595      | TDG533A12900 | 12,900      | .5079 | 155 | 91     | 108 | 3,0 | 45 | 14 |
| 4158596      | TDG533A13000 | 13,000      | .5118 | 155 | 91     | 108 | 3,0 | 45 | 14 |
| 4158597      | TDG533A13096 | 13,096      | .5156 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158598      | TDG533A13100 | 13,100      | .5157 | 155 | 91     | 108 | 3,1 | 45 | 14 |

(continued)

(TDG533A • 8 x D — continued)

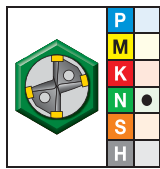


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4158599      | TDG533A13200 | 13,200      | .5197 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158600      | TDG533A13300 | 13,300      | .5236 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158601      | TDG533A13400 | 13,400      | .5276 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158727      | TDG533A13490 | 13,490      | .5311 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158602      | TDG533A13500 | 13,500      | .5315 | 155 | 91     | 108 | 3,1 | 45 | 14 |
| 4158623      | TDG533A13600 | 13,600      | .5354 | 155 | 91     | 108 | 3,2 | 45 | 14 |
| 4158624      | TDG533A13700 | 13,700      | .5394 | 155 | 91     | 108 | 3,2 | 45 | 14 |
| 4158625      | TDG533A13800 | 13,800      | .5433 | 155 | 91     | 108 | 3,2 | 45 | 14 |
| 4158626      | TDG533A13891 | 13,891      | .5469 | 155 | 91     | 108 | 3,2 | 45 | 14 |
| 4158627      | TDG533A13900 | 13,900      | .5472 | 155 | 91     | 108 | 3,2 | 45 | 14 |
| 4158628      | TDG533A14000 | 14,000      | .5512 | 155 | 91     | 108 | 3,3 | 45 | 14 |
| 4158629      | TDG533A14100 | 14,100      | .5551 | 171 | 101    | 121 | 3,3 | 48 | 16 |
| 4158630      | TDG533A14200 | 14,200      | .5591 | 171 | 101    | 121 | 3,3 | 48 | 16 |
| 4158631      | TDG533A14288 | 14,288      | .5625 | 171 | 101    | 121 | 3,3 | 48 | 16 |
| 4158632      | TDG533A14300 | 14,300      | .5630 | 171 | 101    | 121 | 3,3 | 48 | 16 |
| 4158643      | TDG533A14400 | 14,400      | .5669 | 171 | 101    | 121 | 3,4 | 48 | 16 |
| 4158644      | TDG533A14500 | 14,500      | .5709 | 171 | 101    | 121 | 3,4 | 48 | 16 |
| 4158645      | TDG533A14600 | 14,600      | .5748 | 171 | 101    | 121 | 3,4 | 48 | 16 |
| 4158646      | TDG533A14684 | 14,684      | .5781 | 171 | 101    | 121 | 3,4 | 48 | 16 |
| 4158647      | TDG533A14700 | 14,700      | .5787 | 171 | 101    | 121 | 3,4 | 48 | 16 |
| 4158648      | TDG533A14800 | 14,800      | .5827 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158649      | TDG533A14900 | 14,900      | .5866 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158650      | TDG533A15000 | 15,000      | .5906 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158651      | TDG533A15083 | 15,083      | .5938 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158652      | TDG533A15100 | 15,100      | .5945 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158663      | TDG533A15200 | 15,200      | .5984 | 171 | 101    | 121 | 3,5 | 48 | 16 |
| 4158664      | TDG533A15300 | 15,300      | .6024 | 171 | 101    | 121 | 3,6 | 48 | 16 |
| 4158665      | TDG533A15400 | 15,400      | .6063 | 171 | 101    | 121 | 3,6 | 48 | 16 |
| 4158666      | TDG533A15479 | 15,479      | .6094 | 171 | 101    | 121 | 3,6 | 48 | 16 |
| 4158667      | TDG533A15500 | 15,500      | .6102 | 171 | 101    | 121 | 3,6 | 48 | 16 |
| 4158668      | TDG533A15600 | 15,600      | .6142 | 171 | 101    | 121 | 3,6 | 48 | 16 |
| 4158669      | TDG533A15700 | 15,700      | .6181 | 171 | 101    | 121 | 3,7 | 48 | 16 |
| 4158670      | TDG533A15800 | 15,800      | .6220 | 171 | 101    | 121 | 3,7 | 48 | 16 |
| 4158671      | TDG533A15875 | 15,875      | .6250 | 171 | 101    | 121 | 3,7 | 48 | 16 |
| 4158672      | TDG533A15900 | 15,900      | .6260 | 171 | 101    | 121 | 3,7 | 48 | 16 |
| 4158683      | TDG533A16000 | 16,000      | .6299 | 171 | 101    | 121 | 3,7 | 48 | 16 |
| 4158684      | TDG533A16100 | 16,100      | .6339 | 185 | 113    | 135 | 3,8 | 48 | 18 |
| 4158685      | TDG533A16200 | 16,200      | .6378 | 185 | 113    | 135 | 3,8 | 48 | 18 |
| 4158686      | TDG533A16271 | 16,271      | .6406 | 185 | 113    | 135 | 3,8 | 48 | 18 |
| 4158687      | TDG533A16300 | 16,300      | .6417 | 185 | 113    | 135 | 3,8 | 48 | 18 |

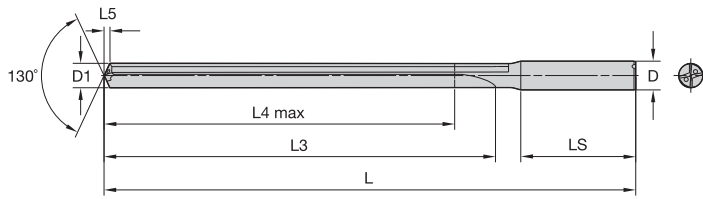
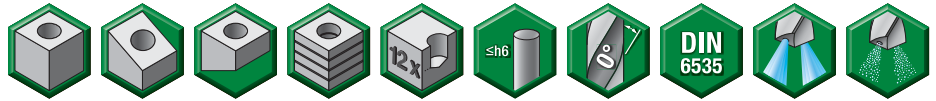
(continued)

(TDG533A • 8 x D — continued)



- first choice  
○ alternate choice

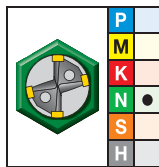
| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4158688      | TDG533A16400 | 16,400      | .6457 | 185 | 113    | 135 | 3,8 | 48 | 18 |
| 4158689      | TDG533A16500 | 16,500      | .6496 | 185 | 113    | 135 | 3,8 | 48 | 18 |
| 4158690      | TDG533A16600 | 16,600      | .6535 | 185 | 113    | 135 | 3,9 | 48 | 18 |
| 4158691      | TDG533A16670 | 16,670      | .6563 | 185 | 113    | 135 | 3,9 | 48 | 18 |
| 4158692      | TDG533A16700 | 16,700      | .6575 | 185 | 113    | 135 | 3,9 | 48 | 18 |
| 4158703      | TDG533A16800 | 16,800      | .6614 | 185 | 113    | 135 | 3,9 | 48 | 18 |
| 4158704      | TDG533A16900 | 16,900      | .6654 | 185 | 113    | 135 | 3,9 | 48 | 18 |
| 4158705      | TDG533A17000 | 17,000      | .6693 | 185 | 113    | 135 | 4,0 | 48 | 18 |
| 4158706      | TDG533A17100 | 17,100      | .6732 | 185 | 113    | 135 | 4,0 | 48 | 18 |
| 4158707      | TDG533A17200 | 17,200      | .6772 | 185 | 113    | 135 | 4,0 | 48 | 18 |
| 4158708      | TDG533A17300 | 17,300      | .6811 | 185 | 113    | 135 | 4,0 | 48 | 18 |
| 4158709      | TDG533A17400 | 17,400      | .6850 | 185 | 113    | 135 | 4,1 | 48 | 18 |
| 4158710      | TDG533A17463 | 17,463      | .6875 | 185 | 113    | 135 | 4,1 | 48 | 18 |
| 4158711      | TDG533A17500 | 17,500      | .6890 | 185 | 113    | 135 | 4,1 | 48 | 18 |
| 4158712      | TDG533A17600 | 17,600      | .6929 | 185 | 113    | 135 | 4,1 | 48 | 18 |
| 4158723      | TDG533A17700 | 17,700      | .6969 | 185 | 113    | 135 | 4,1 | 48 | 18 |
| 4158724      | TDG533A17800 | 17,800      | .7008 | 185 | 113    | 135 | 4,2 | 48 | 18 |
| 4158725      | TDG533A17859 | 17,859      | .7031 | 185 | 113    | 135 | 4,2 | 48 | 18 |
| 4158726      | TDG533A17900 | 17,900      | .7047 | 185 | 113    | 135 | 4,2 | 48 | 18 |
| 4157333      | TDG533A18000 | 18,000      | .7087 | 185 | 113    | 135 | 4,2 | 48 | 18 |
| 4157334      | TDG533A18100 | 18,100      | .7126 | 200 | 124    | 148 | 4,2 | 50 | 20 |
| 4157335      | TDG533A18200 | 18,200      | .7165 | 200 | 124    | 148 | 4,2 | 50 | 20 |
| 4157336      | TDG533A18258 | 18,258      | .7188 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157337      | TDG533A18300 | 18,300      | .7205 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157338      | TDG533A18400 | 18,400      | .7244 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157339      | TDG533A18500 | 18,500      | .7283 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157340      | TDG533A18600 | 18,600      | .7323 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157341      | TDG533A18654 | 18,654      | .7344 | 200 | 124    | 148 | 4,3 | 50 | 20 |
| 4157342      | TDG533A18700 | 18,700      | .7362 | 200 | 124    | 148 | 4,4 | 50 | 20 |
| 4157343      | TDG533A18800 | 18,800      | .7402 | 200 | 124    | 148 | 4,4 | 50 | 20 |
| 4157344      | TDG533A18900 | 18,900      | .7441 | 200 | 124    | 148 | 4,4 | 50 | 20 |
| 4157345      | TDG533A19000 | 19,000      | .7480 | 200 | 124    | 148 | 4,4 | 50 | 20 |
| 4157346      | TDG533A19050 | 19,050      | .7500 | 200 | 124    | 148 | 4,4 | 50 | 20 |
| 4157347      | TDG533A19100 | 19,100      | .7520 | 200 | 124    | 148 | 4,5 | 50 | 20 |
| 4157348      | TDG533A19200 | 19,200      | .7559 | 200 | 124    | 148 | 4,5 | 50 | 20 |
| 4157349      | TDG533A19300 | 19,300      | .7598 | 200 | 124    | 148 | 4,5 | 50 | 20 |
| 4157350      | TDG533A19400 | 19,400      | .7638 | 200 | 124    | 148 | 4,5 | 50 | 20 |
| 4157351      | TDG533A19500 | 19,500      | .7677 | 200 | 124    | 148 | 4,5 | 50 | 20 |
| 4157352      | TDG533A19600 | 19,600      | .7717 | 200 | 124    | 148 | 4,6 | 50 | 20 |
| 4157353      | TDG533A19700 | 19,700      | .7756 | 200 | 124    | 148 | 4,6 | 50 | 20 |
| 4157354      | TDG533A19800 | 19,800      | .7795 | 200 | 124    | 148 | 4,6 | 50 | 20 |
| 4157355      | TDG533A19900 | 19,900      | .7835 | 200 | 124    | 148 | 4,6 | 50 | 20 |
| 4157356      | TDG533A20000 | 20,000      | .7874 | 200 | 124    | 148 | 4,7 | 50 | 20 |



For information on L, L3, and L4 max, see page T143.



### TDG534A • 12 x D



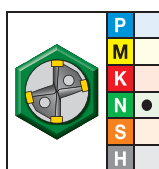
grade WN10HD

- first choice
- alternate choice

| order # | catalogue #  | D1 diameter |       | L   | L4 max | L3 | L5  | LS | D |
|---------|--------------|-------------|-------|-----|--------|----|-----|----|---|
|         |              | mm          | in    |     |        |    |     |    |   |
| 4157357 | TDG534A03000 | 3,000       | .1181 | 93  | 44     | 55 | 0,7 | 36 | 6 |
| 4157358 | TDG534A03048 | 3,048       | .1200 | 93  | 44     | 55 | 0,7 | 36 | 6 |
| 4157359 | TDG534A03100 | 3,100       | .1220 | 93  | 44     | 55 | 0,7 | 36 | 6 |
| 4157360 | TDG534A03175 | 3,175       | .1250 | 93  | 44     | 55 | 0,7 | 36 | 6 |
| 4157361 | TDG534A03200 | 3,200       | .1260 | 93  | 43     | 55 | 0,7 | 36 | 6 |
| 4157362 | TDG534A03264 | 3,264       | .1285 | 93  | 44     | 55 | 0,8 | 36 | 6 |
| 4157363 | TDG534A03300 | 3,300       | .1299 | 93  | 44     | 55 | 0,8 | 36 | 6 |
| 4157364 | TDG534A03400 | 3,400       | .1339 | 93  | 44     | 55 | 0,8 | 36 | 6 |
| 4157365 | TDG534A03455 | 3,455       | .1360 | 93  | 44     | 55 | 0,8 | 36 | 6 |
| 4157366 | TDG534A03500 | 3,500       | .1378 | 93  | 44     | 55 | 0,8 | 36 | 6 |
| 4157367 | TDG534A03571 | 3,571       | .1406 | 93  | 45     | 55 | 0,8 | 36 | 6 |
| 4157368 | TDG534A03600 | 3,600       | .1417 | 93  | 45     | 55 | 0,8 | 36 | 6 |
| 4157369 | TDG534A03658 | 3,658       | .1440 | 93  | 45     | 55 | 0,9 | 36 | 6 |
| 4157370 | TDG534A03700 | 3,700       | .1457 | 93  | 45     | 55 | 0,9 | 36 | 6 |
| 4157371 | TDG534A03734 | 3,734       | .1470 | 93  | 45     | 55 | 0,9 | 36 | 6 |
| 4157372 | TDG534A03800 | 3,800       | .1496 | 107 | 55     | 69 | 0,9 | 36 | 6 |
| 4157373 | TDG534A03900 | 3,900       | .1535 | 107 | 56     | 69 | 0,9 | 36 | 6 |
| 4157374 | TDG534A03970 | 3,970       | .1563 | 107 | 56     | 69 | 0,9 | 36 | 6 |
| 4157375 | TDG534A04000 | 4,000       | .1575 | 107 | 56     | 69 | 0,9 | 36 | 6 |
| 4157376 | TDG534A04039 | 4,039       | .1590 | 107 | 56     | 69 | 0,9 | 36 | 6 |
| 4157377 | TDG534A04090 | 4,090       | .1610 | 107 | 55     | 69 | 1,0 | 36 | 6 |
| 4157378 | TDG534A04100 | 4,100       | .1614 | 107 | 55     | 69 | 1,0 | 36 | 6 |
| 4157379 | TDG534A04200 | 4,200       | .1654 | 107 | 56     | 69 | 1,0 | 36 | 6 |
| 4157380 | TDG534A04217 | 4,217       | .1660 | 107 | 56     | 69 | 1,0 | 36 | 6 |

(continued)

(TDG534A • 12 x D — continued)



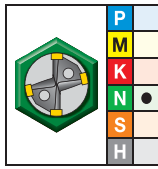
- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |   |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|---|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D |
| 4157381      | TDG534A04300 | 4,300       | .1693 | 107 | 56     | 69  | 1,0 | 36 | 6 |
| 4157382      | TDG534A04366 | 4,366       | .1719 | 107 | 56     | 69  | 1,0 | 36 | 6 |
| 4157383      | TDG534A04400 | 4,400       | .1732 | 107 | 56     | 69  | 1,0 | 36 | 6 |
| 4157384      | TDG534A04500 | 4,500       | .1772 | 107 | 56     | 69  | 1,0 | 36 | 6 |
| 4157385      | TDG534A04600 | 4,600       | .1811 | 107 | 57     | 69  | 1,1 | 36 | 6 |
| 4157386      | TDG534A04623 | 4,623       | .1820 | 107 | 57     | 69  | 1,1 | 36 | 6 |
| 4157387      | TDG534A04700 | 4,700       | .1850 | 107 | 57     | 69  | 1,1 | 36 | 6 |
| 4157388      | TDG534A04763 | 4,763       | .1875 | 125 | 69     | 87  | 1,1 | 36 | 6 |
| 4157389      | TDG534A04800 | 4,800       | .1890 | 125 | 69     | 87  | 1,1 | 36 | 6 |
| 4157390      | TDG534A04852 | 4,852       | .1910 | 125 | 69     | 87  | 1,1 | 36 | 6 |
| 4157391      | TDG534A04900 | 4,900       | .1929 | 125 | 69     | 87  | 1,1 | 36 | 6 |
| 4157392      | TDG534A05000 | 5,000       | .1969 | 125 | 70     | 87  | 1,2 | 36 | 6 |
| 4157393      | TDG534A05100 | 5,100       | .2008 | 125 | 70     | 87  | 1,2 | 36 | 6 |
| 4157394      | TDG534A05106 | 5,106       | .2010 | 125 | 70     | 87  | 1,2 | 36 | 6 |
| 4157395      | TDG534A05159 | 5,159       | .2031 | 125 | 70     | 87  | 1,2 | 36 | 6 |
| 4157396      | TDG534A05200 | 5,200       | .2047 | 125 | 70     | 87  | 1,2 | 36 | 6 |
| 4157397      | TDG534A05300 | 5,300       | .2087 | 125 | 71     | 87  | 1,2 | 36 | 6 |
| 4157398      | TDG534A05400 | 5,400       | .2126 | 125 | 71     | 87  | 1,3 | 36 | 6 |
| 4157399      | TDG534A05410 | 5,410       | .2130 | 125 | 71     | 87  | 1,3 | 36 | 6 |
| 4157400      | TDG534A05500 | 5,500       | .2165 | 125 | 71     | 87  | 1,3 | 36 | 6 |
| 4157401      | TDG534A05558 | 5,558       | .2188 | 125 | 71     | 87  | 1,3 | 36 | 6 |
| 4157402      | TDG534A05600 | 5,600       | .2205 | 125 | 72     | 87  | 1,3 | 36 | 6 |
| 4157403      | TDG534A05616 | 5,616       | .2211 | 125 | 72     | 87  | 1,3 | 36 | 6 |
| 4157404      | TDG534A05700 | 5,700       | .2244 | 125 | 72     | 87  | 1,3 | 36 | 6 |
| 4157405      | TDG534A05800 | 5,800       | .2283 | 125 | 71     | 87  | 1,4 | 36 | 6 |
| 4157406      | TDG534A05900 | 5,900       | .2323 | 125 | 71     | 87  | 1,4 | 36 | 6 |
| 4157407      | TDG534A05954 | 5,954       | .2344 | 125 | 72     | 87  | 1,4 | 36 | 6 |
| 4157408      | TDG534A06000 | 6,000       | .2362 | 125 | 72     | 87  | 1,4 | 36 | 6 |
| 4157409      | TDG534A06100 | 6,100       | .2402 | 139 | 82     | 101 | 1,4 | 36 | 8 |
| 4157410      | TDG534A06200 | 6,200       | .2441 | 139 | 82     | 101 | 1,4 | 36 | 8 |
| 4157411      | TDG534A06300 | 6,300       | .2480 | 139 | 83     | 101 | 1,5 | 36 | 8 |
| 4157412      | TDG534A06350 | 6,350       | .2500 | 139 | 83     | 101 | 1,5 | 36 | 8 |
| 4157413      | TDG534A06400 | 6,400       | .2520 | 139 | 83     | 101 | 1,5 | 36 | 8 |
| 4157414      | TDG534A06500 | 6,500       | .2559 | 139 | 83     | 101 | 1,5 | 36 | 8 |
| 4157415      | TDG534A06528 | 6,528       | .2570 | 139 | 83     | 101 | 1,5 | 36 | 8 |
| 4157416      | TDG534A06600 | 6,600       | .2598 | 139 | 84     | 101 | 1,5 | 36 | 8 |
| 4157417      | TDG534A06630 | 6,630       | .2610 | 139 | 84     | 101 | 1,5 | 36 | 8 |
| 4157418      | TDG534A06700 | 6,700       | .2638 | 139 | 84     | 101 | 1,6 | 36 | 8 |
| 4157419      | TDG534A06746 | 6,746       | .2656 | 139 | 83     | 101 | 1,6 | 36 | 8 |
| 4157420      | TDG534A06800 | 6,800       | .2677 | 139 | 83     | 101 | 1,6 | 36 | 8 |

(continued)



(TDG534A • 12 x D — continued)

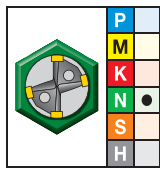


● first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4157421      | TDG534A06900 | 6,900       | .2717 | 139 | 83     | 101 | 1,6 | 36 | 8  |
| 4157422      | TDG534A07000 | 7,000       | .2756 | 139 | 84     | 101 | 1,6 | 36 | 8  |
| 4157423      | TDG534A07100 | 7,100       | .2795 | 153 | 94     | 115 | 1,7 | 36 | 8  |
| 4157424      | TDG534A07145 | 7,145       | .2813 | 153 | 94     | 115 | 1,7 | 36 | 8  |
| 4157425      | TDG534A07200 | 7,200       | .2835 | 153 | 94     | 115 | 1,7 | 36 | 8  |
| 4157426      | TDG534A07300 | 7,300       | .2874 | 153 | 95     | 115 | 1,7 | 36 | 8  |
| 4157427      | TDG534A07400 | 7,400       | .2913 | 153 | 95     | 115 | 1,7 | 36 | 8  |
| 4157428      | TDG534A07500 | 7,500       | .2953 | 153 | 95     | 115 | 1,7 | 36 | 8  |
| 4157429      | TDG534A07541 | 7,541       | .2969 | 153 | 95     | 115 | 1,8 | 36 | 8  |
| 4157430      | TDG534A07600 | 7,600       | .2992 | 153 | 96     | 115 | 1,8 | 36 | 8  |
| 4157431      | TDG534A07700 | 7,700       | .3031 | 153 | 96     | 115 | 1,8 | 36 | 8  |
| 4157432      | TDG534A07800 | 7,800       | .3071 | 153 | 95     | 115 | 1,8 | 36 | 8  |
| 4157433      | TDG534A07900 | 7,900       | .3110 | 153 | 95     | 115 | 1,8 | 36 | 8  |
| 4157434      | TDG534A07938 | 7,938       | .3125 | 153 | 96     | 115 | 1,9 | 36 | 8  |
| 4157435      | TDG534A08000 | 8,000       | .3150 | 153 | 96     | 115 | 1,9 | 36 | 8  |
| 4157436      | TDG534A08100 | 8,100       | .3189 | 185 | 116    | 143 | 1,9 | 40 | 10 |
| 4157437      | TDG534A08200 | 8,200       | .3228 | 185 | 116    | 143 | 1,9 | 40 | 10 |
| 4157438      | TDG534A08300 | 8,300       | .3268 | 185 | 117    | 143 | 1,9 | 40 | 10 |
| 4157439      | TDG534A08334 | 8,334       | .3281 | 185 | 117    | 143 | 1,9 | 40 | 10 |
| 4157440      | TDG534A08400 | 8,400       | .3307 | 185 | 117    | 143 | 2,0 | 40 | 10 |
| 4157441      | TDG534A08433 | 8,433       | .3320 | 185 | 117    | 143 | 2,0 | 40 | 10 |
| 4157442      | TDG534A08500 | 8,500       | .3346 | 185 | 117    | 143 | 2,0 | 40 | 10 |
| 4157443      | TDG534A08600 | 8,600       | .3386 | 185 | 118    | 143 | 2,0 | 40 | 10 |
| 4157444      | TDG534A08700 | 8,700       | .3425 | 185 | 118    | 143 | 2,0 | 40 | 10 |
| 4157445      | TDG534A08733 | 8,733       | .3438 | 185 | 117    | 143 | 2,0 | 40 | 10 |
| 4157446      | TDG534A08800 | 8,800       | .3465 | 185 | 117    | 143 | 2,1 | 40 | 10 |
| 4157447      | TDG534A08900 | 8,900       | .3504 | 185 | 117    | 143 | 2,1 | 40 | 10 |
| 4157448      | TDG534A09000 | 9,000       | .3543 | 185 | 118    | 143 | 2,1 | 40 | 10 |
| 4157449      | TDG534A09100 | 9,100       | .3583 | 185 | 118    | 143 | 2,1 | 40 | 10 |
| 4157450      | TDG534A09129 | 9,129       | .3594 | 185 | 118    | 143 | 2,1 | 40 | 10 |
| 4157451      | TDG534A09200 | 9,200       | .3622 | 185 | 118    | 143 | 2,1 | 40 | 10 |
| 4157452      | TDG534A09300 | 9,300       | .3661 | 185 | 119    | 143 | 2,2 | 40 | 10 |
| 4157453      | TDG534A09347 | 9,347       | .3680 | 185 | 119    | 143 | 2,2 | 40 | 10 |
| 4157454      | TDG534A09400 | 9,400       | .3701 | 185 | 119    | 143 | 2,2 | 40 | 10 |
| 4157455      | TDG534A09500 | 9,500       | .3740 | 185 | 119    | 143 | 2,2 | 40 | 10 |
| 4157456      | TDG534A09525 | 9,525       | .3750 | 185 | 119    | 143 | 2,2 | 40 | 10 |
| 4157457      | TDG534A09600 | 9,600       | .3780 | 185 | 120    | 143 | 2,2 | 40 | 10 |
| 4157458      | TDG534A09700 | 9,700       | .3819 | 185 | 120    | 143 | 2,3 | 40 | 10 |
| 4157459      | TDG534A09800 | 9,800       | .3858 | 185 | 119    | 143 | 2,3 | 40 | 10 |
| 4157460      | TDG534A09900 | 9,900       | .3898 | 185 | 119    | 143 | 2,3 | 40 | 10 |

(continued)

(TDG534A • 12 x D — continued)

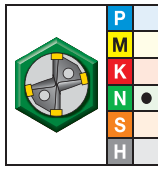


- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4157461      | TDG534A09921 | 9,921       | .3906 | 185 | 120    | 143 | 2,3 | 40 | 10 |
| 4157476      | TDG534A10000 | 10,000      | .3937 | 185 | 120    | 143 | 2,3 | 40 | 10 |
| 4157555      | TDG534A10100 | 10,100      | .3976 | 218 | 140    | 171 | 2,4 | 45 | 12 |
| 4157556      | TDG534A10200 | 10,200      | .4016 | 218 | 140    | 171 | 2,4 | 45 | 12 |
| 4157557      | TDG534A10300 | 10,300      | .4055 | 218 | 141    | 171 | 2,4 | 45 | 12 |
| 4157558      | TDG534A10320 | 10,320      | .4063 | 218 | 141    | 171 | 2,4 | 45 | 12 |
| 4157559      | TDG534A10400 | 10,400      | .4094 | 218 | 141    | 171 | 2,4 | 45 | 12 |
| 4157560      | TDG534A10500 | 10,500      | .4134 | 218 | 141    | 171 | 2,4 | 45 | 12 |
| 4157561      | TDG534A10600 | 10,600      | .4173 | 218 | 142    | 171 | 2,5 | 45 | 12 |
| 4157562      | TDG534A10700 | 10,700      | .4213 | 218 | 142    | 171 | 2,5 | 45 | 12 |
| 4157583      | TDG534A10716 | 10,716      | .4219 | 218 | 142    | 171 | 2,5 | 45 | 12 |
| 4157584      | TDG534A10800 | 10,800      | .4252 | 218 | 141    | 171 | 2,5 | 45 | 12 |
| 4157585      | TDG534A10900 | 10,900      | .4291 | 218 | 141    | 171 | 2,5 | 45 | 12 |
| 4157586      | TDG534A11000 | 11,000      | .4331 | 218 | 142    | 171 | 2,6 | 45 | 12 |
| 4157587      | TDG534A11100 | 11,100      | .4370 | 218 | 142    | 171 | 2,6 | 45 | 12 |
| 4157588      | TDG534A11113 | 11,113      | .4375 | 218 | 142    | 171 | 2,6 | 45 | 12 |
| 4157589      | TDG534A11200 | 11,200      | .4409 | 218 | 142    | 171 | 2,6 | 45 | 12 |
| 4157590      | TDG534A11300 | 11,300      | .4449 | 218 | 143    | 171 | 2,6 | 45 | 12 |
| 4157591      | TDG534A11400 | 11,400      | .4488 | 218 | 143    | 171 | 2,7 | 45 | 12 |
| 4157592      | TDG534A11500 | 11,500      | .4528 | 218 | 143    | 171 | 2,7 | 45 | 12 |
| 4157593      | TDG534A11509 | 11,509      | .4531 | 218 | 143    | 171 | 2,7 | 45 | 12 |
| 4157594      | TDG534A11600 | 11,600      | .4567 | 218 | 144    | 171 | 2,7 | 45 | 12 |
| 4157595      | TDG534A11700 | 11,700      | .4606 | 218 | 144    | 171 | 2,7 | 45 | 12 |
| 4157596      | TDG534A11800 | 11,800      | .4646 | 218 | 143    | 171 | 2,8 | 45 | 12 |
| 4157597      | TDG534A11900 | 11,900      | .4685 | 218 | 143    | 171 | 2,8 | 45 | 12 |
| 4157598      | TDG534A11908 | 11,908      | .4688 | 218 | 143    | 171 | 2,8 | 45 | 12 |
| 4157599      | TDG534A12000 | 12,000      | .4724 | 218 | 144    | 171 | 2,8 | 45 | 12 |
| 4157600      | TDG534A12100 | 12,100      | .4764 | 246 | 164    | 199 | 2,8 | 45 | 14 |
| 4157601      | TDG534A12200 | 12,200      | .4803 | 246 | 164    | 199 | 2,8 | 45 | 14 |
| 4157602      | TDG534A12300 | 12,300      | .4843 | 246 | 165    | 199 | 2,9 | 45 | 14 |
| 4157603      | TDG534A12304 | 12,304      | .4844 | 246 | 165    | 199 | 2,9 | 45 | 14 |
| 4157604      | TDG534A12400 | 12,400      | .4882 | 246 | 165    | 199 | 2,9 | 45 | 14 |
| 4157605      | TDG534A12500 | 12,500      | .4921 | 246 | 165    | 199 | 2,9 | 45 | 14 |
| 4157606      | TDG534A12600 | 12,600      | .4961 | 246 | 165    | 199 | 2,9 | 45 | 14 |
| 4157607      | TDG534A12700 | 12,700      | .5000 | 246 | 166    | 199 | 3,0 | 45 | 14 |
| 4157608      | TDG534A12800 | 12,800      | .5039 | 246 | 166    | 199 | 3,0 | 45 | 14 |
| 4157609      | TDG534A12900 | 12,900      | .5079 | 246 | 165    | 199 | 3,0 | 45 | 14 |
| 4157610      | TDG534A13000 | 13,000      | .5118 | 246 | 166    | 199 | 3,0 | 45 | 14 |
| 4157611      | TDG534A13096 | 13,096      | .5156 | 246 | 166    | 199 | 3,1 | 45 | 14 |
| 4157612      | TDG534A13100 | 13,100      | .5157 | 246 | 166    | 199 | 3,1 | 45 | 14 |

(continued)

(TDG534A • 12 x D — continued)

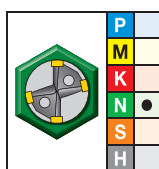


- first choice
- alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4157613      | TDG534A13200 | 13,200      | .5197 | 246 | 166    | 199 | 3,1 | 45 | 14 |
| 4157614      | TDG534A13300 | 13,300      | .5236 | 246 | 167    | 199 | 3,1 | 45 | 14 |
| 4157615      | TDG534A13400 | 13,400      | .5276 | 246 | 167    | 199 | 3,1 | 45 | 14 |
| 4157671      | TDG534A13490 | 13,490      | .5311 | 246 | 167    | 199 | 3,1 | 45 | 14 |
| 4157616      | TDG534A13500 | 13,500      | .5315 | 246 | 167    | 199 | 3,1 | 45 | 14 |
| 4157617      | TDG534A13600 | 13,600      | .5354 | 246 | 167    | 199 | 3,2 | 45 | 14 |
| 4157618      | TDG534A13700 | 13,700      | .5394 | 246 | 168    | 199 | 3,2 | 45 | 14 |
| 4157619      | TDG534A13800 | 13,800      | .5433 | 246 | 168    | 199 | 3,2 | 45 | 14 |
| 4157620      | TDG534A13891 | 13,891      | .5469 | 246 | 167    | 199 | 3,2 | 45 | 14 |
| 4157621      | TDG534A13900 | 13,900      | .5472 | 246 | 167    | 199 | 3,2 | 45 | 14 |
| 4157622      | TDG534A14000 | 14,000      | .5512 | 246 | 168    | 199 | 3,3 | 45 | 14 |
| 4157623      | TDG534A14100 | 14,100      | .5551 | 277 | 188    | 227 | 3,3 | 48 | 16 |
| 4157624      | TDG534A14200 | 14,200      | .5591 | 277 | 188    | 227 | 3,3 | 48 | 16 |
| 4157625      | TDG534A14288 | 14,288      | .5625 | 277 | 188    | 227 | 3,3 | 48 | 16 |
| 4157626      | TDG534A14300 | 14,300      | .5630 | 277 | 188    | 227 | 3,3 | 48 | 16 |
| 4157627      | TDG534A14400 | 14,400      | .5669 | 277 | 189    | 227 | 3,4 | 48 | 16 |
| 4157628      | TDG534A14500 | 14,500      | .5709 | 277 | 189    | 227 | 3,4 | 48 | 16 |
| 4157629      | TDG534A14600 | 14,600      | .5748 | 277 | 189    | 227 | 3,4 | 48 | 16 |
| 4157630      | TDG534A14684 | 14,684      | .5781 | 277 | 190    | 227 | 3,4 | 48 | 16 |
| 4157631      | TDG534A14700 | 14,700      | .5787 | 277 | 190    | 227 | 3,4 | 48 | 16 |
| 4157632      | TDG534A14800 | 14,800      | .5827 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157633      | TDG534A14900 | 14,900      | .5866 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157634      | TDG534A15000 | 15,000      | .5906 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157635      | TDG534A15083 | 15,083      | .5938 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157636      | TDG534A15100 | 15,100      | .5945 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157637      | TDG534A15200 | 15,200      | .5984 | 277 | 190    | 227 | 3,5 | 48 | 16 |
| 4157638      | TDG534A15300 | 15,300      | .6024 | 277 | 191    | 227 | 3,6 | 48 | 16 |
| 4157639      | TDG534A15400 | 15,400      | .6063 | 277 | 191    | 227 | 3,6 | 48 | 16 |
| 4157640      | TDG534A15479 | 15,479      | .6094 | 277 | 191    | 227 | 3,6 | 48 | 16 |
| 4157641      | TDG534A15500 | 15,500      | .6102 | 277 | 191    | 227 | 3,6 | 48 | 16 |
| 4157642      | TDG534A15600 | 15,600      | .6142 | 277 | 191    | 227 | 3,6 | 48 | 16 |
| 4157643      | TDG534A15700 | 15,700      | .6181 | 277 | 192    | 227 | 3,7 | 48 | 16 |
| 4157644      | TDG534A15800 | 15,800      | .6220 | 277 | 192    | 227 | 3,7 | 48 | 16 |
| 4157645      | TDG534A15875 | 15,875      | .6250 | 277 | 192    | 227 | 3,7 | 48 | 16 |
| 4157646      | TDG534A15900 | 15,900      | .6260 | 277 | 192    | 227 | 3,7 | 48 | 16 |
| 4157647      | TDG534A16000 | 16,000      | .6299 | 277 | 192    | 227 | 3,7 | 48 | 16 |
| 4157648      | TDG534A16100 | 16,100      | .6339 | 305 | 212    | 255 | 3,8 | 48 | 18 |
| 4157649      | TDG534A16200 | 16,200      | .6378 | 305 | 212    | 255 | 3,8 | 48 | 18 |
| 4157650      | TDG534A16271 | 16,271      | .6406 | 305 | 212    | 255 | 3,8 | 48 | 18 |
| 4157651      | TDG534A16300 | 16,300      | .6417 | 305 | 212    | 255 | 3,8 | 48 | 18 |

(continued)

(TDG534A • 12 x D — continued)



- first choice  
○ alternate choice

| grade WN10HD |              | D1 diameter |       |     |        |     |     |    |    |
|--------------|--------------|-------------|-------|-----|--------|-----|-----|----|----|
| order #      | catalogue #  | mm          | in    | L   | L4 max | L3  | L5  | LS | D  |
| 4157652      | TDG534A16400 | 16,400      | .6457 | 305 | 213    | 255 | 3,8 | 48 | 18 |
| 4157653      | TDG534A16500 | 16,500      | .6496 | 305 | 213    | 255 | 3,8 | 48 | 18 |
| 4157654      | TDG534A16600 | 16,600      | .6535 | 305 | 213    | 255 | 3,9 | 48 | 18 |
| 4157655      | TDG534A16670 | 16,670      | .6563 | 305 | 214    | 255 | 3,9 | 48 | 18 |
| 4157656      | TDG534A16700 | 16,700      | .6575 | 305 | 214    | 255 | 3,9 | 48 | 18 |
| 4157657      | TDG534A16800 | 16,800      | .6614 | 305 | 214    | 255 | 3,9 | 48 | 18 |
| 4157658      | TDG534A16900 | 16,900      | .6654 | 305 | 214    | 255 | 3,9 | 48 | 18 |
| 4157659      | TDG534A17000 | 17,000      | .6693 | 305 | 214    | 255 | 4,0 | 48 | 18 |
| 4157660      | TDG534A17100 | 17,100      | .6732 | 305 | 214    | 255 | 4,0 | 48 | 18 |
| 4157661      | TDG534A17200 | 17,200      | .6772 | 305 | 214    | 255 | 4,0 | 48 | 18 |
| 4157662      | TDG534A17300 | 17,300      | .6811 | 305 | 214    | 255 | 4,0 | 48 | 18 |
| 4157663      | TDG534A17400 | 17,400      | .6850 | 305 | 215    | 255 | 4,1 | 48 | 18 |
| 4157664      | TDG534A17463 | 17,463      | .6875 | 305 | 215    | 255 | 4,1 | 48 | 18 |
| 4157665      | TDG534A17500 | 17,500      | .6890 | 305 | 215    | 255 | 4,1 | 48 | 18 |
| 4157666      | TDG534A17600 | 17,600      | .6929 | 305 | 215    | 255 | 4,1 | 48 | 18 |
| 4157667      | TDG534A17700 | 17,700      | .6969 | 305 | 216    | 255 | 4,1 | 48 | 18 |
| 4157668      | TDG534A17800 | 17,800      | .7008 | 305 | 216    | 255 | 4,2 | 48 | 18 |
| 4157669      | TDG534A17859 | 17,859      | .7031 | 305 | 216    | 255 | 4,2 | 48 | 18 |
| 4157670      | TDG534A17900 | 17,900      | .7047 | 305 | 216    | 255 | 4,2 | 48 | 18 |
| 4156877      | TDG534A18000 | 18,000      | .7087 | 305 | 216    | 255 | 4,2 | 48 | 18 |
| 4156878      | TDG534A18100 | 18,100      | .7126 | 334 | 237    | 282 | 4,2 | 50 | 20 |
| 4156879      | TDG534A18200 | 18,200      | .7165 | 334 | 236    | 282 | 4,2 | 50 | 20 |
| 4156880      | TDG534A18258 | 18,258      | .7188 | 334 | 236    | 282 | 4,3 | 50 | 20 |
| 4156881      | TDG534A18300 | 18,300      | .7205 | 334 | 236    | 282 | 4,3 | 50 | 20 |
| 4156882      | TDG534A18400 | 18,400      | .7244 | 334 | 237    | 282 | 4,3 | 50 | 20 |
| 4156973      | TDG534A18500 | 18,500      | .7283 | 334 | 237    | 282 | 4,3 | 50 | 20 |
| 4156974      | TDG534A18600 | 18,600      | .7323 | 334 | 237    | 282 | 4,3 | 50 | 20 |
| 4156975      | TDG534A18654 | 18,654      | .7344 | 334 | 237    | 282 | 4,3 | 50 | 20 |
| 4156976      | TDG534A18700 | 18,700      | .7362 | 334 | 237    | 282 | 4,4 | 50 | 20 |
| 4156977      | TDG534A18800 | 18,800      | .7402 | 334 | 238    | 282 | 4,4 | 50 | 20 |
| 4156978      | TDG534A18900 | 18,900      | .7441 | 334 | 238    | 282 | 4,4 | 50 | 20 |
| 4156979      | TDG534A19000 | 19,000      | .7480 | 334 | 238    | 282 | 4,4 | 50 | 20 |
| 4156980      | TDG534A19050 | 19,050      | .7500 | 334 | 239    | 282 | 4,4 | 50 | 20 |
| 4156981      | TDG534A19100 | 19,100      | .7520 | 334 | 239    | 282 | 4,5 | 50 | 20 |
| 4156982      | TDG534A19200 | 19,200      | .7559 | 334 | 238    | 282 | 4,5 | 50 | 20 |
| 4156983      | TDG534A19300 | 19,300      | .7598 | 334 | 238    | 282 | 4,5 | 50 | 20 |
| 4156984      | TDG534A19400 | 19,400      | .7638 | 334 | 239    | 282 | 4,5 | 50 | 20 |
| 4156985      | TDG534A19500 | 19,500      | .7677 | 334 | 239    | 282 | 4,5 | 50 | 20 |
| 4156986      | TDG534A19600 | 19,600      | .7717 | 334 | 239    | 282 | 4,6 | 50 | 20 |
| 4156987      | TDG534A19700 | 19,700      | .7756 | 334 | 239    | 282 | 4,6 | 50 | 20 |
| 4156988      | TDG534A19800 | 19,800      | .7795 | 334 | 240    | 282 | 4,6 | 50 | 20 |
| 4156989      | TDG534A19900 | 19,900      | .7835 | 334 | 240    | 282 | 4,6 | 50 | 20 |
| 4156990      | TDG534A20000 | 20,000      | .7874 | 334 | 240    | 282 | 4,7 | 50 | 20 |

■ TOP DRILL G • TDG532/TDG533/TDG534 • WN10HD™ • Through Coolant • Metric

| Material Group |            |  |  |           |           |           |           |           |           |           |           |  |
|----------------|------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--|
|                |            | Cutting Speed<br>— vc                                                             | Recommended Feed Rate (f) by Diameter                                              |           |           |           |           |           |           |           |           |  |
|                |            | Range — m/min                                                                     |                                                                                    |           |           |           |           |           |           |           |           |  |
|                |            | min — min                                                                         | Tool Diameter<br>(mm)                                                              | 3,0       | 4,0       | 6,0       | 8,0       | 10,0      | 12,0      | 16,0      | 20,0      |  |
| N              | 21         | 100 — 450                                                                         | mm/r                                                                               | 0,16–0,25 | 0,19–0,29 | 0,23–0,35 | 0,27–0,42 | 0,31–0,50 | 0,36–0,57 | 0,44–0,69 | 0,52–0,82 |  |
|                | 22, 23, 24 | 100 — 300                                                                         | mm/r                                                                               | 0,15–0,23 | 0,17–0,28 | 0,21–0,34 | 0,25–0,39 | 0,30–0,46 | 0,34–0,54 | 0,42–0,67 | 0,52–0,82 |  |
|                | 26         | 100 — 250                                                                         | mm/r                                                                               | 0,16–0,28 | 0,15–0,32 | 0,19–0,36 | 0,23–0,40 | 0,25–0,44 | 0,28–0,48 | 0,32–0,56 | 0,35–0,63 |  |

| Metric tolerance   |                 |                |
|--------------------|-----------------|----------------|
| nominal size range | D1 tolerance m7 | D tolerance h6 |
| >3–6               | 0,004/0,016     | 0,000/-0,008   |
| >6–10              | 0,006/0,021     | 0,000/-0,009   |
| >10–18             | 0,007/0,025     | 0,000/-0,011   |
| >18–25,4           | 0,008/0,029     | 0,000/-0,013   |

# WIDIA™ Solid Carbide Drills — Reconditioning

Anyone can regrind your tools — only we can recondition them.

WIDIA™ Reconditioning Services optimise the value of metalcutting tools throughout their entire lifecycle by giving like-new performance — with rapid turnaround time — so tools are always on hand and perform just like new.

## How Does WIDIA Do It?

- Reconditioned tooling undergoes the same process as new tools — the same drill point (WIDIA proprietary geometry) and coating are applied back on the tool.
- Tooling is returned to like-new condition, with WIDIA proprietary geometry providing a longer tooling lifecycle and increased performance.
- With current lead-time less than 10 days, customers get tools back quickly — lowering cost-per-tool usage.



## WIDIA Solid Carbide Drills Reconditioning Product Lines.

- VariDrill™
- Top DRILL S™ for Steel
- Top DRILL S™ for Cast Iron
- Top DRILL S+™
- Top DRILL G™



## Getting Started

1. Visit **www.widia.com**. Click on the “Services” tab, then select “Tool Reconditioning”.
2. Select the reconditioning centre nearest you.
3. Select and print the drill reconditioning form.
4. Complete the form, and ship to the WIDIA™ Reconditioning Centre near you.
5. Drills are reconditioned to like-new condition and returned to you.



## Improve your logistics and protect your investment by using the WIDIA™ Blue Box™ Programme. It is easy as 1, 2, 3...

1. You can either load your tools into our specially designed, reusable Blue Box, or carefully package tools in a sturdy shipping box. Download the form from the WIDIA website.
2. Contact your local Customer Service location for instructions, then send the tools to the nearest WIDIA Reconditioning Centre.
3. WIDIA will recondition and return your tools in like-new condition to boost your productivity!

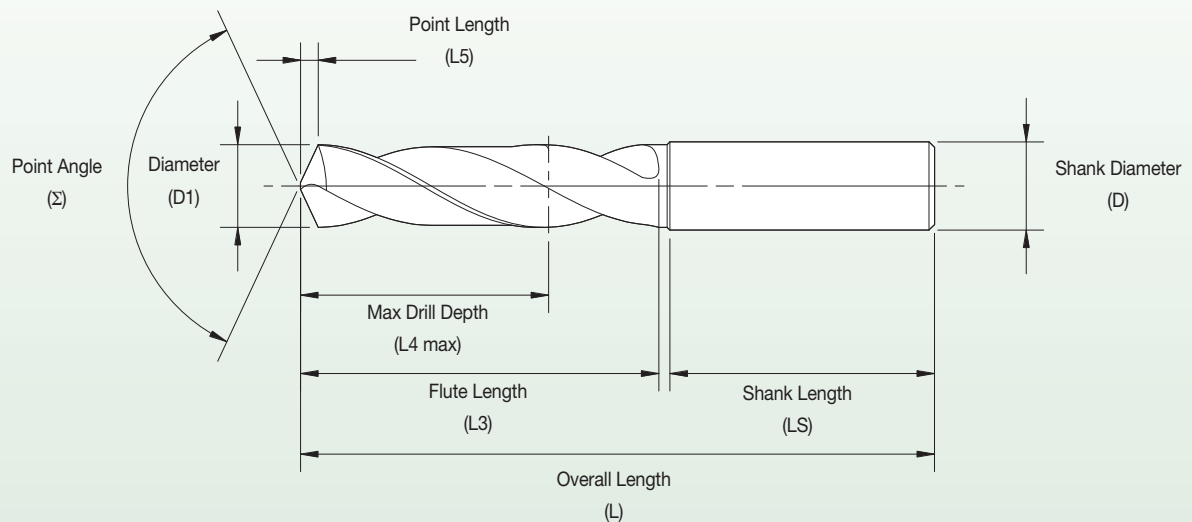


*\*Boxes available from reconditioning centres.*

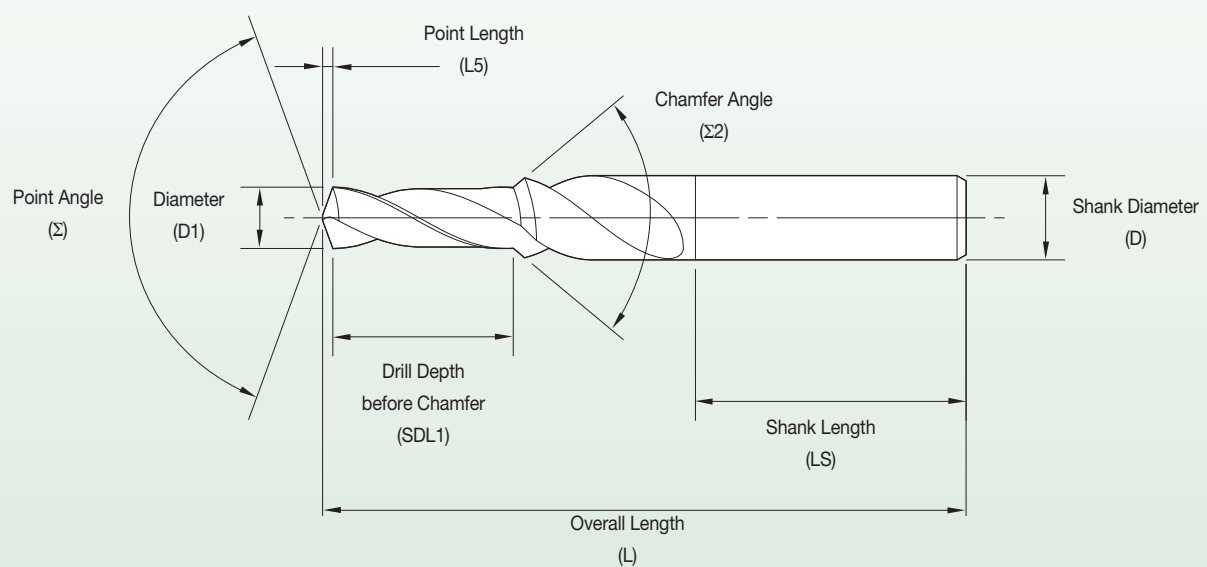


## The Anatomy of a Drill

Use this diagram when describing features of a solid carbide drill.



Use this diagram when describing features of a solid carbide step drill.



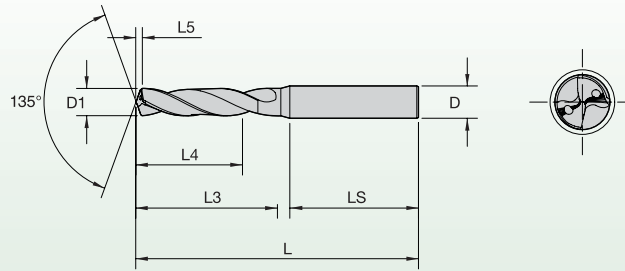
## Shank Designs to DIN 6535



Form HE,  
2° angle  
Design F



Form HA,  
straight  
design A



## Dimensions for WIDIA™ High-Performance Solid Carbide Drills

| mm<br>Ø |        | DIN 6535 |    | SHORT*<br>~3 x D |    |        | LONG*<br>~5 x D |     |        | EXTRA LONG**<br>~8 x D |     |        |
|---------|--------|----------|----|------------------|----|--------|-----------------|-----|--------|------------------------|-----|--------|
| D1 min  | D1 max | D        | LS | L                | L3 | L4 max | L               | L3  | L4 max | L                      | L3  | L4 max |
| 1,000   | 1,400  | 4        | 28 | 58               | 7  | 5      | 58              | 9   | 6      | 58                     | 12  | 10     |
| 1,401   | 1,900  | 4        | 28 | 58               | 9  | 6      | 58              | 12  | 9      | 58                     | 18  | 15     |
| 1,901   | 2,300  | 4        | 28 | 58               | 13 | 9      | 58              | 18  | 14     | 66                     | 26  | 22     |
| 2,301   | 2,999  | 4        | 28 | 58               | 17 | 12     | 58              | 22  | 17     | 66                     | 30  | 25     |
| 3,000   | 3,750  | 6        | 36 | 62               | 20 | 14     | 66              | 28  | 23     | 78                     | 40  | 33     |
| 3,751   | 4,750  | 6        | 36 | 66               | 24 | 17     | 74              | 36  | 29     | 87                     | 49  | 41     |
| 4,751   | 6,000  | 6        | 36 | 66               | 28 | 20     | 82              | 44  | 35     | 94                     | 56  | 48     |
| 6,001   | 7,000  | 8        | 36 | 79               | 34 | 24     | 91              | 53  | 43     | 105                    | 67  | 57     |
| 7,001   | 8,000  | 8        | 36 | 79               | 41 | 29     | 91              | 53  | 43     | 110                    | 72  | 61     |
| 8,001   | 10,000 | 10       | 40 | 89               | 47 | 35     | 103             | 61  | 49     | 122                    | 80  | 68     |
| 10,001  | 12,000 | 12       | 45 | 102              | 55 | 40     | 118             | 71  | 56     | 141                    | 94  | 79     |
| 12,001  | 14,000 | 14       | 45 | 107              | 60 | 43     | 124             | 77  | 60     | 155                    | 108 | 91     |
| 14,001  | 16,000 | 16       | 48 | 115              | 65 | 45     | 133             | 83  | 63     | 171                    | 121 | 101    |
| 16,001  | 18,000 | 18       | 48 | 123              | 73 | 51     | 143             | 93  | 71     | 185                    | 135 | 113    |
| 18,001  | 20,000 | 20       | 50 | 131              | 79 | 55     | 153             | 101 | 77     | 200                    | 148 | 124    |
| 20,001  | 22,000 | 20       | 50 | 141              | 86 | 60     | 167             | 112 | 85     | 217                    | 162 | 136    |
| 22,001  | 25,000 | 25       | 56 | 153              | 95 | 65     | 184             | 126 | 98     | 238                    | 180 | 150    |

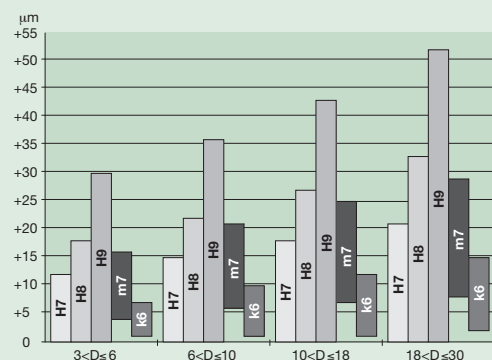
\* D1 < 20mm to DIN 6537K  
D1 > 20mm to factory standard  
\*\* To factory standard

NOTE: Solid Carbide Drills from WIDIA in short and regular lengths conform to DIN 6537.  
Drills with long lengths conform to WIDIA factory standard.  
Solid Carbide Drills with diameter D1 > 20mm (not DIN 6537) are also standardised to factory standard.

## Tolerances of Drills and Holes

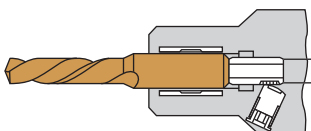
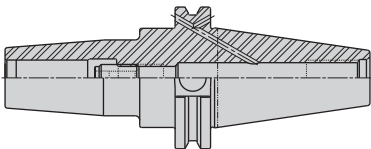
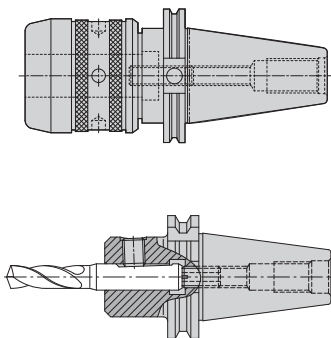
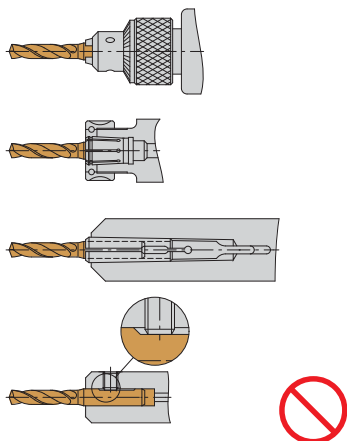
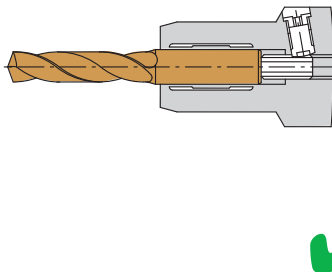
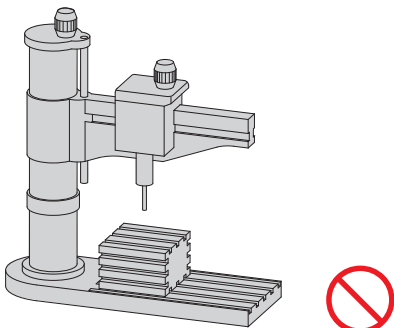
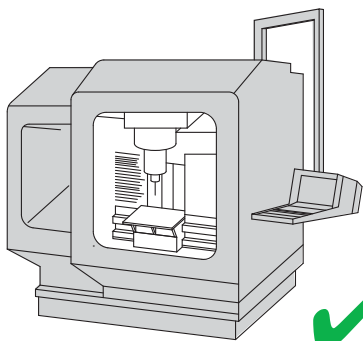
High-performance solid carbide drills with tolerances of m7 create holes with tolerances of H9. H8 can be achieved in very good conditions. The drill should be used for holes in H8, and in favourable conditions, H7 can be achieved. Solid carbide drills with H7 create holes in K9-K11. Other drilling tolerances require special solid carbide drill versions.

Tolerances of diameter D1 on:  
Spiral Flute  
TDG Drill



## Toolholding Systems

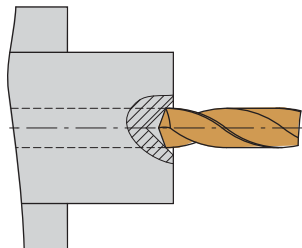
As with any drilling system, components of the entire system contribute to the quality of the machined hole, not just the drill itself. For maximum efficiency and accuracy, the following toolholding systems are your best choices:

|                                                                                                                                   |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>First Choice</b><br/>Hydraulic chucks</p>  | <p><b>Second Choice</b><br/>Shrink Fit</p>                                                                                                                                                                                               | <p><b>Third Choice</b><br/>High-performance milling chucks with reduction sleeves</p>                                      |
| <p><b>Not Recommended</b></p>                  | <p><b>Clamping Chuck</b><br/>Use of all-purpose drilling chuck collets, clamping sleeves, and Weldon® clamping chucks should be avoided because they do not absorb cutting forces reliably and provide insufficient precision of concentricity.</p>                                                                       | <p><b>Highly Recommended</b><br/>Hydraulic chucks ensure a secure torque transmission with excellent concentricity.</p>  |
| <p><b>Not Recommended</b></p>                  | <p><b>Machine</b><br/>Solid carbide drills have a much higher rigidity than conventional high-speed steel drills. This enables the machining of close-tolerance holes with a position accuracy of <math>\pm 0.025\text{mm}</math>. However, it also means that drills require rigid machine tools with good spindles.</p> | <p><b>Rigid Machine Tool Recommended</b></p>                                                                             |

(continued)

(continued)

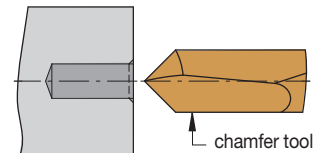
**Wrong**



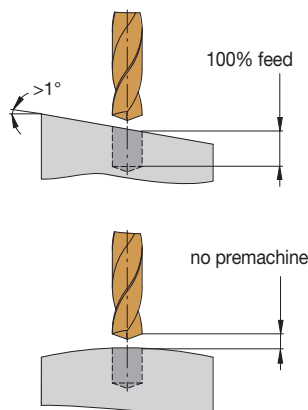
**Drilling and Chamfering**

Drill into the solid first, then chamfer.

**Correct**



**Wrong**



**Drilling on Inclined or Rounded Surfaces**

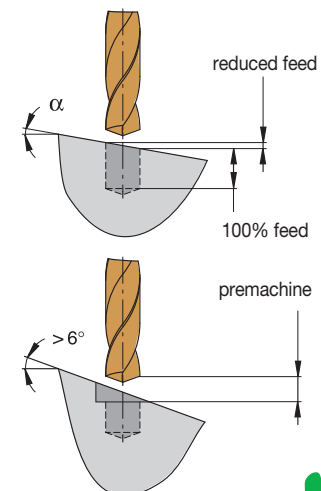
When drilling on inclined or curved surfaces, use a lower feed than the standard value. The reduction of feed required is dependent on the inclination angle of the workpiece surface and the drill type (see table).

reduced feed (% of standard value)

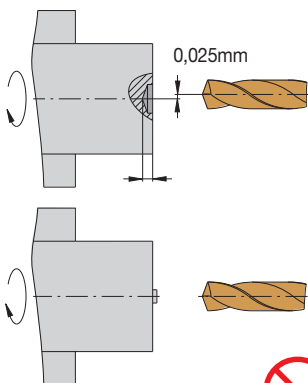
| inclination<br>$\alpha$ | 3 x D  | 5 x D<br>Long | <5 x D     |
|-------------------------|--------|---------------|------------|
| 1°                      | 100%   | 80%           | premachine |
| 2°                      | 80–50% | 80–50%        | premachine |
| 3°                      | 65%    | 50%           | premachine |
| 4°                      | 50%    | premachine    | premachine |
| 6°                      | 30%    | premachine    | premachine |

Premachining is usually done with an end mill operation.

**Correct**



**Wrong**



**Drilling on Turning Machines**

When drilling on turning machines, the drill must be on centre. The tolerance range of the centre position should not exceed  $\pm 0.025\text{mm}$ . On bar-turning lathes, do not drill into centre stub or bur. Cut-off tools must be mounted precisely to eliminate centre stub or bur. Do not drill into pre-existing holes.

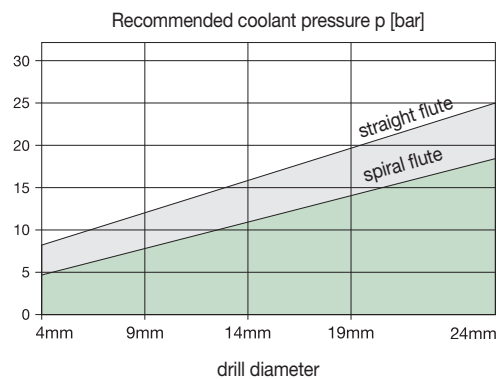
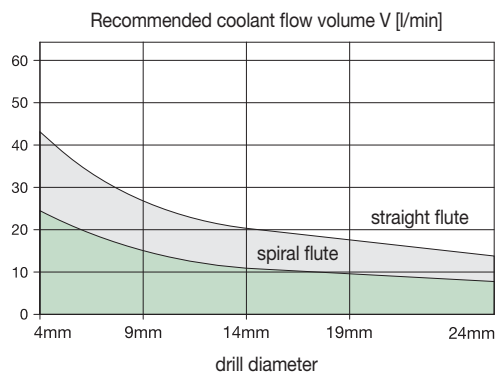
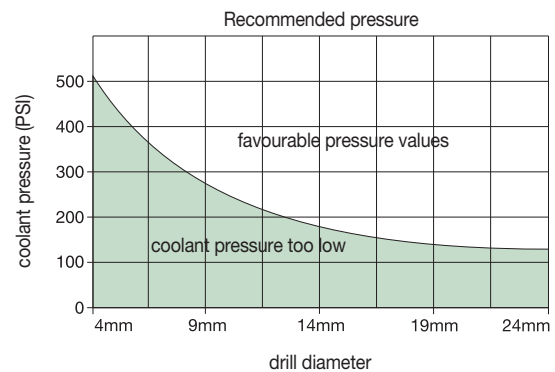
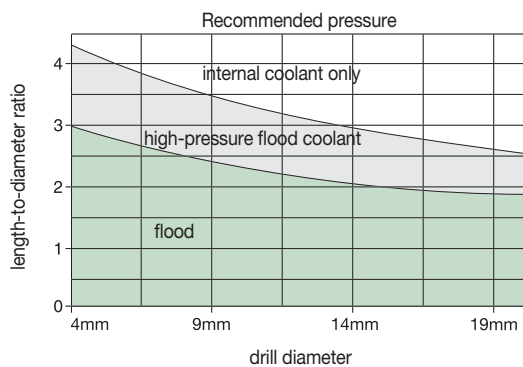
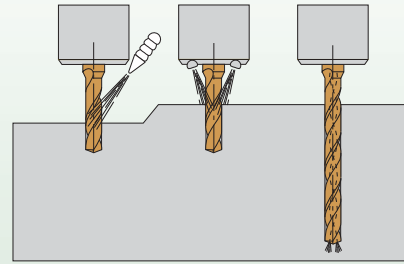
**Hole Depths Greater than 3 x D**

Hole depths that are deeper than three times the drill diameter may require a speed reduction. A 15% lower speed is suggested.

## Coolant

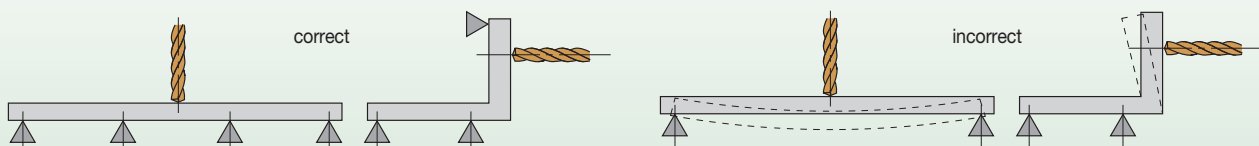
- To optimise their performance, drills must be adequately cooled. With the proper coolant flow, better tool life and higher maximum effective cutting speeds can be achieved.
- If not properly cooled, the drill will heat up rapidly. This causes the drill diameter to expand, which in turn may cause the drill to seize inside the hole.
- Solid carbide drills with internal coolant channels require deeper drilling depths to be effective. The higher the coolant pressure, the better the drilling results. Drill life and hole quality improve with ample coolant flow.
- When using drills without internal coolant flow, try to get at least one coolant jet as parallel to the drill as possible.
- For short-hole applications, drills without internal coolant may often provide better tool life. The tool is more solid, and it does not suffer from thermal shock at the cutting edge.
- It is important to use high coolant concentration to provide lubricity, which will aid in tool life, chip evacuation, and finer surface finishes.
- High-pressure coolant, either through the tool or through a line adjacent and parallel to the tool, should always be considered for increased tool life and production.
- Do not use multi-coolant lines. Use one line with 100% of the flow capacity to evacuate the chips from the hole.

Coolant requirement for carbide drills

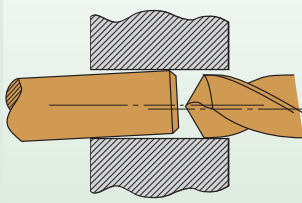
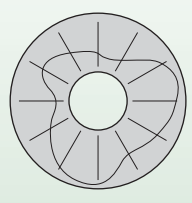
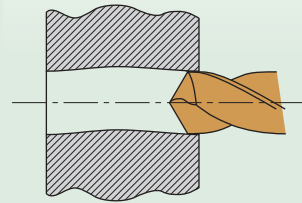


## Workpiece Rigidity

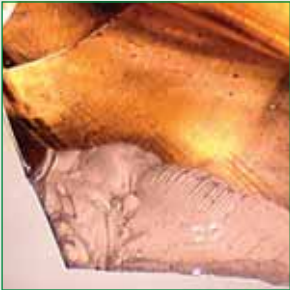
Because solid carbide drills have much higher penetration rates, it is important that the workpiece has adequate support.



| problem                                                                                                                            | source                                            | solution                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>heavy wear on the cutting corners</b><br><br>  | <b>insufficient coolant</b>                       | <ul style="list-style-type: none"> <li>Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.</li> </ul> |
|                                                                                                                                    | <b>workpiece movement</b>                         | <ul style="list-style-type: none"> <li>Stabilise workpiece chucking and check stability of machine tool.</li> </ul>                                                                                                                            |
|                                                                                                                                    | <b>wrong drill</b>                                | <ul style="list-style-type: none"> <li>Check drill type, drilling depth, cooling system, and workpiece material.</li> </ul>                                                                                                                    |
|                                                                                                                                    | <b>cutting conditions</b>                         | <ul style="list-style-type: none"> <li>Reduce cutting speed; increase feed.</li> </ul>                                                                                                                                                         |
| <b>splintering on the chisel edge</b><br><br>    | <b>clamping chuck</b>                             | <ul style="list-style-type: none"> <li>Check clamping accuracy. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                                                     |
|                                                                                                                                    | <b>cutting conditions</b>                         | <ul style="list-style-type: none"> <li>Decrease feed; increase speed.</li> </ul>                                                                                                                                                               |
| <b>built-up edge</b><br><br>                    | <b>insufficient coolant</b>                       | <ul style="list-style-type: none"> <li>Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.</li> </ul> |
|                                                                                                                                    | <b>cutting conditions</b>                         | <ul style="list-style-type: none"> <li>Increase speed 20–30%.</li> </ul>                                                                                                                                                                       |
| <b>splintering on the cutting edges</b><br><br> | <b>clamping chuck</b>                             | <ul style="list-style-type: none"> <li>Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                             |
|                                                                                                                                    | <b>cutting conditions caused by built-up edge</b> | <ul style="list-style-type: none"> <li>Check cutting values, and possibly increase cutting speed.</li> </ul>                                                                                                                                   |
|                                                                                                                                    |                                                   | <ul style="list-style-type: none"> <li>Examine regularly for built-up edge.</li> </ul>                                                                                                                                                         |
| <b>thermal checking/comb cracking</b><br><br>   | <b>cutting conditions</b>                         | <ul style="list-style-type: none"> <li>Adapt coolant and cutting conditions to reduce thermal shock.</li> </ul>                                                                                                                                |

| problem                                                                                                                | source                      | solution                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>hole too big</b><br><br>           | <b>cutting conditions</b>   | <ul style="list-style-type: none"> <li>• Check cutting values, increase cutting speed, or reduce feed.</li> </ul>                                                                                                                                |
|                                                                                                                        | <b>clamping chuck</b>       | <ul style="list-style-type: none"> <li>• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                             |
|                                                                                                                        | <b>wrong drill</b>          | <ul style="list-style-type: none"> <li>• Check drill diameter. Please note that drills are ground to a positive tolerance. Check concentric running.</li> </ul>                                                                                  |
| <b>hole too small</b><br><br>        | <b>insufficient coolant</b> | <ul style="list-style-type: none"> <li>• Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.</li> </ul> |
|                                                                                                                        | <b>cutting conditions</b>   | <ul style="list-style-type: none"> <li>• Decrease feed; increase speed.</li> </ul>                                                                                                                                                               |
|                                                                                                                        | <b>wrong drill</b>          | <ul style="list-style-type: none"> <li>• Check cutting-edge diameter.</li> </ul>                                                                                                                                                                 |
| <b>hole not cylindrical</b><br><br> | <b>clamping chuck</b>       | <ul style="list-style-type: none"> <li>• Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                             |
|                                                                                                                        | <b>workpiece movement</b>   | <ul style="list-style-type: none"> <li>• Stabilise workpiece chucking and check stability of machine tool.</li> </ul>                                                                                                                            |
|                                                                                                                        | <b>wrong drill</b>          | <ul style="list-style-type: none"> <li>• Check drill type and drilling depth. Use longer drills.</li> </ul>                                                                                                                                      |
|                                                                                                                        | <b>cutting conditions</b>   | <ul style="list-style-type: none"> <li>• Reduce feed at entry.</li> </ul>                                                                                                                                                                        |



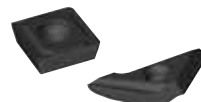
| problem                                                                                                                              | source                      | solution                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>drill breakage</b><br><br>                       | <b>clamping chuck</b>       | <ul style="list-style-type: none"> <li>Check clamping accuracy and torque transmission. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                             |
|                                                                                                                                      | <b>workpiece movement</b>   | <ul style="list-style-type: none"> <li>Stabilise workpiece chucking and check stability of machine tool.</li> </ul>                                                                                                                            |
|                                                                                                                                      | <b>wrong drill</b>          | <ul style="list-style-type: none"> <li>Check drill type, drilling depth, cooling system, and workpiece material.</li> </ul>                                                                                                                    |
|                                                                                                                                      | <b>insufficient coolant</b> | <ul style="list-style-type: none"> <li>Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.</li> </ul> |
|                                                                                                                                      | <b>cutting conditions</b>   | <ul style="list-style-type: none"> <li>Check cutting values, and possibly reduce feed.</li> </ul>                                                                                                                                              |
|                                                                                                                                      | <b>clamping chuck</b>       | <ul style="list-style-type: none"> <li>Check torque transmission. Use hydraulic clamping chuck or high-precision chucking system.</li> </ul>                                                                                                   |
| <b>splintering on the cutting corners</b><br><br> | <b>workpiece movement</b>   | <ul style="list-style-type: none"> <li>Stabilise workpiece chucking and check stability of machine tool.</li> </ul>                                                                                                                            |
|                                                                                                                                      | <b>wrong drill</b>          | <ul style="list-style-type: none"> <li>Check drill type, drilling depth, cooling system, and workpiece material. Possibly use longer drill.</li> </ul>                                                                                         |
|                                                                                                                                      | <b>insufficient coolant</b> | <ul style="list-style-type: none"> <li>Check cooling lubricant. In the case of internal coolant supply, increase coolant pressure. In the case of external coolant supply, adjust positioning of coolant jet. Cool from both sides.</li> </ul> |
|                                                                                                                                      | <b>cutting conditions</b>   | <ul style="list-style-type: none"> <li>Check cutting values, and possibly reduce feed.</li> </ul>                                                                                                                                              |



## Modular Drills

|                    |         |
|--------------------|---------|
| Introduction.....  | U2-U3   |
| TOP DRILL M1 ..... | U4-U24  |
| Spade Blades ..... | U26-U45 |



| modular drills<br>with internal<br>coolant channel                                 | grade/series            | standard*                            |   |   |   |   |   | standard range    |                  |                    |               |                        |  |               |
|------------------------------------------------------------------------------------|-------------------------|--------------------------------------|---|---|---|---|---|-------------------|------------------|--------------------|---------------|------------------------|--|---------------|
|                                                                                    |                         | ● first choice<br>○ alternate choice |   |   |   |   |   | diameter range    |                  |                    |               |                        |  |               |
|                                                                                    |                         | P                                    | M | K | N | S | H |                   |                  |                    |               |                        |  |               |
|                                                                                    |                         |                                      |   |   |   |   |   | hole<br>tolerance | D1 mm<br>min-max | D1 inch<br>min-max |               | drilling depth<br>L/D1 |  |               |
| TOP DRILL M1™ with front clamping mechanism                                        |                         |                                      |   |   |   |   |   |                   |                  |                    |               |                        |  |               |
|   | TOP DRILL M1<br>inserts | WU25PD**                             | ● | ○ | ● |   |   |                   | IT9-IT11         | 7,94-25,99         | .3125-1.1023  | —                      |  |               |
|   | chamfering<br>inserts   | TopSTEP SH—<br>WP20PH                | ● | ○ | ○ | ● | ○ |                   | —                | 12,50-36,01        | .4921-1.4177  | —                      |  |               |
|                                                                                    |                         | TopSTEP VG—<br>WP20PH                | ● | ○ | ○ | ○ | ○ |                   | —                |                    |               |                        |  |               |
|  | TOP DRILL M1<br>bodies  | —                                    |   |   |   |   |   |                   | —                | 7,94≤Ø<9,50        | .3125≤Ø<.3740 | max 3-8 x D            |  |               |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 9,50≤Ø<11,00  |                        |  | .3740≤Ø<.4331 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 11,00≤Ø<12,50 |                        |  | .4331≤Ø<.4921 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 12,50≤Ø<14,00 |                        |  | .4921≤Ø<.5512 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 14,00≤Ø<15,50 |                        |  | .5512≤Ø<.6102 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 15,50≤Ø<16,50 |                        |  | .6102≤Ø<.6496 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 16,50≤Ø<20,50 |                        |  | .6496≤Ø<.8071 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 20,50≤Ø<21,00 |                        |  | .8071≤Ø<.8268 |
|                                                                                    |                         |                                      |   |   |   |   |   |                   |                  |                    | 21,00≤Ø<25,99 |                        |  | .8268≤Ø<1.023 |

\* Apart from our standard drills, we can offer you a wide variety of special coating solutions and edge preparations to fulfill all your needs.  
If a specific drill is not suitable for your workpiece material, please contact your WIDIA™ distributor for available options.

\*\* Grade WU25PD™ was previously named K20FTIAIN.

● Standard Product  
○ Engineered Solutions

|                                                         | engineered solution range |                 |                    | coolant                                                                           | drilling                                                                          | inclined exit                                                                     | counter-sinking                                                                   | counter-boring                                                                    | 2 flute, 2 margin cooled                                                            | corner chamfer                                                                      | plain shank $\leq H6$                                                               | SCF Shanks                                                                          | page(s) |
|---------------------------------------------------------|---------------------------|-----------------|--------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------|
|                                                         | diameter range            |                 |                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |         |
|                                                         | D1 mm min-max             | D1 inch min-max | max drilling depth |  |  |  |  |  |  |  |  |  |         |
| TOP DRILL M1™ with front clamping mechanism (continued) |                           |                 |                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |         |
|                                                         | 7,94–27,99                | .3125–1.1020    | –                  |                                                                                   | ●                                                                                 | ●                                                                                 |                                                                                   |                                                                                   |                                                                                     | ●                                                                                   | ●                                                                                   |                                                                                     | U10–U15 |
|                                                         | 12,50–36,01               | .4921–1.4177    | –                  |                                                                                   |                                                                                   |                                                                                   | ●                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     | U16–U19 |
|                                                         |                           |                 | –                  |                                                                                   |                                                                                   |                                                                                   | ●                                                                                 | ●                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |         |
|                                                         | 7,94≤Ø<9,50               | .3125≤Ø<.3740   | 12 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   | U6–U8   |
|                                                         | 9,50≤Ø<11,00              | .3740≤Ø<.4331   | 13 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 11,00≤Ø<12,50             | .5424≤Ø<.4921   | 14 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 12,50≤Ø<14,00             | .4921≤Ø<.5512   | 15 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 14,00≤Ø<15,00             | .5512≤Ø<.6102   | 16 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 15,50≤Ø<16,50             | .6102≤Ø<.6496   | 17 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 16,50≤Ø<20,50             | .6496≤Ø<.8070   | 18 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 20,50≤Ø<21,00             | .8070≤Ø<.8267   | 20 x D             | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |
|                                                         | 21,00≤Ø<27,99             | .8267≤Ø<1.1010  | 500,0mm            | ●                                                                                 | ●                                                                                 | ●                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     |                                                                                     | ●                                                                                   | ●                                                                                   |         |

## TOP DRILL M1™ Modular Drill System

With performance levels and metal removal rates comparable to that of solid carbide drills, WIDIA™ TOP DRILL M1 offers all the quality and performance you need in one versatile, economical package. The unique front clamping system enables inserts to be changed quickly, even inside the machine tool, saving setup time and manufacturing costs.



# TOP DRILL M1™

The TDM1 platform offers UP(M) drill point design in WU25PD™ grade – a wide application range geometry, specially developed for cost-efficient drilling of steel, cast iron, and stainless steel. It covers diameter ranges from 8–25.99mm within the standard offering in L/D ratios of 3, 5, and 8 x D.

With its high level of performance, wide application range, and proven point geometry, TDM1 combines all of the economic benefits of a modular drilling system with the machining performance and hole quality to tackle even your most challenging operations.

### **UP Point Design – Versatility and Productivity**

- One insert style for all your work in steel, cast iron, and even stainless steels.
- Low cutting forces and excellent centring capabilities.
- Universal point style for consistent performance and excellent hole quality.

### **Easy Insert Change**

- No screws or clamps required.
- Insert blades can be changed with a simple wrench that comes with each holder.

### **Disposable**

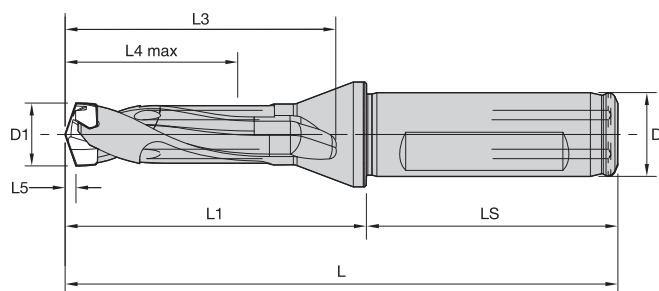
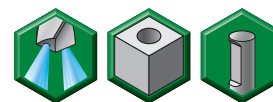
- No reconditioning costs.
- Consistent performance from tip to tip.
- Eliminates number of tools waiting for reconditioning, thus avoiding hidden costs.

### **Customisation**

- All intermediate diameters are quickly available as semi-standards.
- Multiple step drills available as customised solutions.
- New TopSTEP range of inserts offer extended chamfering and counterboring to your one-shot drilling solution.



- Tool body shipped with insert wrench.

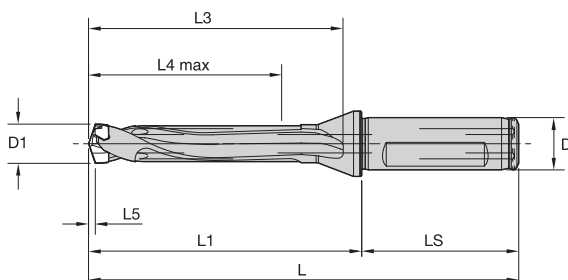
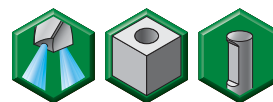


■ TOP DRILL M1 • 3 x D • Flanged • Metric

| order number | catalogue number | D1    | D1 max | D  | L   | L1  | L3  | L4 max | L5  | LS | insert blade seat size |
|--------------|------------------|-------|--------|----|-----|-----|-----|--------|-----|----|------------------------|
| 3850904      | TDM080R3SCF12M   | 7,94  | 8,49   | 12 | 86  | 41  | 35  | 26     | 1,5 | 45 | W10                    |
| 3850906      | TDM085R3SCF12M   | 8,50  | 8,99   | 12 | 88  | 43  | 37  | 27     | 1,6 | 45 | W11                    |
| 3850908      | TDM090R3SCF12M   | 9,00  | 9,49   | 12 | 90  | 45  | 39  | 29     | 1,7 | 45 | W12                    |
| 3850910      | TDM095R3SCF12M   | 9,50  | 9,99   | 12 | 92  | 47  | 41  | 30     | 1,8 | 45 | W13                    |
| 3850912      | TDM100R3SCF16M   | 10,00 | 10,49  | 16 | 97  | 49  | 43  | 32     | 1,9 | 48 | W14                    |
| 3850924      | TDM105R3SCF16M   | 10,50 | 10,99  | 16 | 99  | 51  | 45  | 33     | 2,0 | 48 | W15                    |
| 3850926      | TDM110R3SCF16M   | 11,00 | 11,49  | 16 | 101 | 53  | 47  | 35     | 2,1 | 48 | W16                    |
| 3850928      | TDM115R3SCF16M   | 11,50 | 11,99  | 16 | 103 | 55  | 49  | 36     | 2,2 | 48 | W17                    |
| 3850930      | TDM120R3SCF16M   | 12,00 | 12,49  | 16 | 106 | 58  | 52  | 38     | 2,3 | 48 | W18                    |
| 3850932      | TDM125R3SCF16M   | 12,50 | 12,99  | 16 | 108 | 60  | 54  | 39     | 2,4 | 48 | W19                    |
| 3850934      | TDM130R3SCF16M   | 13,00 | 13,49  | 16 | 110 | 62  | 56  | 41     | 2,5 | 48 | W20                    |
| 3850936      | TDM135R3SCF16M   | 13,50 | 13,99  | 16 | 112 | 64  | 58  | 42     | 2,6 | 48 | W21                    |
| 3850938      | TDM140R3SCF16M   | 14,00 | 14,49  | 16 | 114 | 66  | 60  | 44     | 2,7 | 48 | W22                    |
| 3850940      | TDM145R3SCF16M   | 14,50 | 14,99  | 16 | 116 | 68  | 62  | 45     | 2,8 | 48 | W23                    |
| 3850942      | TDM150R3SCF20M   | 15,00 | 15,99  | 20 | 122 | 72  | 66  | 48     | 2,8 | 50 | W24                    |
| 3850944      | TDM160R3SCF20M   | 16,00 | 16,99  | 20 | 126 | 76  | 70  | 51     | 3,0 | 50 | W25                    |
| 3850946      | TDM170R3SCF20M   | 17,00 | 17,99  | 20 | 131 | 81  | 75  | 54     | 3,2 | 50 | W26                    |
| 3850948      | TDM180R3SCF25M   | 18,00 | 18,99  | 25 | 141 | 85  | 79  | 57     | 3,4 | 56 | W27                    |
| 3850950      | TDM190R3SCF25M   | 19,00 | 19,99  | 25 | 144 | 89  | 83  | 60     | 3,6 | 56 | W28                    |
| 3850952      | TDM200R3SCF25M   | 20,00 | 20,99  | 25 | 149 | 93  | 87  | 63     | 3,8 | 56 | W29                    |
| 3992070      | TDM210R3SCF25M   | 21,00 | 21,99  | 25 | 153 | 97  | 91  | 66     | 3,7 | 56 | W30                    |
| 3992071      | TDM220R3SCF25M   | 22,00 | 22,99  | 25 | 158 | 102 | 96  | 69     | 3,9 | 56 | W31                    |
| 3992072      | TDM230R3SCF25M   | 23,00 | 23,99  | 25 | 162 | 106 | 100 | 72     | 4,1 | 56 | W32                    |
| 3992483      | TDM240R3SCF25M   | 24,00 | 24,99  | 25 | 166 | 110 | 104 | 75     | 4,2 | 56 | W33                    |
| 3992484      | TDM250R3SCF25M   | 25,00 | 25,99  | 25 | 170 | 114 | 108 | 78     | 4,4 | 56 | W34                    |



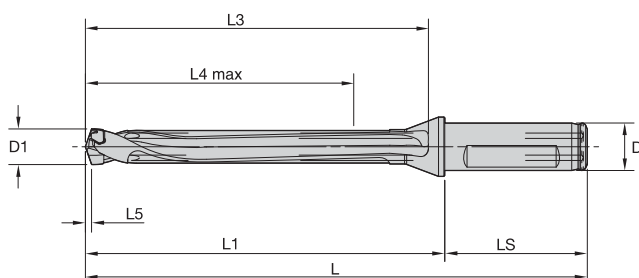
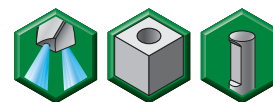
- Tool body shipped with insert wrench.



### ■ TOP DRILL M1 • 5 x D • Flanged • Metric

| order number | catalogue number | D1    | D1 max | D  | L   | L1  | L3  | L4 max | L5  | LS | insert blade<br>seat size |
|--------------|------------------|-------|--------|----|-----|-----|-----|--------|-----|----|---------------------------|
| 3850905      | TDM080R5SCF12M   | 7,94  | 8,49   | 12 | 104 | 59  | 53  | 43     | 1,5 | 45 | W10                       |
| 3850907      | TDM085R5SCF12M   | 8,50  | 8,99   | 12 | 107 | 62  | 56  | 45     | 1,6 | 45 | W11                       |
| 3850909      | TDM090R5SCF12M   | 9,00  | 9,49   | 12 | 110 | 65  | 59  | 48     | 1,7 | 45 | W12                       |
| 3850911      | TDM095R5SCF12M   | 9,50  | 9,99   | 12 | 114 | 69  | 63  | 50     | 1,8 | 45 | W13                       |
| 3850923      | TDM100R5SCF16M   | 10,00 | 10,49  | 16 | 120 | 72  | 66  | 53     | 1,9 | 48 | W14                       |
| 3850925      | TDM105R5SCF16M   | 10,50 | 10,99  | 16 | 123 | 75  | 69  | 55     | 2,0 | 48 | W15                       |
| 3850927      | TDM110R5SCF16M   | 11,00 | 11,49  | 16 | 126 | 78  | 72  | 58     | 2,1 | 48 | W16                       |
| 3850929      | TDM115R5SCF16M   | 11,50 | 11,99  | 16 | 129 | 81  | 75  | 60     | 2,2 | 48 | W17                       |
| 3850931      | TDM120R5SCF16M   | 12,00 | 12,49  | 16 | 132 | 84  | 78  | 63     | 2,3 | 48 | W18                       |
| 3850933      | TDM125R5SCF16M   | 12,50 | 12,99  | 16 | 135 | 87  | 81  | 65     | 2,4 | 48 | W19                       |
| 3850935      | TDM130R5SCF16M   | 13,00 | 13,49  | 16 | 138 | 90  | 84  | 68     | 2,5 | 48 | W20                       |
| 3850937      | TDM135R5SCF16M   | 13,50 | 13,99  | 16 | 142 | 94  | 88  | 70     | 2,6 | 48 | W21                       |
| 3850939      | TDM140R5SCF16M   | 14,00 | 14,49  | 16 | 145 | 97  | 91  | 73     | 2,7 | 48 | W22                       |
| 3850941      | TDM145R5SCF16M   | 14,50 | 14,99  | 16 | 148 | 100 | 94  | 75     | 2,8 | 48 | W23                       |
| 3850943      | TDM150R5SCF20M   | 15,00 | 15,99  | 20 | 156 | 106 | 100 | 80     | 2,8 | 50 | W24                       |
| 3850945      | TDM160R5SCF20M   | 16,00 | 16,99  | 20 | 162 | 112 | 106 | 85     | 3,0 | 50 | W25                       |
| 3850947      | TDM170R5SCF20M   | 17,00 | 17,99  | 20 | 169 | 119 | 113 | 90     | 3,2 | 50 | W26                       |
| 3850949      | TDM180R5SCF25M   | 18,00 | 18,99  | 25 | 181 | 125 | 119 | 95     | 3,4 | 56 | W27                       |
| 3850951      | TDM190R5SCF25M   | 19,00 | 19,99  | 25 | 187 | 131 | 125 | 100    | 3,6 | 56 | W28                       |
| 3850953      | TDM200R5SCF25M   | 20,00 | 20,99  | 25 | 193 | 137 | 131 | 105    | 3,8 | 56 | W29                       |
| 3992485      | TDM210R5SCF25M   | 21,00 | 21,99  | 25 | 200 | 144 | 138 | 110    | 3,7 | 56 | W30                       |
| 3992486      | TDM220R5SCF25M   | 22,00 | 22,99  | 25 | 206 | 150 | 144 | 115    | 3,9 | 56 | W31                       |
| 3992487      | TDM230R5SCF25M   | 23,00 | 23,99  | 25 | 212 | 156 | 150 | 120    | 4,1 | 56 | W32                       |
| 3992488      | TDM240R5SCF25M   | 24,00 | 24,99  | 25 | 218 | 162 | 156 | 125    | 4,2 | 56 | W33                       |
| 3992489      | TDM250R5SCF25M   | 25,00 | 25,99  | 25 | 225 | 169 | 163 | 130    | 4,4 | 56 | W34                       |

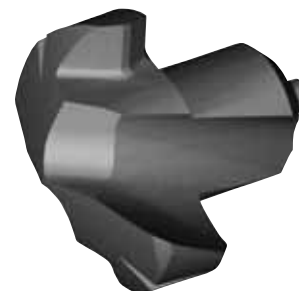
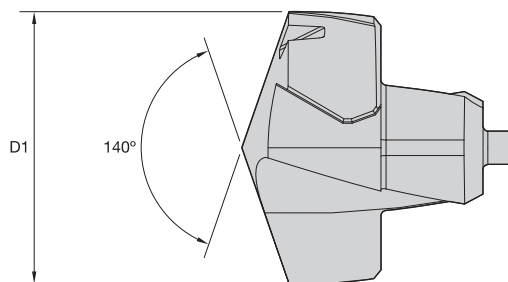
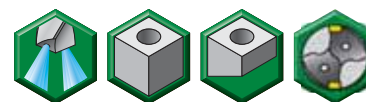
- Tool body shipped with insert wrench.



■ TOP DRILL M1 • 8 x D • Flanged • Metric

| order number | catalogue number | D1    | D1 max | D  | L   | L1  | L3  | L4 max | L5  | LS | insert blade seat size |
|--------------|------------------|-------|--------|----|-----|-----|-----|--------|-----|----|------------------------|
| 3992141      | TDM080R8SCF12M   | 7,94  | 8,49   | 12 | 129 | 84  | 79  | 68     | 1,4 | 45 | W10                    |
| 3992142      | TDM085R8SCF12M   | 8,50  | 8,99   | 12 | 134 | 89  | 83  | 72     | 1,5 | 45 | W11                    |
| 3992213      | TDM090R8SCF12M   | 9,00  | 9,49   | 12 | 138 | 93  | 88  | 76     | 1,6 | 45 | W12                    |
| 3992214      | TDM095R8SCF12M   | 9,50  | 9,99   | 12 | 144 | 99  | 93  | 80     | 1,7 | 45 | W13                    |
| 3992215      | TDM100R8SCF16M   | 10,00 | 10,49  | 16 | 151 | 103 | 98  | 84     | 1,8 | 48 | W14                    |
| 3992216      | TDM105R8SCF16M   | 10,50 | 10,99  | 16 | 156 | 108 | 102 | 88     | 1,9 | 48 | W15                    |
| 3992217      | TDM110R8SCF16M   | 11,00 | 11,49  | 16 | 160 | 112 | 107 | 92     | 2,0 | 48 | W16                    |
| 3992218      | TDM115R8SCF16M   | 11,50 | 11,99  | 16 | 165 | 117 | 111 | 96     | 2,1 | 48 | W17                    |
| 3992219      | TDM120R8SCF16M   | 12,00 | 12,49  | 16 | 169 | 121 | 116 | 100    | 2,1 | 48 | W18                    |
| 3992220      | TDM125R8SCF16M   | 12,50 | 12,99  | 16 | 174 | 126 | 120 | 104    | 2,2 | 48 | W19                    |
| 3992221      | TDM130R8SCF16M   | 13,00 | 13,49  | 16 | 178 | 130 | 125 | 108    | 2,3 | 48 | W20                    |
| 3992222      | TDM135R8SCF16M   | 13,50 | 13,99  | 16 | 184 | 136 | 130 | 112    | 2,4 | 48 | W21                    |
| 3992223      | TDM140R8SCF16M   | 14,00 | 14,49  | 16 | 188 | 140 | 135 | 116    | 2,5 | 48 | W22                    |
| 3992224      | TDM145R8SCF16M   | 14,50 | 14,99  | 16 | 193 | 145 | 139 | 120    | 2,6 | 48 | W23                    |
| 3992225      | TDM150R8SCF20M   | 15,00 | 15,99  | 20 | 204 | 154 | 148 | 128    | 2,7 | 50 | W24                    |
| 3992226      | TDM160R8SCF20M   | 16,00 | 16,99  | 20 | 213 | 163 | 157 | 136    | 2,8 | 50 | W25                    |
| 3992227      | TDM170R8SCF20M   | 17,00 | 17,99  | 20 | 223 | 173 | 167 | 144    | 3,0 | 50 | W26                    |
| 3992228      | TDM180R8SCF25M   | 18,00 | 18,99  | 25 | 238 | 182 | 176 | 152    | 3,2 | 56 | W27                    |
| 3992229      | TDM190R8SCF25M   | 19,00 | 19,99  | 25 | 247 | 191 | 185 | 160    | 3,4 | 56 | W28                    |
| 3992230      | TDM200R8SCF25M   | 20,00 | 20,99  | 25 | 256 | 200 | 194 | 168    | 3,6 | 56 | W29                    |
| 3992231      | TDM210R8SCF25M   | 21,00 | 21,99  | 25 | 266 | 210 | 204 | 176    | 3,7 | 56 | W30                    |
| 3992232      | TDM220R8SCF25M   | 22,00 | 22,99  | 25 | 275 | 219 | 213 | 184    | 3,9 | 56 | W31                    |
| 3992233      | TDM230R8SCF25M   | 23,00 | 23,99  | 25 | 284 | 228 | 222 | 192    | 4,1 | 56 | W32                    |
| 3992234      | TDM240R8SCF25M   | 24,00 | 24,99  | 25 | 293 | 237 | 231 | 200    | 4,2 | 56 | W33                    |
| 3992235      | TDM250R8SCF25M   | 25,00 | 25,99  | 25 | 303 | 247 | 241 | 208    | 4,4 | 56 | W34                    |





■ TOP DRILL M1 • UP(M)

|   |   |
|---|---|
| P | ● |
| M | ○ |
| K | ● |
| N | ○ |
| S | ○ |
| H | ○ |

- first choice
- alternate choice

grade WU25PD  
TiAlN

| order # | catalogue # | D1   | seat size/series |
|---------|-------------|------|------------------|
| 3850959 | TDM0794UPM  | 7,94 | W10              |
| 3848984 | TDM0800UPM  | 8,00 | W10              |
| 3848985 | TDM0810UPM  | 8,10 | W10              |
| 3850960 | TDM0816UPM  | 8,16 | W10              |
| 3850961 | TDM0820UPM  | 8,20 | W10              |
| 3848986 | TDM0830UPM  | 8,30 | W10              |
| 3850962 | TDM0833UPM  | 8,33 | W10              |
| 3848987 | TDM0840UPM  | 8,40 | W10              |
| 3850963 | TDM0843UPM  | 8,43 | W10              |
| 3848988 | TDM0850UPM  | 8,50 | W11              |
| 3848989 | TDM0860UPM  | 8,60 | W11              |
| 3850964 | TDM0861UPM  | 8,61 | W11              |
| 3848990 | TDM0870UPM  | 8,70 | W11              |
| 3850965 | TDM0873UPM  | 8,73 | W11              |
| 3848991 | TDM0880UPM  | 8,80 | W11              |
| 3850966 | TDM0884UPM  | 8,84 | W11              |
| 3848992 | TDM0890UPM  | 8,90 | W11              |
| 3849043 | TDM0900UPM  | 9,00 | W12              |
| 3850967 | TDM0909UPM  | 9,09 | W12              |
| 3849044 | TDM0910UPM  | 9,10 | W12              |
| 3850968 | TDM0913UPM  | 9,13 | W12              |
| 3849045 | TDM0920UPM  | 9,20 | W12              |
| 3849046 | TDM0930UPM  | 9,30 | W12              |
| 3850969 | TDM0935UPM  | 9,35 | W12              |

(continued)

(TOP DRILL M1 • UP(M) – continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |             |       |                  |
|-----------------------|-------------|-------|------------------|
| order #               | catalogue # | D1    | seat size/series |
| 3849047               | TDM0940UPM  | 9,40  | W12              |
| 3849048               | TDM0950UPM  | 9,50  | W13              |
| 3850970               | TDM0953UPM  | 9,53  | W13              |
| 3850971               | TDM0956UPM  | 9,56  | W13              |
| 3850972               | TDM0958UPM  | 9,58  | W13              |
| 3849049               | TDM0960UPM  | 9,60  | W13              |
| 3850973               | TDM0970UPM  | 9,70  | W13              |
| 3850974               | TDM0980UPM  | 9,80  | W13              |
| 3849050               | TDM0990UPM  | 9,90  | W13              |
| 3850975               | TDM0992UPM  | 9,92  | W13              |
| 3849051               | TDM1000UPM  | 10,00 | W14              |
| 3850976               | TDM1002UPM  | 10,02 | W14              |
| 3850977               | TDM1008UPM  | 10,08 | W14              |
| 3849052               | TDM1010UPM  | 10,10 | W14              |
| 3849053               | TDM1020UPM  | 10,20 | W14              |
| 3850978               | TDM1026UPM  | 10,26 | W14              |
| 3849054               | TDM1030UPM  | 10,30 | W14              |
| 3850979               | TDM1032UPM  | 10,32 | W14              |
| 3849055               | TDM1040UPM  | 10,40 | W14              |
| 3850980               | TDM1049UPM  | 10,49 | W14              |
| 3849056               | TDM1050UPM  | 10,50 | W15              |
| 3849057               | TDM1060UPM  | 10,60 | W15              |
| 3849058               | TDM1070UPM  | 10,70 | W15              |
| 3850981               | TDM1072UPM  | 10,72 | W15              |
| 3849059               | TDM1080UPM  | 10,80 | W15              |
| 3849060               | TDM1090UPM  | 10,90 | W15              |
| 3849061               | TDM1100UPM  | 11,00 | W16              |
| 3849062               | TDM1110UPM  | 11,10 | W16              |
| 3850982               | TDM1111UPM  | 11,11 | W16              |
| 3849063               | TDM1120UPM  | 11,20 | W16              |
| 3849064               | TDM1130UPM  | 11,30 | W16              |
| 3849065               | TDM1140UPM  | 11,40 | W16              |
| 3849066               | TDM1150UPM  | 11,50 | W17              |
| 3850983               | TDM1151UPM  | 11,51 | W17              |
| 3849067               | TDM1160UPM  | 11,60 | W17              |
| 3850984               | TDM1161UPM  | 11,61 | W17              |
| 3849068               | TDM1170UPM  | 11,70 | W17              |
| 3849069               | TDM1180UPM  | 11,80 | W17              |
| 3849070               | TDM1190UPM  | 11,90 | W17              |
| 3850985               | TDM1191UPM  | 11,91 | W17              |

(continued)

(TOP DRILL M1 • UP(M) – continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |             |       |                  |
|-----------------------|-------------|-------|------------------|
| order #               | catalogue # | D1    | seat size/series |
| 3849071               | TDM1200UPM  | 12,00 | W18              |
| 3849072               | TDM1210UPM  | 12,10 | W18              |
| 3849073               | TDM1220UPM  | 12,20 | W18              |
| 3850986               | TDM1230UPM  | 12,30 | W18              |
| 3849074               | TDM1240UPM  | 12,40 | W18              |
| 3850987               | TDM1247UPM  | 12,47 | W18              |
| 3849075               | TDM1250UPM  | 12,50 | W19              |
| 3849076               | TDM1260UPM  | 12,60 | W19              |
| 3850988               | TDM1270UPM  | 12,70 | W19              |
| 3849077               | TDM1280UPM  | 12,80 | W19              |
| 3850989               | TDM1290UPM  | 12,90 | W19              |
| 3849078               | TDM1300UPM  | 13,00 | W20              |
| 3850990               | TDM1310UPM  | 13,10 | W20              |
| 3849079               | TDM1320UPM  | 13,20 | W20              |
| 3849080               | TDM1330UPM  | 13,30 | W20              |
| 3849081               | TDM1340UPM  | 13,40 | W20              |
| 3850991               | TDM1349UPM  | 13,49 | W20              |
| 3849082               | TDM1350UPM  | 13,50 | W21              |
| 3849083               | TDM1360UPM  | 13,60 | W21              |
| 3849084               | TDM1370UPM  | 13,70 | W21              |
| 3849085               | TDM1380UPM  | 13,80 | W21              |
| 3850992               | TDM1389UPM  | 13,89 | W21              |
| 3850993               | TDM1390UPM  | 13,90 | W21              |
| 3849086               | TDM1400UPM  | 14,00 | W22              |
| 3849087               | TDM1410UPM  | 14,10 | W22              |
| 3849088               | TDM1420UPM  | 14,20 | W22              |
| 3850994               | TDM1429UPM  | 14,29 | W22              |
| 3849089               | TDM1430UPM  | 14,30 | W22              |
| 3849090               | TDM1440UPM  | 14,40 | W22              |
| 3849091               | TDM1450UPM  | 14,50 | W23              |
| 3849092               | TDM1460UPM  | 14,60 | W23              |
| 3850995               | TDM1467UPM  | 14,67 | W23              |
| 3850996               | TDM1468UPM  | 14,68 | W23              |
| 3849093               | TDM1470UPM  | 14,70 | W23              |
| 3849094               | TDM1480UPM  | 14,80 | W23              |
| 3849095               | TDM1490UPM  | 14,90 | W23              |
| 3849096               | TDM1500UPM  | 15,00 | W24              |
| 3850997               | TDM1508UPM  | 15,08 | W24              |
| 3849097               | TDM1510UPM  | 15,10 | W24              |
| 3849098               | TDM1520UPM  | 15,20 | W24              |

(continued)

(TOP DRILL M1 • UP(M) – continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |             |       |                  |
|-----------------------|-------------|-------|------------------|
| order #               | catalogue # | D1    | seat size/series |
| 3849099               | TDM1530UPM  | 15,30 | W24              |
| 3849100               | TDM1540UPM  | 15,40 | W24              |
| 3850998               | TDM1548UPM  | 15,48 | W24              |
| 3849101               | TDM1550UPM  | 15,50 | W24              |
| 3849102               | TDM1560UPM  | 15,60 | W24              |
| 3849103               | TDM1570UPM  | 15,70 | W24              |
| 3849104               | TDM1580UPM  | 15,80 | W24              |
| 3850999               | TDM1588UPM  | 15,88 | W24              |
| 3849105               | TDM1600UPM  | 16,00 | W25              |
| 3851000               | TDM1603UPM  | 16,03 | W25              |
| 3851001               | TDM1608UPM  | 16,08 | W25              |
| 3849106               | TDM1610UPM  | 16,10 | W25              |
| 4010625               | TDM1618UPM  | 16,18 | W25              |
| 3849107               | TDM1620UPM  | 16,20 | W25              |
| 3851002               | TDM1627UPM  | 16,27 | W25              |
| 3849108               | TDM1630UPM  | 16,30 | W25              |
| 3849109               | TDM1640UPM  | 16,40 | W25              |
| 3849110               | TDM1650UPM  | 16,50 | W25              |
| 3849111               | TDM1660UPM  | 16,60 | W25              |
| 3851003               | TDM1667UPM  | 16,67 | W25              |
| 3849112               | TDM1670UPM  | 16,70 | W25              |
| 3849113               | TDM1680UPM  | 16,80 | W25              |
| 3851004               | TDM1687UPM  | 16,87 | W25              |
| 3849114               | TDM1690UPM  | 16,90 | W25              |
| 3849119               | TDM1700UPM  | 17,00 | W26              |
| 3851005               | TDM1707UPM  | 17,07 | W26              |
| 3849120               | TDM1710UPM  | 17,10 | W26              |
| 3849121               | TDM1720UPM  | 17,20 | W26              |
| 3849122               | TDM1730UPM  | 17,30 | W26              |
| 3849193               | TDM1740UPM  | 17,40 | W26              |
| 3851006               | TDM1746UPM  | 17,46 | W26              |
| 3849194               | TDM1750UPM  | 17,50 | W26              |
| 3849195               | TDM1760UPM  | 17,60 | W26              |
| 3849196               | TDM1770UPM  | 17,70 | W26              |
| 3849197               | TDM1780UPM  | 17,80 | W26              |
| 3851007               | TDM1786UPM  | 17,86 | W26              |
| 3849198               | TDM1790UPM  | 17,90 | W26              |
| 3849199               | TDM1800UPM  | 18,00 | W27              |
| 3849200               | TDM1810UPM  | 18,10 | W27              |
| 3849201               | TDM1820UPM  | 18,20 | W27              |

(continued)

(TOP DRILL M1 • UP(M) – continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |             |       |                  |
|-----------------------|-------------|-------|------------------|
| order #               | catalogue # | D1    | seat size/series |
| 3851008               | TDM1826UPM  | 18,26 | W27              |
| 3849202               | TDM1830UPM  | 18,30 | W27              |
| 3849203               | TDM1840UPM  | 18,40 | W27              |
| 3849204               | TDM1850UPM  | 18,50 | W27              |
| 3849205               | TDM1860UPM  | 18,60 | W27              |
| 3851009               | TDM1865UPM  | 18,65 | W27              |
| 3849206               | TDM1870UPM  | 18,70 | W27              |
| 3849207               | TDM1880UPM  | 18,80 | W27              |
| 3849208               | TDM1890UPM  | 18,90 | W27              |
| 3849209               | TDM1900UPM  | 19,00 | W28              |
| 3851010               | TDM1905UPM  | 19,05 | W28              |
| 3849210               | TDM1910UPM  | 19,10 | W28              |
| 3849211               | TDM1920UPM  | 19,20 | W28              |
| 3851011               | TDM1923UPM  | 19,23 | W28              |
| 3851012               | TDM1925UPM  | 19,25 | W28              |
| 3851013               | TDM1928UPM  | 19,28 | W28              |
| 3849212               | TDM1930UPM  | 19,30 | W28              |
| 3851014               | TDM1935UPM  | 19,35 | W28              |
| 3849213               | TDM1940UPM  | 19,40 | W28              |
| 3851015               | TDM1945UPM  | 19,45 | W28              |
| 3849214               | TDM1950UPM  | 19,50 | W28              |
| 3849215               | TDM1960UPM  | 19,60 | W28              |
| 3849216               | TDM1970UPM  | 19,70 | W28              |
| 3849217               | TDM1980UPM  | 19,80 | W28              |
| 3851016               | TDM1984UPM  | 19,84 | W28              |
| 3849218               | TDM1990UPM  | 19,90 | W28              |
| 3849219               | TDM2000UPM  | 20,00 | W29              |
| 3849220               | TDM2010UPM  | 20,10 | W29              |
| 3849221               | TDM2020UPM  | 20,20 | W29              |
| 3851017               | TDM2024UPM  | 20,24 | W29              |
| 3849222               | TDM2030UPM  | 20,30 | W29              |
| 3849223               | TDM2040UPM  | 20,40 | W29              |
| 3849224               | TDM2050UPM  | 20,50 | W29              |
| 3849225               | TDM2060UPM  | 20,60 | W29              |
| 3851018               | TDM2064UPM  | 20,64 | W29              |
| 3849226               | TDM2070UPM  | 20,70 | W29              |
| 3849227               | TDM2080UPM  | 20,80 | W29              |
| 3849228               | TDM2090UPM  | 20,90 | W29              |
| 3849229               | TDM2099UPM  | 20,99 | W29              |
| 4003225               | TDM2100UPM  | 21,00 | W30              |

(continued)



(TOP DRILL M1 • UP(M) – continued)



● first choice  
○ alternate choice

| grade WU25PD<br>TiAlN |             |       |                  |
|-----------------------|-------------|-------|------------------|
| order #               | catalogue # | D1    | seat size/series |
| 4003203               | TDM2144UPM  | 21,44 | W30              |
| 3969291               | TDM2150UPM  | 21,50 | W30              |
| 4003226               | TDM2200UPM  | 22,00 | W31              |
| 4003204               | TDM2223UPM  | 22,23 | W31              |
| 4003205               | TDM2245UPM  | 22,45 | W31              |
| 4003227               | TDM2250UPM  | 22,50 | W31              |
| 4003228               | TDM2300UPM  | 23,00 | W32              |
| 4003229               | TDM2350UPM  | 23,50 | W32              |
| 4003206               | TDM2381UPM  | 23,81 | W32              |
| 4003230               | TDM2400UPM  | 24,00 | W33              |
| 4003231               | TDM2450UPM  | 24,50 | W33              |
| 4003207               | TDM2461UPM  | 24,61 | W33              |
| 4003232               | TDM2500UPM  | 25,00 | W34              |
| 4003208               | TDM2540UPM  | 25,40 | W34              |
| 4002444               | TDM2550UPM  | 25,50 | W34              |
| 4003209               | TDM2568UPM  | 25,68 | W34              |
| 4003210               | TDM2581UPM  | 25,81 | W34              |
| 3992013               | TDM2599UPM  | 25,99 | W34              |

| Metric<br>tolerance |              |
|---------------------|--------------|
| D1                  | tolerance k8 |
| 8–10                | 0,000/+0,022 |
| >10–17              | 0,000/+0,027 |
| >17–18              | 0,000/+0,027 |
| >18–21              | 0,000/+0,033 |

## Modular TOP DRILL M1 Step Drill

Provides high productivity through high-feed, one-shot operations, and excellent tool life.

- Use TopSTEP VG and SH chamfer and counterboring inserts to create your specific TDM1 modular step drill.
- Create complex holes with countersinks, chamfers, or even both operations in one shot.
- Save time, achieve better cost, and run your complex drilling process with higher stability.

**Standard**  
TOP DRILL M1™ inserts.

**Standard**  
TopSTEP SH counterboring insert.

**Standard**  
TopSTEP VG chamfering insert.

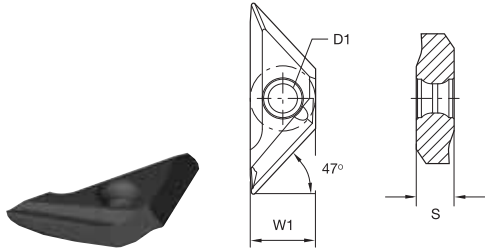
**Made-to-Order** TDM1 Toolholder

- Available within 3–4 weeks.
- Made custom to your needs.

Let your WIDIA™ representative know about your specific needs. Use the Chamfer and Counterboring Order Planning pages to create and send us your request — available online as well.

**TopSTEP VG Chamfering Inserts**

- 45° chamfer angle with broad cutting edge.
- Hassle-free usage.
- Very stable and accurate positioning in pocket.
- Two times indexable.
- One universal insert size for a lot of applications.



- first choice
- alternate choice

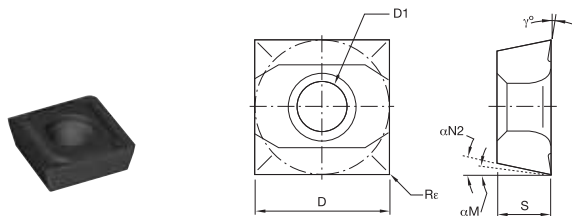
|   |   |
|---|---|
| P | ● |
| M | ○ |
| K | ● |
| N | ○ |
| S | ○ |
| H |   |

**TopSTEP VG Chamfering Inserts**

| catalogue number | W1   | D1   | S    | WP20PH  |
|------------------|------|------|------|---------|
| VXGX10030234     | 6,35 | 2,85 | 3,48 | 5983706 |

**TopSTEP SH Counterboring Inserts**

- 90° insert can be positioned in alternative angles.
- Very good chip forming and surface quality.
- Two times indexable.
- Stocked standards in six insert sizes.



- first choice
- alternate choice

|   |   |
|---|---|
| P | ● |
| M | ○ |
| K | ○ |
| N |   |
| S |   |
| H |   |

**TopSTEP SH Counterboring Inserts**

| catalogue number | D    | D1   | S    | Rε   | αN | αN M | WP20PH  |
|------------------|------|------|------|------|----|------|---------|
| SXHX060204R20    | 6,35 | 2,85 | 2,38 | 0,40 | 11 | 7    | 5983390 |
| SXHX070304R20    | 6,35 | 2,85 | 2,38 | 0,40 | 11 | 7    | 5983702 |
| SXHX060208R20    | 6,35 | 2,85 | 2,38 | 0,80 | 11 | 7    | 5983701 |
| SXHX070308R20    | 6,35 | 2,85 | 2,38 | 0,80 | 11 | 7    | 5983703 |
| SXHX090304R20    | 9,52 | 3,50 | 3,18 | 0,40 | 11 | 7    | 5983704 |
| SXHX090308R20    | 9,52 | 3,50 | 3,18 | 0,80 | 11 | 7    | 5983705 |

Please utilise guide below to plan your TOP DRILL M1™ modular step drill based on your needs and requirements. Please contact your distributor for a quote.

### Option 1 TOP DRILL M1 Drilling and Chamfering

Overall Length [L]

Drill Length [L1]

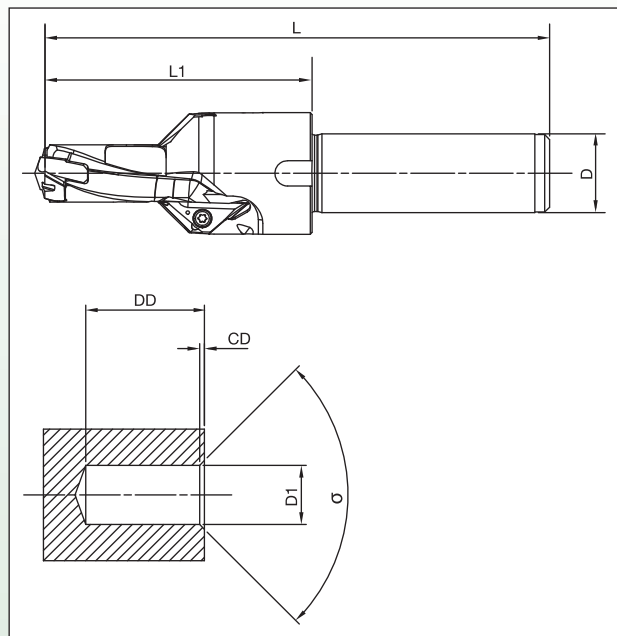
Shank Diameter [D]

Drill Diameter Min [D1]

Drilling Depth [DD]

Cutting Diameter 2 Angle  $\sigma$

Chamfering Depth [CD]



### Option 2 TOP DRILL M1 Drilling and Countersinking

Overall Length [L]

Drill Length [L1]

Shank Diameter [D]

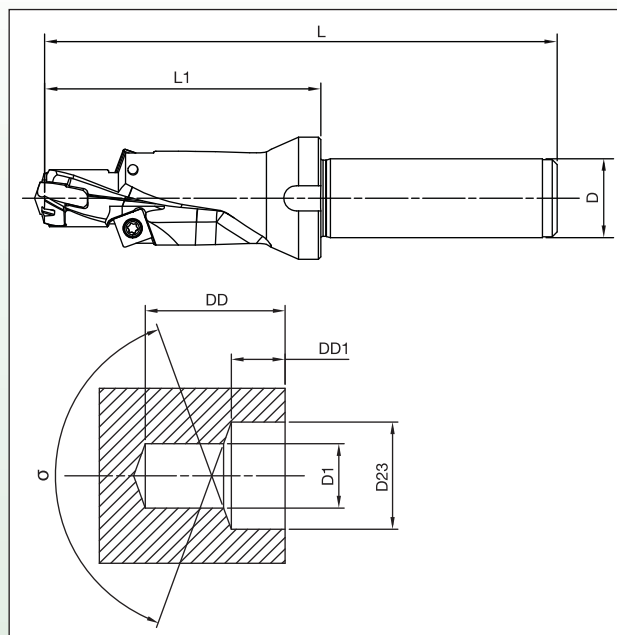
Drill Diameter Min [D1]

Drilling Depth [DD]

Cut Diameter 23 [D23]

Countersinking Depth [DD1]

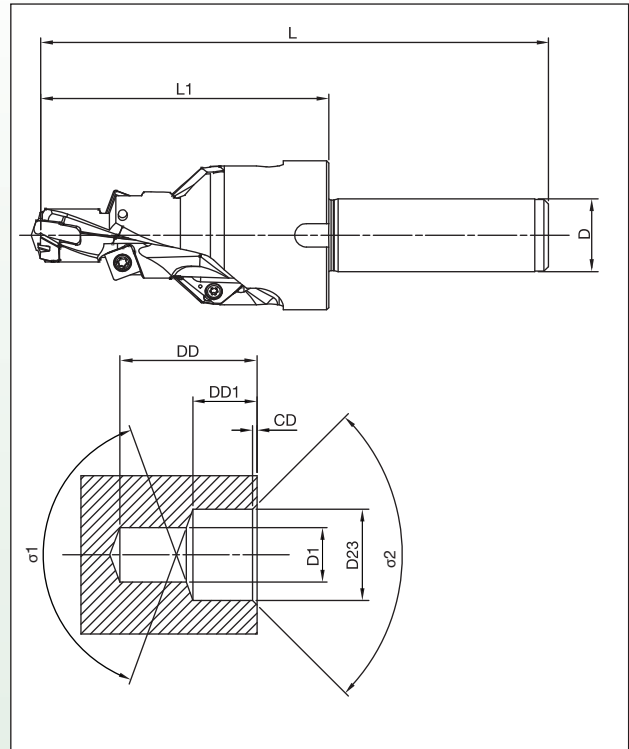
Cutting Diameter 2 Angle  $\sigma$



Please utilise guide below to plan your TOP DRILL M1™ modular step drill based on your needs and requirements. Please contact your distributor for a quote.

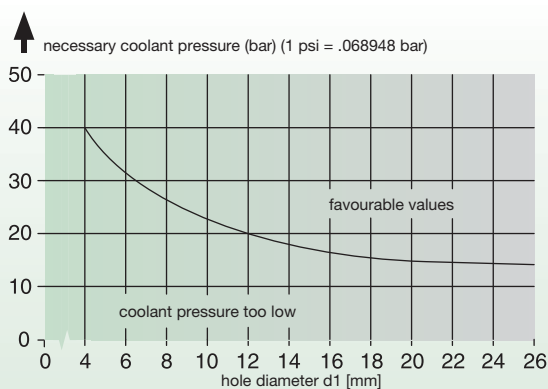
### Option 3 TOP DRILL M1 Drilling and Countersinking and Chamfering

|                          |            |                      |
|--------------------------|------------|----------------------|
| Overall Length           | [L]        | <input type="text"/> |
| Drill Length             | [L1]       | <input type="text"/> |
| Shank Diameter           | [D]        | <input type="text"/> |
| Drill Diameter Min       | [D1]       | <input type="text"/> |
| Drilling Depth           | [DD]       | <input type="text"/> |
| Cut Diameter 23          | [D23]      | <input type="text"/> |
| Countersinking Depth     | [DD1]      | <input type="text"/> |
| Cutting Diameter 2 Angle | $\sigma 1$ | <input type="text"/> |
| Cutting Diameter 3 Angle | $\sigma 2$ | <input type="text"/> |
| Chamfering depth         | [CD]       | <input type="text"/> |



If a more complex tool is required, we need your individual information to serve your specific needs. Please contact your WIDIA™ distributor for further guidance.



**Coolant Pressure**

The diagram at left shows the coolant pressure as a function of the hole diameter. The higher the coolant pressure, the better the drilling result. Tool life and hole quality improve with increased coolant flow.

**Drilling on Inclined Surfaces**

When drilling on inclined or curved surfaces, use a 50% lower feed than the standard value. After the drill margins are fully engaged in the workpiece, increase the feed to the standard value (100%). Premachining is required on surfaces with inclination greater than 3°.

**TOP DRILL M1 • UP(M) • WU25PD™ • Speed and Feed Chart • Metric**

| Material Group |   |   |                |     |  |           |           |           |           |           |           |           |
|----------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                |   | Cutting Speed – vc                                                                                                                                                  |                |     | Recommended Feed Rate                                                              |           |           |           |           |           |           |           |
|                |   | min                                                                                                                                                                 | Starting Value | max | Tool Diameter (mm)                                                                 | 8,0       | 10,0      | 12,0      | 14,0      | 16,0      | 20,0      | 25,0      |
| P              | 1 | 90                                                                                                                                                                  | 125            | 170 | mm/r                                                                               | 0,11–0,20 | 0,13–0,25 | 0,14–0,31 | 0,17–0,39 | 0,19–0,45 | 0,25–0,48 | 0,30–0,52 |
|                | 2 | 105                                                                                                                                                                 | 140            | 180 | mm/r                                                                               | 0,11–0,28 | 0,12–0,35 | 0,16–0,37 | 0,21–0,46 | 0,23–0,46 | 0,28–0,50 | 0,30–0,52 |
|                | 3 | 50                                                                                                                                                                  | 75             | 100 | mm/r                                                                               | 0,11–0,28 | 0,12–0,35 | 0,16–0,37 | 0,21–0,46 | 0,23–0,46 | 0,28–0,50 | 0,30–0,52 |
|                | 4 | 50                                                                                                                                                                  | 75             | 100 | mm/r                                                                               | 0,11–0,28 | 0,12–0,35 | 0,16–0,37 | 0,17–0,36 | 0,19–0,45 | 0,22–0,48 | 0,25–0,50 |
|                | 5 | 50                                                                                                                                                                  | 65             | 80  | mm/r                                                                               | 0,10–0,20 | 0,10–0,23 | 0,10–0,25 | 0,14–0,29 | 0,16–0,32 | 0,18–0,36 | 0,22–0,42 |
|                | 6 | 50                                                                                                                                                                  | 65             | 80  | mm/r                                                                               | 0,10–0,20 | 0,10–0,23 | 0,10–0,25 | 0,14–0,29 | 0,16–0,32 | 0,18–0,36 | 0,22–0,42 |
| M              | 1 | 40                                                                                                                                                                  | 80             | 110 | mm/r                                                                               | 0,06–0,22 | 0,08–0,23 | 0,09–0,24 | 0,10–0,25 | 0,11–0,26 | 0,13–0,28 | 0,13–0,32 |
|                | 2 | 35                                                                                                                                                                  | 55             | 75  | mm/r                                                                               | 0,06–0,22 | 0,08–0,23 | 0,09–0,24 | 0,10–0,25 | 0,11–0,26 | 0,13–0,28 | 0,13–0,32 |
|                | 3 | 20                                                                                                                                                                  | 35             | 50  | mm/r                                                                               | 0,06–0,22 | 0,08–0,23 | 0,09–0,24 | 0,10–0,25 | 0,11–0,26 | 0,13–0,28 | 0,13–0,32 |
| K              | 1 | 60                                                                                                                                                                  | 95             | 170 | mm/r                                                                               | 0,15–0,29 | 0,16–0,32 | 0,17–0,35 | 0,21–0,42 | 0,25–0,48 | 0,28–0,52 | 0,32–0,56 |
|                | 2 | 60                                                                                                                                                                  | 75             | 90  | mm/r                                                                               | 0,15–0,29 | 0,16–0,30 | 0,17–0,33 | 0,21–0,41 | 0,25–0,48 | 0,28–0,52 | 0,32–0,56 |
|                | 3 | 40                                                                                                                                                                  | 65             | 90  | mm/r                                                                               | 0,16–0,30 | 0,17–0,33 | 0,18–0,36 | 0,20–0,41 | 0,21–0,44 | 0,23–0,48 | 0,25–0,50 |

NOTE: Through coolant recommended for greater than 3 x D applications.

### How to attach inserts



- 1) Fix drill holder on arbour. For insert exchange, fix arbour on the machine or set on tool presetter.



- 2) Remove dust using air blast.



- 3) Put insert into drill holder. (Use gloves to protect your hands.)



- 4) Turn lightly in a clockwise direction. (Use gloves to protect your hands.)



- 5) Set the wrench properly.\*



- 6) Make sure the wrench fits with the insert slot for the wrench. (Is the wrench unfixed from the slot?)



Slot for wrench



- 7) Slowly turn the wrench in a clockwise direction.



- 8) Complete.

### How to detach inserts



- 1) Remove dust from insert using air blast.



- 2) Set the wrench properly.\*



- 3) Fit the wrench to insert slot.



- 4) Turn the wrench in an anti-clockwise direction.



- 5) Once lock is released, insert can be turned with fingers. (Use gloves to protect your hands.)



- 6) Remove insert. (Use gloves to protect your hands.)

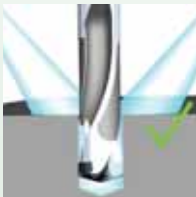
*\*To order the TDM1 Wrench, please use order number 3861623 and catalogue number 170.315.*

## Cautions

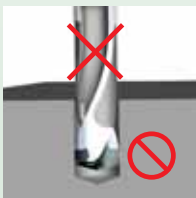
### Coolant



1) Internal coolant is recommended.



2) In case of external coolant, cutting depth must be 3 x D or less.

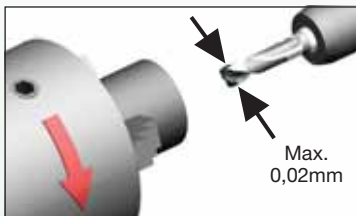


3) Dry cutting is not recommended.  
Limited applicability in cast iron materials,  
MQL strongly recommended.

### Usage Precautions

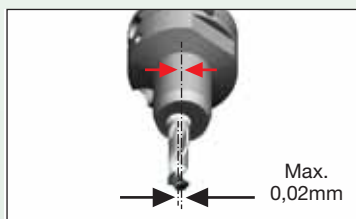
#### Core deviation

1) For Turning Machines



Set deviation amount under 0,02mm  
between workpiece and drill.

2) For Machining Centres

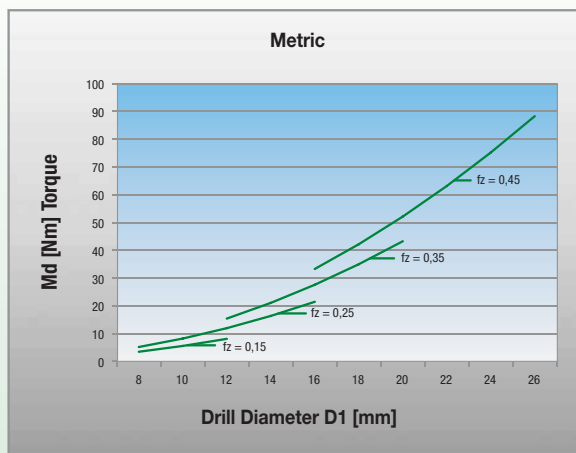


Do not use any arbour with a damaged attachment surface.  
Centre of arbour deviation must be within 0,02mm.

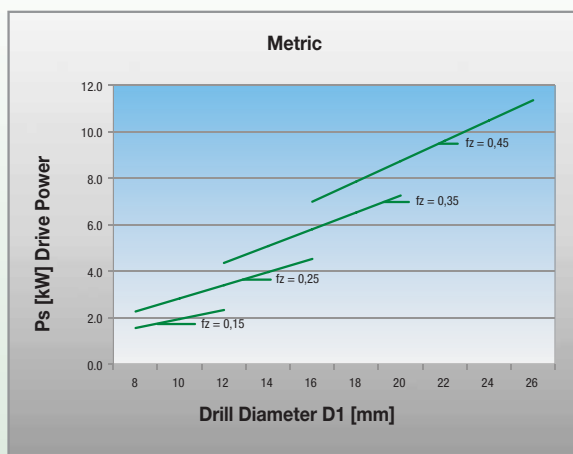
| Application Recommendation                     | Workpiece Shape |
|------------------------------------------------|-----------------|
| Flat Face<br><b>Recommended</b>                |                 |
| Stacked Plates<br><b>Recommended</b>           |                 |
| Inclined Surface >3°<br><b>Not Recommended</b> |                 |
| Half Cylindrical<br><b>Not Recommended</b>     |                 |
| Hole Expansion<br><b>Not Recommended</b>       |                 |
| Concave Surface<br><b>Not Recommended</b>      |                 |
| Pipe Material<br><b>Not Recommended</b>        |                 |
| Cored Hole<br><b>Not Recommended</b>           |                 |



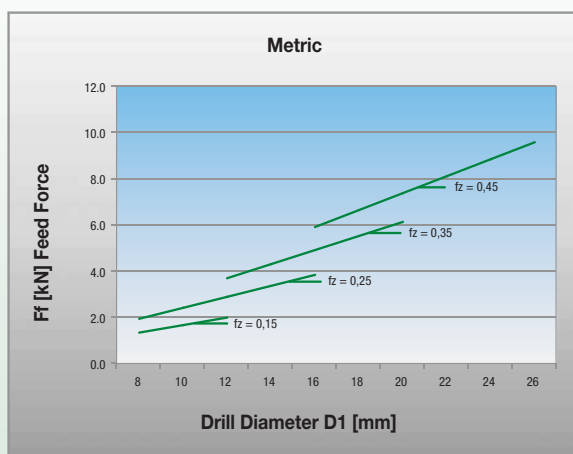
■ Torque



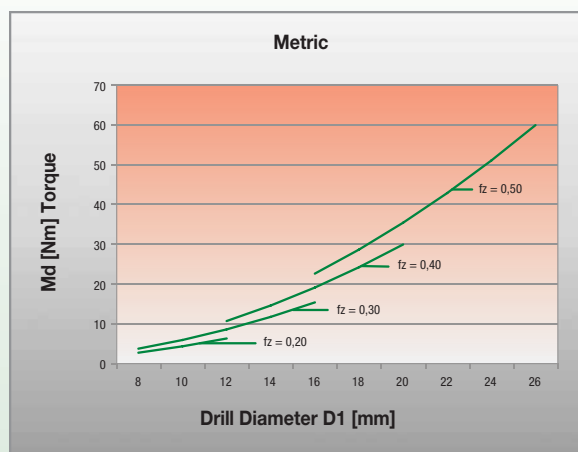
■ Power



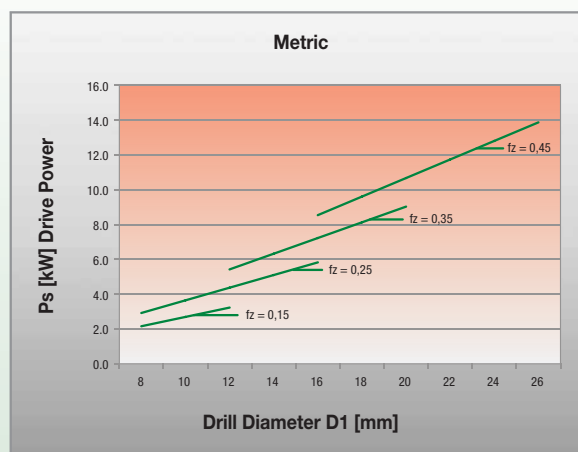
■ Feed Force



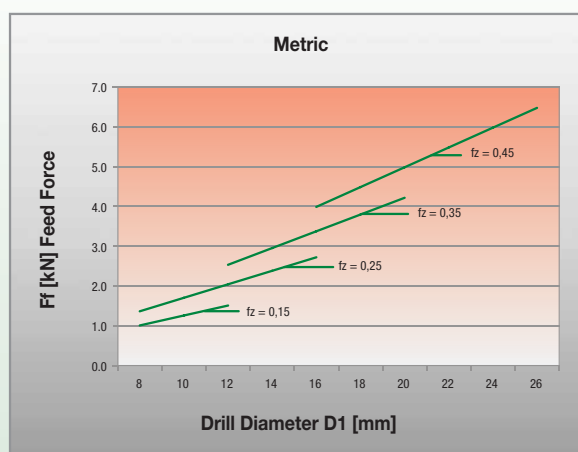
## ■ Torque



## ■ Power



## ■ Feed Force





## WIDIA-Metcut™ Spade Blades •

A compliment to TOP DRILL M1™

WIDIA™ provides a comprehensive line of spade blades from 8–114mm (.315–4.5") to cover a wide range of machining environments and materials.



# Spade Blades

- Fast penetration rates, less downtime, and lower variability.
- Interchangeable with other conventional spade blade holders.
- Improved surface finish — eliminates subsequent hole finishing operations.
- Standard and special drill body/holder offering, including step drill and porting tool configurations.
- Intermediate diameters and specific toolholder length quickly available upon request.

### WIDIA-Metcut spade blades are great choices for:

- Universal application for most plain and alloyed steel applications as well as for cast iron and stainless steels.
- Machining environments where rigidity, coolant supply, or speed and feed rates are limiting factors.
- Short run manufacturing and prototyping environments.
- Especially when dealing with larger diameters and deeper holes.

## Application Information

T-15 HSS spade blades are recommended:

- For providing straighter and more consistent holes with superior surface finishes than can be produced using either HSS twist drills or carbide indexable drills.
- When rigidity of the machine or the fixture requires a more forgiving, durable and tougher tool; T-15 steel possesses a higher transverse rupture strength and is more impact-resistant than comparable carbide spade blades and/or carbide indexable drills.
- In applications requiring hole depths up through 15x to 20x diameter; pecking may be required for depths above 7x diameter for some materials.
- As a cost-effective alternative to carbide indexable drills since T-15 steel spade blades operate at comparable penetration rates to single-effective indexable drills in materials <35 Rc, and one spade blade holder accommodates multiple diameter blades.

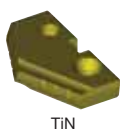


## Spade Blade Holders

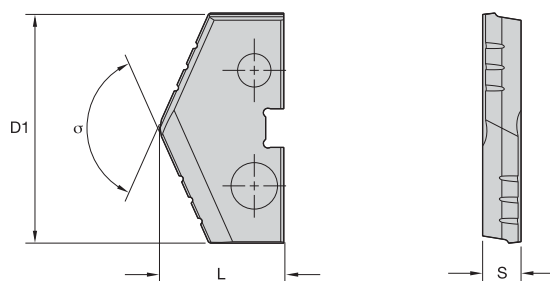
Generally can accommodate a range of blade sizes up to 1.30–1.35 times the smallest blade size. It is therefore possible to cover the entire range of hole sizes with just a few spade drill holders. Contrast this with the inventories required for indexable drills and steel taper shank drills.



TiAlN



TiN



## Seat Size Z



TiAlN

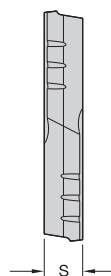
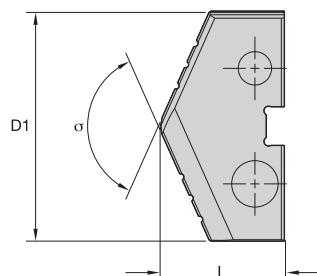
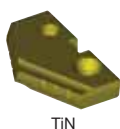


TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | $\sigma$ |
|---------|-------------|---------|-------------|----------|---------|---------|----------|
| 2759621 | 7FZ-0438A   | —       | —           | 11,11    | 9,19    | 2,39    | 132°     |
| 2759599 | 7FZ-0472A   | —       | —           | 12,00    | 9,19    | 2,39    | 132°     |
| 2759592 | 7FZ-0484A   | —       | —           | 12,30    | 9,19    | 2,39    | 132°     |
| 2759588 | 7FZ-0492A   | —       | —           | 12,50    | 9,19    | 2,39    | 132°     |
| 2891175 | 7FZ-0500A   | 2759581 | 7FZ-0500T   | 12,70    | 9,19    | 2,39    | 132°     |

NOTE: Toolholders available upon request as an Engineered Solution.



## ■ Seat Size 0



TiAlN



TiN

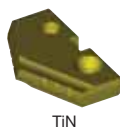
- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | σ    |
|---------|-------------|---------|-------------|----------|---------|---------|------|
| 2907270 | 7F0-0509A   | —       | —           | 12,93    | 10,80   | 3,18    | 132° |
| —       | —           | 2760494 | 7F0-0512T   | 13,00    | 10,80   | 3,18    | 132° |
| 2760492 | 7F0-0516A   | —       | —           | 13,10    | 10,80   | 3,18    | 132° |
| 2760489 | 7F0-0531A   | 2760485 | 7F0-0531T   | 13,50    | 10,80   | 3,18    | 132° |
| 2760481 | 7F0-0547A   | 2760478 | 7F0-0547T   | 13,89    | 10,80   | 3,18    | 132° |
| 2760477 | 7F0-0551A   | 2760473 | 7F0-0551T   | 14,00    | 10,80   | 3,18    | 132° |
| 2760472 | 7F0-0563A   | 2760466 | 7F0-0563T   | 14,29    | 10,80   | 3,18    | 132° |
| 2760463 | 7F0-0571A   | —       | —           | 14,50    | 10,80   | 3,18    | 132° |
| 2760460 | 7F0-0578A   | 2760458 | 7F0-0578T   | 14,68    | 10,80   | 3,18    | 132° |
| 2760454 | 7F0-0591A   | 2760453 | 7F0-0591T   | 15,00    | 10,80   | 3,18    | 132° |
| 2760452 | 7F0-0594A   | 2760449 | 7F0-0594T   | 15,08    | 10,80   | 3,18    | 132° |
| 2760444 | 7F0-0609A   | 2760441 | 7F0-0609T   | 15,48    | 10,80   | 3,18    | 132° |
| 2760440 | 7F0-0610A   | —       | —           | 15,50    | 10,80   | 3,18    | 132° |
| 3053979 | 7F0-0625A   | 2760430 | 7F0-0625T   | 15,88    | 10,80   | 3,18    | 132° |
| 2891178 | 7F0-0630A   | 2760424 | 7F0-0630T   | 16,00    | 10,80   | 3,18    | 132° |
| 2760420 | 7F0-0641A   | 2760418 | 7F0-0641T   | 16,27    | 10,80   | 3,18    | 132° |
| —       | —           | 2760415 | 7F0-0650T   | 16,50    | 10,80   | 3,18    | 132° |
| 2760413 | 7F0-0656A   | 1988432 | 7F0-0656T   | 16,67    | 10,80   | 3,18    | 132° |
| 2760404 | 7F0-0669A   | —       | —           | 17,00    | 10,80   | 3,18    | 132° |
| 2760399 | 7F0-0672A   | 2760397 | 7F0-0672T   | 17,07    | 10,80   | 3,18    | 132° |
| 2760393 | 7F0-0688A   | 2760390 | 7F0-0688T   | 17,46    | 10,80   | 3,18    | 132° |
| 3083635 | 7F0-0689A   | 2760386 | 7F0-0689T   | 17,50    | 10,80   | 3,18    | 132° |

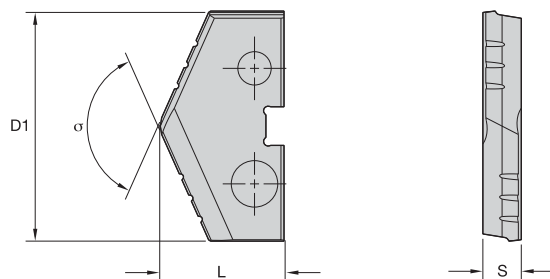
NOTE: Toolholders available upon request as an Engineered Solution.



TiAlN



TiN



### Seat Size 1



TiAlN



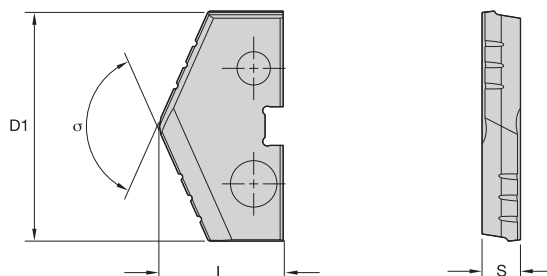
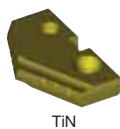
TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | σ    |
|---------|-------------|---------|-------------|----------|---------|---------|------|
| 2760383 | 7F1-0703A   | 2760381 | 7F1-0703T   | 17,86    | 13,84   | 3,96    | 132° |
| 2760380 | 7F1-0709A   | 2760377 | 7F1-0709T   | 18,00    | 13,84   | 3,96    | 132° |
| —       | —           | 2760371 | 7F1-0719T   | 18,26    | 13,84   | 3,96    | 132° |
| 2760365 | 7F1-0734A   | 2760362 | 7F1-0734T   | 18,65    | 13,84   | 3,96    | 132° |
| 2760361 | 7F1-0748A   | 2760359 | 7F1-0748T   | 19,00    | 13,84   | 3,96    | 132° |
| 3114699 | 7F1-0750A   | 2387228 | 7F1-0750T   | 19,05    | 13,84   | 3,96    | 132° |
| —       | —           | 2604191 | 7F1-0756T   | 19,20    | 13,84   | 3,96    | 132° |
| 2760344 | 7F1-0766A   | 2760341 | 7F1-0766T   | 19,45    | 13,84   | 3,96    | 132° |
| —       | —           | 2760338 | 7F1-0768T   | 19,50    | 13,84   | 3,96    | 132° |
| 2760335 | 7F1-0781A   | 2760331 | 7F1-0781T   | 19,85    | 13,84   | 3,96    | 132° |
| 2760330 | 7F1-0787A   | 2760328 | 7F1-0787T   | 20,00    | 13,84   | 3,96    | 132° |
| —       | —           | 2760323 | 7F1-0797T   | 20,24    | 13,84   | 3,96    | 132° |
| 2255810 | 7F1-0806A   | —       | —           | 20,47    | 13,84   | 3,96    | 132° |
| 2760319 | 7F1-0807A   | 2760316 | 7F1-0807T   | 20,50    | 13,84   | 3,96    | 132° |
| 2760315 | 7F1-0813A   | 2760310 | 7F1-0813T   | 20,64    | 13,84   | 3,96    | 132° |
| 2760305 | 7F1-0827A   | 2760303 | 7F1-0827T   | 21,00    | 13,84   | 3,96    | 132° |
| 2760302 | 7F1-0828A   | 2760300 | 7F1-0828T   | 21,03    | 13,84   | 3,96    | 132° |
| —       | —           | 2760296 | 7F1-0844T   | 21,43    | 13,84   | 3,96    | 132° |
| 2760292 | 7F1-0859A   | 2760290 | 7F1-0859T   | 21,83    | 13,84   | 3,96    | 132° |
| 2940716 | 7F1-0866A   | 2760287 | 7F1-0866T   | 22,00    | 13,84   | 3,96    | 132° |
| 1926120 | 7F1-0875A   | 2760282 | 7F1-0875T   | 22,23    | 13,84   | 3,96    | 132° |
| 2760280 | 7F1-0891A   | 2760278 | 7F1-0891T   | 22,62    | 13,84   | 3,96    | 132° |
| 2760276 | 7F1-0906A   | 2760273 | 7F1-0906T   | 23,02    | 13,84   | 3,96    | 132° |
| 3099442 | 7F1-0922A   | 2760268 | 7F1-0922T   | 23,42    | 13,84   | 3,96    | 132° |
| 2760265 | 7F1-0938A   | 2760262 | 7F1-0938T   | 23,81    | 13,84   | 3,96    | 132° |
| 2891181 | 7F1-0945A   | 2760257 | 7F1-0945T   | 24,00    | 13,84   | 3,96    | 132° |
| 2760256 | 7F1-0953A   | 2760253 | 7F1-0953T   | 24,21    | 13,84   | 3,96    | 132° |
| —       | —           | 3339713 | 7F1-0960T   | 24,38    | 13,84   | 3,96    | 132° |

NOTE: Toolholders available upon request as an Engineered Solution.





## Seat Size 2



TiAlN



TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | $\sigma$ |
|---------|-------------|---------|-------------|----------|---------|---------|----------|
| —       | —           | 2760247 | 7F2-0969T   | 24,61    | 16,13   | 4,76    | 132°     |
| 2760243 | 7F2-0984A   | 2760240 | 7F2-0984T   | 25,00    | 16,13   | 4,76    | 132°     |
| 2760239 | 7F2-1000A   | 2760235 | 7F2-1000T   | 25,40    | 16,13   | 4,76    | 132°     |
| 2760234 | 7F2-1003A   | —       | —           | 25,48    | 16,13   | 4,76    | 132°     |
| 3088200 | 7F2-1016A   | 2760226 | 7F2-1016T   | 25,80    | 16,13   | 4,76    | 132°     |
| 3096208 | 7F2-1024A   | 2760223 | 7F2-1024T   | 26,00    | 16,13   | 4,76    | 132°     |
| 2760222 | 7F2-1031A   | 2760219 | 7F2-1031T   | 26,20    | 16,13   | 4,76    | 132°     |
| 2760216 | 7F2-1047A   | 2760214 | 7F2-1047T   | 26,59    | 16,13   | 4,76    | 132°     |
| 3096207 | 7F2-1063A   | 2760207 | 7F2-1063T   | 26,99    | 16,13   | 4,76    | 132°     |
| 2261849 | 7F2-1078A   | 2760203 | 7F2-1078T   | 27,61    | 16,13   | 4,76    | 132°     |
| 2760199 | 7F2-1094A   | 2760196 | 7F2-1094T   | 27,78    | 16,13   | 4,76    | 132°     |
| 2760195 | 7F2-1102A   | 2760194 | 7F2-1102T   | 28,00    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760189 | 7F2-1109T   | 28,17    | 16,13   | 4,76    | 132°     |
| 2760188 | 7F2-1125A   | 2760184 | 7F2-1125T   | 28,58    | 16,13   | 4,76    | 132°     |
| 3024915 | 7F2-1141A   | —       | —           | 28,97    | 16,13   | 4,76    | 132°     |
| 2760181 | 7F2-1142A   | —       | —           | 29,00    | 16,13   | 4,76    | 132°     |
| 3088746 | 7F2-1156A   | 2760174 | 7F2-1156T   | 29,37    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760169 | 7F2-1172T   | 29,77    | 16,13   | 4,76    | 132°     |
| 2760167 | 7F2-1181A   | 2760164 | 7F2-1181T   | 30,00    | 16,13   | 4,76    | 132°     |
| 2760162 | 7F2-1188A   | 2760159 | 7F2-1188T   | 30,16    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760152 | 7F2-1203T   | 30,56    | 16,13   | 4,76    | 132°     |
| 2760150 | 7F2-1219A   | 2760148 | 7F2-1219T   | 30,96    | 16,13   | 4,76    | 132°     |
| 2760147 | 7F2-1221A   | —       | —           | 31,00    | 16,13   | 4,76    | 132°     |
| 2907272 | 7F2-1231A   | —       | —           | 31,27    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760141 | 7F2-1234T   | 31,35    | 16,13   | 4,76    | 132°     |
| 2760137 | 7F2-1250A   | 2760134 | 7F2-1250T   | 31,75    | 16,13   | 4,76    | 132°     |
| —       | —           | 2895976 | 7F2-1254T   | 31,85    | 16,13   | 4,76    | 132°     |
| 2760131 | 7F2-1260A   | 2760128 | 7F2-1260T   | 32,00    | 16,13   | 4,76    | 132°     |
| 3032539 | 7F2-1266A   | 2967699 | 7F2-1266T   | 32,15    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760121 | 7F2-1281T   | 32,55    | 16,13   | 4,76    | 132°     |
| 2760118 | 7F2-1299A   | —       | —           | 33,00    | 16,13   | 4,76    | 132°     |
| 2760112 | 7F2-1313A   | 2760109 | 7F2-1313T   | 33,34    | 16,13   | 4,76    | 132°     |

NOTE: Toolholders available upon request as an Engineered Solution.

(continued)

(Seat Size 2 — continued)

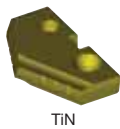
| TiAlN   |             | TiN     |             | D1<br>mm | L<br>mm | S<br>mm | $\sigma$ |
|---------|-------------|---------|-------------|----------|---------|---------|----------|
| order # | catalogue # | order # | catalogue # |          |         |         |          |
| —       | —           | 2760106 | 7F2-1328T   | 33,73    | 16,13   | 4,76    | 132°     |
| 2760105 | 7F2-1339A   | —       | —           | 34,00    | 16,13   | 4,76    | 132°     |
| 2760101 | 7F2-1344A   | 2760098 | 7F2-1344T   | 34,13    | 16,13   | 4,76    | 132°     |
| —       | —           | 2760094 | 7F2-1359T   | 34,53    | 16,13   | 4,76    | 132°     |
| 1926121 | 7F2-1375A   | 2760090 | 7F2-1375T   | 34,93    | 16,13   | 4,76    | 132°     |
| 2760089 | 7F2-1378A   | —       | —           | 35,00    | 16,13   | 4,76    | 132°     |
| 2759880 | 7F4-2166A   | —       | —           | 55,02    | 23,62   | 7,94    | 132°     |

● first choice  
○ alternate choice

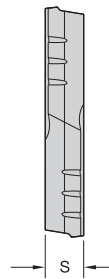
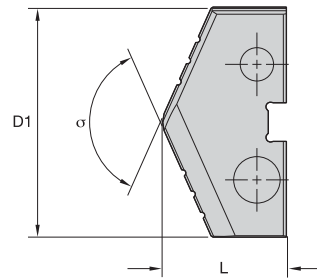
NOTE: Toolholders available upon request as an Engineered Solution.



TiAlN



TiN



### Seat Size 3



TiAlN



TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | σ    |
|---------|-------------|---------|-------------|----------|---------|---------|------|
| —       | —           | 2760079 | 7F3-1391T   | 35,32    | 20,45   | 6,35    | 132° |
| 2760078 | 7F3-1406A   | 2760076 | 7F3-1406T   | 35,72    | 20,45   | 6,35    | 132° |
| 2760072 | 7F3-1417A   | 2760069 | 7F3-1417T   | 36,00    | 20,45   | 6,35    | 132° |
| 2760066 | 7F3-1438A   | 2760063 | 7F3-1438T   | 36,51    | 20,45   | 6,35    | 132° |
| 2760060 | 7F3-1457A   | 2760059 | 7F3-1457T   | 37,00    | 20,45   | 6,35    | 132° |
| 2760058 | 7F3-1469A   | 2760056 | 7F3-1469T   | 37,31    | 20,45   | 6,35    | 132° |
| —       | —           | 2760053 | 7F3-1484T   | 37,70    | 20,45   | 6,35    | 132° |
| 2760051 | 7F3-1496A   | —       | —           | 38,00    | 20,45   | 6,35    | 132° |
| 2760048 | 7F3-1500A   | 2760045 | 7F3-1500T   | 38,10    | 20,45   | 6,35    | 132° |
| —       | —           | 2760038 | 7F3-1516T   | 38,50    | 20,45   | 6,35    | 132° |
| —       | —           | 2760035 | 7F3-1531T   | 38,90    | 20,45   | 6,35    | 132° |
| 2760034 | 7F3-1535A   | —       | —           | 39,00    | 20,45   | 6,35    | 132° |
| 2760027 | 7F3-1563A   | 2760024 | 7F3-1563T   | 39,69    | 20,45   | 6,35    | 132° |
| 2760023 | 7F3-1575A   | 2760021 | 7F3-1575T   | 40,00    | 20,45   | 6,35    | 132° |
| —       | —           | 2760015 | 7F3-1594T   | 40,48    | 20,45   | 6,35    | 132° |
| 2760011 | 7F3-1614A   | —       | —           | 41,00    | 20,45   | 6,35    | 132° |
| 2760008 | 7F3-1625A   | 2760004 | 7F3-1625T   | 41,28    | 20,45   | 6,35    | 132° |
| 2760001 | 7F3-1654A   | —       | —           | 42,00    | 20,45   | 6,35    | 132° |
| —       | —           | 2759996 | 7F3-1656T   | 42,07    | 20,45   | 6,35    | 132° |
| 2759993 | 7F3-1688A   | 2759991 | 7F3-1688T   | 42,86    | 20,45   | 6,35    | 132° |
| —       | —           | 2759989 | 7F3-1693T   | 43,00    | 20,45   | 6,35    | 132° |
| 2759987 | 7F3-1719A   | 2759985 | 7F3-1719T   | 43,66    | 20,45   | 6,35    | 132° |
| 2759984 | 7F3-1732A   | —       | —           | 44,00    | 20,45   | 6,35    | 132° |
| 2759977 | 7F3-1750A   | 2759974 | 7F3-1750T   | 44,45    | 20,45   | 6,35    | 132° |
| —       | —           | 2759970 | 7F3-1766T   | 44,85    | 20,45   | 6,35    | 132° |
| 2759969 | 7F3-1772A   | 2759967 | 7F3-1772T   | 45,00    | 20,45   | 6,35    | 132° |
| —       | —           | 2759963 | 7F3-1781T   | 45,25    | 20,45   | 6,35    | 132° |
| 2759960 | 7F3-1811A   | —       | —           | 46,00    | 20,45   | 6,35    | 132° |
| 2759958 | 7F3-1813A   | 2759956 | 7F3-1813T   | 46,04    | 20,45   | 6,35    | 132° |
| —       | —           | 2759951 | 7F3-1844T   | 46,83    | 20,45   | 6,35    | 132° |
| —       | —           | 2759949 | 7F3-1850T   | 47,00    | 20,45   | 6,35    | 132° |
| 2759945 | 7F3-1875A   | 2759942 | 7F3-1875T   | 47,63    | 20,45   | 6,35    | 132° |

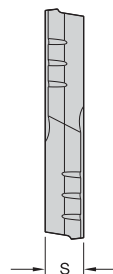
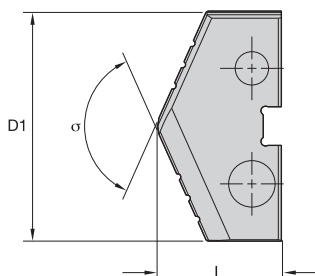
NOTE: Toolholders available upon request as an Engineered Solution.



TiAlN



TiN



### Seat Size 4



TiAlN



TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | $\sigma$ |
|---------|-------------|---------|-------------|----------|---------|---------|----------|
| —       | —           | 2759937 | 7F4-1880T   | 47,75    | 23,62   | 7,95    | 132°     |
| 2759936 | 7F4-1890A   | 2759935 | 7F4-1890T   | 48,00    | 23,62   | 7,95    | 132°     |
| 2759934 | 7F4-1906A   | 2759932 | 7F4-1906T   | 48,42    | 23,62   | 7,95    | 132°     |
| 2759930 | 7F4-1929A   | —       | —           | 49,00    | 23,62   | 7,95    | 132°     |
| 2759927 | 7F4-1938A   | 2759925 | 7F4-1938T   | 49,21    | 23,62   | 7,95    | 132°     |
| 2759921 | 7F4-1969A   | 2759919 | 7F4-1969T   | 50,00    | 23,62   | 7,95    | 132°     |
| 2759916 | 7F4-2000A   | 2759913 | 7F4-2000T   | 50,80    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759911 | 7F4-2008T   | 51,00    | 23,62   | 7,95    | 132°     |
| —       | —           | 2952747 | 7F4-2016T   | 51,20    | 23,62   | 7,95    | 132°     |
| 2759904 | 7F4-2031A   | 2759902 | 7F4-2031T   | 51,60    | 23,62   | 7,95    | 132°     |
| 2759901 | 7F4-2047A   | 2759900 | 7F4-2047T   | 52,00    | 23,62   | 7,95    | 132°     |
| 2759899 | 7F4-2063A   | 2759896 | 7F4-2063T   | 52,39    | 23,62   | 7,95    | 132°     |
| 2895971 | 7F4-2087A   | —       | —           | 53,00    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759892 | 7F4-2094T   | 53,18    | 23,62   | 7,95    | 132°     |
| 2759891 | 7F4-2125A   | 2759888 | 7F4-2125T   | 53,98    | 23,62   | 7,95    | 132°     |
| 2759887 | 7F4-2126A   | —       | —           | 54,00    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759882 | 7F4-2156T   | 54,77    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759876 | 7F4-2188T   | 55,56    | 23,62   | 7,95    | 132°     |
| 2759874 | 7F4-2205A   | —       | —           | 56,00    | 23,62   | 7,95    | 132°     |
| 2759872 | 7F4-2219A   | 2759870 | 7F4-2219T   | 56,36    | 23,62   | 7,95    | 132°     |
| 2759868 | 7F4-2244A   | —       | —           | 57,00    | 23,62   | 7,95    | 132°     |
| 2759865 | 7F4-2250A   | 2759862 | 7F4-2250T   | 57,15    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759858 | 7F4-2281T   | 57,95    | 23,62   | 7,95    | 132°     |
| 2759857 | 7F4-2284A   | —       | —           | 58,00    | 23,62   | 7,95    | 132°     |
| 2759854 | 7F4-2313A   | 2759852 | 7F4-2313T   | 58,74    | 23,62   | 7,95    | 132°     |
| 2759851 | 7F4-2323A   | —       | —           | 59,00    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759848 | 7F4-2344T   | 59,53    | 23,62   | 7,95    | 132°     |
| —       | —           | 2759845 | 7F4-2362T   | 60,00    | 23,62   | 7,95    | 132°     |

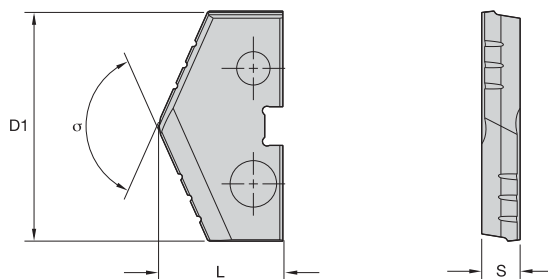
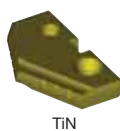
NOTE: Toolholders available upon request as an Engineered Solution.

(continued)

(Seat Size 4 — continued)

| <br>TiAlN |             | <br>TiN |             |          |         |         | ● first choice<br>○ alternate choice |  |
|--------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------|-------------|----------|---------|---------|--------------------------------------|--|
| order #                                                                                    | catalogue # | order #                                                                                  | catalogue # | D1<br>mm | L<br>mm | S<br>mm | $\sigma$                             |  |
| 2759843                                                                                    | 7F4-2375A   | 2759840                                                                                  | 7F4-2375T   | 60,33    | 23,62   | 7,95    | 132°                                 |  |
| 2759833                                                                                    | 7F4-2438A   | 2759831                                                                                  | 7F4-2438T   | 61,91    | 23,62   | 7,95    | 132°                                 |  |
| 2759830                                                                                    | 7F4-2441A   | —                                                                                        | —           | 62,00    | 23,62   | 7,95    | 132°                                 |  |
| 2759828                                                                                    | 7F4-2469A   | —                                                                                        | —           | 62,71    | 23,62   | 7,95    | 132°                                 |  |
| —                                                                                          | —           | 2759823                                                                                  | 7F4-2480T   | 63,00    | 23,62   | 7,95    | 132°                                 |  |
| 2759822                                                                                    | 7F4-2500A   | 2759820                                                                                  | 7F4-2500T   | 63,50    | 23,62   | 7,95    | 132°                                 |  |
| —                                                                                          | —           | 2759816                                                                                  | 7F4-2531T   | 64,30    | 23,62   | 7,95    | 132°                                 |  |
| 3027222                                                                                    | 7F4-2559A   | —                                                                                        | —           | 65,00    | 23,62   | 7,95    | 132°                                 |  |
| 2759813                                                                                    | 7F4-2563A   | 2759811                                                                                  | 7F4-2563T   | 65,09    | 23,62   | 7,95    | 132°                                 |  |

NOTE: Toolholders available upon request as an Engineered Solution.



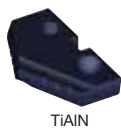
■ Seat Size 5



● first choice  
○ alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | $\sigma$ |
|---------|-------------|---------|-------------|----------|---------|---------|----------|
| —       | —           | 2759808 | 7F5-2500T   | 63,50    | 31,50   | 11,11   | 144°     |
| 2759802 | 7F5-2563A   | 2759801 | 7F5-2563T   | 65,09    | 31,50   | 11,11   | 144°     |
| —       | —           | 2759791 | 7F5-2625T   | 66,68    | 31,50   | 11,11   | 144°     |
| —       | —           | 2759789 | 7F5-2656T   | 67,47    | 31,50   | 11,11   | 144°     |
| 2759788 | 7F5-2677A   | —       | —           | 68,00    | 31,50   | 11,11   | 144°     |
| —       | —           | 2759781 | 7F5-2719T   | 69,06    | 31,50   | 11,11   | 144°     |
| 2759780 | 7F5-2750A   | 2759778 | 7F5-2750T   | 69,85    | 31,50   | 11,11   | 144°     |
| 2961641 | 7F5-2756A   | —       | —           | 70,00    | 31,50   | 11,11   | 144°     |
| 2759773 | 7F5-2813A   | —       | —           | 71,44    | 31,50   | 11,11   | 144°     |
| 2759766 | 7F5-2875A   | 2759764 | 7F5-2875T   | 73,03    | 31,50   | 11,11   | 144°     |
| —       | —           | 2759756 | 7F5-2938T   | 74,61    | 31,50   | 11,11   | 144°     |
| 2759755 | 7F5-2969A   | 2759753 | 7F5-2969T   | 75,41    | 31,50   | 11,11   | 144°     |
| 2759751 | 7F5-3000A   | 2759748 | 7F5-3000T   | 76,20    | 31,50   | 11,11   | 144°     |

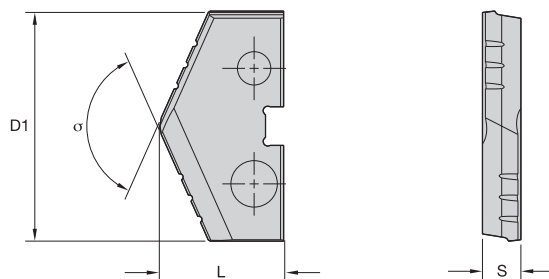
NOTE: Toolholders available upon request as an Engineered Solution.



TiAlN



TiN



## Seat Size 6



TiAlN



TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | σ    |
|---------|-------------|---------|-------------|----------|---------|---------|------|
| 2759745 | 7F6-3063A   | 2759743 | 7F6-3063T   | 77,79    | 31,50   | 11,11   | 144° |
| 2759742 | 7F6-3071A   | —       | —           | 78,00    | 31,50   | 11,11   | 144° |
| 2759739 | 7F6-3125A   | —       | —           | 79,38    | 31,50   | 11,11   | 144° |
| 2759736 | 7F6-3150A   | —       | —           | 80,00    | 31,50   | 11,11   | 144° |
| —       | —           | 2759731 | 7F6-3188T   | 80,96    | 31,50   | 11,11   | 144° |
| —       | —           | 2759726 | 7F6-3250T   | 82,55    | 31,50   | 11,11   | 144° |
| —       | —           | 2759718 | 7F6-3375T   | 85,73    | 31,50   | 11,13   | 144° |
| —       | —           | 2759715 | 7F6-3438T   | 87,31    | 31,50   | 11,13   | 144° |
| —       | —           | 2759709 | 7F6-3500T   | 88,90    | 31,50   | 11,13   | 144° |

NOTE: Toolholders available upon request as an Engineered Solution.

## Seat Size 7



TiAlN



TiN

- first choice
- alternate choice

| order # | catalogue # | order # | catalogue # | D1<br>mm | L<br>mm | S<br>mm | σ    |
|---------|-------------|---------|-------------|----------|---------|---------|------|
| —       | —           | 3279755 | 7F7-3543T   | 90,00    | 31,50   | 11,13   | 144° |
| —       | —           | 2759703 | 7F7-3563T   | 90,49    | 31,50   | 11,13   | 144° |
| —       | —           | 2759698 | 7F7-3688T   | 93,66    | 31,50   | 11,13   | 144° |
| —       | —           | 2759688 | 7F7-3938T   | 96,00    | 31,50   | 11,13   | 144° |
| 2972689 | 7F7-3813A   | —       | —           | 96,84    | 31,50   | 11,13   | 144° |
| 2759684 | 7F7-4000A   | —       | —           | 101,60   | 31,50   | 11,13   | 144° |

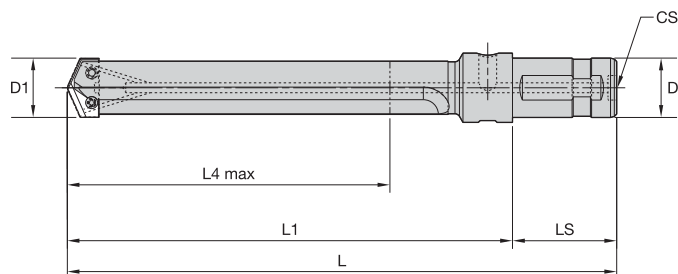
NOTE: Toolholders available upon request as an Engineered Solution.

## ■ HSS Spade Blades • Speed and Feed Chart • Metric

|                |     |              | Grade   |       | Feed (mm/rev)    |             |              |              |                 |              |               |                     |
|----------------|-----|--------------|---------|-------|------------------|-------------|--------------|--------------|-----------------|--------------|---------------|---------------------|
| Material Group |     | Hardness BHN | TiN     | TiAlN | Y & Z (9.5–12.7) | 0 (13–17.5) | 1 (17.86–24) | 2 (24.61–35) | 3 (35.72–47.63) | 4 (48–65.09) | 5 (63.5–76.2) | 6–7–8 (76.99–114.3) |
| P              | 0   | 85–125       | 55      | –     | 0,18             | 0,23        | 0,30         | 0,38         | 0,48            | 0,58         | 0,64          | 0,69                |
|                |     | 125–175      | 50      | –     | 0,15             | 0,23        | 0,30         | 0,38         | 0,48            | 0,58         | 0,61          | 0,66                |
|                |     | 175–225      | 45      | –     | 0,13             | 0,20        | 0,25         | 0,36         | 0,46            | 0,53         | 0,58          | 0,64                |
|                |     | 225–275      | 45      | –     | 0,13             | 0,20        | 0,25         | 0,36         | 0,46            | 0,53         | 0,58          | 0,64                |
|                | 1   | 100–150      | 60      | –     | 0,20             | 0,28        | 0,36         | 0,43         | 0,53            | 0,64         | 0,66          | 0,71                |
|                |     | 150–200      | 55      | –     | 0,18             | 0,25        | 0,33         | 0,41         | 0,51            | 0,58         | 0,61          | 0,66                |
|                |     | 200–250      | 50      | –     | 0,15             | 0,25        | 0,33         | 0,41         | 0,51            | 0,58         | 0,61          | 0,66                |
|                | 2   | 125–175      | 50      | –     | 0,15             | 0,23        | 0,30         | 0,38         | 0,48            | 0,58         | 0,64          | 0,69                |
|                |     | 175–225      | 45      | –     | 0,13             | 0,20        | 0,25         | 0,36         | 0,46            | 0,53         | 0,58          | 0,64                |
|                |     | 225–275      | 45      | 65    | 0,13             | 0,20        | 0,25         | 0,36         | 0,46            | 0,53         | 0,56          | 0,61                |
|                |     | 275–325      | 40      | 60    | 0,10             | 0,18        | 0,23         | 0,30         | 0,41            | 0,48         | 0,53          | 0,58                |
|                | 3   | 125–175      | 45      | –     | 0,18             | 0,23        | 0,28         | 0,36         | 0,46            | 0,53         | 0,58          | 0,64                |
|                |     | 175–225      | 45      | –     | 0,15             | 0,20        | 0,25         | 0,36         | 0,43            | 0,48         | 0,53          | 0,58                |
|                |     | 225–275      | 40      | 55    | 0,13             | 0,18        | 0,25         | 0,33         | 0,43            | 0,48         | 0,51          | 0,53                |
|                |     | 275–325      | 35      | 50    | 0,10             | 0,15        | 0,23         | 0,30         | 0,38            | 0,43         | 0,46          | 0,48                |
|                |     | 325–375      | 35      | 50    | 0,08             | 0,15        | 0,23         | 0,30         | 0,38            | 0,43         | 0,46          | 0,48                |
|                | 4   | 225–300      | 25      | 35    | 0,13             | 0,18        | 0,23         | 0,25         | 0,36            | 0,41         | 0,46          | 0,51                |
|                |     | 300–350      | 20      | 30    | 0,10             | 0,18        | 0,23         | 0,25         | 0,36            | 0,41         | 0,46          | 0,51                |
|                |     | 350–400      | 15      | 25    | 0,08             | 0,15        | 0,20         | 0,23         | 0,30            | 0,36         | 0,41          | 0,46                |
|                | 5   | 100–150      | 45      | –     | 0,15             | 0,25        | 0,30         | 0,36         | 0,46            | 0,53         | 0,56          | 0,61                |
|                |     | 150–250      | 40      | 60    | 0,13             | 0,23        | 0,25         | 0,30         | 0,41            | 0,48         | 0,51          | 0,56                |
|                |     | 250–350      | 30      | 50    | 0,10             | 0,20        | 0,23         | 0,25         | 0,36            | 0,43         | 0,46          | 0,51                |
|                | 6   | 150–200      | 25      | –     | 0,13             | 0,15        | 0,20         | 0,25         | 0,30            | 0,38         | 0,41          | 0,43                |
|                |     | 200–250      | 20      | –     | 0,10             | 0,15        | 0,20         | 0,25         | 0,30            | 0,38         | 0,41          | 0,43                |
|                |     | 250–300      | 15      | 20    | 0,10             | 0,13        | 0,18         | 0,20         | 0,25            | 0,33         | 0,36          | 0,38                |
|                |     | 300–350      | –       | 15    | 0,08             | 0,10        | 0,15         | 0,18         | 0,23            | 0,30         | 0,33          | 0,36                |
|                | M   | 1            | 135–185 | 25    | 35               | 0,15        | 0,20         | 0,23         | 0,28            | 0,36         | 0,41          | 0,46                |
| 185–275        |     |              | 30      | 30    | 0,13             | 0,18        | 0,20         | 0,25         | 0,30            | 0,36         | 0,41          | 0,46                |
| 275–350        |     |              | –       | 25    | 0,13             | 0,15        | 0,18         | 0,23         | 0,28            | 0,33         | 0,38          | 0,43                |
| K              | 1,2 | 120–150      | 55      | 80    | 0,20             | 0,30        | 0,41         | 0,51         | 0,61            | 0,69         | 0,74          | 0,79                |
|                |     | 150–200      | 45      | 75    | 0,18             | 0,28        | 0,36         | 0,46         | 0,56            | 0,64         | 0,69          | 0,74                |
|                |     | 200–220      | 40      | 65    | 0,15             | 0,23        | 0,30         | 0,41         | 0,46            | 0,53         | 0,58          | 0,64                |
|                |     | 220–260      | 35      | 55    | 0,13             | 0,18        | 0,23         | 0,30         | 0,36            | 0,43         | 0,48          | 0,53                |
|                |     | 260–320      | 30      | 45    | 0,10             | 0,15        | 0,18         | 0,23         | 0,30            | 0,36         | 0,41          | 0,46                |
| N              | 1   | –            | 180     | –     | 0,18             | 0,30        | 0,38         | 0,48         | 0,53            | 0,61         | 0,64          | 0,66                |
|                |     | –            | 90      | –     | 0,20             | 0,33        | 0,41         | 0,51         | 0,56            | 0,64         | 0,66          | 0,69                |
| S              | 1   | 140–210      | –       | 15    | 0,13             | 0,18        | 0,20         | 0,25         | 0,30            | 0,38         | 0,41          | 0,43                |
|                |     | 210–280      | –       | 10    | 0,10             | 0,15        | 0,18         | 0,20         | 0,25            | 0,30         | 0,33          | 0,36                |
|                |     | 280–340      | –       | 10    | 0,10             | 0,13        | 0,15         | 0,18         | 0,23            | 0,28         | 0,30          | 0,33                |







■ **Straight Flute Holders • Inch • Short**

| short   | D1    |       | D1 max |       | L     | L1   | L4 max | LS   | D     | seat size | CS           |  insert screw |  Torx wrench |
|---------|-------|-------|--------|-------|-------|------|--------|------|-------|-----------|--------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|         | mm    | in    | mm     | in    |       |      |        |      |       |           |              |                                                                                                  |                                                                                                 |
| 7SZSS   | 11,10 | .437  | 12,90  | .508  | 5.75  | 3.37 | 1.09   | 2.38 | .750  | Z         | 1/8 - 27 NPT | 56-1015                                                                                          | 56-2026                                                                                         |
| 7S0SS   | 12,93 | .509  | 17,65  | .695  | 6.35  | 3.97 | 1.85   | 2.38 | .750  | 0         | 1/8 - 27 NPT | 56-1014                                                                                          | 56-2017                                                                                         |
| 7S0.5SS | 15,47 | .609  | 17,65  | .695  | 6.35  | 3.97 | 1.76   | 2.38 | .750  | —         | 1/8 - 27 NPT | 56-1014                                                                                          | 56-2017                                                                                         |
| 7S1SS   | 17,53 | .690  | 24,38  | .960  | 7.23  | 4.85 | 2.25   | 2.38 | 1.000 | 1         | 1/4 - 18 NPT | 56-1020                                                                                          | 56-2028                                                                                         |
| 7S1.5SS | 21,82 | .859  | 24,38  | .960  | 7.23  | 4.85 | 2.17   | 2.38 | 1.000 | 1.5       | 1/4 - 18 NPT | 56-1020                                                                                          | 56-2028                                                                                         |
| 7S2SS   | 24,41 | .961  | 35,05  | 1.380 | 8.00  | 5.56 | 2.77   | 2.44 | 1.250 | 2         | 1/4 - 18 NPT | 56-1018                                                                                          | 56-2015                                                                                         |
| 7S2.5SS | 30,15 | 1.187 | 35,05  | 1.380 | 8.00  | 5.56 | 3.59   | 2.44 | 1.250 | 2.5       | 1/4 - 18 NPT | 56-1018                                                                                          | 56-2015                                                                                         |
| 7S3SS   | 35,08 | 1.381 | 47,73  | 1.879 | 9.88  | 7.25 | 3.76   | 2.63 | 1.500 | 3         | 1/4 - 18 NPT | 56-1585                                                                                          | 56-2020                                                                                         |
| 7S4SS   | 47,75 | 1.880 | 65,28  | 2.570 | 11.38 | 8.75 | 6.21   | 2.63 | 1.500 | 4         | 1/4 - 18 NPT | 56-1585                                                                                          | 56-2020                                                                                         |
| 7S5SS   | 63,50 | 2.500 | 88,90  | 3.500 | 12.50 | 9.25 | 5.36   | 3.25 | 2.000 | 5         | 1/4 - 18 NPT | 56-1025                                                                                          | 56-2125                                                                                         |

■ **Straight Flute Holders • Inch • Medium**

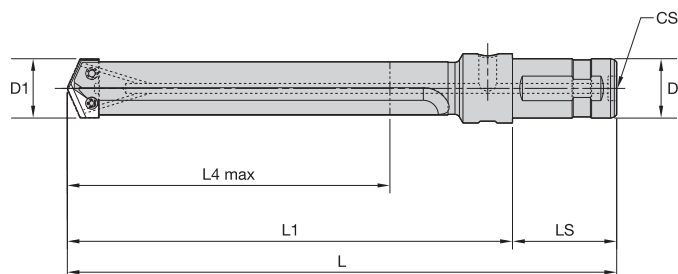
| medium  | D1    |       | D1 max |       | L     | L1    | L4 max | LS   | D     | seat size | CS           |  insert screw |  Torx wrench |
|---------|-------|-------|--------|-------|-------|-------|--------|------|-------|-----------|--------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|         | mm    | in    | mm     | in    |       |       |        |      |       |           |              |                                                                                                    |                                                                                                   |
| 7SZSM   | 11,10 | .437  | 12,90  | .508  | 6.76  | 4.38  | 2.08   | 2.38 | .750  | Z         | 1/8 - 27 NPT | 56-1015                                                                                            | 56-2026                                                                                           |
| 7S0SM   | 12,93 | .509  | 17,65  | .695  | 7.71  | 5.33  | 2.93   | 2.38 | .750  | 0         | 1/8 - 27 NPT | 56-1014                                                                                            | 56-2017                                                                                           |
| 7S0.5SM | 15,47 | .609  | 17,65  | .695  | 7.71  | 5.33  | 2.90   | 2.38 | .750  | —         | 1/8 - 27 NPT | 56-1014                                                                                            | 56-2017                                                                                           |
| 7S1SM   | 17,53 | .690  | 24,38  | .960  | 9.18  | 6.80  | 4.20   | 2.38 | 1.000 | 1         | 1/4 - 18 NPT | 56-1020                                                                                            | 56-2028                                                                                           |
| 7S1.5SM | 21,82 | .859  | 24,38  | .960  | 9.18  | 6.80  | 4.12   | 2.38 | 1.000 | 1.5       | 1/4 - 18 NPT | 56-1020                                                                                            | 56-2028                                                                                           |
| 7S2SM   | 24,41 | .961  | 35,05  | 1.380 | 10.38 | 7.94  | 5.15   | 2.44 | 1.250 | 2         | 1/4 - 18 NPT | 56-1018                                                                                            | 56-2015                                                                                           |
| 7S2.5SM | 30,15 | 1.187 | 35,05  | 1.380 | 10.38 | 7.94  | 5.03   | 2.44 | 1.250 | 2.5       | 1/4 - 18 NPT | 56-1020                                                                                            | 56-2028                                                                                           |
| 7S3SM   | 35,08 | 1.381 | 47,73  | 1.879 | 13.88 | 11.25 | 7.89   | 2.63 | 1.500 | 3         | 1/4 - 18 NPT | 56-1585                                                                                            | 56-2020                                                                                           |
| 7S4SM   | 47,75 | 1.880 | 65,28  | 2.570 | 15.38 | 12.75 | 9.57   | 2.63 | 1.500 | 4         | 1/4 - 18 NPT | 56-1585                                                                                            | 56-2020                                                                                           |
| 7S5SM   | 63,50 | 2.500 | 88,90  | 3.500 | 18.25 | 15.00 | 11.38  | 3.25 | 2.000 | 5         | 1/4 - 18 NPT | 56-1025                                                                                            | 56-2125                                                                                           |
| 7S7SM   | 88,93 | 3.501 | 114,30 | 4.500 | 21.25 | 14.62 | 11.50  | 6.63 | 3.000 | 7         | 1/4 - 18 NPT | 56-1025                                                                                            | 56-2125                                                                                           |

### ■ Straight Flute Holders • Inch • Long

| long    | D1    |       | D1 max |       | L     | L1    | L4 max | LS   | D     | seat size | CS           | <br>insert screw | <br>Torx wrench |
|---------|-------|-------|--------|-------|-------|-------|--------|------|-------|-----------|--------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|         | mm    | in    | mm     | in    |       |       |        |      |       |           |              |                                                                                                     |                                                                                                    |
| 7SZSL   | 11,10 | .437  | 12,90  | .508  | 7.76  | 5.38  | 3.10   | 2.38 | .750  | Z         | 1/8 - 27 NPT | 56-1015                                                                                             | 56-2026                                                                                            |
| 7S0SL   | 12,93 | .509  | 17,65  | .695  | 9.13  | 6.75  | 4.60   | 2.38 | .750  | 0         | 1/8 - 27 NPT | 56-1014                                                                                             | 56-2017                                                                                            |
| 7S0.5SL | 15,47 | .609  | 17,65  | .695  | 9.13  | 6.75  | 7.36   | 2.38 | .750  | —         | 1/8 - 27 NPT | 56-1014                                                                                             | 56-2017                                                                                            |
| 7S1SL   | 17,53 | .690  | 24,38  | .960  | 11.10 | 8.72  | 6.34   | 2.38 | 1.000 | 1         | 1/4 - 18 NPT | 56-1020                                                                                             | 56-2028                                                                                            |
| 7S2SL   | 24,41 | .961  | 35,05  | 1.380 | 12.75 | 10.31 | 7.86   | 2.44 | 1.250 | 2         | 1/4 - 18 NPT | 56-1018                                                                                             | 56-2015                                                                                            |
| 7S3SL   | 35,08 | 1.381 | 47,73  | 1.879 | 18.63 | 16.00 | 13.28  | 2.63 | 1.500 | 3         | 1/4 - 18 NPT | 56-1585                                                                                             | 56-2020                                                                                            |
| 7S4SL   | 47,75 | 1.880 | 65,28  | 2.570 | 21.50 | 18.87 | 15.89  | 2.63 | 1.500 | 4         | 1/4 - 18 NPT | 56-1585                                                                                             | 56-2020                                                                                            |
| 7S7SL   | 88,93 | 3.501 | 114,30 | 4.500 | 29.50 | 22.88 | 19.25  | 6.63 | 3.000 | 7         | 1/4 - 18 NPT | 56-1025                                                                                             | 56-2125                                                                                            |

### ■ Straight Flute Holders • Inch • Extra Long

| extra long | D1    |       | D1 max |       | L     | L1    | L4 max | LS   | D     | seat size | CS           | <br>insert screw | <br>Torx wrench |
|------------|-------|-------|--------|-------|-------|-------|--------|------|-------|-----------|--------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|            | mm    | in    | mm     | in    |       |       |        |      |       |           |              |                                                                                                       |                                                                                                      |
| 7S0SE      | 12,93 | .509  | 17,65  | .695  | 12.17 | 9.80  | 7.44   | 2.38 | .750  | 0         | 1/8 - 27 NPT | 56-1014                                                                                               | 56-2017                                                                                              |
| 7S0.5SE    | 15,47 | .609  | 17,65  | .695  | 12.17 | 9.80  | 7.60   | 2.38 | .750  | —         | 1/8 - 27 NPT | 56-1014                                                                                               | 56-2017                                                                                              |
| 7S1SE      | 17,53 | .690  | 24,38  | .960  | 15.12 | 12.75 | 5.67   | 2.38 | 1.000 | 1         | 1/4 - 18 NPT | 56-1020                                                                                               | 56-2028                                                                                              |
| 7S1.5SE    | 21,82 | .859  | 24,38  | .960  | 15.13 | 12.75 | 10.29  | 2.38 | 1.000 | 1.5       | 1/4 - 18 NPT | 56-1020                                                                                               | 56-2028                                                                                              |
| 7S2SE      | 24,41 | .961  | 35,05  | 1.380 | 15.82 | 13.38 | 11.07  | 2.44 | 1.250 | 2         | 1/4 - 18 NPT | 56-1018                                                                                               | 56-2015                                                                                              |
| 7S3SE      | 35,08 | 1.381 | 47,73  | 1.879 | 25.51 | 22.88 | 20.16  | 2.63 | 1.500 | 3         | 1/4 - 18 NPT | 56-1585                                                                                               | 56-2020                                                                                              |
| 7S4SE      | 47,75 | 1.880 | 65,28  | 2.570 | —     | —     | 15.89  | 2.63 | 1.500 | 4         | 1/4 - 18 NPT | 56-1585                                                                                               | 56-2020                                                                                              |



■ **Straight Flute Holders • Metric • Short**

| short | D1    |       | D1 max |       | L     | L1   | L4 max | LS   | D     | seat size | <br>insert screw | <br>Torx wrench |
|-------|-------|-------|--------|-------|-------|------|--------|------|-------|-----------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|       | mm    | in    | mm     | in    |       |      |        |      |       |           |                                                                                                     |                                                                                                    |
| 8S0SS | 13,00 | .512  | 17,50  | .689  | 4.88  | 2.88 | 1.91   | 2.01 | .787  | 0         | 56-1014                                                                                             | FT7                                                                                                |
| 8S1SS | 17,86 | .703  | 24,00  | .945  | 6.53  | 4.33 | 2.16   | 2.24 | .984  | 1         | 56-1020                                                                                             | FT8                                                                                                |
| 8S2SS | 24,61 | .969  | 35,00  | 1.378 | 7.49  | 5.13 | 2.72   | 2.40 | 1.260 | 2         | 56-1585                                                                                             | FT15                                                                                               |
| 8S4SS | 48,00 | 1.890 | 65,09  | 2.563 | 10.08 | 7.32 | 3.97   | 2.80 | 1.575 | 4         | 56-1585                                                                                             | FT20                                                                                               |

■ **Straight Flute Holders • Metric • Medium**

| medium | D1    |       | D1 max |       | L     | L1   | L4 max | LS   | D     | seat size | <br>insert screw | <br>Torx wrench |
|--------|-------|-------|--------|-------|-------|------|--------|------|-------|-----------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|        | mm    | in    | mm     | in    |       |      |        |      |       |           |                                                                                                       |                                                                                                      |
| 8S0SM  | 13,00 | .512  | 17,50  | .689  | 6.01  | 4.00 | 2.76   | 2.01 | .787  | 0         | 56-1014                                                                                               | FT7                                                                                                  |
| 8S1SM  | 17,86 | .703  | 24,00  | .945  | 8.58  | 6.33 | 4.16   | 2.24 | .984  | 1         | 56-1020                                                                                               | FT8                                                                                                  |
| 8S2SM  | 24,61 | .969  | 35,00  | 1.378 | 9.53  | 7.13 | 4.72   | 2.40 | 1.260 | 2         | 56-1018                                                                                               | FT15                                                                                                 |
| 8S3SM  | 35,72 | 1.406 | 47,63  | 1.875 | 11.11 | 8.31 | 5.32   | 2.80 | 1.575 | 3         | 56-1585                                                                                               | FT20                                                                                                 |

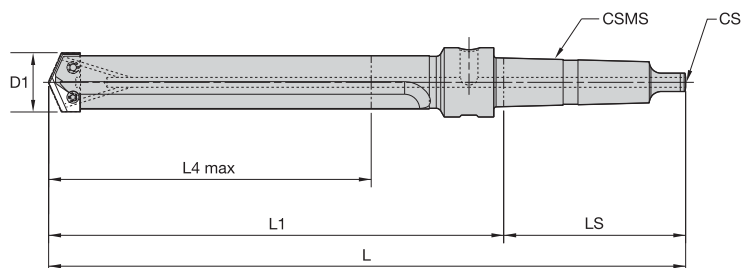
### ■ Straight Flute Holders • Metric • Long

| long  | D1    |      | D1 max |       | L     | L1   | L4 max | LS   | D     | seat size | CS   | <br>insert screw | <br>Torx wrench |
|-------|-------|------|--------|-------|-------|------|--------|------|-------|-----------|------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|       | mm    | in   | mm     | in    |       |      |        |      |       |           |      |                                                                                                     |                                                                                                    |
| 8S0SL | 12,93 | .509 | 17,53  | .690  | 8.01  | 6.00 | 4.13   | 2.01 | .787  | 0         | R1/8 | 56-1014                                                                                             | FT7                                                                                                |
| 8S1SL | 17,86 | .703 | 24,00  | .945  | 10.53 | 8.33 | 6.16   | 2.24 | .984  | 1         | —    | 56-1020                                                                                             | FT8                                                                                                |
| 8S2SL | 24,61 | .969 | 35,00  | 1.378 | 11.53 | 9.13 | 6.72   | 2.40 | 1.260 | 2         | —    | 56-1018                                                                                             | FT15                                                                                               |

### ■ Straight Flute Holders • Metric • Extra Long

| extra long | D1    |      | D1 max |       | L     | L1    | L4 max | LS   | D     | seat size | <br>insert screw | <br>Torx wrench |
|------------|-------|------|--------|-------|-------|-------|--------|------|-------|-----------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|            | mm    | in   | mm     | in    |       |       |        |      |       |           |                                                                                                      |                                                                                                     |
| 8S2SE      | 24,61 | .969 | 35,00  | 1.378 | 18.17 | 15.76 | 14.27  | 2.40 | 1.260 | 2         | 56-1018                                                                                              | FT15                                                                                                |

- Through coolant must be used with spade drills depths greater than 1 x D.
- Direct spindle cooling is preferable when using WIDIA™ Spade Blades.
- If spindle cooling is unavailable, then coolant glands or inducers should be used to provide through coolant capability.
- Our holders provide both options; please find available coolant glands below.



### ■ Straight Flute Holders • Short

| short   | D1    |       | D1 max |       | L     | L1   | L4 max | LS   | CSMS system size | seat size | CS       | insert screw | Torx wrench |
|---------|-------|-------|--------|-------|-------|------|--------|------|------------------|-----------|----------|--------------|-------------|
|         | mm    | in    | mm     | in    |       |      |        |      |                  |           |          |              |             |
| 7SZTS   | 11,10 | .437  | 12,90  | .508  | 6.50  | 3.56 | 1.30   | 3.13 | 2                | Z         | 8 - 32   | 56-1015      | 56-2026     |
| 7S1TS   | 17,53 | .690  | 24,38  | .960  | 8.73  | 5.04 | 2.48   | 3.88 | 3                | 1         | 1/4 - 20 | 56-1020      | 56-2028     |
| 7S2TS   | 24,41 | .961  | 35,05  | 1.380 | 9.44  | 5.75 | 3.11   | 3.88 | 3                | 2         | 1/4 - 20 | 56-1018      | 56-2015     |
| 7S2.5TS | 30,15 | 1.187 | 35,05  | 1.380 | 9.44  | 5.56 | 3.00   | 3.88 | 3                | 2.5       | 1/4 - 20 | 56-1018      | 56-2015     |
| 7S3TS   | 35,08 | 1.381 | 47,73  | 1.879 | 12.13 | 7.50 | 4.21   | 4.88 | 4                | 3         | 5/16-18  | 56-1585      | 56-2020     |
| 7S4TS   | 47,75 | 1.880 | 65,28  | 2.570 | 13.62 | 9.00 | 5.60   | 4.88 | 4                | 4         | 5/16-18  | 56-1585      | 56-2020     |
| 7S5TS   | 63,50 | 2.500 | 88,90  | 3.500 | 15.38 | 9.50 | 5.63   | 6.13 | 5                | 5         | 1/2 - 13 | 56-1025      | 56-2125     |

NOTE: CSMS = Morse taper size.

### ■ Straight Flute Holders • Medium

| medium      | D1    |       | D1 max |       | L     | L1    | L4 max | LS   | CSMS system size | seat size | CS       | insert screw | Torx wrench |
|-------------|-------|-------|--------|-------|-------|-------|--------|------|------------------|-----------|----------|--------------|-------------|
|             | mm    | in    | mm     | in    |       |       |        |      |                  |           |          |              |             |
| 7S0TM       | 12,93 | .509  | 17,65  | .695  | 8.46  | 5.52  | 3.20   | 3.13 | 2                | 0         | 8 - 32   | 56-1014      | 56-2017     |
| 7S1TM       | 17,53 | .690  | 24,38  | .960  | 10.68 | 6.99  | 4.43   | 3.88 | 3                | 1         | 1/4 - 20 | 56-1020      | 56-2028     |
| 7S1.5TM     | 21,82 | .859  | 24,38  | .960  | 10.68 | 6.80  | 4.35   | 3.88 | 3                | 1.5       | 1/4 - 20 | 56-1020      | 56-2028     |
| 7S2TM       | 24,41 | .961  | 35,05  | 1.380 | 11.82 | 8.13  | 5.49   | 3.88 | 3                | 2         | 1/4 - 20 | 56-1018      | 56-2015     |
| 7S2.5TM-4MT | 30,15 | 1.187 | 35,05  | 1.380 | 12.82 | 8.19  | 5.38   | 4.88 | 4                | 2.5       | 5/16-18  | 56-1018      | 56-2015     |
| 7S3TM       | 35,08 | 1.381 | 47,73  | 1.879 | 16.13 | 11.50 | 8.34   | 4.88 | 4                | 3         | 5/16-18  | 56-1585      | 56-2020     |
| 7S4TM       | 47,75 | 1.880 | 65,28  | 2.570 | 17.63 | 13.00 | 9.58   | 4.88 | 4                | 4         | 5/16-18  | 56-1585      | 56-2020     |
| 7S5TM       | 63,50 | 2.500 | 88,90  | 3.500 | 21.13 | 15.25 | 11.38  | 6.13 | 5                | 5         | 1/2 - 13 | 56-1025      | 56-2125     |
| 7S7TM       | 88,93 | 3.501 | 114,30 | 4.500 | 22.28 | 16.40 | 11.50  | 6.13 | 5                | 7         | 1/2 - 13 | 56-1025      | 56-2125     |

NOTE: CSMS = Morse taper size.

### ■ Straight Flute Holders • Long

| long  | D1    |       | D1 max |       | L     | L1    | L4 max | LS   | CSMS<br>system size | seat<br>size | CS       | insert<br>screw | Torx<br>wrench |
|-------|-------|-------|--------|-------|-------|-------|--------|------|---------------------|--------------|----------|-----------------|----------------|
|       | mm    | in    | mm     | in    |       |       |        |      |                     |              |          |                 |                |
| 7SZTL | 11,10 | .437  | 12,90  | .508  | 8.51  | 5.57  | 3.30   | 3.13 | 2                   | Z            | 8 - 32   | 56-1015         | 56-2026        |
| 7S0TL | 12,93 | .509  | 17,65  | .695  | 9.88  | 6.94  | 4.60   | 3.13 | 2                   | 0            | 8 - 32   | 56-1014         | 56-2017        |
| 7S1TL | 17,53 | .690  | 24,38  | .960  | 12.60 | 8.91  | 6.36   | 3.88 | 3                   | 1            | 1/4 - 20 | 56-1020         | 56-2028        |
| 7S2TL | 24,41 | .961  | 35,05  | 1.380 | 14.19 | 10.50 | 7.86   | 3.88 | 3                   | 2            | 1/4 - 20 | 56-1018         | 56-2015        |
| 7S3TL | 35,08 | 1.381 | 47,73  | 1.879 | 20.88 | 16.25 | 13.28  | 4.88 | 4                   | 3            | 5/16-18  | 56-1585         | 56-2020        |
| 7S4TL | 47,75 | 1.880 | 65,28  | 2.570 | 23.75 | 19.12 | 15.90  | 4.88 | 4                   | 4            | 5/16-18  | 56-1585         | 56-2020        |
| 7S5TL | 63,50 | 2.500 | 88,90  | 3.500 | 26.88 | 21.00 | 17.13  | 6.13 | 5                   | 5            | 1/2 - 13 | 56-1025         | 56-2125        |
| 7S7TL | 88,93 | 3.501 | 114,30 | 4.500 | 30.53 | 24.65 | 19.75  | 6.13 | 5                   | 7            | 1/2 - 13 | 56-1025         | 56-2125        |

NOTE: CSMS = Morse taper size.

### ■ Straight Flute Holders • Extra Long

| extra long | D1    |      | D1 max |       | L     | L1    | L4 max | LS   | CSMS<br>system size | seat<br>size | CS       | insert<br>screw | Torx<br>wrench |
|------------|-------|------|--------|-------|-------|-------|--------|------|---------------------|--------------|----------|-----------------|----------------|
|            | mm    | in   | mm     | in    |       |       |        |      |                     |              |          |                 |                |
| 7S0TE      | 12,93 | .509 | 17,65  | .695  | 12.93 | 10.00 | 7.65   | 3.13 | 2                   | 0            | 8 - 32   | 56-1014         | 56-2017        |
| 7S0.5TE    | 15,47 | .609 | 17,65  | .695  | 12.93 | 9.80  | 7.60   | 3.13 | 2                   | —            | 8 - 32   | 56-1014         | 56-2017        |
| 7S2TE      | 24,41 | .961 | 35,05  | 1.380 | 17.26 | 13.57 | 11.07  | 3.88 | 3                   | 2            | 1/4 - 20 | 56-1018         | 56-2015        |

NOTE: CSMS = Morse taper size.





# Indexable Drills

|                   |        |
|-------------------|--------|
| Introduction..... | V2-V3  |
| Top Cut 4.....    | V4-V40 |



|                                                                                   |                                                                          | standard                             |   |   |   |   |   | hole<br>tolerance | standard range |          |                                  | customised solution range |           |                       |  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------|---|---|---|---|---|-------------------|----------------|----------|----------------------------------|---------------------------|-----------|-----------------------|--|
|                                                                                   |                                                                          | ● first choice<br>○ alternate choice |   |   |   |   |   |                   | diameter range |          | drilling<br>depth L/D1           | diameter range            |           | drilling<br>depth     |  |
|                                                                                   |                                                                          |                                      |   |   |   |   |   |                   | D1 mm          | D1 in    |                                  | D1 mm                     | D1 inch   |                       |  |
|                                                                                   |                                                                          | P                                    | M | K | N | S | H |                   | min-max        | min-max  |                                  | min-max                   | min-max   |                       |  |
|  | <b>Top Cut 4™</b><br><i>Indexable Drill Body<br/>Short Hole Drilling</i> | ●                                    | ● | ● |   |   |   | IT9–11            | 12–68          | .473–2.5 | 2 x D<br>3 x D<br>4 x D<br>5 x D | 12–110                    | .473–4.33 | 2–5 x D <sup>2)</sup> |  |

In regard to insert and drill coatings, anything is possible. If a specific insert or drill is not suitable for your workpiece material, please contact our Engineered Solutions Department for an offer about special coatings and edge preparations.

\*Except for L/D 5 x D.

1) Other shank styles available as customised solution.

2) Dependent on the application, up to 6 x D is possible.

| ● standard capabilities 1)                                                        |                                                                                   |                                                                                   | ● standard ○ customised solution capabilities                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |   | page(s) |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---|---------|
| Coolant                                                                           |                                                                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |   |         |
|  |  |  |  |  |  |  |  |  |  |  |  |  |   |         |
|                                                                                   | ●                                                                                 | ●●                                                                                | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●*                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ● | V8–V23  |

## **WIDIA™ Top Cut 4™ • New Generation Indexable Drilling System**

The new WIDIA Top Cut 4 (TC4) portfolio is a broad offering for customers looking for a versatile indexable drilling platform.

The newly developed TC4 features improved centring capabilities and inserts with four cutting edges for both pocket seats (central and periphery). This, in combination with the renowned WIDIA grade technology, leads to outstanding flexibility and efficiency.

The TC4 platform offers three easy-to-select grades and two geometries applicable for steel, cast iron, and stainless steel materials. It covers the diameter range from 12–68mm within the standard offering in L/D ratios of 2–5 x D.

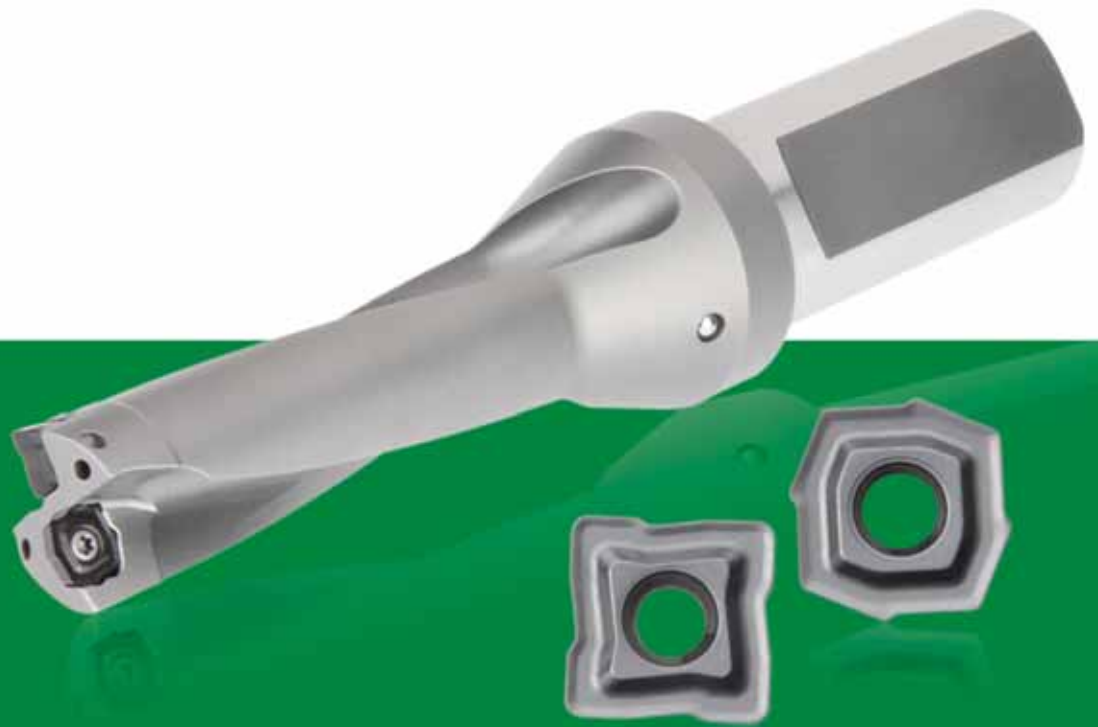
# TOP CUT 4

### **One Comprehensive Platform**

- Standard diameter range covering 12–68mm in 2 x D, 3 x D, 4 x D, and 5 x D.
- Four real cutting edges each for entire platform.
- Eight insert sizes to cover complete diameter range.

### **Easy to Apply**

- No risk of mixing up inner and outer insert due to clear visual differences.
- Easy-to-change inserts, laser marked with geometries and grades.
- Easy-to-use nomenclature guide enabling the tool body and the related insert selection to avoid order failures.



## Highly Versatile

- Breadth of application capabilities include through and cross holes, inclined entry and exit opportunity, 45° corner, half cylindrical, concave, or chain drilling.
- Various geometries and grades available.

## Highest Performance

- 2x four true cutting edges.
- Cutting edge profile of central and periphery insert work together, leading to high stabilisation of the drill, preventing drifting of the tool even on irregular surfaces.
- X-offset design to adjust diameter size on turning machines and optimise tolerances on machining centres.
- Apply where speed and economy are prime considerations.
- Three grades to achieve higher tool life at accelerated speeds:
  - WU25CH grade for highest metal removal rate in general applications.
  - WU40PH grade for high toughness demands.
  - WPK10CH grade for high speed applications.

The guide below provides an example of how to select the Top Cut 4 tool body and accompanying inserts for a stable steel drilling application.

## Metric Body

|                          |                                                                                                      |                       |                                                   |                                             |            |          |             |
|--------------------------|------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------|---------------------------------------------|------------|----------|-------------|
| <b>TCF</b>               | <b>250</b>                                                                                           | <b>R</b>              | <b>3</b>                                          | <b>SL</b>                                   | <b>32</b>  | <b>M</b> | <b>D</b>    |
| Tool Family<br>Top Cut 4 | Diameter<br>Metric =<br>3 digits<br>(e.g. 250 =<br>25mm)<br>Inch =<br>4 digits (e.g.<br>2500 = 2.5") | Right-Hand<br>Cutting | Length<br>Diameter<br>Ratio<br>$L/D = 3 \times D$ | Shank Style<br>SL =<br>Side Lock<br>Adaptor | Shank Size | Metric   | Insert Size |

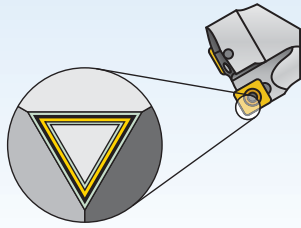
## Periphery Insert

|                          |                      |                     |                            |             |                                                             |                    |               |
|--------------------------|----------------------|---------------------|----------------------------|-------------|-------------------------------------------------------------|--------------------|---------------|
| <b>TCF</b>               | <b>08</b>            | <b>03</b>           | <b>08</b>                  | <b>D</b>    | <b>P</b>                                                    | <b>V34</b>         | <b>WU25CH</b> |
| Tool Family<br>Top Cut 4 | Size<br>In-Circle D1 | Insert<br>Thickness | Insert<br>Corner<br>Radius | Insert Size | Insert<br>Positioning<br>C =<br>Central<br>P =<br>Periphery | Insert<br>Geometry | Grade         |

Insert Geometry – V34 for steel or cast iron or V36 for stainless steel and long chipping steel.

## Insert Guide for Grades

|          |                                                                  |                                                                                                                                                                   |                               |                                  |
|----------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------|
| <b>W</b> | <b>U</b>                                                         | <b>25</b>                                                                                                                                                         | <b>C</b>                      | <b>H</b>                         |
| <b>W</b> | <b>U</b>                                                         | <b>40</b>                                                                                                                                                         | <b>P</b>                      | <b>H</b>                         |
| <b>W</b> | <b>PK</b>                                                        | <b>10</b>                                                                                                                                                         | <b>C</b>                      | <b>H</b>                         |
| WIDIA™   | Material<br>Range<br>U = Universal<br>P = Steel<br>K = Cast Iron | Toughness<br>Range<br>Choose high<br>numbers for<br>toughness<br>in stable<br>conditions,<br>low numbers<br>for high wear<br>resistance at<br>continuous<br>cuts. | Coating<br>P = PVD<br>C = CVD | Application<br>H =<br>Holemaking |

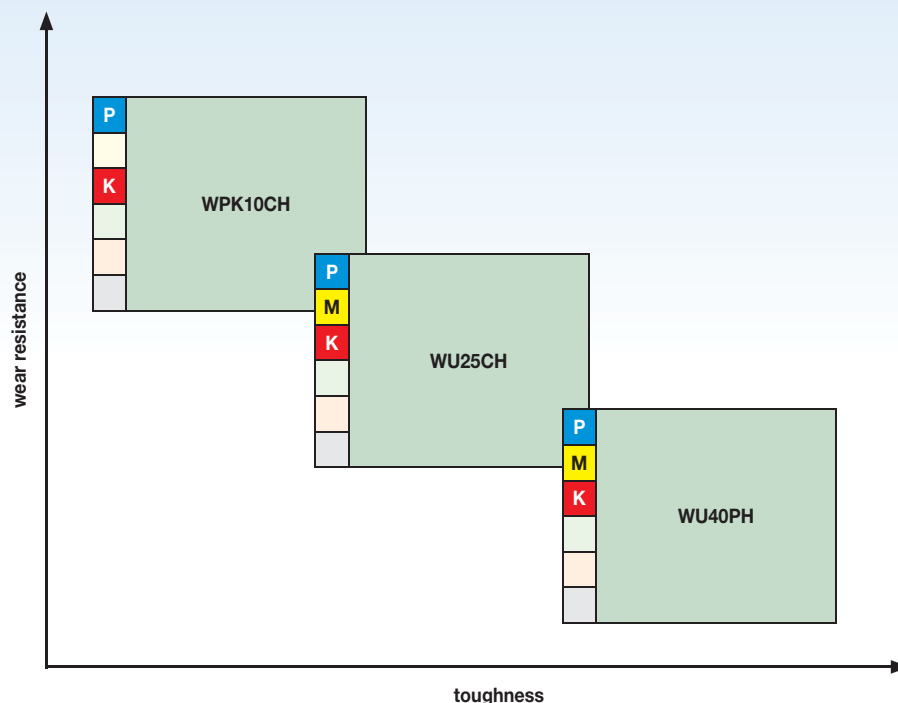


Coatings provide high-speed capability and are engineered for finishing to light roughing.

|   |                    |
|---|--------------------|
| P | Steel              |
| M | Stainless Steel    |
| K | Cast Iron          |
| N | Non-Ferrous        |
| S | High-Temp Alloys   |
| H | Hardened Materials |

wear resistance ← → toughness

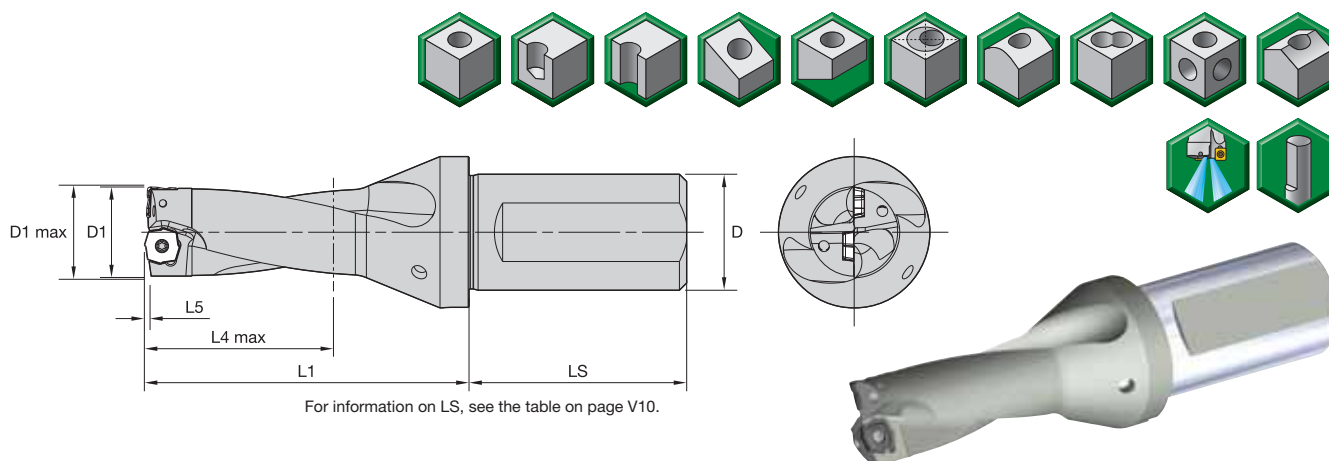
| Coating                                        | Grade Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   | 05 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|----|----|----|----|----|----|----|----|
| WPK10CH<br>TiCN-Al <sub>2</sub> O <sub>3</sub> | <b>Composition:</b> With an advanced CVD TiCN-Al <sub>2</sub> O <sub>3</sub> coating combined with a cobalt-enriched carbide substrate, this grade offers a balanced combination of deformation-resistance and edge toughness.<br><b>Application:</b> Offers outstanding abrasion and crater wear resistance for high-speed machining of steels and cast irons. Use for very high cutting speeds with low to medium feed rates.                                                         | P |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | M |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | K |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | N |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | S |    |    |    |    |    |    |    |    |    |
| WU25CH<br>TiCN-Al <sub>2</sub> O <sub>3</sub>  | <b>Composition:</b> Advanced CVD TiCN-Al <sub>2</sub> O <sub>3</sub> coating together with a newly engineered tough carbide substrate. Ensures adequate deformation resistance and excellent edge strength and offers very good wear resistance over a wide range of machining conditions.<br><b>Application:</b> A high productivity grade with high speeds and feeds. First choice for high productivity with very good reliability in steels, stainless steels, and cast iron rates. | P |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | M |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | K |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | N |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | S |    |    |    |    |    |    |    |    |    |
| WU40PH<br>TiCN-Al <sub>2</sub> O <sub>3</sub>  | <b>Composition:</b> With a multilayered PVD TiN-TiAlN coating and a tough substrate, this grade withstands interruptions and provides high wear resistance for long tool life.<br><b>Application:</b> First choice for high reliability in most materials. This grade should be used at medium speeds and high feeds due to sharper edges and as a grade for high-toughness applications. It covers steel, stainless steel, cast iron, and high-temp alloys under certain conditions.   | P |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | M |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | K |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | N |    |    |    |    |    |    |    |    |    |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | S |    |    |    |    |    |    |    |    |    |



**WPK10CH:**  
High-Speed Grade

**WU25CH:**  
High Metal Removal Rate Grade

**WU40PH:**  
High Toughness Grade



■ Top Cut 4 Drill • Metric • 2 x D • SL Shanks

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537778      | TCF120R2SL20MA   | 12,00 | 12,50  | 20 | 54,6  | 24,0   | 0,41 | A           | TCF040204AP      | TCF040203AC   |
| 5537779      | TCF125R2SL20MA   | 12,50 | 13,00  | 20 | 55,8  | 25,0   | 0,48 | A           | TCF040204AP      | TCF040203AC   |
| 5537860      | TCF127R2SL20MA   | 12,70 | 13,20  | 20 | 56,2  | 26,0   | 0,51 | A           | TCF040204AP      | TCF040203AC   |
| 5537861      | TCF130R2SL20MA   | 13,00 | 13,50  | 20 | 56,9  | 26,0   | 0,56 | A           | TCF040204AP      | TCF040203AC   |
| 5537862      | TCF135R2SL20MA   | 13,50 | 14,00  | 20 | 58,1  | 27,0   | 0,64 | A           | TCF040204AP      | TCF040203AC   |
| 5577828      | TCF140R2SL25MB   | 14,00 | 14,50  | 25 | 59,8  | 28,0   | 0,42 | B           | TCF050204BP      | TCF060203BC   |
| 5577829      | TCF145R2SL25MB   | 14,50 | 15,00  | 25 | 60,9  | 29,0   | 0,45 | B           | TCF050204BP      | TCF060203BC   |
| 5577920      | TCF150R2SL25MB   | 15,00 | 15,50  | 25 | 62,1  | 30,0   | 0,49 | B           | TCF050204BP      | TCF060203BC   |
| 5577921      | TCF155R2SL25MB   | 15,50 | 16,00  | 25 | 63,3  | 31,0   | 0,54 | B           | TCF050204BP      | TCF060203BC   |
| 5577922      | TCF160R2SL25MB   | 16,00 | 16,50  | 25 | 64,4  | 32,0   | 0,60 | B           | TCF050204BP      | TCF060203BC   |
| 5577923      | TCF165R2SL25MB   | 16,50 | 17,00  | 25 | 65,6  | 33,0   | 0,68 | B           | TCF050204BP      | TCF060203BC   |
| 5577924      | TCF170R2SL25MB   | 17,00 | 17,50  | 25 | 68,4  | 34,0   | 0,74 | B           | TCF050204BP      | TCF060203BC   |
| 5577925      | TCF175R2SL25MB   | 17,50 | 18,00  | 25 | 69,6  | 35,0   | 0,79 | B           | TCF050204BP      | TCF060203BC   |
| 5577926      | TCF180R2SL25MB   | 18,00 | 18,50  | 25 | 70,8  | 36,0   | 0,86 | B           | TCF050204BP      | TCF060203BC   |
| 5577927      | TCF185R2SL25MB   | 18,50 | 19,00  | 25 | 71,9  | 37,0   | 0,83 | B           | TCF050204BP      | TCF060203BC   |
| 5578820      | TCF190R2SL25MC   | 19,00 | 19,50  | 25 | 72,1  | 38,0   | 0,60 | C           | TCF070306CP      | TCF070304CC   |
| 5578821      | TCF195R2SL25MC   | 19,50 | 20,00  | 25 | 73,2  | 39,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578822      | TCF200R2SL25MC   | 20,00 | 20,50  | 25 | 74,4  | 40,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578823      | TCF205R2SL25MC   | 20,50 | 21,00  | 25 | 75,6  | 41,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578824      | TCF210R2SL25MC   | 21,00 | 21,50  | 25 | 76,7  | 42,0   | 0,80 | C           | TCF070306CP      | TCF070304CC   |
| 5578825      | TCF220R2SL25MC   | 22,00 | 22,50  | 25 | 79,0  | 44,0   | 1,00 | C           | TCF070306CP      | TCF070304CC   |
| 5578826      | TCF225R2SL25MC   | 22,50 | 23,00  | 25 | 80,2  | 45,0   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5578827      | TCF230R2SL25MC   | 23,00 | 23,50  | 25 | 81,4  | 46,0   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5537167      | TCF240R2SL25MD   | 24,00 | 25,00  | 25 | 87,2  | 48,0   | 0,78 | D           | TCF080308DP      | TCF090305DC   |
| 5537168      | TCF250R2SL32MD   | 25,00 | 26,00  | 32 | 89,6  | 50,0   | 0,86 | D           | TCF080308DP      | TCF090305DC   |
| 5537169      | TCF260R2SL32MD   | 26,00 | 27,00  | 32 | 91,9  | 52,0   | 0,97 | D           | TCF080308DP      | TCF090305DC   |
| 5537820      | TCF265R2SL32MD   | 26,50 | 27,50  | 32 | 93,0  | 53,0   | 1,05 | D           | TCF080308DP      | TCF090305DC   |
| 5537821      | TCF270R2SL32MD   | 27,00 | 28,00  | 32 | 94,2  | 54,0   | 1,15 | D           | TCF080308DP      | TCF090305DC   |
| 5537822      | TCF280R2SL32MD   | 28,00 | 29,00  | 32 | 96,5  | 56,0   | 1,30 | D           | TCF080308DP      | TCF090305DC   |
| 5537823      | TCF290R2SL32MD   | 29,00 | 30,00  | 32 | 98,8  | 58,0   | 1,45 | D           | TCF080308DP      | TCF090305DC   |
| 5537937      | TCF300R2SL32ME   | 30,00 | 31,00  | 32 | 100,2 | 60,0   | 0,63 | E           | TCF100408EP      | TCF120405EC   |
| 5537938      | TCF310R2SL32ME   | 31,00 | 32,00  | 32 | 102,5 | 62,0   | 0,72 | E           | TCF100408EP      | TCF120405EC   |

(continued)



(Top Cut 4 Drill • Metric • 2 x D • SL Shanks — continued)

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537939      | TCF320R2SL32ME   | 32,00 | 33,00  | 32 | 104,8 | 64,0   | 0,82 | E           | TCF100408EP      | TCF120405EC   |
| 5537940      | TCF330R2SL40ME   | 33,00 | 34,00  | 40 | 107,1 | 66,0   | 0,95 | E           | TCF100408EP      | TCF120405EC   |
| 5537941      | TCF340R2SL40ME   | 34,00 | 35,00  | 40 | 109,4 | 68,0   | 1,14 | E           | TCF100408EP      | TCF120405EC   |
| 5537942      | TCF350R2SL40ME   | 35,00 | 36,00  | 40 | 111,8 | 70,0   | 1,30 | E           | TCF100408EP      | TCF120405EC   |
| 5537943      | TCF360R2SL40ME   | 36,00 | 37,00  | 40 | 114,1 | 72,0   | 1,45 | E           | TCF100408EP      | TCF120405EC   |
| 5578539      | TCF370R2SL40MF   | 37,00 | 38,00  | 40 | 118,1 | 74,0   | 1,19 | F           | TCF120412FP      | TCF150406FC   |
| 5578600      | TCF375R2SL40MF   | 37,50 | 38,50  | 40 | 119,3 | 75,0   | 1,23 | F           | TCF120412FP      | TCF150406FC   |
| 5578601      | TCF380R2SL40MF   | 38,00 | 39,00  | 40 | 120,5 | 76,0   | 1,27 | F           | TCF120412FP      | TCF150406FC   |
| 5578602      | TCF390R2SL40MF   | 39,00 | 40,00  | 40 | 122,8 | 78,0   | 1,36 | F           | TCF120412FP      | TCF150406FC   |
| 5578603      | TCF400R2SL40MF   | 40,00 | 41,00  | 40 | 125,1 | 80,0   | 1,47 | F           | TCF120412FP      | TCF150406FC   |
| 5578604      | TCF410R2SL40MF   | 41,00 | 42,00  | 40 | 127,4 | 82,0   | 1,60 | F           | TCF120412FP      | TCF150406FC   |
| 5578605      | TCF420R2SL40MF   | 42,00 | 43,00  | 40 | 129,7 | 84,0   | 1,77 | F           | TCF120412FP      | TCF150406FC   |
| 5578606      | TCF430R2SL40MF   | 43,00 | 44,00  | 40 | 132,1 | 86,0   | 1,99 | F           | TCF120412FP      | TCF150406FC   |
| 5578607      | TCF440R2SL40MF   | 44,00 | 45,00  | 40 | 134,4 | 88,0   | 2,10 | F           | TCF120412FP      | TCF150406FC   |
| 5578608      | TCF450R2SL50MF   | 45,00 | 46,00  | 50 | 136,7 | 90,0   | 2,21 | F           | TCF120412FP      | TCF150406FC   |
| 5578694      | TCF460R2SL50MG   | 46,00 | 47,00  | 50 | 139,0 | 92,0   | 1,45 | G           | TCF150512GP      | TCF180508GC   |
| 5578695      | TCF470R2SL50MG   | 47,00 | 48,00  | 50 | 141,3 | 94,0   | 1,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578696      | TCF480R2SL50MG   | 48,00 | 49,00  | 50 | 143,7 | 96,0   | 1,63 | G           | TCF150512GP      | TCF180508GC   |
| 5578697      | TCF490R2SL50MG   | 49,00 | 50,00  | 50 | 146,0 | 98,0   | 1,74 | G           | TCF150512GP      | TCF180508GC   |
| 5578698      | TCF500R2SL50MG   | 50,00 | 51,00  | 50 | 149,8 | 100,0  | 1,87 | G           | TCF150512GP      | TCF180508GC   |
| 5578699      | TCF505R2SL50MG   | 50,50 | 51,50  | 50 | 151,0 | 101,0  | 1,94 | G           | TCF150512GP      | TCF180508GC   |
| 5578710      | TCF510R2SL50MG   | 51,00 | 52,00  | 50 | 152,1 | 102,0  | 2,02 | G           | TCF150512GP      | TCF180508GC   |
| 5578711      | TCF520R2SL50MG   | 52,00 | 53,00  | 50 | 154,4 | 104,0  | 2,22 | G           | TCF150512GP      | TCF180508GC   |
| 5578712      | TCF530R2SL50MG   | 53,00 | 54,00  | 50 | 156,8 | 106,0  | 2,46 | G           | TCF150512GP      | TCF180508GC   |
| 5578713      | TCF540R2SL50MG   | 54,00 | 55,00  | 50 | 159,1 | 108,0  | 2,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578714      | TCF550R2SL50MG   | 55,00 | 56,00  | 50 | 161,4 | 110,0  | 2,73 | G           | TCF150512GP      | TCF180508GC   |
| 5578715      | TCF560R2SL50MG   | 56,00 | 57,00  | 50 | 163,7 | 112,0  | 2,37 | G           | TCF150512GP      | TCF180508GC   |
| 5538613      | TCF570R2SL50MH   | 57,00 | 58,00  | 50 | 165,5 | 114,0  | 1,76 | H           | TCF180614HP      | TCF210608HC   |
| 5538614      | TCF580R2SL50MH   | 58,00 | 59,00  | 50 | 167,9 | 116,0  | 1,85 | H           | TCF180614HP      | TCF210608HC   |
| 5538615      | TCF590R2SL50MH   | 59,00 | 60,00  | 50 | 170,2 | 118,0  | 1,96 | H           | TCF180614HP      | TCF210608HC   |
| 5538616      | TCF600R2SL50MH   | 60,00 | 61,00  | 50 | 172,5 | 120,0  | 1,42 | H           | TCF180614HP      | TCF210608HC   |
| 5538617      | TCF610R2SL50MH   | 61,00 | 62,00  | 50 | 174,8 | 122,0  | 2,23 | H           | TCF180614HP      | TCF210608HC   |
| 5538618      | TCF620R2SL50MH   | 62,00 | 63,00  | 50 | 177,1 | 124,0  | 2,41 | H           | TCF180614HP      | TCF210608HC   |
| 5538619      | TCF630R2SL50MH   | 63,00 | 64,00  | 50 | 179,5 | 126,0  | 2,64 | H           | TCF180614HP      | TCF210608HC   |
| 5538630      | TCF640R2SL50MH   | 64,00 | 65,00  | 50 | 181,8 | 128,0  | 2,94 | H           | TCF180614HP      | TCF210608HC   |
| 5538631      | TCF650R2SL50MH   | 65,00 | 66,00  | 50 | 184,1 | 130,0  | 3,06 | H           | TCF180614HP      | TCF210608HC   |
| 5538632      | TCF660R2SL50MH   | 66,00 | 67,00  | 50 | 186,4 | 132,0  | 3,18 | H           | TCF180614HP      | TCF210608HC   |
| 5538633      | TCF670R2SL50MH   | 67,00 | 68,00  | 50 | 188,7 | 134,0  | 3,30 | H           | TCF180614HP      | TCF210608HC   |
| 5538634      | TCF680R2SL50MH   | 68,00 | 69,00  | 50 | 191,1 | 136,0  | 2,93 | H           | TCF180614HP      | TCF210608HC   |

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(Top Cut 4 Drill • Metric • 2 x D • SL Shanks — continued)

## ■ Spare Parts



| insert size | periphery insert | centre insert | insert screw order number | Torx size | Torx driver order number | tightening torque Nm |
|-------------|------------------|---------------|---------------------------|-----------|--------------------------|----------------------|
| A           | TCF040204AP      | TCF040203AC   | <b>2025073</b>            | T5        | <b>2029221</b>           | 0,40                 |
| B           | TCF050204BP      | TCF060203BC   | <b>1175225</b>            | T6        | <b>1138455</b>           | 0,53                 |
| C           | TCF070306CP      | TCF070304CC   | <b>1021337</b>            | T7        | <b>2029266</b>           | 0,90                 |
| D           | TCF080308DP      | TCF090305DC   | <b>1134385</b>            | T8        | <b>2029598</b>           | 1,10                 |
| E           | TCF100408EP      | TCF120405EC   | <b>2018194</b>            | T9        | <b>1138430</b>           | 2,00                 |
| F           | TCF120412FP      | TCF150406FC   | <b>1756815</b>            | T15       | <b>2029596</b>           | 4,00                 |
| G           | TCF150512GP      | TCF180508GC   | <b>1099645</b>            | T20       | <b>2029488</b>           | 6,30                 |
| H           | TCF180614HP      | TCF210608HC   | <b>1823871</b>            | T25       | <b>1022519</b>           | 8,80                 |

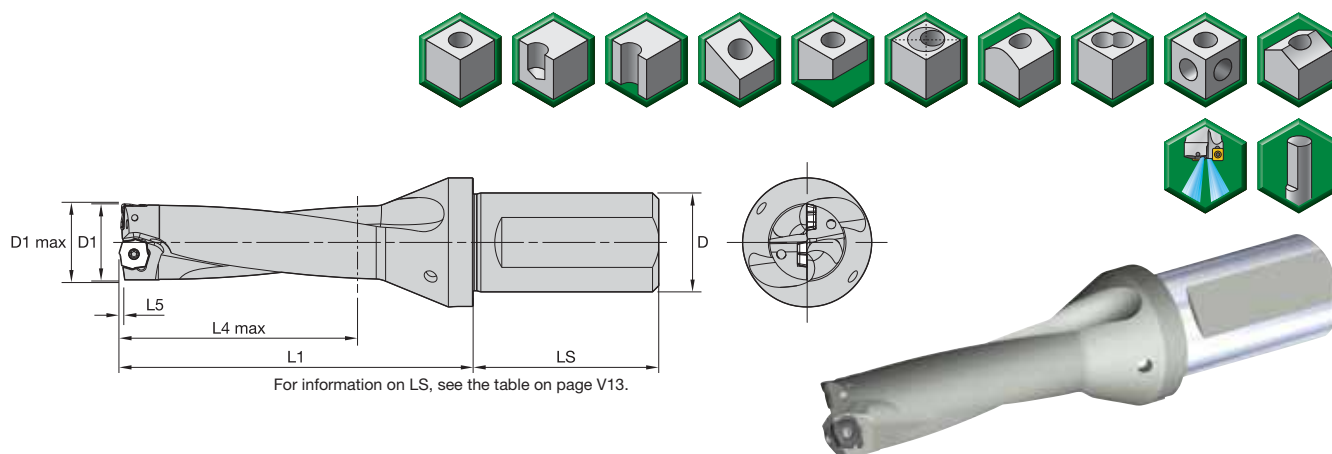
| D     | LS |
|-------|----|
| 20,00 | 50 |
| 25,00 | 56 |
| 32,00 | 60 |
| 40,00 | 70 |
| 50,00 | 80 |

NOTE: Drilling in stacked plates possible in certain applications. Ask for technical support.  
Drill shipped with insert screws and Torx wrench.  
See pages V20–V23 for inserts.  
SL = Side Lock  
D1 max is an achievable diameter using x-offset.



### WARNING

During through-hole operations, a slug or disc is produced as the tool breaks through the workpiece. When the drill is stationary and the workpiece is rotating, this slug may be hurled from the chuck by centrifugal force. Provide adequate shielding to protect bystanders.



### ■ Top Cut 4 Drill • Metric • 3 x D • SL Shanks

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537863      | TCF120R3SL20MA   | 12,00 | 12,50  | 20 | 66,6  | 36,0   | 0,41 | A           | TCF040204AP      | TCF040203AC   |
| 5537864      | TCF125R3SL20MA   | 12,50 | 13,00  | 20 | 68,3  | 37,5   | 0,48 | A           | TCF040204AP      | TCF040203AC   |
| 5537866      | TCF127R3SL20MA   | 12,70 | 13,20  | 20 | 68,9  | 38,1   | 0,51 | A           | TCF040204AP      | TCF040203AC   |
| 5537867      | TCF130R3SL20MA   | 13,00 | 13,50  | 20 | 69,9  | 39,0   | 0,56 | A           | TCF040204AP      | TCF040203AC   |
| 5537868      | TCF135R3SL20MA   | 13,50 | 14,00  | 20 | 71,6  | 41,0   | 0,64 | A           | TCF040204AP      | TCF040203AC   |
| 5577928      | TCF140R3SL25MB   | 14,00 | 14,50  | 25 | 73,8  | 42,0   | 0,42 | B           | TCF050204BP      | TCF060203BC   |
| 5577929      | TCF145R3SL25MB   | 14,50 | 15,00  | 25 | 75,4  | 43,5   | 0,45 | B           | TCF050204BP      | TCF060203BC   |
| 5577930      | TCF150R3SL25MB   | 15,00 | 15,50  | 25 | 77,1  | 45,0   | 0,49 | B           | TCF050204BP      | TCF060203BC   |
| 5577931      | TCF155R3SL25MB   | 15,50 | 16,00  | 25 | 78,8  | 46,5   | 0,54 | B           | TCF050204BP      | TCF060203BC   |
| 5577932      | TCF160R3SL25MB   | 16,00 | 16,50  | 25 | 80,4  | 48,0   | 0,60 | B           | TCF050204BP      | TCF060203BC   |
| 5577933      | TCF165R3SL25MB   | 16,50 | 17,00  | 25 | 82,1  | 49,5   | 0,68 | B           | TCF050204BP      | TCF060203BC   |
| 5577934      | TCF170R3SL25MB   | 17,00 | 17,50  | 25 | 85,4  | 51,0   | 0,74 | B           | TCF050204BP      | TCF060203BC   |
| 5577935      | TCF175R3SL25MB   | 17,50 | 18,00  | 25 | 87,1  | 52,5   | 0,79 | B           | TCF050204BP      | TCF060203BC   |
| 5577936      | TCF180R3SL25MB   | 18,00 | 18,50  | 25 | 88,8  | 54,0   | 0,86 | B           | TCF050204BP      | TCF060203BC   |
| 5577937      | TCF185R3SL25MB   | 18,50 | 19,00  | 25 | 90,4  | 55,5   | 0,83 | B           | TCF050204BP      | TCF060203BC   |
| 5578828      | TCF190R3SL25MC   | 19,00 | 19,50  | 25 | 91,1  | 57,0   | 0,60 | C           | TCF070306CP      | TCF070304CC   |
| 5578829      | TCF195R3SL25MC   | 19,50 | 20,00  | 25 | 92,7  | 58,5   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578830      | TCF200R3SL25MC   | 20,00 | 20,50  | 25 | 94,4  | 60,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578831      | TCF205R3SL25MC   | 20,50 | 21,00  | 25 | 96,1  | 61,5   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578832      | TCF210R3SL25MC   | 21,00 | 21,50  | 25 | 97,7  | 63,0   | 0,80 | C           | TCF070306CP      | TCF070304CC   |
| 5578833      | TCF220R3SL25MC   | 22,00 | 22,50  | 25 | 101,0 | 66,0   | 1,00 | C           | TCF070306CP      | TCF070304CC   |
| 5578834      | TCF225R3SL25MC   | 22,50 | 23,00  | 25 | 102,7 | 67,5   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5578835      | TCF230R3SL25MC   | 23,00 | 23,50  | 25 | 104,4 | 69,0   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5537824      | TCF240R3SL25MD   | 24,00 | 25,00  | 25 | 111,2 | 72,0   | 0,78 | D           | TCF080308DP      | TCF090305DC   |
| 5537825      | TCF250R3SL32MD   | 25,00 | 26,00  | 32 | 114,6 | 75,0   | 0,86 | D           | TCF080308DP      | TCF090305DC   |
| 5537826      | TCF260R3SL32MD   | 26,00 | 27,00  | 32 | 117,9 | 78,0   | 0,97 | D           | TCF080308DP      | TCF090305DC   |
| 5537827      | TCF265R3SL32MD   | 26,50 | 27,50  | 32 | 119,5 | 79,5   | 1,05 | D           | TCF080308DP      | TCF090305DC   |
| 5537828      | TCF270R3SL32MD   | 27,00 | 28,00  | 32 | 121,2 | 81,0   | 1,15 | D           | TCF080308DP      | TCF090305DC   |
| 5537829      | TCF280R3SL32MD   | 28,00 | 29,00  | 32 | 124,5 | 84,0   | 1,30 | D           | TCF080308DP      | TCF090305DC   |
| 5537830      | TCF290R3SL32MD   | 29,00 | 30,00  | 32 | 127,8 | 87,0   | 1,45 | D           | TCF080308DP      | TCF090305DC   |
| 5537944      | TCF300R3SL32ME   | 30,00 | 31,00  | 32 | 130,2 | 90,0   | 0,63 | E           | TCF100408EP      | TCF120405EC   |
| 5537945      | TCF310R3SL32ME   | 31,00 | 32,00  | 32 | 133,5 | 93,0   | 0,72 | E           | TCF100408EP      | TCF120405EC   |

(continued)

(Top Cut 4 Drill • Metric • 3 x D • SL Shanks — continued)

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537946      | TCF320R3SL32ME   | 32,00 | 33,00  | 32 | 136,8 | 96,0   | 0,82 | E           | TCF100408EP      | TCF120405EC   |
| 5537947      | TCF330R3SL40ME   | 33,00 | 34,00  | 40 | 140,1 | 99,0   | 0,95 | E           | TCF100408EP      | TCF120405EC   |
| 5537948      | TCF340R3SL40ME   | 34,00 | 35,00  | 40 | 143,4 | 102,0  | 1,14 | E           | TCF100408EP      | TCF120405EC   |
| 5537949      | TCF350R3SL40ME   | 35,00 | 36,00  | 40 | 146,8 | 105,0  | 1,30 | E           | TCF100408EP      | TCF120405EC   |
| 5537950      | TCF360R3SL40ME   | 36,00 | 37,00  | 40 | 150,1 | 108,0  | 1,45 | E           | TCF100408EP      | TCF120405EC   |
| 5578609      | TCF370R3SL40MF   | 37,00 | 38,00  | 40 | 155,1 | 111,0  | 1,19 | F           | TCF120412FP      | TCF150406FC   |
| 5578610      | TCF375R3SL40MF   | 37,50 | 38,50  | 40 | 156,8 | 113,0  | 1,23 | F           | TCF120412FP      | TCF150406FC   |
| 5578611      | TCF380R3SL40MF   | 38,00 | 39,00  | 40 | 158,5 | 114,0  | 1,27 | F           | TCF120412FP      | TCF150406FC   |
| 5578612      | TCF390R3SL40MF   | 39,00 | 40,00  | 40 | 161,8 | 117,0  | 1,36 | F           | TCF120412FP      | TCF150406FC   |
| 5578613      | TCF400R3SL40MF   | 40,00 | 41,00  | 40 | 165,1 | 120,0  | 1,47 | F           | TCF120412FP      | TCF150406FC   |
| 5578614      | TCF410R3SL40MF   | 41,00 | 42,00  | 40 | 168,4 | 123,0  | 1,60 | F           | TCF120412FP      | TCF150406FC   |
| 5578615      | TCF420R3SL40MF   | 42,00 | 43,00  | 40 | 171,7 | 126,0  | 1,77 | F           | TCF120412FP      | TCF150406FC   |
| 5578616      | TCF430R3SL40MF   | 43,00 | 44,00  | 40 | 175,1 | 129,0  | 1,99 | F           | TCF120412FP      | TCF150406FC   |
| 5578617      | TCF440R3SL40MF   | 44,00 | 45,00  | 40 | 178,4 | 132,0  | 2,10 | F           | TCF120412FP      | TCF150406FC   |
| 5578618      | TCF450R3SL50MF   | 45,00 | 46,00  | 50 | 181,7 | 135,0  | 2,21 | F           | TCF120412FP      | TCF150406FC   |
| 5578716      | TCF460R3SL50MG   | 46,00 | 47,00  | 50 | 185,0 | 138,0  | 1,45 | G           | TCF150512GP      | TCF180508GC   |
| 5578717      | TCF470R3SL50MG   | 47,00 | 48,00  | 50 | 188,3 | 141,0  | 1,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578718      | TCF480R3SL50MG   | 48,00 | 49,00  | 50 | 191,7 | 144,0  | 1,63 | G           | TCF150512GP      | TCF180508GC   |
| 5578719      | TCF490R3SL50MG   | 49,00 | 50,00  | 50 | 195,0 | 147,0  | 1,74 | G           | TCF150512GP      | TCF180508GC   |
| 5578720      | TCF500R3SL50MG   | 50,00 | 51,00  | 50 | 199,8 | 150,0  | 1,87 | G           | TCF150512GP      | TCF180508GC   |
| 5578721      | TCF505R3SL50MG   | 50,50 | 51,50  | 50 | 201,5 | 152,0  | 1,94 | G           | TCF150512GP      | TCF180508GC   |
| 5578722      | TCF510R3SL50MG   | 51,00 | 52,00  | 50 | 203,1 | 153,0  | 2,02 | G           | TCF150512GP      | TCF180508GC   |
| 5578723      | TCF520R3SL50MG   | 52,00 | 53,00  | 50 | 206,4 | 156,0  | 2,22 | G           | TCF150512GP      | TCF180508GC   |
| 5578724      | TCF530R3SL50MG   | 53,00 | 54,00  | 50 | 209,8 | 159,0  | 2,46 | G           | TCF150512GP      | TCF180508GC   |
| 5578726      | TCF540R3SL50MG   | 54,00 | 55,00  | 50 | 213,1 | 162,0  | 2,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578727      | TCF550R3SL50MG   | 55,00 | 56,00  | 50 | 216,4 | 165,0  | 2,73 | G           | TCF150512GP      | TCF180508GC   |
| 5578728      | TCF560R3SL50MG   | 56,00 | 57,00  | 50 | 219,7 | 168,0  | 2,37 | G           | TCF150512GP      | TCF180508GC   |
| 5538635      | TCF570R3SL50MH   | 57,00 | 58,00  | 50 | 222,5 | 171,0  | 1,76 | H           | TCF180614HP      | TCF210608HC   |
| 5538636      | TCF580R3SL50MH   | 58,00 | 59,00  | 50 | 225,9 | 174,0  | 1,85 | H           | TCF180614HP      | TCF210608HC   |
| 5538637      | TCF590R3SL50MH   | 59,00 | 60,00  | 50 | 229,2 | 177,0  | 1,96 | H           | TCF180614HP      | TCF210608HC   |
| 5538638      | TCF600R3SL50MH   | 60,00 | 61,00  | 50 | 232,5 | 180,0  | 1,42 | H           | TCF180614HP      | TCF210608HC   |
| 5538639      | TCF610R3SL50MH   | 61,00 | 62,00  | 50 | 235,8 | 183,0  | 2,23 | H           | TCF180614HP      | TCF210608HC   |
| 5538640      | TCF620R3SL50MH   | 62,00 | 63,00  | 50 | 239,1 | 186,0  | 2,41 | H           | TCF180614HP      | TCF210608HC   |
| 5538641      | TCF630R3SL50MH   | 63,00 | 64,00  | 50 | 242,5 | 189,0  | 2,64 | H           | TCF180614HP      | TCF210608HC   |
| 5538642      | TCF640R3SL50MH   | 64,00 | 65,00  | 50 | 245,8 | 192,0  | 2,94 | H           | TCF180614HP      | TCF210608HC   |
| 5538643      | TCF650R3SL50MH   | 65,00 | 66,00  | 50 | 249,1 | 195,0  | 3,06 | H           | TCF180614HP      | TCF210608HC   |
| 5538644      | TCF660R3SL50MH   | 66,00 | 67,00  | 50 | 252,4 | 198,0  | 3,18 | H           | TCF180614HP      | TCF210608HC   |
| 5538645      | TCF670R3SL50MH   | 67,00 | 68,00  | 50 | 255,7 | 201,0  | 3,30 | H           | TCF180614HP      | TCF210608HC   |
| 5538646      | TCF680R3SL50MH   | 68,00 | 69,00  | 50 | 259,1 | 204,0  | 2,93 | H           | TCF180614HP      | TCF210608HC   |

(continued)

(Top Cut 4 Drill • Metric • 3 x D • SL Shanks — continued)

### ■ Spare Parts




| insert size | periphery insert | centre insert | insert screw order number | Torx size | Torx driver order number | tightening torque Nm |
|-------------|------------------|---------------|---------------------------|-----------|--------------------------|----------------------|
| A           | TCF040204AP      | TCF040203AC   | 2025073                   | T5        | 2029221                  | 0,40                 |
| B           | TCF050204BP      | TCF060203BC   | 1175225                   | T6        | 1138455                  | 0,53                 |
| C           | TCF070306CP      | TCF070304CC   | 1021337                   | T7        | 2029266                  | 0,90                 |
| D           | TCF080308DP      | TCF090305DC   | 1134385                   | T8        | 2029598                  | 1,10                 |
| E           | TCF100408EP      | TCF120405EC   | 2018194                   | T9        | 1138430                  | 2,00                 |
| F           | TCF120412FP      | TCF150406FC   | 1756815                   | T15       | 2029596                  | 4,00                 |
| G           | TCF150512GP      | TCF180508GC   | 1099645                   | T20       | 2029488                  | 6,30                 |
| H           | TCF180614HP      | TCF210608HC   | 1823871                   | T25       | 1022519                  | 8,80                 |

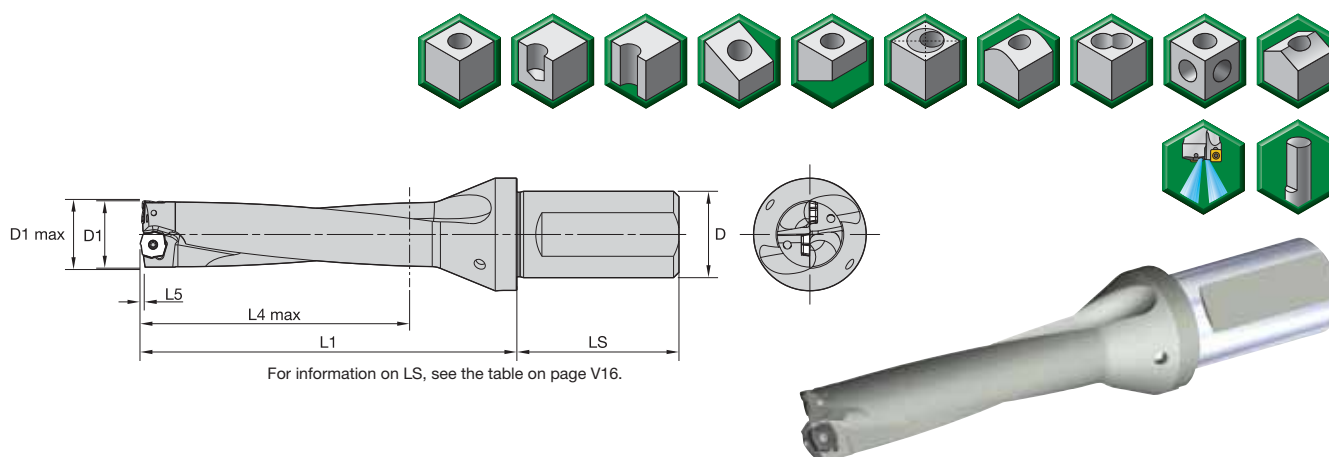
| D     | LS |
|-------|----|
| 20,00 | 50 |
| 25,00 | 56 |
| 32,00 | 60 |
| 40,00 | 70 |
| 50,00 | 80 |

NOTE: Drilling in stacked plates possible in certain applications. Ask for technical support.  
 Drill shipped with insert screws and Torx wrench.  
 See pages V20–V23 for inserts.  
 SL = Side Lock  
 D1 max is an achievable diameter using x-offset.



#### WARNING

During through-hole operations, a slug or disc is produced as the tool breaks through the workpiece. When the drill is stationary and the workpiece is rotating, this slug may be hurled from the chuck by centrifugal force. Provide adequate shielding to protect bystanders.



■ Top Cut 4 Drill • Metric • 4 x D • SL Shanks

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537869      | TCF120R4SL20MA   | 12,00 | 12,50  | 20 | 78,6  | 48,0   | 0,41 | A           | TCF040204AP      | TCF040203AC   |
| 5537870      | TCF125R4SL20MA   | 12,50 | 13,00  | 20 | 80,8  | 50,0   | 0,48 | A           | TCF040204AP      | TCF040203AC   |
| 5537871      | TCF127R4SL20MA   | 12,70 | 13,20  | 20 | 81,6  | 50,8   | 0,51 | A           | TCF040204AP      | TCF040203AC   |
| 5537872      | TCF130R4SL20MA   | 13,00 | 13,50  | 20 | 82,9  | 52,0   | 0,56 | A           | TCF040204AP      | TCF040203AC   |
| 5537873      | TCF135R4SL20MA   | 13,50 | 14,00  | 20 | 85,1  | 54,0   | 0,64 | A           | TCF040204AP      | TCF040203AC   |
| 5577938      | TCF140R4SL25MB   | 14,00 | 14,50  | 25 | 87,8  | 56,0   | 0,42 | B           | TCF050204BP      | TCF060203BC   |
| 5577939      | TCF145R4SL25MB   | 14,50 | 15,00  | 25 | 89,9  | 58,0   | 0,45 | B           | TCF050204BP      | TCF060203BC   |
| 5577940      | TCF150R4SL25MB   | 15,00 | 15,50  | 25 | 92,1  | 60,0   | 0,49 | B           | TCF050204BP      | TCF060203BC   |
| 5577941      | TCF155R4SL25MB   | 15,50 | 16,00  | 25 | 94,3  | 62,0   | 0,54 | B           | TCF050204BP      | TCF060203BC   |
| 5577942      | TCF160R4SL25MB   | 16,00 | 16,50  | 25 | 96,4  | 64,0   | 0,60 | B           | TCF050204BP      | TCF060203BC   |
| 5577943      | TCF165R4SL25MB   | 16,50 | 17,00  | 25 | 98,6  | 66,0   | 0,68 | B           | TCF050204BP      | TCF060203BC   |
| 5577944      | TCF170R4SL25MB   | 17,00 | 17,50  | 25 | 102,4 | 68,0   | 0,74 | B           | TCF050204BP      | TCF060203BC   |
| 5577945      | TCF175R4SL25MB   | 17,50 | 18,00  | 25 | 104,6 | 70,0   | 0,79 | B           | TCF050204BP      | TCF060203BC   |
| 5577946      | TCF180R4SL25MB   | 18,00 | 18,50  | 25 | 106,8 | 72,0   | 0,86 | B           | TCF050204BP      | TCF060203BC   |
| 5577947      | TCF185R4SL25MB   | 18,50 | 19,00  | 25 | 108,9 | 74,0   | 0,83 | B           | TCF050204BP      | TCF060203BC   |
| 5578836      | TCF190R4SL25MC   | 19,00 | 19,50  | 25 | 110,1 | 76,0   | 0,60 | C           | TCF070306CP      | TCF070304CC   |
| 5578837      | TCF195R4SL25MC   | 19,50 | 20,00  | 25 | 112,2 | 78,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578838      | TCF200R4SL25MC   | 20,00 | 20,50  | 25 | 114,4 | 80,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578839      | TCF205R4SL25MC   | 20,50 | 21,00  | 25 | 116,6 | 82,0   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578840      | TCF210R4SL25MC   | 21,00 | 21,50  | 25 | 118,7 | 84,0   | 0,80 | C           | TCF070306CP      | TCF070304CC   |
| 5578841      | TCF220R4SL25MC   | 22,00 | 22,50  | 25 | 123,0 | 88,0   | 1,00 | C           | TCF070306CP      | TCF070304CC   |
| 5578842      | TCF225R4SL25MC   | 22,50 | 23,00  | 25 | 125,2 | 90,0   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5578843      | TCF230R4SL25MC   | 23,00 | 23,50  | 25 | 127,4 | 92,0   | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5537831      | TCF240R4SL25MD   | 24,00 | 25,00  | 25 | 135,2 | 96,0   | 0,78 | D           | TCF080308DP      | TCF090305DC   |
| 5537832      | TCF250R4SL32MD   | 25,00 | 26,00  | 32 | 139,6 | 100,0  | 0,86 | D           | TCF080308DP      | TCF090305DC   |
| 5537833      | TCF260R4SL32MD   | 26,00 | 27,00  | 32 | 143,9 | 104,0  | 0,97 | D           | TCF080308DP      | TCF090305DC   |
| 5537834      | TCF265R4SL32MD   | 26,50 | 27,50  | 32 | 146,0 | 106,0  | 1,05 | D           | TCF080308DP      | TCF090305DC   |
| 5537835      | TCF270R4SL32MD   | 27,00 | 28,00  | 32 | 148,2 | 108,0  | 1,15 | D           | TCF080308DP      | TCF090305DC   |
| 5537836      | TCF280R4SL32MD   | 28,00 | 29,00  | 32 | 152,5 | 112,0  | 1,30 | D           | TCF080308DP      | TCF090305DC   |
| 5537837      | TCF290R4SL32MD   | 29,00 | 30,00  | 32 | 156,8 | 116,0  | 1,45 | D           | TCF080308DP      | TCF090305DC   |
| 5537951      | TCF300R4SL32ME   | 30,00 | 31,00  | 32 | 160,2 | 120,0  | 0,63 | E           | TCF100408EP      | TCF120405EC   |
| 5537952      | TCF310R4SL32ME   | 31,00 | 32,00  | 32 | 164,5 | 124,0  | 0,72 | E           | TCF100408EP      | TCF120405EC   |

(continued)

(Top Cut 4 Drill • Metric • 4 x D • SL Shanks — continued)

| order number | catalogue number | D1    | D1 max | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|--------|----|-------|--------|------|-------------|------------------|---------------|
| 5537953      | TCF320R4SL32ME   | 32,00 | 33,00  | 32 | 168,8 | 128,0  | 0,82 | E           | TCF100408EP      | TCF120405EC   |
| 5537954      | TCF330R4SL40ME   | 33,00 | 34,00  | 40 | 173,1 | 132,0  | 0,95 | E           | TCF100408EP      | TCF120405EC   |
| 5537955      | TCF340R4SL40ME   | 34,00 | 35,00  | 40 | 177,4 | 136,0  | 1,14 | E           | TCF100408EP      | TCF120405EC   |
| 5537956      | TCF350R4SL40ME   | 35,00 | 36,00  | 40 | 181,8 | 140,0  | 1,30 | E           | TCF100408EP      | TCF120405EC   |
| 5537957      | TCF360R4SL40ME   | 36,00 | 37,00  | 40 | 186,1 | 144,0  | 1,45 | E           | TCF100408EP      | TCF120405EC   |
| 5578619      | TCF370R4SL40MF   | 37,00 | 38,00  | 40 | 192,1 | 148,0  | 1,19 | F           | TCF120412FP      | TCF150406FC   |
| 5578620      | TCF375R4SL40MF   | 37,50 | 38,50  | 40 | 194,3 | 150,0  | 1,23 | F           | TCF120412FP      | TCF150406FC   |
| 5578621      | TCF380R4SL40MF   | 38,00 | 39,00  | 40 | 196,5 | 152,0  | 1,27 | F           | TCF120412FP      | TCF150406FC   |
| 5578622      | TCF390R4SL40MF   | 39,00 | 40,00  | 40 | 200,8 | 156,0  | 1,36 | F           | TCF120412FP      | TCF150406FC   |
| 5578623      | TCF400R4SL40MF   | 40,00 | 41,00  | 40 | 205,1 | 160,0  | 1,47 | F           | TCF120412FP      | TCF150406FC   |
| 5578624      | TCF410R4SL40MF   | 41,00 | 42,00  | 40 | 209,4 | 164,0  | 1,60 | F           | TCF120412FP      | TCF150406FC   |
| 5578625      | TCF420R4SL40MF   | 42,00 | 43,00  | 40 | 213,7 | 168,0  | 1,77 | F           | TCF120412FP      | TCF150406FC   |
| 5578626      | TCF430R4SL40MF   | 43,00 | 44,00  | 40 | 218,1 | 172,0  | 1,99 | F           | TCF120412FP      | TCF150406FC   |
| 5578627      | TCF440R4SL40MF   | 44,00 | 45,00  | 40 | 222,4 | 176,0  | 2,10 | F           | TCF120412FP      | TCF150406FC   |
| 5578628      | TCF450R4SL50MF   | 45,00 | 46,00  | 50 | 226,7 | 180,0  | 2,21 | F           | TCF120412FP      | TCF150406FC   |
| 5578729      | TCF460R4SL50MG   | 46,00 | 47,00  | 50 | 231,0 | 184,0  | 1,45 | G           | TCF150512GP      | TCF180508GC   |
| 5578730      | TCF470R4SL50MG   | 47,00 | 48,00  | 50 | 235,3 | 188,0  | 1,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578731      | TCF480R4SL50MG   | 48,00 | 49,00  | 50 | 239,7 | 192,0  | 1,63 | G           | TCF150512GP      | TCF180508GC   |
| 5578732      | TCF490R4SL50MG   | 49,00 | 50,00  | 50 | 244,0 | 196,0  | 1,74 | G           | TCF150512GP      | TCF180508GC   |
| 5578733      | TCF500R4SL50MG   | 50,00 | 51,00  | 50 | 249,8 | 200,0  | 1,87 | G           | TCF150512GP      | TCF180508GC   |
| 5578734      | TCF505R4SL50MG   | 50,50 | 51,50  | 50 | 252,0 | 202,0  | 1,94 | G           | TCF150512GP      | TCF180508GC   |
| 5578735      | TCF510R4SL50MG   | 51,00 | 52,00  | 50 | 254,1 | 204,0  | 2,02 | G           | TCF150512GP      | TCF180508GC   |
| 5578736      | TCF520R4SL50MG   | 52,00 | 53,00  | 50 | 258,4 | 208,0  | 2,22 | G           | TCF150512GP      | TCF180508GC   |
| 5578737      | TCF530R4SL50MG   | 53,00 | 54,00  | 50 | 262,8 | 212,0  | 2,46 | G           | TCF150512GP      | TCF180508GC   |
| 5578738      | TCF540R4SL50MG   | 54,00 | 55,00  | 50 | 267,1 | 216,0  | 2,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578739      | TCF550R4SL50MG   | 55,00 | 56,00  | 50 | 271,4 | 220,0  | 2,73 | G           | TCF150512GP      | TCF180508GC   |
| 5578750      | TCF560R4SL50MG   | 56,00 | 57,00  | 50 | 275,7 | 224,0  | 2,37 | G           | TCF150512GP      | TCF180508GC   |
| 5538647      | TCF570R4SL50MH   | 57,00 | 58,00  | 50 | 279,5 | 228,0  | 1,76 | H           | TCF180614HP      | TCF210608HC   |
| 5538648      | TCF580R4SL50MH   | 58,00 | 59,00  | 50 | 283,9 | 232,0  | 1,85 | H           | TCF180614HP      | TCF210608HC   |
| 5538649      | TCF590R4SL50MH   | 59,00 | 60,00  | 50 | 288,2 | 236,0  | 1,96 | H           | TCF180614HP      | TCF210608HC   |
| 5538650      | TCF600R4SL50MH   | 60,00 | 61,00  | 50 | 292,5 | 240,0  | 1,42 | H           | TCF180614HP      | TCF210608HC   |
| 5538651      | TCF610R4SL50MH   | 61,00 | 62,00  | 50 | 296,8 | 244,0  | 2,23 | H           | TCF180614HP      | TCF210608HC   |
| 5538652      | TCF620R4SL50MH   | 62,00 | 63,00  | 50 | 301,1 | 248,0  | 2,41 | H           | TCF180614HP      | TCF210608HC   |
| 5538653      | TCF630R4SL50MH   | 63,00 | 64,00  | 50 | 305,5 | 252,0  | 2,64 | H           | TCF180614HP      | TCF210608HC   |
| 5538654      | TCF640R4SL50MH   | 64,00 | 65,00  | 50 | 309,8 | 256,0  | 2,94 | H           | TCF180614HP      | TCF210608HC   |
| 5538655      | TCF650R4SL50MH   | 65,00 | 66,00  | 50 | 314,1 | 260,0  | 3,06 | H           | TCF180614HP      | TCF210608HC   |
| 5538656      | TCF660R4SL50MH   | 66,00 | 67,00  | 50 | 318,4 | 264,0  | 3,18 | H           | TCF180614HP      | TCF210608HC   |
| 5538657      | TCF670R4SL50MH   | 67,00 | 68,00  | 50 | 322,7 | 268,0  | 3,30 | H           | TCF180614HP      | TCF210608HC   |
| 5538658      | TCF680R4SL50MH   | 68,00 | 69,00  | 50 | 327,1 | 272,0  | 2,93 | H           | TCF180614HP      | TCF210608HC   |

(continued)



(Top Cut 4 Drill • Metric • 4 x D • SL Shanks — continued)

## ■ Spare Parts

| insert size | periphery insert | centre insert | insert screw<br>order number | Torx size | Torx driver<br>order number | tightening<br>torque Nm |
|-------------|------------------|---------------|------------------------------|-----------|-----------------------------|-------------------------|
| A           | TCF040204AP      | TCF040203AC   | <b>2025073</b>               | T5        | <b>2029221</b>              | 0,40                    |
| B           | TCF050204BP      | TCF060203BC   | <b>1175225</b>               | T6        | <b>1138455</b>              | 0,53                    |
| C           | TCF070306CP      | TCF070304CC   | <b>1021337</b>               | T7        | <b>2029266</b>              | 0,90                    |
| D           | TCF080308DP      | TCF090305DC   | <b>1134385</b>               | T8        | <b>2029598</b>              | 1,10                    |
| E           | TCF100408EP      | TCF120405EC   | <b>2018194</b>               | T9        | <b>1138430</b>              | 2,00                    |
| F           | TCF120412FP      | TCF150406FC   | <b>1756815</b>               | T15       | <b>2029596</b>              | 4,00                    |
| G           | TCF150512GP      | TCF180508GC   | <b>1099645</b>               | T20       | <b>2029488</b>              | 6,30                    |
| H           | TCF180614HP      | TCF210608HC   | <b>1823871</b>               | T25       | <b>1022519</b>              | 8,80                    |

| D     | LS |
|-------|----|
| 20,00 | 50 |
| 25,00 | 56 |
| 32,00 | 60 |
| 40,00 | 70 |
| 50,00 | 80 |

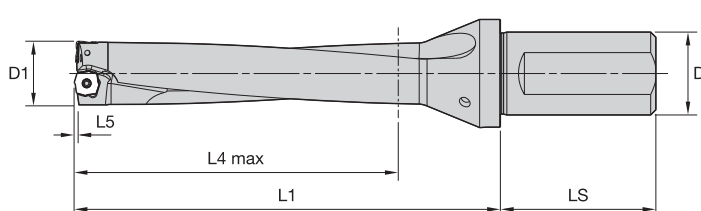
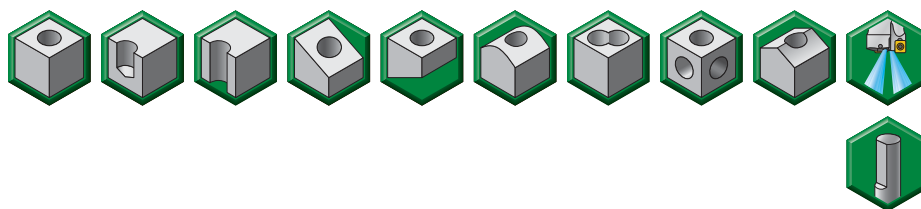
NOTE: Drilling in stacked plates possible in certain applications. Ask for technical support.  
Drill shipped with insert screws and Torx wrench.  
See pages V20–V23 for inserts.  
SL = Side Lock  
D1 max is an achievable diameter using x-offset.



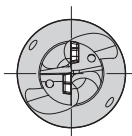
### WARNING

During through-hole operations, a slug or disc is produced as the tool breaks through the workpiece. When the drill is stationary and the workpiece is rotating, this slug may be hurled from the chuck by centrifugal force. Provide adequate shielding to protect bystanders.





For information on LS, see the table on page V19.



### ■ Top Cut 4 Drill • Metric • 5 x D • SL Shanks

| order number | catalogue number | D1    | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|----|-------|--------|------|-------------|------------------|---------------|
| 5537874      | TCF120R5SL20MA   | 12,00 | 20 | 86,0  | 60,0   | 0,41 | A           | TCF040204AP      | TCF040203AC   |
| 5537875      | TCF125R5SL20MA   | 12,50 | 20 | 89,0  | 63,0   | 0,48 | A           | TCF040204AP      | TCF040203AC   |
| 5537876      | TCF127R5SL20MA   | 12,70 | 20 | 90,0  | 63,5   | 0,51 | A           | TCF040204AP      | TCF040203AC   |
| 5537877      | TCF130R5SL20MA   | 13,00 | 20 | 90,0  | 65,0   | 0,56 | A           | TCF040204AP      | TCF040203AC   |
| 5537878      | TCF135R5SL20MA   | 13,50 | 20 | 94,0  | 68,0   | 0,64 | A           | TCF040204AP      | TCF040203AC   |
| 5577948      | TCF140R5SL25MB   | 14,00 | 25 | 99,0  | 70,0   | 0,42 | B           | TCF050204BP      | TCF060203BC   |
| 5577949      | TCF145R5SL25MB   | 14,50 | 25 | 100,0 | 72,5   | 0,45 | B           | TCF050204BP      | TCF060203BC   |
| 5577950      | TCF150R5SL25MB   | 15,00 | 25 | 103,0 | 75,0   | 0,49 | B           | TCF050204BP      | TCF060203BC   |
| 5577951      | TCF155R5SL25MB   | 15,50 | 25 | 104,8 | 77,5   | 0,54 | B           | TCF050204BP      | TCF060203BC   |
| 5577952      | TCF160R5SL25MB   | 16,00 | 25 | 108,4 | 80,0   | 0,60 | B           | TCF050204BP      | TCF060203BC   |
| 5577953      | TCF165R5SL25MB   | 16,50 | 25 | 111,1 | 82,5   | 0,68 | B           | TCF050204BP      | TCF060203BC   |
| 5577954      | TCF170R5SL25MB   | 17,00 | 25 | 115,4 | 85,0   | 0,74 | B           | TCF050204BP      | TCF060203BC   |
| 5577955      | TCF175R5SL25MB   | 17,50 | 25 | 118,1 | 87,5   | 0,79 | B           | TCF050204BP      | TCF060203BC   |
| 5577956      | TCF180R5SL25MB   | 18,00 | 25 | 120,8 | 90,0   | 0,86 | B           | TCF050204BP      | TCF060203BC   |
| 5577957      | TCF185R5SL25MB   | 18,50 | 25 | 122,4 | 92,5   | 0,83 | B           | TCF050204BP      | TCF060203BC   |
| 5578844      | TCF190R5SL25MC   | 19,00 | 25 | 129,1 | 95,0   | 0,60 | C           | TCF070306CP      | TCF070304CC   |
| 5578845      | TCF195R5SL25MC   | 19,50 | 25 | 131,7 | 97,5   | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578846      | TCF200R5SL25MC   | 20,00 | 25 | 132,0 | 100,0  | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578847      | TCF205R5SL25MC   | 20,50 | 25 | 134,1 | 102,5  | 0,70 | C           | TCF070306CP      | TCF070304CC   |
| 5578848      | TCF210R5SL25MC   | 21,00 | 25 | 137,0 | 105,0  | 0,80 | C           | TCF070306CP      | TCF070304CC   |
| 5578849      | TCF220R5SL25MC   | 22,00 | 25 | 142,0 | 110,0  | 1,00 | C           | TCF070306CP      | TCF070304CC   |
| 5578850      | TCF225R5SL25MC   | 22,50 | 25 | 144,7 | 112,5  | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5578851      | TCF230R5SL25MC   | 23,00 | 25 | 147,0 | 115,0  | 1,10 | C           | TCF070306CP      | TCF070304CC   |
| 5537838      | TCF240R5SL25MD   | 24,00 | 25 | 152,0 | 120,0  | 0,78 | D           | TCF080308DP      | TCF090305DC   |
| 5537839      | TCF250R5SL32MD   | 25,00 | 32 | 158,0 | 125,0  | 0,86 | D           | TCF080308DP      | TCF090305DC   |
| 5537840      | TCF260R5SL32MD   | 26,00 | 32 | 164,0 | 130,0  | 0,97 | D           | TCF080308DP      | TCF090305DC   |
| 5537841      | TCF265R5SL32MD   | 26,50 | 32 | 166,5 | 132,5  | 1,05 | D           | TCF080308DP      | TCF090305DC   |
| 5537842      | TCF270R5SL32MD   | 27,00 | 32 | 170,0 | 135,0  | 1,15 | D           | TCF080308DP      | TCF090305DC   |
| 5537843      | TCF280R5SL32MD   | 28,00 | 32 | 176,5 | 140,0  | 1,30 | D           | TCF080308DP      | TCF090305DC   |
| 5537844      | TCF290R5SL32MD   | 29,00 | 32 | 181,0 | 145,0  | 1,45 | D           | TCF080308DP      | TCF090305DC   |
| 5537958      | TCF300R5SL32ME   | 30,00 | 32 | 186,0 | 150,0  | 0,63 | E           | TCF100408EP      | TCF120405EC   |
| 5537959      | TCF310R5SL32ME   | 31,00 | 32 | 193,0 | 155,0  | 0,72 | E           | TCF100408EP      | TCF120405EC   |

(continued)

(Top Cut 4 Drill • Metric • 5 x D • SL Shanks — continued)

| order number | catalogue number | D1    | D  | L1    | L4 max | L5   | insert size | periphery insert | centre insert |
|--------------|------------------|-------|----|-------|--------|------|-------------|------------------|---------------|
| 5537960      | TCF320R5SL32ME   | 32,00 | 32 | 199,0 | 160,0  | 0,82 | E           | TCF100408EP      | TCF120405EC   |
| 5537961      | TCF330R5SL40ME   | 33,00 | 40 | 204,0 | 165,0  | 0,95 | E           | TCF100408EP      | TCF120405EC   |
| 5537962      | TCF340R5SL40ME   | 34,00 | 40 | 210,0 | 170,0  | 1,14 | E           | TCF100408EP      | TCF120405EC   |
| 5537963      | TCF350R5SL40ME   | 35,00 | 40 | 216,8 | 175,0  | 1,30 | E           | TCF100408EP      | TCF120405EC   |
| 5537964      | TCF360R5SL40ME   | 36,00 | 40 | 222,0 | 180,0  | 1,45 | E           | TCF100408EP      | TCF120405EC   |
| 5578629      | TCF370R5SL40MF   | 37,00 | 40 | 228,0 | 185,0  | 1,19 | F           | TCF120412FP      | TCF150406FC   |
| 5578640      | TCF375R5SL40MF   | 37,50 | 40 | 231,8 | 188,0  | 1,23 | F           | TCF120412FP      | TCF150406FC   |
| 5578641      | TCF380R5SL40MF   | 38,00 | 40 | 234,5 | 190,0  | 1,27 | F           | TCF120412FP      | TCF150406FC   |
| 5578642      | TCF390R5SL40MF   | 39,00 | 40 | 239,8 | 195,0  | 1,36 | F           | TCF120412FP      | TCF150406FC   |
| 5578643      | TCF400R5SL40MF   | 40,00 | 40 | 245,1 | 200,0  | 1,47 | F           | TCF120412FP      | TCF150406FC   |
| 5578644      | TCF410R5SL40MF   | 41,00 | 40 | 250,4 | 205,0  | 1,60 | F           | TCF120412FP      | TCF150406FC   |
| 5578645      | TCF420R5SL40MF   | 42,00 | 40 | 255,7 | 210,0  | 1,77 | F           | TCF120412FP      | TCF150406FC   |
| 5578646      | TCF430R5SL40MF   | 43,00 | 40 | 261,1 | 215,0  | 1,99 | F           | TCF120412FP      | TCF150406FC   |
| 5578647      | TCF440R5SL40MF   | 44,00 | 40 | 266,4 | 220,0  | 2,10 | F           | TCF120412FP      | TCF150406FC   |
| 5578648      | TCF450R5SL50MF   | 45,00 | 50 | 271,7 | 225,0  | 2,21 | F           | TCF120412FP      | TCF150406FC   |
| 5578751      | TCF460R5SL50MG   | 46,00 | 50 | 277,0 | 230,0  | 1,45 | G           | TCF150512GP      | TCF180508GC   |
| 5578752      | TCF470R5SL50MG   | 47,00 | 50 | 282,3 | 235,0  | 1,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578753      | TCF480R5SL50MG   | 48,00 | 50 | 287,7 | 240,0  | 1,63 | G           | TCF150512GP      | TCF180508GC   |
| 5578754      | TCF490R5SL50MG   | 49,00 | 50 | 293,0 | 245,0  | 1,74 | G           | TCF150512GP      | TCF180508GC   |
| 5578755      | TCF500R5SL50MG   | 50,00 | 50 | 299,8 | 250,0  | 1,87 | G           | TCF150512GP      | TCF180508GC   |
| 5578756      | TCF505R5SL50MG   | 50,50 | 50 | 302,5 | 253,0  | 1,94 | G           | TCF150512GP      | TCF180508GC   |
| 5578757      | TCF510R5SL50MG   | 51,00 | 50 | 305,1 | 255,0  | 2,02 | G           | TCF150512GP      | TCF180508GC   |
| 5578758      | TCF520R5SL50MG   | 52,00 | 50 | 310,4 | 260,0  | 2,22 | G           | TCF150512GP      | TCF180508GC   |
| 5578759      | TCF530R5SL50MG   | 53,00 | 50 | 315,8 | 265,0  | 2,46 | G           | TCF150512GP      | TCF180508GC   |
| 5578760      | TCF540R5SL50MG   | 54,00 | 50 | 321,1 | 270,0  | 2,53 | G           | TCF150512GP      | TCF180508GC   |
| 5578761      | TCF550R5SL50MG   | 55,00 | 50 | 326,4 | 275,0  | 2,73 | G           | TCF150512GP      | TCF180508GC   |
| 5578762      | TCF560R5SL50MG   | 56,00 | 50 | 331,7 | 280,0  | 2,37 | G           | TCF150512GP      | TCF180508GC   |
| 5538659      | TCF570R5SL50MH   | 57,00 | 50 | 330,0 | 285,0  | 1,76 | H           | TCF180614HP      | TCF210608HC   |
| 5538680      | TCF580R5SL50MH   | 58,00 | 50 | 336,0 | 290,0  | 1,85 | H           | TCF180614HP      | TCF210608HC   |
| 5538681      | TCF590R5SL50MH   | 59,00 | 50 | 339,2 | 295,0  | 1,96 | H           | TCF180614HP      | TCF210608HC   |
| 5538682      | TCF600R5SL50MH   | 60,00 | 50 | 345,5 | 300,0  | 1,42 | H           | TCF180614HP      | TCF210608HC   |
| 5538683      | TCF610R5SL50MH   | 61,00 | 50 | 347,8 | 305,0  | 2,23 | H           | TCF180614HP      | TCF210608HC   |
| 5538684      | TCF620R5SL50MH   | 62,00 | 50 | 358,0 | 310,0  | 2,41 | H           | TCF180614HP      | TCF210608HC   |
| 5538685      | TCF630R5SL50MH   | 63,00 | 50 | 365,0 | 315,0  | 2,64 | H           | TCF180614HP      | TCF210608HC   |
| 5538686      | TCF640R5SL50MH   | 64,00 | 50 | 363,8 | 320,0  | 2,94 | H           | TCF180614HP      | TCF210608HC   |
| 5538687      | TCF650R5SL50MH   | 65,00 | 50 | 375,0 | 325,0  | 3,06 | H           | TCF180614HP      | TCF210608HC   |
| 5538688      | TCF660R5SL50MH   | 66,00 | 50 | 376,4 | 330,0  | 3,18 | H           | TCF180614HP      | TCF210608HC   |
| 5538689      | TCF670R5SL50MH   | 67,00 | 50 | 385,0 | 335,0  | 3,30 | H           | TCF180614HP      | TCF210608HC   |
| 5538700      | TCF680R5SL50MH   | 68,00 | 50 | 390,0 | 340,0  | 2,93 | H           | TCF180614HP      | TCF210608HC   |

(continued)

(Top Cut 4 Drill • Metric • 5 x D • SL Shanks — continued)

## ■ Spare Parts

| insert size | periphery insert | centre insert | insert screw order number | Torx size | Torx driver order number | tightening torque Nm |
|-------------|------------------|---------------|---------------------------|-----------|--------------------------|----------------------|
| A           | TCF040204AP      | TCF040203AC   | <b>2025073</b>            | T5        | <b>2029221</b>           | 0,40                 |
| B           | TCF050204BP      | TCF060203BC   | <b>1175225</b>            | T6        | <b>1138455</b>           | 0,53                 |
| C           | TCF070306CP      | TCF070304CC   | <b>1021337</b>            | T7        | <b>2029266</b>           | 0,90                 |
| D           | TCF080308DP      | TCF090305DC   | <b>1134385</b>            | T8        | <b>2029598</b>           | 1,10                 |
| E           | TCF100408EP      | TCF120405EC   | <b>2018194</b>            | T9        | <b>1138430</b>           | 2,00                 |
| F           | TCF120412FP      | TCF150406FC   | <b>1756815</b>            | T15       | <b>2029596</b>           | 4,00                 |
| G           | TCF150512GP      | TCF180508GC   | <b>1099645</b>            | T20       | <b>2029488</b>           | 6,30                 |
| H           | TCF180614HP      | TCF210608HC   | <b>1823871</b>            | T25       | <b>1022519</b>           | 8,80                 |

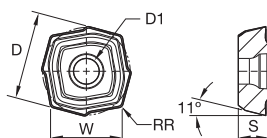
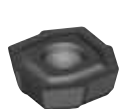
| D     | LS |
|-------|----|
| 20,00 | 50 |
| 25,00 | 56 |
| 32,00 | 60 |
| 40,00 | 70 |
| 50,00 | 80 |

NOTE: Drill shipped with insert screws and Torx wrench.  
 See pages V20–V23 for inserts.  
 SL = Side Lock



### WARNING

During through-hole operations, a slug or disc is produced as the tool breaks through the workpiece. When the drill is stationary and the workpiece is rotating, this slug may be hurled from the chuck by centrifugal force. Provide adequate shielding to protect bystanders.



● first choice  
○ alternate choice

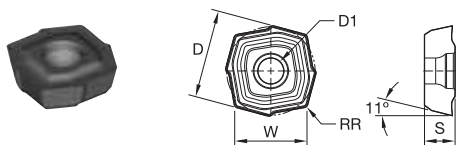
|   |  |  |  |  |
|---|--|--|--|--|
| P |  |  |  |  |
| M |  |  |  |  |
| K |  |  |  |  |
| N |  |  |  |  |
| S |  |  |  |  |
| H |  |  |  |  |

■ Top Cut 4 Drill • Centre Inserts • V34

| catalogue number | D     | D1   | W     | S    | RR    | insert size | WPK10CH | WU25CH  | WU40PH  |
|------------------|-------|------|-------|------|-------|-------------|---------|---------|---------|
| TCF040203ACV34   | 4,47  | 2,10 | 3,65  | 2,00 | 0,300 | A           | I       | 5541817 | 5541818 |
| TCF060203BCV34   | 6,00  | 2,40 | 4,90  | 2,40 | 0,300 | B           | I       | 5542602 | 5542604 |
| TCF070304CCV34   | 7,59  | 2,60 | 6,20  | 2,80 | 0,400 | C           | I       | 5542642 | 5542643 |
| TCF090305DCV34   | 9,55  | 2,80 | 7,80  | 3,00 | 0,500 | D           | I       | 5538554 | 5538555 |
| TCF120405ECV34   | 12,00 | 3,40 | 9,80  | 3,60 | 0,500 | E           | I       | 5538603 | 5538604 |
| TCF150406FCV34   | 14,94 | 4,80 | 12,20 | 4,20 | 0,600 | F           | I       | 5542623 | 5542624 |
| TCF180508GCV34   | 17,88 | 6,00 | 14,60 | 5,40 | 0,800 | G           | I       | 5542475 | 5542476 |
| TCF210608HCV34   | 21,68 | 7,50 | 17,70 | 6,50 | 0,800 | H           | I       | 5542002 | 5542003 |

NOTE: For application-specific insert selection, please refer to the application data on pages V24–V35.

| Geometry | Application                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------|
| V34      | First choice for machining steel, cast iron, and short chipping materials.<br>Suitable for severe cutting conditions. |
| V36      | First choice for stainless steel.<br>Suitable for long chipping steel and where low power consumption is required.    |



- first choice
- alternate choice

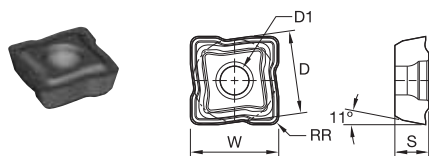
|   |   |   |   |   |
|---|---|---|---|---|
| P | ● | ○ | ○ | ● |
| M | ● | ○ | ○ | ● |
| K | ○ | ○ | ○ | ● |
| N | ○ | ○ | ○ | ○ |
| S | ○ | ○ | ○ | ○ |
| H | ○ | ○ | ○ | ○ |

### ■ Top Cut 4 Drill • Centre Inserts • V36

| catalogue number | D     | D1   | W     | S    | RR    | insert size | WPK10CH | WU25CH  | WU40PH |
|------------------|-------|------|-------|------|-------|-------------|---------|---------|--------|
| TCF040203ACV36   | 4,47  | 2,10 | 3,65  | 2,00 | 0,300 | A           | 5541819 | 5541840 |        |
| TCF060203BCV36   | 6,00  | 2,40 | 4,90  | 2,40 | 0,300 | B           | 5542606 | 5542607 |        |
| TCF070304CCV36   | 7,59  | 2,60 | 6,20  | 2,80 | 0,400 | C           | 5542644 | 5542645 |        |
| TCF090305DCV36   | 9,55  | 2,80 | 7,80  | 3,00 | 0,500 | D           | 5538556 | 5538557 |        |
| TCF120405ECV36   | 12,00 | 3,40 | 9,80  | 3,60 | 0,500 | E           | 5538606 | 5538607 |        |
| TCF150406FCV36   | 14,94 | 4,80 | 12,20 | 4,20 | 0,600 | F           | 5542625 | 5542626 |        |
| TCF180508GCV36   | 17,88 | 6,00 | 14,60 | 5,40 | 0,800 | G           | 5542477 | 5542478 |        |
| TCF210608HCV36   | 21,68 | 7,50 | 17,70 | 6,50 | 0,800 | H           | 5542004 | 5542005 |        |

NOTE: For application-specific insert selection, please refer to the application data on pages V24–V35.

| Geometry | Application                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------|
| V34      | First choice for machining steel, cast iron, and short chipping materials. Suitable for severe cutting conditions. |
| V36      | First choice for stainless steel. Suitable for long chipping steel and where low power consumption is required.    |



● first choice  
○ alternate choice

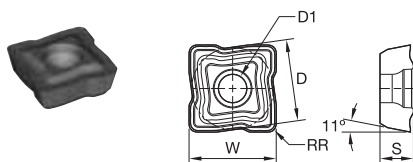
|   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| P |  |  |  |  |
| M |  |  |  |  |
| K |  |  |  |  |
| N |  |  |  |  |
| S |  |  |  |  |
| H |  |  |  |  |

■ Top Cut 4 Drill • Periphery Inserts • V34

| catalogue number | D     | D1   | W     | S    | RR    | insert size | WPK10CH | WU25CH  | WU40PH  |
|------------------|-------|------|-------|------|-------|-------------|---------|---------|---------|
| TCF040204APV34   | 4,14  | 2,10 | 4,40  | 2,00 | 0,400 | A           | 5541843 | 5541841 | 5541842 |
| TCF050204BPV34   | 5,07  | 2,40 | 5,40  | 2,40 | 0,400 | B           | 5542620 | 5542608 | 5542609 |
| TCF070306CPV34   | 6,67  | 2,60 | 7,10  | 2,80 | 0,600 | C           | 5542648 | 5542646 | 5542647 |
| TCF080308DPV34   | 8,08  | 2,80 | 8,60  | 3,00 | 0,800 | D           | 5538600 | 5538558 | 5538559 |
| TCF100408EPV34   | 9,96  | 3,40 | 10,60 | 3,60 | 0,800 | E           | 5538610 | 5538608 | 5538609 |
| TCF120412FPV34   | 12,59 | 4,80 | 13,40 | 4,20 | 1,200 | F           | 5542629 | 5542627 | 5542628 |
| TCF150512GPV34   | 15,13 | 6,00 | 16,10 | 5,40 | 1,200 | G           | 5542601 | 5542479 | 5542600 |
| TCF180614HPV34   | 18,04 | 7,50 | 19,20 | 6,50 | 1,400 | H           | 5542008 | 5542006 | 5542007 |

NOTE: For application-specific insert selection, please refer to the application data on pages V24–V35.

| Geometry | Application                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------|
| V34      | First choice for machining steel, cast iron, and short chipping materials.<br>Suitable for severe cutting conditions. |
| V36      | First choice for stainless steel.<br>Suitable for long chipping steel and where low power consumption is required.    |



● first choice  
○ alternate choice

|   |   |   |   |   |
|---|---|---|---|---|
| P | ● | ○ | ○ | ● |
| M | ● | ○ | ○ | ● |
| K | ○ | ○ | ○ | ● |
| N | ○ | ○ | ○ | ○ |
| S | ○ | ○ | ○ | ○ |
| H | ○ | ○ | ○ | ○ |

### ■ Top Cut 4 Drill • Periphery Inserts • V36

| catalogue number | D     | D1   | W     | S    | RR    | insert size | WPK10CH | WU25CH  | WU40PH |
|------------------|-------|------|-------|------|-------|-------------|---------|---------|--------|
| TCF040204APV36   | 4,14  | 2,10 | 4,40  | 2,00 | 0,400 | A           | 5541844 | 5541845 |        |
| TCF050204BPV36   | 5,07  | 2,40 | 5,40  | 2,40 | 0,400 | B           | 5542621 | 5542622 |        |
| TCF070306CPV36   | 6,67  | 2,60 | 7,10  | 2,80 | 0,600 | C           | 5542649 | 5542650 |        |
| TCF080308DPV36   | 8,08  | 2,80 | 8,60  | 3,00 | 0,800 | D           | 5538601 | 5538602 |        |
| TCF100408EPV36   | 9,96  | 3,40 | 10,60 | 3,60 | 0,800 | E           | 5538611 | 5538612 |        |
| TCF120412FPV36   | 12,59 | 4,80 | 13,40 | 4,20 | 1,200 | F           | 5542640 | 5542641 |        |
| TCF150512GPV36   | 15,13 | 6,00 | 16,10 | 5,40 | 1,200 | G           | 5542603 | 5542605 |        |
| TCF180614HPV36   | 18,04 | 7,50 | 19,20 | 6,50 | 1,400 | H           | 5542009 | 5542020 |        |

NOTE: For application-specific insert selection, please refer to the application data on pages V24–V35.

| Geometry | Application                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------|
| V34      | First choice for machining steel, cast iron, and short chipping materials.<br>Suitable for severe cutting conditions. |
| V36      | First choice for stainless steel.<br>Suitable for long chipping steel and where low power consumption is required.    |

■ Top Cut 4 • Steel • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|------|
|                |           |             |          |       | Insert Size A                               |       |      | Insert Size B                               |       |      | Insert Size C                               |       |      | Insert Size D                               |       |      |      |
|                |           |             |          |       | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm |       |      | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |       |      | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |       |      | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |       |      |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |      |
| P              | 1         | S           | P        | V36   | WU25CH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,13                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,13                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,13                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 2         | S           | P        | V34   | WPK10CH                                     | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,12 | 0,15                                        | 0,10  | 0,13 | 0,16                                        | 0,11  | 0,14 | 0,17 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,12 | 0,15                                        | 0,10  | 0,13 | 0,16                                        | 0,11  | 0,14 | 0,17 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,12 | 0,15                                        | 0,10  | 0,13 | 0,16                                        | 0,11  | 0,14 | 0,17 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 3         | S           | P        | V34   | WPK10CH                                     | 0,08  | 0,11 | 0,15                                        | 0,10  | 0,12 | 0,16                                        | 0,11  | 0,14 | 0,18                                        | 0,12  | 0,15 | 0,20 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,08  | 0,11 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,14 | 0,16                                        | 0,12  | 0,15 | 0,18 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,08  | 0,11 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,14 | 0,16                                        | 0,12  | 0,15 | 0,18 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 4         | S           | P        | V34   | WPK10CH                                     | 0,08  | 0,11 | 0,15                                        | 0,10  | 0,12 | 0,16                                        | 0,11  | 0,14 | 0,18                                        | 0,12  | 0,15 | 0,20 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,08  | 0,11 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,14 | 0,16                                        | 0,12  | 0,15 | 0,18 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,08  | 0,11 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,14 | 0,16                                        | 0,12  | 0,15 | 0,18 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 5         | S           | P        | V36   | WU25CH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 6         | S           | P        | V36   | WU25CH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,10                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15                                        | 0,11  | 0,13 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert



■ Top Cut 4 • Steel • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Cutting Speed by Diameter (m/min) |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|----------------|-----------|-------------|----------|-------|-----------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|
|                |           |             |          |       | Insert Size A                                 |       |     | Insert Size B                               |       |     | Insert Size C                               |       |     | Insert Size D                               |       |     |
|                |           |             |          |       | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm   |       |     | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |       |     | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |       |     | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |       |     |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                           | Start | max | min                                         | Start | max | min                                         | Start | max | min                                         | Start | max |
| P              | 1         | S           | P        | V36   | 120                                           | 140   | 160 | 140                                         | 160   | 240 | 150                                         | 180   | 260 | 160                                         | 180   | 260 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 110                                           | 120   | 140 | 130                                         | 150   | 220 | 130                                         | 170   | 250 | 140                                         | 170   | 250 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 90                                            | 100   | 120 | 130                                         | 150   | 210 | 130                                         | 170   | 240 | 140                                         | 170   | 240 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 2         | S           | P        | V34   | 120                                           | 140   | 160 | 140                                         | 170   | 260 | 150                                         | 190   | 280 | 160                                         | 190   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 110                                           | 120   | 140 | 130                                         | 170   | 240 | 140                                         | 180   | 260 | 150                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 90                                            | 100   | 120 | 130                                         | 170   | 230 | 130                                         | 170   | 240 | 140                                         | 170   | 240 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 3         | S           | P        | V34   | 120                                           | 140   | 180 | 140                                         | 170   | 270 | 150                                         | 200   | 290 | 160                                         | 200   | 310 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 110                                           | 120   | 160 | 130                                         | 160   | 260 | 140                                         | 200   | 280 | 150                                         | 200   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 100                                           | 110   | 140 | 120                                         | 150   | 250 | 130                                         | 180   | 260 | 140                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 4         | S           | P        | V34   | 120                                           | 140   | 180 | 140                                         | 170   | 270 | 150                                         | 200   | 290 | 160                                         | 200   | 310 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 110                                           | 120   | 160 | 130                                         | 160   | 260 | 140                                         | 200   | 280 | 150                                         | 200   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 100                                           | 110   | 140 | 120                                         | 150   | 250 | 130                                         | 180   | 260 | 140                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 5         | S           | P        | V36   | 120                                           | 140   | 160 | 140                                         | 170   | 240 | 150                                         | 180   | 250 | 160                                         | 180   | 250 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 110                                           | 120   | 140 | 130                                         | 160   | 230 | 140                                         | 170   | 240 | 150                                         | 170   | 240 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 90                                            | 100   | 120 | 130                                         | 160   | 230 | 130                                         | 160   | 220 | 140                                         | 160   | 220 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 6         | S           | P        | V36   | 120                                           | 140   | 160 | 140                                         | 170   | 200 | 140                                         | 170   | 210 | 150                                         | 170   | 210 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 110                                           | 120   | 140 | 120                                         | 150   | 190 | 130                                         | 160   | 200 | 140                                         | 160   | 200 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 90                                            | 100   | 120 | 110                                         | 130   | 180 | 120                                         | 140   | 190 | 120                                         | 140   | 190 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Steel • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|
|                |           |             |          |       | Insert Size E                               |       |      | Insert Size F                               |       |      | Insert Size G                               |       |      | Insert Size H                               |       |      |
|                |           |             |          |       | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm |       |      | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |      | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |      | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |
| P              | 1         | S           | P        | V36   | 0,13                                        | 0,14  | 0,18 | 0,15                                        | 0,17  | 0,20 | 0,16                                        | 0,23  | 0,27 | 0,17                                        | 0,24  | 0,29 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,13 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,13 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                | 2         | S           | P        | V34   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,12  | 0,15 | 0,10                                        | 0,13  | 0,16 | 0,11                                        | 0,14  | 0,17 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V34   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,12  | 0,15 | 0,10                                        | 0,13  | 0,16 | 0,11                                        | 0,14  | 0,17 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V34   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,12  | 0,15 | 0,10                                        | 0,13  | 0,16 | 0,11                                        | 0,14  | 0,17 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                | 3         | S           | P        | V34   | 0,08                                        | 0,11  | 0,15 | 0,10                                        | 0,12  | 0,16 | 0,11                                        | 0,14  | 0,18 | 0,12                                        | 0,15  | 0,20 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V34   | 0,08                                        | 0,11  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,14  | 0,16 | 0,12                                        | 0,15  | 0,18 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V34   | 0,08                                        | 0,11  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,14  | 0,16 | 0,12                                        | 0,15  | 0,18 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                | 4         | S           | P        | V34   | 0,08                                        | 0,11  | 0,15 | 0,10                                        | 0,12  | 0,16 | 0,11                                        | 0,14  | 0,18 | 0,12                                        | 0,15  | 0,20 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V34   | 0,08                                        | 0,11  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,14  | 0,16 | 0,12                                        | 0,15  | 0,18 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V34   | 0,08                                        | 0,11  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,14  | 0,16 | 0,12                                        | 0,15  | 0,18 |
|                |           |             | C        | V34   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                | 5         | S           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                | 6         | S           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | U           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |
|                |           | I           | P        | V36   | 0,06                                        | 0,08  | 0,10 | 0,08                                        | 0,10  | 0,14 | 0,10                                        | 0,12  | 0,15 | 0,11                                        | 0,13  | 0,16 |
|                |           |             | C        | V36   |                                             |       |      |                                             |       |      |                                             |       |      |                                             |       |      |

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Pocket Seat: P = periphery insert,  
C = center insert

## ■ Top Cut 4 • Steel • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Cutting Speed by Diameter (m/min) |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|----------------|-----------|-------------|----------|-------|-----------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|
|                |           |             |          |       | Insert Size E                                 |       |     | Insert Size F                               |       |     | Insert Size G                               |       |     | Insert Size H                               |       |     |
|                |           |             |          |       | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm   |       |     | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |     | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |     | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |     |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                           | Start | max | min                                         | Start | max | min                                         | Start | max | min                                         | Start | max |
| P              | 1         | S           | P        | V36   | 160                                           | 180   | 260 | 160                                         | 180   | 260 | 160                                         | 180   | 260 | 160                                         | 180   | 260 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 140                                           | 170   | 250 | 140                                         | 170   | 250 | 140                                         | 170   | 250 | 140                                         | 170   | 250 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 140                                           | 170   | 240 | 140                                         | 170   | 240 | 140                                         | 170   | 240 | 140                                         | 170   | 240 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 2         | S           | P        | V34   | 160                                           | 190   | 280 | 160                                         | 190   | 280 | 160                                         | 190   | 280 | 160                                         | 190   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 150                                           | 180   | 260 | 150                                         | 180   | 260 | 150                                         | 180   | 260 | 150                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 140                                           | 170   | 240 | 140                                         | 170   | 240 | 140                                         | 170   | 240 | 140                                         | 170   | 240 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 3         | S           | P        | V34   | 160                                           | 200   | 310 | 160                                         | 200   | 310 | 160                                         | 200   | 310 | 160                                         | 200   | 310 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 150                                           | 200   | 280 | 150                                         | 200   | 280 | 150                                         | 200   | 280 | 150                                         | 200   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 140                                           | 180   | 260 | 140                                         | 180   | 260 | 140                                         | 180   | 260 | 140                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 4         | S           | P        | V34   | 160                                           | 200   | 310 | 160                                         | 200   | 310 | 160                                         | 200   | 310 | 160                                         | 200   | 310 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | 150                                           | 200   | 280 | 150                                         | 200   | 280 | 150                                         | 200   | 280 | 150                                         | 200   | 280 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | 140                                           | 180   | 260 | 140                                         | 180   | 260 | 140                                         | 180   | 260 | 140                                         | 180   | 260 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 5         | S           | P        | V36   | 160                                           | 180   | 250 | 160                                         | 180   | 250 | 160                                         | 180   | 250 | 160                                         | 180   | 250 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 150                                           | 170   | 240 | 150                                         | 170   | 240 | 150                                         | 170   | 240 | 150                                         | 170   | 240 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 140                                           | 160   | 220 | 140                                         | 160   | 220 | 140                                         | 160   | 220 | 140                                         | 160   | 220 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 6         | S           | P        | V36   | 150                                           | 170   | 210 | 150                                         | 170   | 210 | 150                                         | 170   | 210 | 150                                         | 170   | 210 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 140                                           | 160   | 200 | 140                                         | 160   | 200 | 140                                         | 160   | 200 | 140                                         | 160   | 200 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 120                                           | 140   | 190 | 120                                         | 140   | 190 | 120                                         | 140   | 190 | 120                                         | 140   | 190 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Stainless Steel • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|------|
|                |           |             |          |       | Insert Size A                               |       |      | Insert Size B                               |       |      | Insert Size C                               |       |      | Insert Size D                               |       |      |      |
|                |           |             |          |       | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm |       |      | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |       |      | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |       |      | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |       |      |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |      |
| M              | 1         | S           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,13                                        | 0,08  | 0,10 | 0,15                                        | 0,10  | 0,12 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,12                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,11                                        | 0,07  | 0,10 | 0,11                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 2         | S           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,13                                        | 0,08  | 0,10 | 0,15                                        | 0,10  | 0,12 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,12                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,11                                        | 0,07  | 0,10 | 0,11                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 3         | S           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,13                                        | 0,08  | 0,10 | 0,15                                        | 0,10  | 0,12 | 0,16 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,12                                        | 0,07  | 0,10 | 0,12                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,06  | 0,08 | 0,11                                        | 0,07  | 0,10 | 0,11                                        | 0,08  | 0,10 | 0,14                                        | 0,10  | 0,12 | 0,15 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Stainless Steel • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Cutting Speed by Diameter (m/min) |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|----------------|-----------|-------------|----------|-------|-----------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|
|                |           |             |          |       | Insert Size A                                 |       |     | Insert Size B                               |       |     | Insert Size C                               |       |     | Insert Size D                               |       |     |
|                |           |             |          |       | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm   |       |     | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |       |     | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |       |     | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |       |     |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                           | Start | max | min                                         | Start | max | min                                         | Start | max | min                                         | Start | max |
| M              | 1         | S           | P        | V36   | 120                                           | 140   | 160 | 140                                         | 160   | 230 | 150                                         | 170   | 240 | 150                                         | 170   | 240 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 110                                           | 120   | 140 | 130                                         | 150   | 210 | 130                                         | 160   | 210 | 130                                         | 160   | 210 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 90                                            | 100   | 120 | 130                                         | 150   | 200 | 130                                         | 160   | 200 | 130                                         | 160   | 200 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 2         | S           | P        | V36   | 120                                           | 140   | 160 | 140                                         | 160   | 200 | 150                                         | 170   | 210 | 150                                         | 170   | 210 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 110                                           | 120   | 140 | 130                                         | 150   | 180 | 130                                         | 160   | 200 | 130                                         | 160   | 200 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 90                                            | 100   | 120 | 120                                         | 140   | 170 | 130                                         | 150   | 180 | 130                                         | 150   | 180 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 3         | S           | P        | V36   | 110                                           | 120   | 140 | 130                                         | 150   | 180 | 140                                         | 160   | 200 | 140                                         | 160   | 200 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V36   | 90                                            | 110   | 120 | 120                                         | 130   | 160 | 130                                         | 140   | 180 | 130                                         | 140   | 180 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V36   | 80                                            | 100   | 110 | 100                                         | 120   | 150 | 110                                         | 130   | 160 | 110                                         | 130   | 160 |
|                |           |             | C        | V36   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Stainless Steel • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|------|
|                |           |             |          |       | Insert Size E                               |       |      | Insert Size F                               |       |      | Insert Size G                               |       |      | Insert Size H                               |       |      |      |
|                |           |             |          |       | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm |       |      | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |      | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |      | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |      |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |      |
| M              | 1         | S           | P        | V36   | WU40PH                                      | 0,12  | 0,14 | 0,20                                        | 0,14  | 0,16 | 0,25                                        | 0,16  | 0,18 | 0,28                                        | 0,16  | 0,20 | 0,30 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 2         | S           | P        | V36   | WU40PH                                      | 0,12  | 0,14 | 0,20                                        | 0,14  | 0,16 | 0,25                                        | 0,16  | 0,18 | 0,28                                        | 0,16  | 0,20 | 0,30 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 3         | S           | P        | V36   | WU40PH                                      | 0,12  | 0,14 | 0,20                                        | 0,14  | 0,16 | 0,25                                        | 0,16  | 0,18 | 0,28                                        | 0,16  | 0,20 | 0,30 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V36   | WU40PH                                      | 0,11  | 0,13 | 0,18                                        | 0,12  | 0,14 | 0,22                                        | 0,14  | 0,16 | 0,25                                        | 0,14  | 0,18 | 0,26 |
|                |           |             | C        | V36   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |

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 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
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 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Stainless Steel • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |   |           |             |          |        | Recommended Cutting Speed by Diameter (m/min) |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|----------------|---|-----------|-------------|----------|--------|-----------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|
|                |   |           |             |          |        | Insert Size E                                 |       |     | Insert Size F                               |       |     | Insert Size G                               |       |     | Insert Size H                               |       |     |
|                |   |           |             |          |        | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm   |       |     | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |     | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |     | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |     |
| Material Group |   | Condition | Pocket Seat | Geometry | Grade  | min                                           | Start | max | min                                         | Start | max | min                                         | Start | max | min                                         | Start | max |
| M              | 1 | S         | P           | V36      | WU40PH | 150                                           | 170   | 240 | 150                                         | 170   | 240 | 150                                         | 170   | 240 | 150                                         | 170   | 240 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | U         | P           | V36      | WU40PH | 130                                           | 160   | 210 | 130                                         | 160   | 210 | 130                                         | 160   | 210 | 130                                         | 160   | 210 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | I         | P           | V36      | WU40PH | 130                                           | 160   | 200 | 130                                         | 160   | 200 | 130                                         | 160   | 200 | 130                                         | 160   | 200 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 2 | S         | P           | V36      | WU40PH | 150                                           | 170   | 210 | 150                                         | 170   | 210 | 150                                         | 170   | 210 | 150                                         | 170   | 210 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | U         | P           | V36      | WU40PH | 130                                           | 160   | 200 | 130                                         | 160   | 200 | 130                                         | 160   | 200 | 130                                         | 160   | 200 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | I         | P           | V36      | WU40PH | 130                                           | 150   | 180 | 130                                         | 150   | 180 | 130                                         | 150   | 180 | 130                                         | 150   | 180 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 3 | S         | P           | V36      | WU40PH | 140                                           | 160   | 200 | 140                                         | 160   | 200 | 140                                         | 160   | 200 | 140                                         | 160   | 200 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | U         | P           | V36      | WU40PH | 130                                           | 140   | 180 | 130                                         | 140   | 180 | 130                                         | 140   | 180 | 130                                         | 140   | 180 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |   | I         | P           | V36      | WU40PH | 110                                           | 130   | 160 | 110                                         | 130   | 160 | 110                                         | 130   | 160 | 110                                         | 130   | 160 |
|                |   |           | C           | V36      | WU40PH |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |

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 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Cast Iron • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|------|
|                |           |             |          |       | Insert Size A                               |       |      | Insert Size B                               |       |      | Insert Size C                               |       |      | Insert Size D                               |       |      |      |
|                |           |             |          |       | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm |       |      | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |       |      | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |       |      | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |       |      |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |      |
| K              | 1         | S           | P        | V34   | WPK10CH                                     | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 2         | S           | P        | V34   | WPK10CH                                     | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 3         | S           | P        | V34   | WPK10CH                                     | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,08  | 0,10 | 0,14                                        | 0,08  | 0,10 | 0,16                                        | 0,10  | 0,13 | 0,18                                        | 0,12  | 0,16 | 0,24 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert



■ Top Cut 4 • Cast Iron • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |           |             |          |       |         | Recommended Cutting Speed by Diameter (m/min) |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|----------------|-----------|-------------|----------|-------|---------|-----------------------------------------------|-----|-----|---------------------------------------------|-----|-----|---------------------------------------------|-----|-----|---------------------------------------------|-----|-----|
|                |           |             |          |       |         | Insert Size A                                 |     |     | Insert Size B                               |     |     | Insert Size C                               |     |     | Insert Size D                               |     |     |
|                |           |             |          |       |         | TCF040203AC<br>TCF040204AP<br>12,00–13,99mm   |     |     | TCF060203BC<br>TCF050204BP<br>14,00–18,99mm |     |     | TCF070304CC<br>TCF070306CP<br>19,00–23,99mm |     |     | TCF090305DC<br>TCF080308DP<br>24,00–29,99mm |     |     |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min     | Start                                         | max | min | Start                                       | max | min | Start                                       | max | min | Start                                       | max |     |
| K              | 1         | S           | P        | V34   | WPK10CH | 120                                           | 140 | 180 | 140                                         | 170 | 250 | 150                                         | 180 | 260 | 160                                         | 200 | 280 |
|                |           |             | C        | V34   | WU25CH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | U           | P        | V34   | WU25CH  | 110                                           | 120 | 160 | 130                                         | 160 | 240 | 140                                         | 170 | 250 | 150                                         | 180 | 260 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | I           | P        | V34   | WU40PH  | 100                                           | 110 | 140 | 120                                         | 150 | 230 | 130                                         | 160 | 240 | 140                                         | 170 | 260 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                | 2         | S           | P        | V34   | WPK10CH | 120                                           | 140 | 180 | 130                                         | 160 | 240 | 140                                         | 180 | 250 | 150                                         | 180 | 260 |
|                |           |             | C        | V34   | WU25CH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | U           | P        | V34   | WU25CH  | 110                                           | 120 | 160 | 120                                         | 150 | 230 | 130                                         | 160 | 240 | 140                                         | 160 | 250 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | I           | P        | V34   | WU40PH  | 100                                           | 110 | 140 | 120                                         | 150 | 220 | 130                                         | 160 | 240 | 140                                         | 160 | 250 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                | 3         | S           | P        | V34   | WPK10CH | 120                                           | 140 | 160 | 130                                         | 160 | 240 | 140                                         | 170 | 240 | 150                                         | 170 | 250 |
|                |           |             | C        | V34   | WU25CH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | U           | P        | V34   | WU25CH  | 110                                           | 120 | 140 | 120                                         | 150 | 230 | 130                                         | 160 | 230 | 140                                         | 160 | 240 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |
|                |           | I           | P        | V34   | WU40PH  | 90                                            | 100 | 120 | 120                                         | 150 | 230 | 130                                         | 160 | 230 | 140                                         | 160 | 220 |
|                |           |             | C        | V34   | WU40PH  |                                               |     |     |                                             |     |     |                                             |     |     |                                             |     |     |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.  
 For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.  
 For 5 x D, diameter range 24–68mm (insert sizes D to H), it is highly recommended to start with feed and speed values reduced by 15% less than above recommendations.  
 For 4 x D and 5 x D, it is recommended to reduce the feed rate during entry and exit by 30–50%.

Condition: S = stable conditions,  
 U = unstable cutting conditions,  
 I = interrupted cutting conditions  
 Pocket Seat: P = periphery insert,  
 C = center insert

■ Top Cut 4 • Cast Iron • 2 x D/3 x D • Feed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Feed Rate by Diameter (mm/r)    |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|----------------|-----------|-------------|----------|-------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|---------------------------------------------|-------|------|------|
|                |           |             |          |       | Insert Size E                               |       |      | Insert Size F                               |       |      | Insert Size G                               |       |      | Insert Size H                               |       |      |      |
|                |           |             |          |       | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm |       |      | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |      | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |      | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |      |      |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  | min                                         | Start | max  |      |
| K              | 1         | S           | P        | V34   | WPK10CH                                     | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 2         | S           | P        | V34   | WPK10CH                                     | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                | 3         | S           | P        | V34   | WPK10CH                                     | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU25CH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | U           | P        | V34   | WU25CH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |
|                |           | I           | P        | V34   | WU40PH                                      | 0,14  | 0,16 | 0,26                                        | 0,16  | 0,20 | 0,3                                         | 0,18  | 0,22 | 0,32                                        | 0,20  | 0,24 | 0,36 |
|                |           |             | C        | V34   | WU40PH                                      |       |      |                                             |       |      |                                             |       |      |                                             |       |      |      |

NOTE: For 4 x D, it is highly recommended to start with feed and speed values reduced by 10% less than above recommendations.

For 5 x D, diameter range 12–23,99mm (insert sizes A to C), it is highly recommended to start with feed and speed values reduced by 20% less than above recommendations.

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Condition: S = stable conditions,

U = unstable cutting conditions,

I = interrupted cutting conditions

Pocket Seat: P = periphery insert,

C = center insert

■ Top Cut 4 • Cast Iron • 2 x D/3 x D • Speed Chart • Metric

| Top Cut 4      |           |             |          |       | Recommended Cutting Speed by Diameter (m/min) |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|----------------|-----------|-------------|----------|-------|-----------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|---------------------------------------------|-------|-----|
|                |           |             |          |       | Insert Size E                                 |       |     | Insert Size F                               |       |     | Insert Size G                               |       |     | Insert Size H                               |       |     |
|                |           |             |          |       | TCF120405EC<br>TCF100408EP<br>30,00–36,99mm   |       |     | TCF150406FC<br>TCF120412FP<br>37,00–45,99mm |       |     | TCF180508GC<br>TCF150512GP<br>46,00–56,99mm |       |     | TCF210608HC<br>TCF180614HP<br>57,00–68,00mm |       |     |
| Material Group | Condition | Pocket Seat | Geometry | Grade | min                                           | Start | max | min                                         | Start | max | min                                         | Start | max | min                                         | Start | max |
| K              | 1         | S           | P        | V34   | WPK10CH                                       | 160   | 200 | 280                                         | 160   | 200 | 280                                         | 160   | 200 | 280                                         | 160   | 200 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | WU25CH                                        | 150   | 180 | 260                                         | 150   | 180 | 260                                         | 150   | 180 | 260                                         | 150   | 180 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | WU40PH                                        | 140   | 170 | 260                                         | 140   | 170 | 260                                         | 140   | 170 | 260                                         | 140   | 170 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 2         | S           | P        | V34   | WPK10CH                                       | 150   | 180 | 260                                         | 150   | 180 | 260                                         | 150   | 180 | 260                                         | 150   | 180 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | WU25CH                                        | 140   | 160 | 250                                         | 140   | 160 | 250                                         | 140   | 160 | 250                                         | 140   | 160 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | WU40PH                                        | 140   | 160 | 250                                         | 140   | 160 | 250                                         | 140   | 160 | 250                                         | 140   | 160 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                | 3         | S           | P        | V34   | WPK10CH                                       | 150   | 170 | 250                                         | 150   | 170 | 250                                         | 150   | 170 | 250                                         | 150   | 170 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | U           | P        | V34   | WU25CH                                        | 140   | 160 | 240                                         | 140   | 160 | 240                                         | 140   | 160 | 240                                         | 140   | 160 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |
|                |           | I           | P        | V34   | WU40PH                                        | 140   | 160 | 220                                         | 140   | 160 | 220                                         | 140   | 160 | 220                                         | 140   | 160 |
|                |           |             | C        | V34   |                                               |       |     |                                             |       |     |                                             |       |     |                                             |       |     |

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 Pocket Seat: P = periphery insert,  
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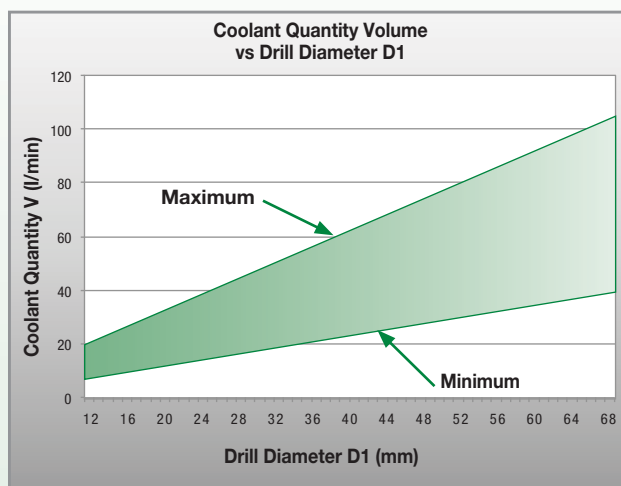
■ Top Cut 4 • Drill Depth • 2 x D/3 x D • Hole Tolerance Table

| Insert size | Diameter Range (mm) | Hole Tolerance (mm) |
|-------------|---------------------|---------------------|
| A           | 12,00–13,99         | +/- 0,20            |
| B           | 14,00–18,99         | +/- 0,20            |
| C           | 19,00–23,99         | +/- 0,20            |
| D           | 24,00–29,99         | +/- 0,20            |
| E           | 30,00–36,99         | +/- 0,20            |
| F           | 37,00–45,99         | +/- 0,25            |
| G           | 46,00–56,99         | +/- 0,25            |
| H           | 57,00–68,00         | +/- 0,28            |

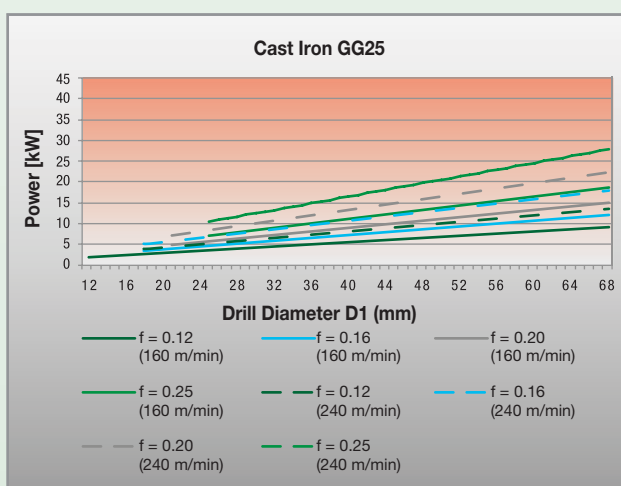
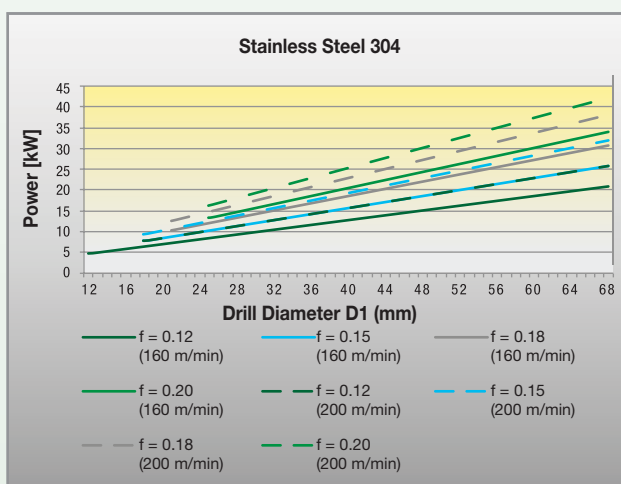
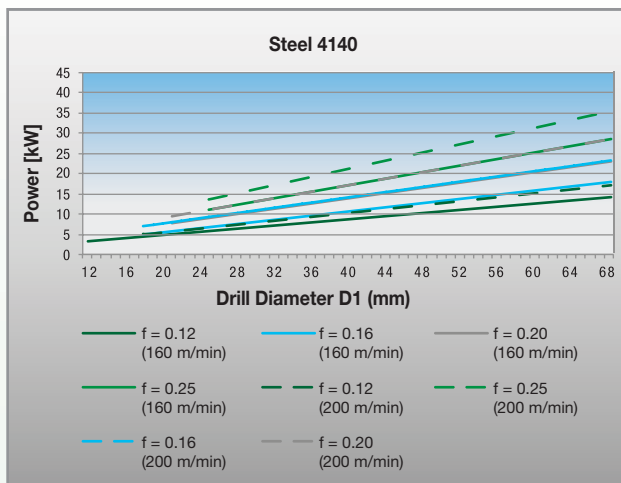
■ Top Cut 4 • Drill Depth • 4 x D/5 x D • Hole Tolerance Table

| Insert size | Diameter Range (mm) | Hole Tolerance (mm) |
|-------------|---------------------|---------------------|
| A           | 12,00–13,99         | +/- 0,35            |
| B           | 14,00–18,99         | +/- 0,35            |
| C           | 19,00–23,99         | +/- 0,35            |
| D           | 24,00–29,99         | +/- 0,35            |
| E           | 30,00–36,99         | +/- 0,35            |
| F           | 37,00–45,99         | +/- 0,38            |
| G           | 46,00–56,99         | +/- 0,38            |
| H           | 57,00–68,00         | +/- 0,42            |

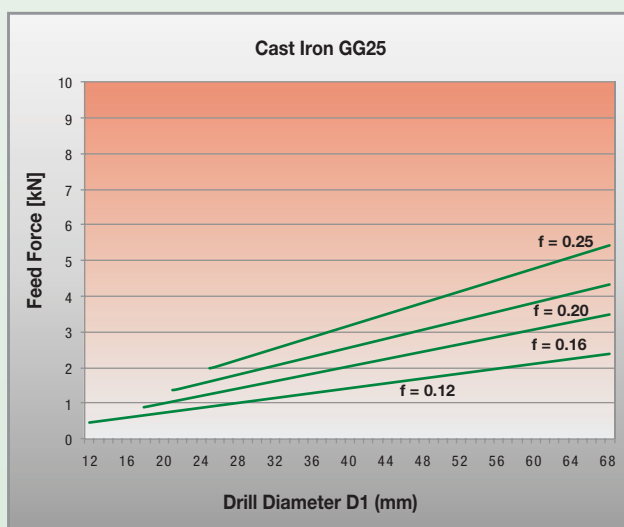
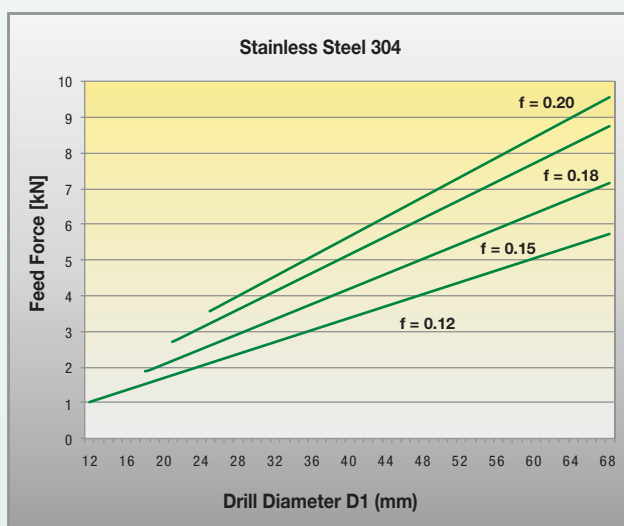
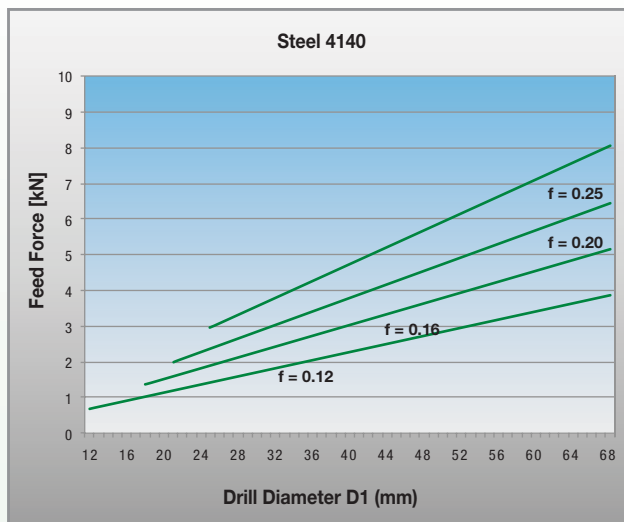
■ Coolant Requirement/Recommendation



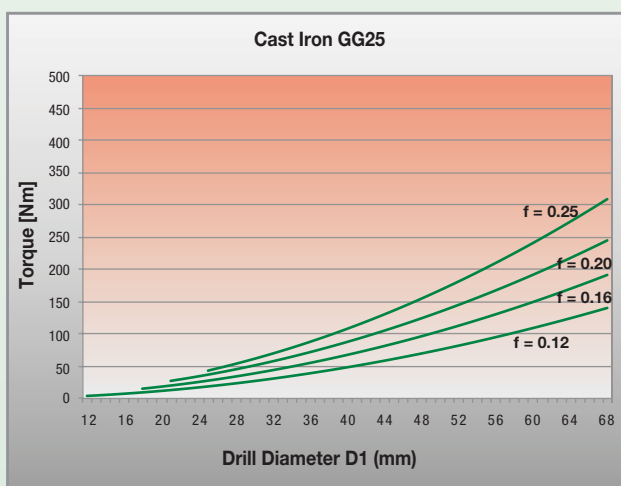
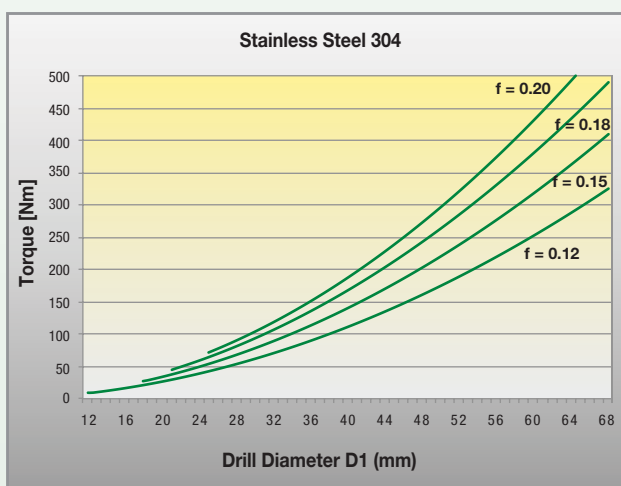
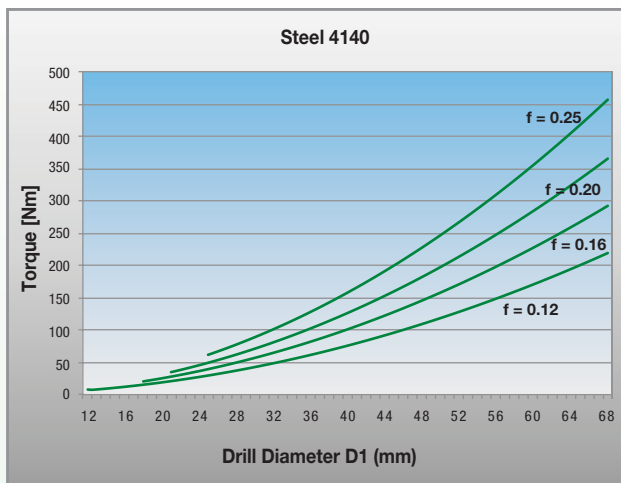
■ Power Requirement



■ Feed Force Requirement



■ Torque Requirement



■ X-Offset Capabilities • Metric

| Insert size | Diameter Range (mm) | 2 x D and 3 x D           |              | 4 x D                     |              | 5 x D               |              |
|-------------|---------------------|---------------------------|--------------|---------------------------|--------------|---------------------|--------------|
|             |                     | X-offset value max. in mm | D1 max value | X-offset value max. in mm | D1 max value | X-offset value max. | D1 max value |
| A           | 12,00–13,99         | 0,5                       | D1 + 1mm     | 0,5                       | D1 + 1mm     | —                   | —            |
| B           | 14,00–18,99         | 0,5                       | D1 + 1mm     | 0,5                       | D1 + 1mm     | —                   | —            |
| C           | 19,00–23,99         | 0,5                       | D1 + 1mm     | 0,5                       | D1 + 1mm     | —                   | —            |
| D           | 24,00–29,99         | 0,8                       | D1 + 1,6mm   | 0,8                       | D1 + 1mm     | —                   | —            |
| E           | 30,00–36,99         | 0,8                       | D1 + 1,6mm   | 0,8                       | D1 + 1mm     | —                   | —            |
| F           | 37,00–45,99         | 0,8                       | D1 + 1,6mm   | 0,8                       | D1 + 1mm     | —                   | —            |
| G           | 46,00–56,99         | 1                         | D1 + 2mm     | 0,8                       | D1 + 1mm     | —                   | —            |
| H           | 57,00–68,00         | 1                         | D1 + 2mm     | 0,8                       | D1 + 1mm     | —                   | —            |







## Hole Finishing

|                         |         |
|-------------------------|---------|
| Introduction.....       | W2-W5   |
| HSR Reaming Tools ..... | W6-W29  |
| WIDIA TRM .....         | W30-W33 |
| ROTAFLEX .....          | W34-W71 |
| Custom Solutions .....  | W72-W81 |



# Hole Finishing with WIDIA™

WIDIA is one of the only sources in the metalworking industry that offers all types of Hole Finishing tooling — from reaming and fine boring to motion tooling. By owning the entire process chain — from raw materials to reconditioning — WIDIA offers customised solutions to meet any imaging challenge, regardless of portfolio or capacity.

## REAMING



**Solid Carbide**



**Tipped**



**Modular**

## BORING



**Roughing**



**Finishing**

## COUNTERSINKING

**Countersinkers**



**Porting  
Fluid Power**



## PCD ROUND TOOLS

**Steel-based**



**Carbide-based**



|                          |                                                                                     |                                                                           |                                      |   |   |   |   |   | standard diameter                          |          | engineered solution diameter |                       |  |  |
|--------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------|---|---|---|---|---|--------------------------------------------|----------|------------------------------|-----------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                          |                                                                                     |                                                                           |                                      |   |   |   |   |   | range                                      | accuracy | range                        | accuracy              |                                                                                     |                                                                                     |
|                          |                                                                                     |                                                                           | ● first choice<br>○ alternate choice |   |   |   |   |   |                                            |          |                              |                       |                                                                                     |                                                                                     |
| reaming tools            |    | <b>HSR™ — Solid Carbide</b><br>High-Speed Reamer<br>Carbide               | ●                                    | ● | ● | ● | ○ |   | .196–.551"<br>5–14mm                       | IT7      | .056–1.00"<br>1,4–25,4mm     | IT6<br>>.39"<br>>10mm | .0004"<br>10 μm                                                                     | .0003"<br>7 μm                                                                      |
|                          |    | <b>HSR™ — Carbide Tipped</b><br>High-Speed Reamer<br>Carbide/Cermet       | ●                                    | ● | ● | ● | ○ |   | .551–1.26"<br>14–32mm                      | IT7      | .551–2.55"<br>14–65mm        | IT6                   | .0004"<br>10 μm                                                                     | .0003"<br>7 μm                                                                      |
| boring/fine-boring tools |    | <b>ROTAFLEX™ FBHBB</b><br>Fine-Boring<br>Carbide/Cermet/PCD/CBN           | ●                                    | ● | ● | ● | ● | ○ | .236–.866"<br>6–22mm                       | IT7      | —                            | —                     | .0002"<br>5 μm                                                                      | .0002–.0004"<br>5–10 μm                                                             |
|                          |    | <b>ROTAFLEX™ FBH</b><br>Fine-Boring<br>Carbide/Cermet/PCD/CBN             | ●                                    | ● | ● | ● | ● | ○ | .866–4.25"<br>22–115mm                     | IT7      | —                            | —                     | .0002"<br>5 μm                                                                      | .0002–.0004"<br>5–10 μm                                                             |
|                          |    | <b>ROTAFLEX™ TCHS</b><br>Roughing<br>Carbide/Cermet/PCD/CBN               | ●                                    | ● | ● | ● | ● |   | .886–4.52"<br>22,5–115mm                   | IT7      | —                            | —                     | .0004"<br>10 μm                                                                     | >.0008"<br>>20 μm                                                                   |
|                          |    | <b>ROTAFLEX™ Small Bridge Tools</b><br>Roughing<br>Carbide/Cermet/PCD/CBN | ●                                    | ● | ● | ● | ● |   | 3.425–7.87"<br>87–200mm                    | IT7      | —                            | —                     | .0004"<br>10 μm                                                                     | >.0008"<br>>20 μm                                                                   |
|                          |   | <b>ROTAFLEX™ Large Bridge Tools</b><br>Roughing<br>Carbide/Cermet/PCD/CBN | ●                                    | ● | ● | ● | ● |   | 7.87–20.47"<br>200–520mm                   | IT7      | —                            | —                     | .0004"<br>10 μm                                                                     | >.0008"<br>>20 μm                                                                   |
|                          |  | <b>Fine-Boring Cartridges</b><br>Fine-Boring<br>Carbide/Cermet/PCD/CBN    | ●                                    | ○ | ● | ● | ○ |   | 3.425–20.47"<br>87–520mm                   | IT7      | —                            | —                     | .0002"<br>5 μm                                                                      | .0002–.0004"<br>5–10 μm                                                             |
| countersinking           |  | <b>Countersinking</b><br>Round Tools<br>Steel Base                        |                                      |   |   | ● |   |   | —                                          | —        | —                            | IT7                   | .0004"<br>10 μm                                                                     | .0004"<br>10 μm                                                                     |
|                          |  | <b>Port Cutters</b><br>Carbide/Cermet<br>Steel Base                       |                                      |   |   | ● |   |   | for standard<br>ports<br>SAE, BSPP,<br>ISO | —        | —                            | IT7                   | .0004"<br>10 μm                                                                     | .0004"<br>10 μm                                                                     |
| PCD                      |  | <b>PCD</b><br>Round Tools<br>Steel Base CBN                               |                                      |   |   | ● |   |   | —                                          | —        | .394–4.00"<br>10–100mm       | IT6                   | .0004"<br>10 μm                                                                     | .0004"<br>10 μm                                                                     |
|                          |  | <b>PCD</b><br>Round Tools<br>Carbide Base                                 |                                      |   |   | ● |   |   | —                                          | —        | .197–1.00"<br>5–25mm         | IT6                   | .0002"<br>5 μm                                                                      | .0003"<br>7 μm                                                                      |



**Cylindricity**  
NOTE: Process- and application-dependent.  
Highly dependent on the pre-machine hole accuracy.  
Use of high-performance drilling/pre-machining tools mandatory to reach values.



**Position**  
NOTE: Process- and application-dependent.  
Highly dependent on the pre-machine hole accuracy.  
Use of high-performance drilling/pre-machining tools mandatory to reach values.

| achievable surface quality Ra |                           |                           |                          |                           |                     | capability |  |              |              | cost/part | cycle time | required operator experience | page(s)             |
|-------------------------------|---------------------------|---------------------------|--------------------------|---------------------------|---------------------|------------|--|--------------|--------------|-----------|------------|------------------------------|---------------------|
| P                             | M                         | K                         | N                        | S                         | H                   |            |  |              |              |           |            |                              |                     |
| 20–40 µ-in<br>0,5–1,0 µm      | 20–40 µ-in<br>0,5–1,0 µm  | 20–60 µ-in<br>0,5–1,5 µm  | –                        | 20–40 µ-in<br>0,5–1,0 µm  | –                   |            |  |              |              | moderate  | low        | low                          | W8–W10,<br>W13–W14  |
| 20–40 µ-in<br>0,5–1,0 µm      | 20–40 µ-in<br>0,5–1,0 µm  | 20–60 µ-in<br>0,5–1,5 µm  | –                        | 20–40 µ-in<br>0,5–1,0 µm  | –                   |            |  | carbide only | carbide only | moderate  | low        | low                          | W11–W12,<br>W15–W16 |
| 32–80 µ-in<br>0,8–2,0 µm      | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm | 32–80 µ-in<br>0,8–2,0 µm  | <48 µ-in<br><1,2 µm |            |  |              |              | low       | moderate   | low–moderate                 | W49–W51             |
| 32–80 µ-in<br>0,8–2,0 µm      | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm | 32–80 µ-in<br>0,8–2,0 µm  | <48 µ-in<br><1,2 µm |            |  |              |              | low       | moderate   | low–moderate                 | W52–W53             |
| 40–200 µ-in<br>1,0–5,0 µm     | 40–200 µ-in<br>1,0–5,0 µm | 40–200 µ-in<br>1,0–5,0 µm | 40–80 µ-in<br>1,0–2,0 µm | 40–200 µ-in<br>1,0–5,0 µm | –                   |            |  |              |              | low       | moderate   | low–moderate                 | W36–W37             |
| 40–200 µ-in<br>1,0–5,0 µm     | 40–200 µ-in<br>1,0–5,0 µm | 40–200 µ-in<br>1,0–5,0 µm | 40–80 µ-in<br>1,0–2,0 µm | 40–200 µ-in<br>1,0–5,0 µm | –                   |            |  |              |              | low       | low        | low–moderate                 | W38–W39             |
| 40–200 µ-in<br>1,0–5,0 µm     | 40–200 µ-in<br>1,0–5,0 µm | 40–200 µ-in<br>1,0–5,0 µm | 40–80 µ-in<br>1,0–2,0 µm | 40–200 µ-in<br>1,0–5,0 µm | –                   |            |  |              |              | low       | moderate   | low–moderate                 | W40–W45             |
| 32–80 µ-in<br>0,8–2,0 µm      | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm  | 32–80 µ-in<br>0,8–2,0 µm | 32–80 µ-in<br>0,8–2,0 µm  | –                   |            |  |              |              | low       | moderate   | low–moderate                 | W46–W48             |
| 32–80 µ-in<br>–2,0 µm         | 32–80 µ-in<br>–2,0 µm     | 32–80 µ-in<br>–2,0 µm     | 32–80 µ-in<br>0,8–2,0 µm | –                         | –                   |            |  |              |              | very low  | very low   | moderate                     | W76–W77             |
| 32–80 µ-in<br>–2,0 µm         | 32–80 µ-in<br>–2,0 µm     | 32–80 µ-in<br>–2,0 µm     | 32–80 µ-in<br>0,8–2,0 µm | –                         | –                   |            |  |              |              | very low  | very low   | moderate                     | W74–W75             |
| –                             | –                         | –                         | 4–32 µ-in<br>0,1–0,8 µm  | –                         | –                   |            |  |              |              | low       | very low   | moderate                     | W80–W81             |
| –                             | –                         | –                         | 4–32 µ-in<br>0,1–0,8 µm  | –                         | –                   |            |  |              |              | low       | very low   | moderate                     | W80–W81             |

**Ra** Surface roughness

NOTE: Surface roughness values are guidelines and depend on the application, coolant situation, machine, and cutting data applied.

## HSR™ Reaming Tools

HSR Reaming Tools combine high-performance micrograin substrates, specific coatings, and extremely unequal flutes for outstanding machining results. Increase your productivity with the HSR leads and lapped grinding of surface rake, clearance, and relief angle.



# Reaming Tools

### HSR™ Solid Carbide Reaming Tools

- Diameters starting at 1,40mm (.055") with internal coolant supply available as standard.
- Ground to H7 tolerance class for use in most applications.
- Specific coatings and lead configurations available for high-speed machining of steel, stainless steel, and cast iron.
- Uncoated micrograin substrates for machining stainless steel and non-ferrous materials at accelerated speeds.

### Features and Benefits

- Lapped ground leads for high-speed cutting.
- Long tool life with increased hole and surface quality.
- High metal removal rates (MRR) at increased speeds and feeds.
- Radial coolant supply for through hole applications and axial coolant supply for blind holes to achieve higher feed rates.
- Decreased runout and improved straightness due to unequal flutes.

### Customisation

- Diameters starting at 1,40mm (.055") up to 14,15mm (.557") available with and without internal coolant in 0,001mm steps.
- Solid cermet reaming tools and tooling for heat-resistant materials are available on request.



## HSR™ Carbide- and Cermet-Tipped Reaming Tools

- Achieve solid carbide and solid cermet metal removal rates from 14–32mm (.551–1.26") with no customisation required.
- Ground to H7 tolerance class to accommodate most applications.
- Specific coatings and lead configuration for high-speed machining of steel, stainless steel, cast iron, and non-ferrous materials at accelerated speeds.
- Coated and uncoated micrograin substrate carbide and coated cermet specifically engineered for reaming.

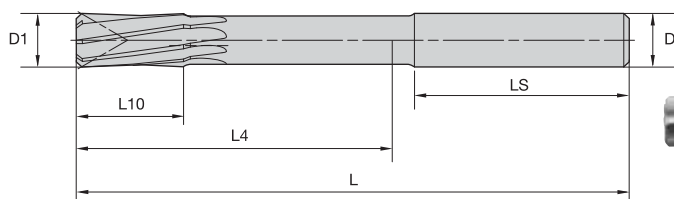
### Features and Benefits

- Lapped ground leads for high-speed cutting.
- Long tool life with increased hole and surface quality.
- Highest metal removal rates at higher speeds and feeds.
- Decreased runout and improved straightness due to unequal flutes.
- Adjustment screw at straight-fluted HSR reamers to change internal coolant supply from axial to radial.
- Optimised coolant options for blind holes and blind hole applications with interrupted cut.

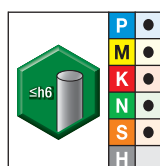
### Customisation

- Diameters up to 50mm (1.968") available with and without internal coolant in 0,001mm steps.
- HSR tooling for machining heat-resistant materials is available on request.





■ HSR Reamers with Helical Flutes for Through Holes • K10™ • 1,4–10mm

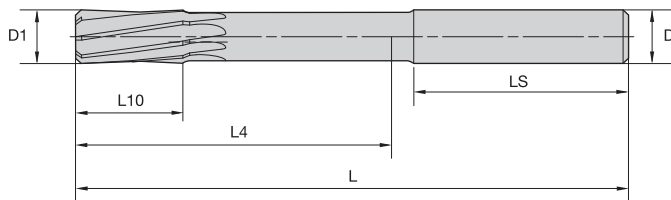
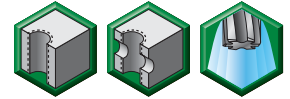


● first choice  
○ alternate choice

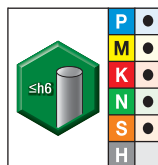
grade K10  
uncoated

| order # | catalogue #   | D1    | D     | L   | L4 | L10 | LS | Z |
|---------|---------------|-------|-------|-----|----|-----|----|---|
| 2293636 | 050221-000014 | 1,40  | 1,40  | 40  | 18 | 8   | 22 | 3 |
| 2293637 | 050221-000015 | 1,50  | 1,50  | 40  | 18 | 8   | 22 | 3 |
| 2293638 | 050221-000016 | 1,60  | 1,60  | 43  | 20 | 9   | 23 | 3 |
| 2283423 | 050221-000020 | 2,00  | 2,00  | 49  | 24 | 11  | 25 | 4 |
| 2283424 | 050221-000022 | 2,20  | 2,20  | 53  | 26 | 12  | 27 | 4 |
| 2283426 | 050221-000025 | 2,50  | 2,50  | 57  | 28 | 14  | 29 | 4 |
| 2283427 | 050221-000028 | 2,80  | 2,80  | 61  | 32 | 15  | 29 | 4 |
| 2283428 | 050221-000030 | 3,00  | 3,00  | 61  | 32 | 15  | 29 | 6 |
| 2283429 | 050221-000032 | 3,20  | 3,20  | 65  | 35 | 16  | 30 | 6 |
| 2283430 | 050221-000035 | 3,50  | 3,50  | 70  | 40 | 18  | 30 | 6 |
| 2283431 | 050221-000040 | 4,00  | 4,00  | 75  | 41 | 19  | 32 | 6 |
| 2293640 | 050221-000045 | 4,50  | 4,50  | 80  | 44 | 21  | 33 | 6 |
| 2283445 | 050221-000050 | 5,00  | 5,00  | 86  | 51 | 23  | 34 | 6 |
| 2293641 | 050221-000055 | 5,50  | 5,60  | 93  | 57 | 26  | 36 | 6 |
| 2293642 | 050221-000060 | 6,00  | 5,60  | 93  | 53 | 26  | 36 | 6 |
| 2293643 | 050221-000065 | 6,50  | 6,30  | 101 | 63 | 28  | 38 | 6 |
| 2293644 | 050221-000070 | 7,00  | 7,10  | 109 | 69 | 31  | 40 | 6 |
| 2283450 | 050221-000075 | 7,50  | 7,10  | 109 | 69 | 31  | 40 | 6 |
| 2283451 | 050221-000080 | 8,00  | 8,00  | 117 | 75 | 33  | 42 | 6 |
| 2283463 | 050221-000085 | 8,50  | 8,00  | 117 | 75 | 33  | 42 | 6 |
| 2283464 | 050221-000090 | 9,00  | 9,00  | 125 | 81 | 36  | 44 | 6 |
| 2283465 | 050221-000095 | 9,50  | 9,00  | 125 | 81 | 36  | 44 | 6 |
| 2283466 | 050221-000100 | 10,00 | 10,00 | 133 | 87 | 38  | 46 | 6 |

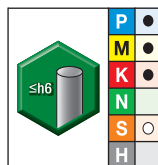
- Standard reamers listed are ground to achieve an H7 tolerance hole. IT6 hole tolerance capability starting at diameter 10mm is available as a Custom Solution. Additional diameters and lengths made to order.



### ■ HSR Reamers with Helical Flutes for Through Holes • K10F™/K10F-DCFD™ • 2–144mm



grade K10F  
uncoated

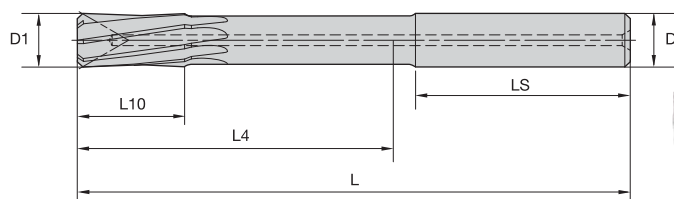
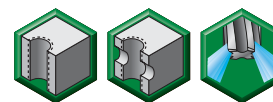


grade K10F-DCFD  
TiAlN

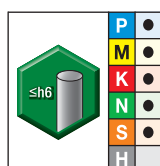
- first choice
- alternate choice

| order # | catalogue #   | order # | catalogue #   | D1    | D     | L   | L4 | L10 | LS | Z |
|---------|---------------|---------|---------------|-------|-------|-----|----|-----|----|---|
| 2436494 | 050227-000200 | 2441162 | 450227-000200 | 2,00  | 3,00  | 48  | 15 | 6   | 28 | 4 |
| 2436871 | 050227-000300 | 2441253 | 450227-000300 | 3,00  | 3,00  | 48  | 15 | 6   | 28 | 4 |
| 2436872 | 050227-000400 | 2441254 | 450227-000400 | 4,00  | 4,00  | 54  | 21 | 8   | 28 | 4 |
| 2436913 | 050227-000500 | 2441256 | 450227-000500 | 5,00  | 6,00  | 74  | 32 | 12  | 36 | 4 |
| 2436914 | 050227-000600 | 2441257 | 450227-000600 | 6,00  | 6,00  | 74  | 33 | 12  | 36 | 4 |
| 2436916 | 050227-000800 | 2441260 | 450227-000800 | 8,00  | 8,00  | 91  | 50 | 16  | 36 | 6 |
| 2436919 | 050227-001000 | 2441261 | 450227-001000 | 10,00 | 10,00 | 103 | 58 | 20  | 40 | 6 |
| 2436922 | 050227-001200 | 2441284 | 450227-001200 | 12,00 | 12,00 | 118 | 68 | 24  | 45 | 6 |
| 2436946 | 050227-001400 | 2441285 | 450227-001400 | 14,00 | 14,00 | 132 | 81 | 28  | 45 | 6 |

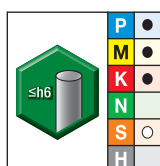
- Standard reamers listed are ground to achieve an H7 tolerance hole.  
IT6 capability is available. Additional diameters and lengths made to order.



■ HSR Reamers with Helical Flutes for Through Holes • K10F™/K10F-DCFD™ • 5–14mm



grade K10F  
uncoated

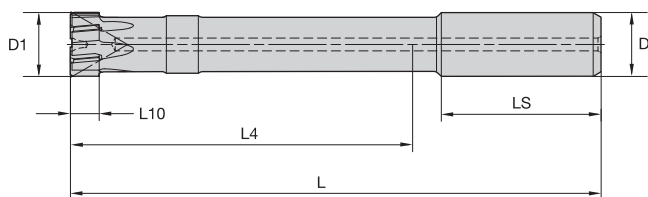
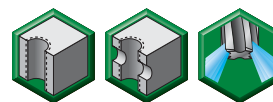


grade K10F-DCFD  
TiAlN

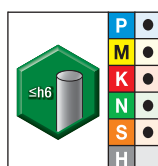
- first choice
- alternate choice

| order # | catalogue #   | order # | catalogue #   | D1    | D     | L   | L4 | L10 | LS | Z |
|---------|---------------|---------|---------------|-------|-------|-----|----|-----|----|---|
| 2437425 | 050271-000500 | 2441380 | 450271-000500 | 5,00  | 6,00  | 74  | 32 | 12  | 36 | 4 |
| 2437426 | 050271-000600 | 2441381 | 450271-000600 | 6,00  | 6,00  | 74  | 33 | 12  | 36 | 4 |
| 2437428 | 050271-000800 | 2441453 | 450271-000800 | 8,00  | 8,00  | 91  | 50 | 16  | 36 | 6 |
| 2437430 | 050271-001000 | 2441455 | 450271-001000 | 10,00 | 10,00 | 103 | 58 | 20  | 40 | 6 |
| 2437432 | 050271-001200 | 2441457 | 450271-001200 | 12,00 | 12,00 | 118 | 68 | 24  | 45 | 6 |
| 2437468 | 050271-001400 | 2441494 | 450271-001400 | 14,00 | 14,00 | 132 | 81 | 28  | 45 | 6 |

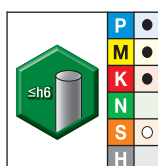
- Standard reamers listed are ground to achieve an H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Helical Flutes for Through Holes • K10F™/K10F-DCFD™ • 14–32mm



grade K10F  
uncoated

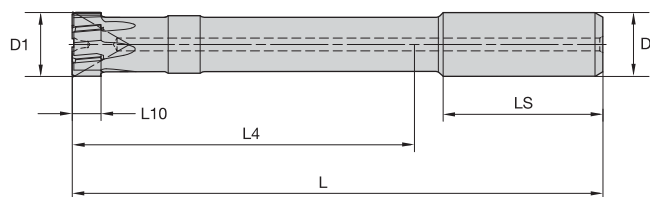
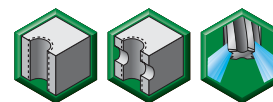


grade K10F-DCFD  
TiAlN

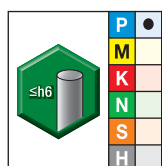
- first choice
- alternate choice

| grade K10F uncoated |               | grade K10F-DCFD TiAlN |               | D1    | D     | L   | L4  | L10 | LS | Z |
|---------------------|---------------|-----------------------|---------------|-------|-------|-----|-----|-----|----|---|
| order #             | catalogue #   | order #               | catalogue #   |       |       |     |     |     |    |   |
| 3084978             | 050281-001400 | 3084312               | 450281-001400 | 14,00 | 16,00 | 145 | 90  | 9   | 48 | 6 |
| 3084983             | 050281-001600 | 3084317               | 450281-001600 | 16,00 | 20,00 | 157 | 100 | 9   | 50 | 6 |
| 3084992             | 050281-001800 | 3084321               | 450281-001800 | 18,00 | 20,00 | 171 | 114 | 9   | 50 | 6 |
| 3085083             | 050281-002000 | 3084319               | 450281-002000 | 20,00 | 20,00 | 200 | 143 | 9   | 50 | 6 |
| 3085084             | 050281-002200 | 3084322               | 450281-002200 | 22,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3085087             | 050281-002400 | 3084323               | 450281-002400 | 24,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3085089             | 050281-002500 | 3084324               | 450281-002500 | 25,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3085090             | 050281-002600 | 3084325               | 450281-002600 | 26,00 | 25,00 | 240 | 177 | 11  | 56 | 8 |
| 3085092             | 050281-002800 | 3084327               | 450281-002800 | 28,00 | 25,00 | 240 | 177 | 11  | 56 | 8 |
| 3085104             | 050281-003000 | 3084320               | 450281-003000 | 30,00 | 25,00 | 270 | 207 | 11  | 56 | 8 |
| -                   |               | 3084328               | 450281-003200 | 32,00 | 25,00 | 270 | 207 | 11  | 56 | 8 |

- Standard reamers listed are ground to achieve an H7 tolerance hole.  
IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Helical Flutes for Through Holes • CERMET-DCFD™ • 14–20mm

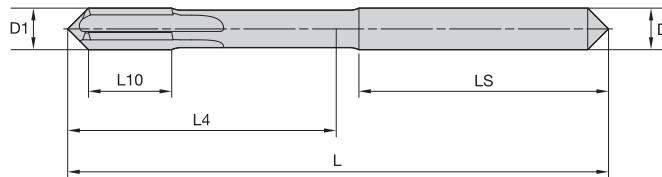
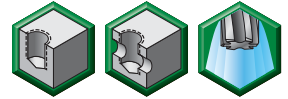


grade CERMET-DCFD  
TiAlN

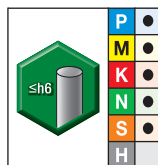
- first choice
- alternate choice

| order # | catalogue #   | D1    | D     | L   | L4  | L10 | LS | Z |
|---------|---------------|-------|-------|-----|-----|-----|----|---|
| 3888130 | 456681-001400 | 14,00 | 16,00 | 145 | 76  | 8   | 49 | 6 |
| 3888131 | 456681-001500 | 15,00 | 16,00 | 145 | 76  | 8   | 49 | 6 |
| 3888132 | 456681-001600 | 16,00 | 20,00 | 157 | 86  | 8   | 51 | 6 |
| 3888403 | 456681-001700 | 17,00 | 20,00 | 157 | 86  | 10  | 51 | 6 |
| 3888404 | 456681-001800 | 18,00 | 20,00 | 171 | 100 | 10  | 51 | 6 |
| 3888405 | 456681-001900 | 19,00 | 20,00 | 171 | 100 | 10  | 51 | 6 |
| 3888406 | 456681-002000 | 20,00 | 20,00 | 200 | 129 | 10  | 51 | 6 |

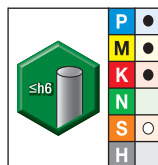
- Standard reamers listed are ground to achieve an H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Straight Flutes for Blind Holes • K10F™/K10F-DCFD™ • 2–4mm



grade K10F  
uncoated

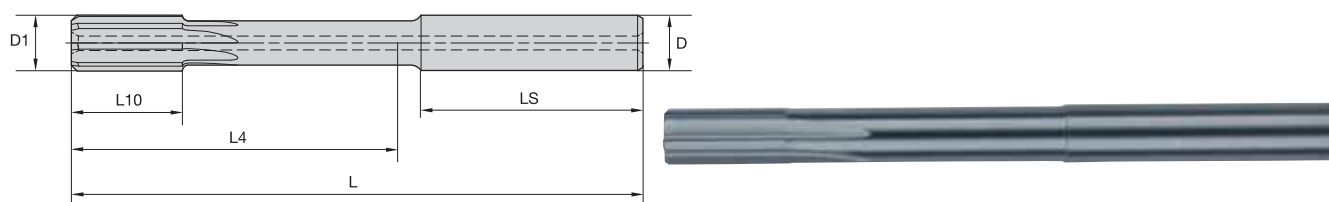
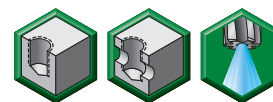


grade K10F-DCFD  
TiAlN

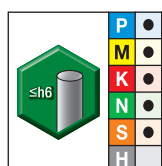
- first choice
- alternate choice

| order # | catalogue #   | order # | catalogue #   | D1   | D    | L  | L4 | L10 | LS | Z |
|---------|---------------|---------|---------------|------|------|----|----|-----|----|---|
| 2446025 | 050222-000200 | 2446371 | 450222-000200 | 2,00 | 3,00 | 48 | 15 | 6   | 28 | 4 |
| 2446029 | 050222-000300 | 2446372 | 450222-000300 | 3,00 | 3,00 | 48 | 15 | 8   | 28 | 4 |
| 2446031 | 050222-000400 | 2446415 | 450222-000400 | 4,00 | 4,00 | 54 | 21 | 8   | 28 | 4 |

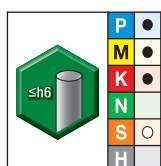
- Standard reamers listed are ground to achieve an H7 tolerance hole.  
IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Straight Flutes for Blind Holes • K10F™/K10F-DCFD™ • 5-14mm



grade K10F  
uncoated



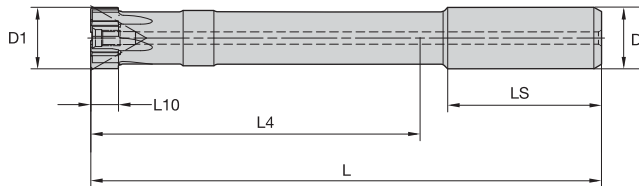
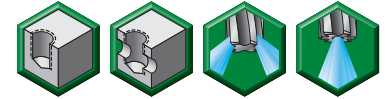
grade K10F-DCFD  
TiAlN

- first choice
- alternate choice

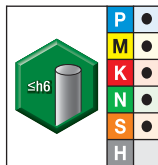
| order # | catalogue #   | order # | catalogue #   | D1    | D     | L   | L4 | L10 | LS | Z |
|---------|---------------|---------|---------------|-------|-------|-----|----|-----|----|---|
| 2437472 | 050270-000500 | 2441337 | 450270-000500 | 5,00  | 6,00  | 74  | 32 | 12  | 36 | 4 |
| 2437523 | 050270-000600 | 2441339 | 450270-000600 | 6,00  | 6,00  | 74  | 33 | 12  | 36 | 4 |
| 2437525 | 050270-000800 | 2441341 | 450270-000800 | 8,00  | 8,00  | 91  | 50 | 16  | 36 | 6 |
| 2437526 | 050270-001000 | 2441342 | 450270-001000 | 10,00 | 10,00 | 103 | 58 | 20  | 40 | 6 |
| 2437527 | 050270-001200 | 2441353 | 450270-001200 | 12,00 | 12,00 | 118 | 68 | 24  | 45 | 6 |
| 2437529 | 050270-001400 | 2441354 | 450270-001400 | 14,00 | 14,00 | 132 | 81 | 28  | 45 | 6 |



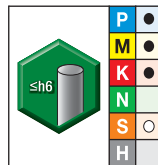
- Standard reamers listed are ground to achieve an H7 tolerance hole. IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Straight Flutes for Blind Holes • K10F™/K10F-DCFD™ • 14–32mm



grade K10F  
uncoated

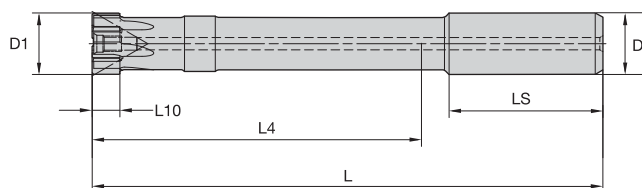


grade K10F-DCFD  
TiAlN

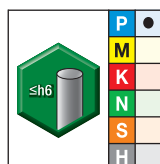
- first choice
- alternate choice

| order # | catalogue #   | order # | catalogue #   | D1    | D     | L   | L4  | L10 | LS | Z |
|---------|---------------|---------|---------------|-------|-------|-----|-----|-----|----|---|
| 3055655 | 050280-001400 | 3084512 | 450280-001400 | 14,00 | 16,00 | 145 | 90  | 9   | 48 | 6 |
| 3055656 | 050280-001600 | 3084526 | 450280-001600 | 16,00 | 20,00 | 157 | 100 | 9   | 50 | 6 |
| 3055657 | 050280-001800 | 3084528 | 450280-001800 | 18,00 | 20,00 | 171 | 114 | 9   | 50 | 6 |
| 3056095 | 050280-002000 | 3077292 | 450280-002000 | 20,00 | 20,00 | 200 | 143 | 9   | 50 | 6 |
| 3056096 | 050280-002200 | 3084529 | 450280-002200 | 22,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3056097 | 050280-002400 | 3084530 | 450280-002400 | 24,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3056098 | 050280-002500 | 3084531 | 450280-002500 | 25,00 | 20,00 | 210 | 153 | 11  | 50 | 6 |
| 3056099 | 050280-002600 | 3084532 | 450280-002600 | 26,00 | 25,00 | 240 | 177 | 11  | 56 | 8 |
| 3056100 | 050280-002800 | 3084593 | 450280-002800 | 28,00 | 25,00 | 240 | 177 | 11  | 56 | 8 |
| 3056102 | 050280-003000 | 3084594 | 450280-003000 | 30,00 | 25,00 | 270 | 207 | 11  | 56 | 8 |
| 3056273 | 050280-003200 | 3084595 | 450280-003200 | 32,00 | 25,00 | 270 | 207 | 11  | 56 | 8 |

- Standard reamers listed are ground to achieve an H7 tolerance hole.  
IT6 capability is available. Additional diameters and lengths made to order.



### ■ HSR Reamers with Straight Flutes for Blind Holes • CERMET-DCFD™ • 14–20mm



grade CERMET-DCFD  
TiAlN

- first choice
- alternate choice

| order # | catalogue #   | D1    | D     | L   | L4  | L10 | LS | Z |
|---------|---------------|-------|-------|-----|-----|-----|----|---|
| 3888407 | 456680-001400 | 14,00 | 16,00 | 145 | 76  | 8   | 49 | 6 |
| 3888408 | 456680-001500 | 15,00 | 16,00 | 145 | 76  | 8   | 49 | 6 |
| 3888409 | 456680-001600 | 16,00 | 20,00 | 157 | 86  | 8   | 51 | 6 |
| 3888410 | 456680-001700 | 17,00 | 20,00 | 157 | 86  | 10  | 51 | 6 |
| 3888411 | 456680-001800 | 18,00 | 20,00 | 171 | 100 | 10  | 51 | 6 |
| 3888412 | 456680-001900 | 19,00 | 20,00 | 171 | 100 | 10  | 51 | 6 |
| 3888413 | 456680-002000 | 20,00 | 20,00 | 200 | 129 | 10  | 51 | 6 |

■ Series 050221 • Solid Carbide • Helical Flute • Grade K10™ • Metric

| Material Group |   |                    |   |     |                               |           |           |           |           |            |
|----------------|---|--------------------|---|-----|-------------------------------|-----------|-----------|-----------|-----------|------------|
|                |   | Cutting Speed — vc |   |     | Recommended Feed Rate per Rev |           |           |           |           |            |
|                |   | min                |   | max | Tool Diameter                 | 1,40–3,15 | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 |
| P              | 1 | 20                 | – | 30  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 2 | 20                 | – | 20  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 3 | 10                 | – | 20  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 4 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 5 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 6 | 10                 | – | 10  | mm/r                          | 0,06–0,10 | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23  |
| M              | 1 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 2 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 3 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
| K              | 1 | 10                 | – | 20  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 2 | 10                 | – | 20  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 3 | 10                 | – | 20  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
| N              | 1 | 30                 | – | 30  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 2 | 30                 | – | 40  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 3 | 30                 | – | 40  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 4 | 30                 | – | 30  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 5 | 20                 | – | 30  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
|                | 6 | 30                 | – | 40  | mm/r                          | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  |
| S              | 1 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 2 | 10                 | – | 10  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 3 | 10                 | – | 20  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |
|                | 4 | 10                 | – | 20  | mm/r                          | 0,07–0,13 | 0,08–0,16 | 0,10–0,20 | 0,13–0,23 | 0,15–0,25  |

■ Series 050227 • Solid Carbide • Helical Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |           |           |           |           |            |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |           |           |           |           |            |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 1,40–3,15 | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 30                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 10                                                                                | – | 10  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| N              | 1 | 70                                                                                | – | 90  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 80                                                                                | – | 100 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 80                                                                                | – | 100 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 4 | 70                                                                                | – | 90  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 5 | 60                                                                                | – | 80  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 6 | 90                                                                                | – | 110 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 10                                                                                | – | 10  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 4 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |

■ Series 450227 • Solid Carbide • Helical Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |           |           |           |           |            |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |           |           |           |           |            |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 1,40–3,15 | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 60                                                                                | – | 80  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 60                                                                                | – | 80  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 60                                                                                | – | 70  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,40–0,70 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |

■ Series 050271 • Solid Carbide • Helical Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |           |           |           |            |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc                                                                |   |     | Recommended Feed Rate per Rev                                                      |           |           |           |            |             |
|                |   | Range — m/min                                                                     |   |     |                                                                                    |           |           |           |            |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| N              | 1 | 130                                                                               | – | 150 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 140                                                                               | – | 160 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 140                                                                               | – | 160 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 4 | 130                                                                               | – | 150 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 5 | 120                                                                               | – | 140 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 6 | 150                                                                               | – | 170 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |

■ Series 450271 • Solid Carbide • Helical Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |           |           |           |            |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |           |           |           |            |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 110                                                                               | – | 130 | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 110                                                                               | – | 130 | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 100                                                                               | – | 120 | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 60                                                                                | – | 80  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 30                                                                                | – | 50  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 80                                                                                | – | 100 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 80                                                                                | – | 100 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 70                                                                                | – | 90  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |

■ Series 050281 • Uncoated • Carbide-Tipped • Helical Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |             |             |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-------------|-------------|-------------|
|                |   | Cutting Speed – vc<br>Range – m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |             |             |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 12,70–15,00 | 15,00–20,00 | 20,00–32,00 |
| P              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 2 | 40                                                                                | – | 60  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 3 | 40                                                                                | – | 60  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| K              | 1 | 30                                                                                | – | 50  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 30                                                                                | – | 50  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| N              | 1 | 130                                                                               | – | 150 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 140                                                                               | – | 160 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 140                                                                               | – | 160 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 4 | 130                                                                               | – | 150 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 5 | 120                                                                               | – | 140 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 6 | 150                                                                               | – | 170 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |



■ Series 450281 • Coated • Carbide-Tipped • Helical Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |             |             |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-------------|-------------|-------------|
|                |   | Cutting Speed — vc                                                                |   |     | Recommended Feed Rate per Rev                                                      |             |             |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 12,70–15,00 | 15,00–20,00 | 20,00–32,00 |
| <b>P</b>       | 1 | 110                                                                               | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 2 | 110                                                                               | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 3 | 100                                                                               | – | 120 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 4 | 60                                                                                | – | 80  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 5 | 30                                                                                | – | 50  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 6 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| <b>M</b>       | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 2 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| <b>K</b>       | 1 | 80                                                                                | – | 100 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 80                                                                                | – | 100 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 70                                                                                | – | 90  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| <b>S</b>       | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 2 | 20                                                                                | – | 30  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |

■ Series 456681 • Cermet-Tipped • Helical Flute • Grade CERMET-DCFD™ • Metric

| Material Group |   |   |   |     |  |             |             |
|----------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-------------|-------------|
|                |   | Cutting Speed — vc<br>Range — m/min                                                                                                                                 |   |     | Recommended Feed Rate per Rev                                                      |             |             |
|                |   | min                                                                                                                                                                 |   | max | Tool Diameter                                                                      | 12,70–15,00 | 15,00–20,00 |
| P              | 1 | 110                                                                                                                                                                 | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   |
|                | 2 | 110                                                                                                                                                                 | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   |
|                | 3 | 100                                                                                                                                                                 | – | 120 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   |
|                | 4 | 60                                                                                                                                                                  | – | 80  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   |
|                | 5 | 30                                                                                                                                                                  | – | 50  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   |
|                | 6 | 30                                                                                                                                                                  | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   |

■ Series 050222 • Solid Carbide • Straight Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |           |           |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |           |           |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 1,40–3,15 | 3,16–4,80 |
| P              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 2 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 3 | 30                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 4 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 5 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
|                | 3 | 10                                                                                | – | 10  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
| K              | 1 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 2 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
| N              | 1 | 70                                                                                | – | 90  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 2 | 80                                                                                | – | 100 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 3 | 80                                                                                | – | 100 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 4 | 70                                                                                | – | 90  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 5 | 60                                                                                | – | 80  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 6 | 90                                                                                | – | 110 | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 |
|                | 2 | 10                                                                                | – | 10  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
|                | 4 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |

■ Series 450222 • Solid Carbide • Straight Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |           |           |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |           |           |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 1,40–3,15 | 3,16–4,80 |
| P              | 1 | 60                                                                                | – | 80  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 2 | 60                                                                                | – | 80  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 3 | 50                                                                                | – | 70  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 4 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 |
|                | 6 | 20                                                                                | – | 30  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 |
| K              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 2 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
|                | 3 | 50                                                                                | – | 70  | mm/r                                                                               | 0,25–0,45 | 0,35–0,65 |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,10–0,20 | 0,15–0,30 |

■ Series 050270 • Solid Carbide • Straight Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |           |           |           |            |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc                                                                |   |     | Recommended Feed Rate per Rev                                                      |           |           |           |            |             |
|                |   | Range — m/min                                                                     |   |     |                                                                                    |           |           |           |            |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 40                                                                                | – | 60  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 30                                                                                | – | 50  | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| N              | 1 | 130                                                                               | – | 150 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 140                                                                               | – | 160 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 140                                                                               | – | 160 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 4 | 130                                                                               | – | 150 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 5 | 120                                                                               | – | 140 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 6 | 150                                                                               | – | 170 | mm/r                                                                               | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |

HSR™ Application Data • Series 450270

■ Series 450270 • Solid Carbide • Straight Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |           |           |           |            |             |
|----------------|---|-------------------------------------------------------------------------------------|---|-----|--------------------------------------------------------------------------------------|-----------|-----------|-----------|------------|-------------|
|                |   | Cutting Speed — vc                                                                  |   |     | Recommended Feed Rate per Rev                                                        |           |           |           |            |             |
|                |   | Range — m/min                                                                       |   |     |                                                                                      |           |           |           |            |             |
|                |   | min                                                                                 |   | max | Tool Diameter                                                                        | 3,16–4,80 | 4,81–7,15 | 7,16–9,59 | 9,60–12,70 | 12,70–15,00 |
| P              | 1 | 110                                                                                 | – | 130 | mm/r                                                                                 | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 2 | 110                                                                                 | – | 130 | mm/r                                                                                 | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 3 | 100                                                                                 | – | 120 | mm/r                                                                                 | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 4 | 60                                                                                  | – | 80  | mm/r                                                                                 | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 5 | 30                                                                                  | – | 50  | mm/r                                                                                 | 0,20–0,40 | 0,30–0,50 | 0,35–0,65 | 0,40–0,80  | 0,50–0,90   |
|                | 6 | 30                                                                                  | – | 40  | mm/r                                                                                 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| M              | 1 | 30                                                                                  | – | 40  | mm/r                                                                                 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 2 | 30                                                                                  | – | 40  | mm/r                                                                                 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
|                | 3 | 20                                                                                  | – | 30  | mm/r                                                                                 | 0,20–0,30 | 0,20–0,40 | 0,30–0,50 | 0,30–0,60  | 0,35–0,65   |
| K              | 1 | 80                                                                                  | – | 100 | mm/r                                                                                 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 2 | 80                                                                                  | – | 100 | mm/r                                                                                 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
|                | 3 | 70                                                                                  | – | 90  | mm/r                                                                                 | 0,35–0,65 | 0,40–0,80 | 0,50–0,90 | 0,60–1,05  | 0,60–1,20   |
| S              | 1 | 30                                                                                  | – | 40  | mm/r                                                                                 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |
|                | 2 | 20                                                                                  | – | 30  | mm/r                                                                                 | 0,15–0,30 | 0,20–0,30 | 0,20–0,40 | 0,25–0,45  | 0,30–0,50   |

■ Series 050280 • Uncoated • Carbide-Tipped • Straight Flute • Grade K10F™ • Metric

| Material Group |   |  |   |     |  |             |             |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-------------|-------------|-------------|
|                |   | Cutting Speed — vc<br>Range — m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |             |             |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 12,70–15,00 | 15,00–20,00 | 20,00–32,00 |
| P              | 1 | 50                                                                                | – | 70  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,20   |
|                | 2 | 40                                                                                | – | 60  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,20   |
|                | 3 | 40                                                                                | – | 60  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,20   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,20   |
|                | 5 | 20                                                                                | – | 30  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,20   |
|                | 6 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| M              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 3 | 10                                                                                | – | 20  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| K              | 1 | 30                                                                                | – | 50  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 30                                                                                | – | 50  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| N              | 1 | 130                                                                               | – | 150 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 140                                                                               | – | 160 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 140                                                                               | – | 160 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 4 | 130                                                                               | – | 150 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 5 | 120                                                                               | – | 140 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 6 | 150                                                                               | – | 170 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| S              | 1 | 10                                                                                | – | 20  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 2 | 10                                                                                | – | 20  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 3 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 4 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |

■ Series 450280 • Coated • Carbide-Tipped • Straight Flute • Grade K10F-DCFD™ • Metric

| Material Group |   |  |   |     |  |             |             |             |
|----------------|---|-----------------------------------------------------------------------------------|---|-----|------------------------------------------------------------------------------------|-------------|-------------|-------------|
|                |   | Cutting Speed – vc<br>Range – m/min                                               |   |     | Recommended Feed Rate per Rev                                                      |             |             |             |
|                |   | min                                                                               |   | max | Tool Diameter                                                                      | 12,70–15,00 | 15,00–20,00 | 20,00–32,00 |
| P              | 1 | 110                                                                               | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 2 | 110                                                                               | – | 130 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 3 | 100                                                                               | – | 120 | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 4 | 60                                                                                | – | 80  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 5 | 30                                                                                | – | 50  | mm/r                                                                               | 0,50–0,90   | 0,60–1,05   | 0,60–1,10   |
|                | 6 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| M              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 2 | 30                                                                                | – | 40  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
|                | 3 | 20                                                                                | – | 30  | mm/r                                                                               | 0,35–0,65   | 0,40–0,80   | 0,50–0,90   |
| K              | 1 | 80                                                                                | – | 100 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 2 | 80                                                                                | – | 100 | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
|                | 3 | 70                                                                                | – | 90  | mm/r                                                                               | 0,60–1,20   | 0,70–1,30   | 0,80–1,40   |
| S              | 1 | 30                                                                                | – | 40  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |
|                | 2 | 20                                                                                | – | 30  | mm/r                                                                               | 0,30–0,50   | 0,30–0,60   | 0,35–0,65   |

HSR™ Application Data • Series 456680

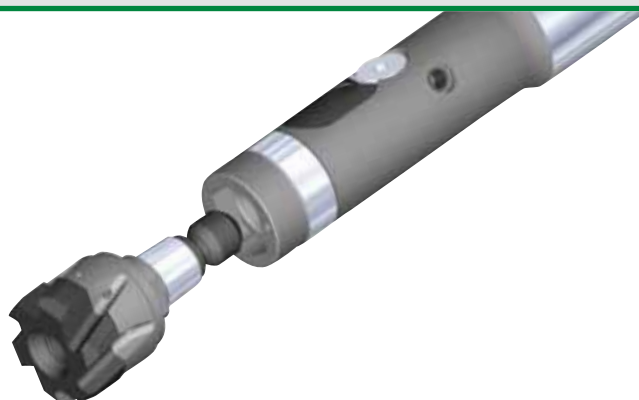
■ Series 456680 • Cermet-Tipped • Straight Flute • Grade CERMET-DCFD™ • Metric

| Material Group |   |  |   |     |  |             |             |
|----------------|---|-------------------------------------------------------------------------------------|---|-----|--------------------------------------------------------------------------------------|-------------|-------------|
|                |   | Cutting Speed – vc<br>Range – m/min                                                 |   |     | Recommended Feed Rate per Rev                                                        |             |             |
|                |   | min                                                                                 |   | max | Tool Diameter                                                                        | 12,70–15,00 | 15,00–20,00 |
| P              | 1 | 110                                                                                 | – | 130 | mm/r                                                                                 | 0,50–0,90   | 0,60–1,05   |
|                | 2 | 110                                                                                 | – | 130 | mm/r                                                                                 | 0,50–0,90   | 0,60–1,05   |
|                | 3 | 100                                                                                 | – | 120 | mm/r                                                                                 | 0,50–0,90   | 0,60–1,05   |
|                | 4 | 60                                                                                  | – | 80  | mm/r                                                                                 | 0,50–0,90   | 0,60–1,05   |
|                | 5 | 30                                                                                  | – | 50  | mm/r                                                                                 | 0,50–0,90   | 0,60–1,05   |
|                | 6 | 30                                                                                  | – | 40  | mm/r                                                                                 | 0,35–0,65   | 0,40–0,80   |

# WIDIA™ TRM • Top Ream Modular (Available as Semi-Standards)

## Primary Application

- Achieve solid carbide metal removal rates.
- Five sizes of standard straight shank bodies available to couple reaming heads from 20–42mm (.787–1.653").



# WIDIA TRM

## Features and Benefits

- High-speed and high-performance ready.
- Unique proprietary coupling system enables same runout accuracy as monoblock systems (<3 microns).
- Comfortable radial clamping for quick exchanging even in narrow situations in the machine.
- No fixture for clamping or dismantling necessary.

## Customisation

- Heads fully customisable as simple specials with different lead geometries, grades, coatings, and edge hones.
- Semi-finished heads on stock for shorter lead times.

## Ordering Process

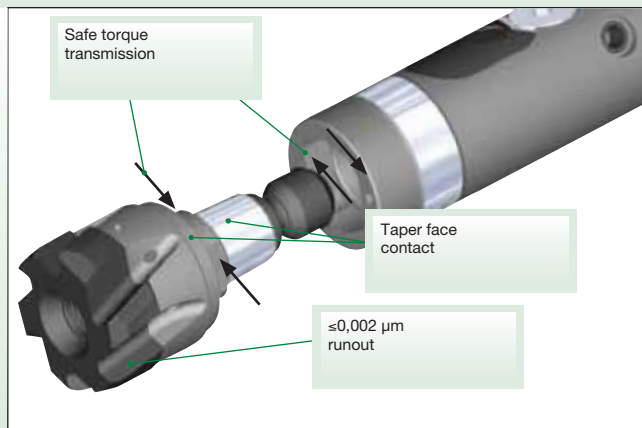
- Please contact your local Authorised Distributor for a quote.



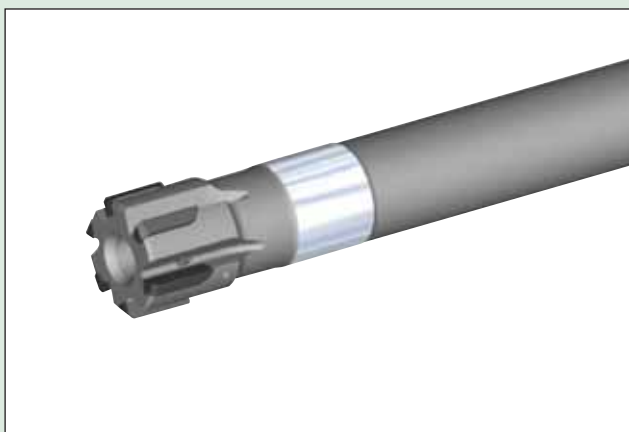


## WST™ — WIDIA™ Short Taper

- Easy to handle.
- Fewer vibrations due to safe torque transmission.
- No head-to-body orientation adjustment necessary.
- Higher hole quality due to minimal runout and taper face contact.
- Easy to disassemble due to push out effect of head.

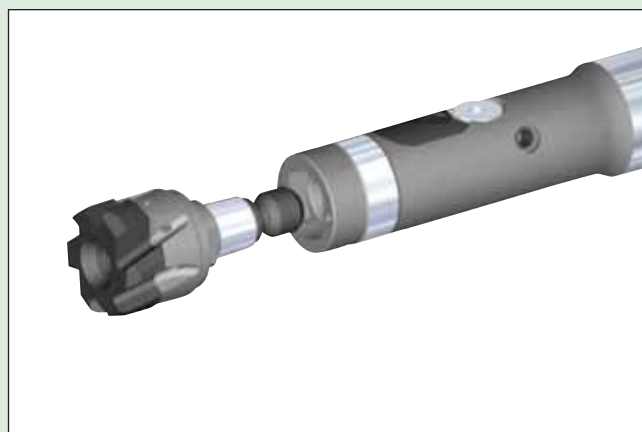


## Special Design – Top Ream Tipped Tools



### Regular Tipped

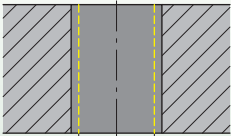
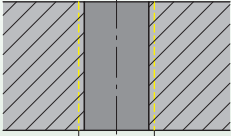
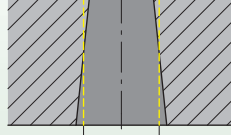
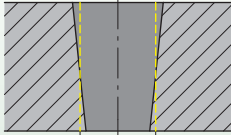
- 4–8 brazing joints depending on diameter (number of teeth).
- Less stiffness.
- More vibrations.
- Higher runout after thermal influence (e.g., coating, reconditioning, etc.).



### WIDIA Top Ream

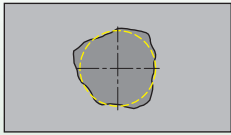
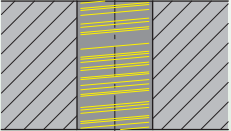
- Min 4x reconditionable.
- New reaming grade WU05PR™ holds bore surface finish more than 2x longer.
- Stronger brazing joint than conventional tipped reamers.
- Less influence of coating process on runout.

## Reamer Troubleshooting

| Problem                                                                                                                                                        | Cause                                                                                                                                                                                                                                                                                 | Possible Remedy                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Hole diameter too large</p>  <p>Nom diameter</p>                           | <ol style="list-style-type: none"> <li>1. Reaming tool running out of centre.</li> <li>2. Concentricity of pilot hole and ream machining unsatisfactory.</li> <li>3. Built-up edge.</li> <li>4. Unsuitable cooling lubricant.</li> <li>5. Reaming tool diameter too large.</li> </ol> | <ul style="list-style-type: none"> <li>• Use equalising adaptor.</li> <li>• Re-align, use floating head.</li> <li>• Change cooling lubricant.</li> <li>• Change cutting speed.</li> <li>• Measure reamers and send for repairs.</li> </ul> |
| <p>Hole diameter too small</p>  <p>Nom diameter</p>                           | <ol style="list-style-type: none"> <li>1. Reamer worn.</li> <li>2. Unsuitable cooling lubricant.</li> <li>3. Reaming allowance too small.</li> </ol>                                                                                                                                  | <ul style="list-style-type: none"> <li>• Replace and refit tool.</li> <li>• Change cooling lubricant.</li> <li>• Increase reaming allowance.</li> </ul>                                                                                    |
| <p>Conical hole profile wider towards drill runout</p>  <p>Nom diameter</p> | <ol style="list-style-type: none"> <li>1. Concentricity of pilot hole and reaming unsatisfactory.</li> <li>2. Positioning accuracy of pilot hole to reaming.</li> </ol>                                                                                                               | <ul style="list-style-type: none"> <li>• Re-align, use equalising adaptor.</li> <li>• Correct positioning accuracy.</li> </ul>                                                                                                             |
| <p>Conical hole profile wider at drill entry point</p>  <p>Nom diameter</p> | <ol style="list-style-type: none"> <li>1. Concentricity of pilot hole and reaming unsatisfactory.</li> <li>2. Reaming tool skim cutting with ledger.</li> </ol>                                                                                                                       | <ul style="list-style-type: none"> <li>• Re-align, use floating head.</li> <li>• Securely clamp reaming tool axially.</li> </ul>                                                                                                           |

(continued)

## Reamer Troubleshooting *(continued)*

| Problem                                                                                                                                  | Cause                                                                                                                                                                                                                       | Possible Remedy                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Conical hole profile wider at drill entry point</p>  | <ol style="list-style-type: none"> <li>1. Reaming tool running out of centre.</li> <li>2. Slanted cutting surface/asymmetrical cutting.</li> <li>3. Workpiece twisted.</li> </ol>                                           | <ul style="list-style-type: none"> <li>• Use equalising adaptor.</li> <li>• Spot face as drilling preparation.</li> <li>• Take the direction of impact into account when clamping the workpiece.</li> </ul>                                |
| <p>Surface quality does not meet specification</p>      | <ol style="list-style-type: none"> <li>1. Tool cutters worn.</li> <li>2. Reaming tool running out of centre.</li> <li>3. Incorrect technology data (cutting parameters).</li> <li>4. Inadequate chip evacuation.</li> </ol> | <ul style="list-style-type: none"> <li>• Use equalising adaptor.</li> <li>• Re-align, use floating head.</li> <li>• Change cooling lubricant.</li> <li>• Change cutting speed.</li> <li>• Measure reamers and send for repairs.</li> </ul> |
| <p>Feed grooves</p>                                   | <ol style="list-style-type: none"> <li>1. Built-up edge.</li> </ol>                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Change cooling lubricant.</li> <li>• Change cutting speed.</li> </ul>                                                                                                                             |

## Precision Hole Finishing • ROTAFLEX™

The WIDIA™ line of Precision Hole Finishing ensures decreased vibration, increased productivity, and reduced calls for scheduled maintenance. You can count on consistent hole diameters, high speed and feed rates, and good surface quality at a great price.

- Easy adjustments and low initial investment.
- Roughing and precision finishing heads available.
- For roughing and fine finishing operations over a broad diameter range.



# ROTAFLEX

### **The newly developed RFX coupling eases assembly and disassembly and enhances stability**

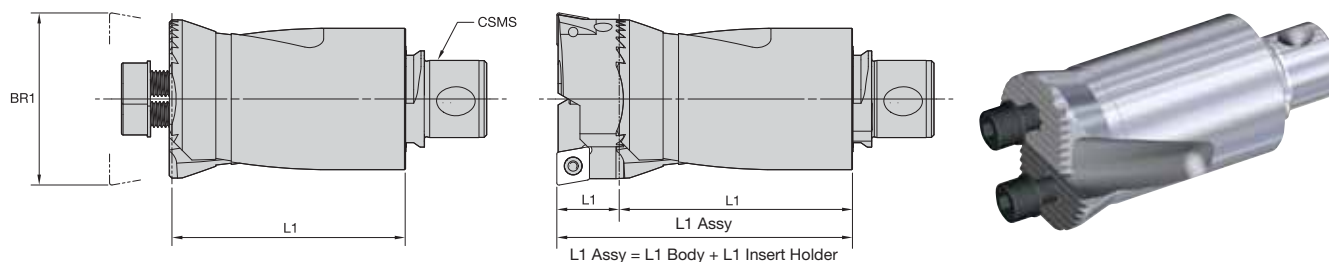
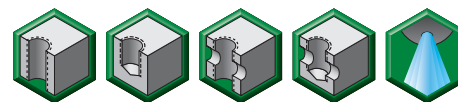
- Increased machine tool productivity and less vibration.
- Standard micro-adjustable cartridges for fine finishing operations.
- Internal coolant and spacious chip flutes.



**Advanced system uses the progressive RFX coupling and the latest technology WIDIA™ Victory™ ISO turning inserts**

- High feed rates due to the proprietary front serration of the TCHS twin cutters.
- Internal coolant and spacious chip flutes ensure secure chip evacuation.
- High-precision adjustment of FBH and FBHBB Fine-Boring Heads with the axial and radial pre-loaded eccentric bushing instead of a threaded spindle.
- Higher rigidity with the new RFX bayonet-type coupling.
- Achieve unmatched tool life with WIDIA Victory grades.

- Basic body shipped without insert holders.
- Order insert holder, slides, or micro-adjustable cartridges separately.



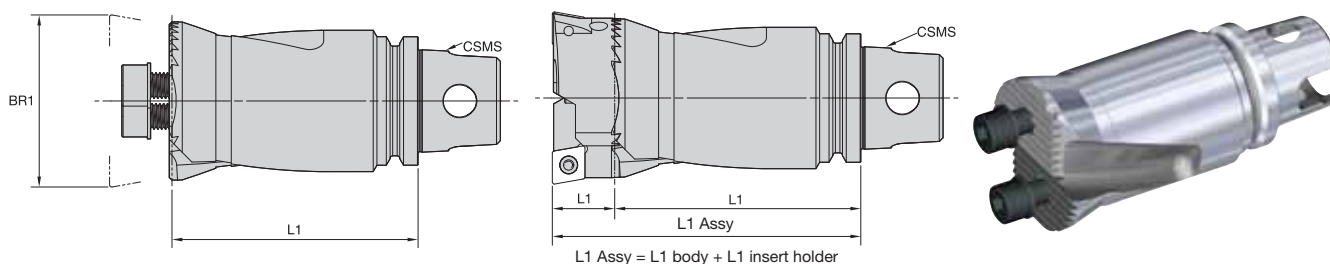
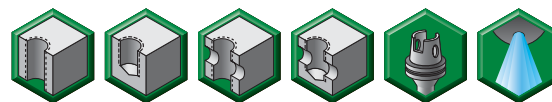
### ■ TCHS • RFX Shank Series

| order number | catalogue number | BR1 bore range | L1    | CSMS system size | kg   |
|--------------|------------------|----------------|-------|------------------|------|
| 3861179      | RFX185TCHS022030 | 22,500-30,000  | 27,7  | RFX185           | 0,20 |
| 3861180      | RFX245TCHS030039 | 30,000-39,000  | 37,7  | RFX245           | 0,20 |
| 3861181      | RFX320TCHS039050 | 39,000-50,000  | 48,7  | RFX320           | 0,50 |
| 3861182      | RFX420TCHS050067 | 50,000-67,000  | 68,2  | RFX420           | 1,00 |
| 3861183      | RFX550TCHS067088 | 67,000-88,000  | 90,7  | RFX550           | 2,00 |
| 3861184      | RFX720TCHS088115 | 88,000-115,000 | 113,7 | RFX720           | 4,00 |

### ■ Spare Parts

| catalogue number | fixing screw | disc washer |
|------------------|--------------|-------------|
| RFX185TCHS022030 | 12147602700  | 12147600100 |
| RFX245TCHS030039 | 12147602300  | 12147603900 |
| RFX320TCHS039050 | 12147602400  | 12147600200 |
| RFX420TCHS050067 | 12147602500  | 12147604000 |
| RFX550TCHS067088 | 12147602600  | 12147600300 |
| RFX720TCHS088115 | 12147602800  | 12147600400 |

- Basic body shipped without insert holders.
- Order insert holder, slides, or micro-adjustable cartridges separately.



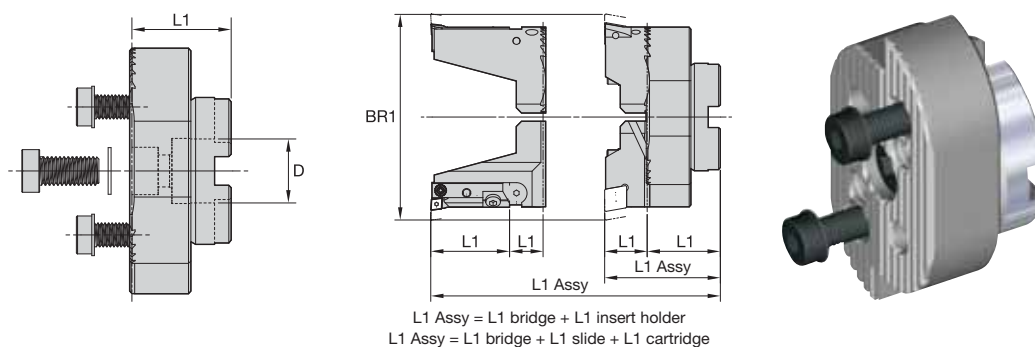
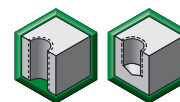
### ■ TCHS • KM™ Shank Series

| order number | catalogue number | BR1 bore range | L1   | CSMS system size | kg   |
|--------------|------------------|----------------|------|------------------|------|
| 3861149      | KM32TSTCHS022030 | 22,000-30,000  | 52,7 | KM32TS           | 0,30 |
| 3861150      | KM32TSTCHS030039 | 30,000-39,000  | 67,7 | KM32TS           | 0,50 |
| 3861152      | KM40TSTCHS030039 | 30,000-39,000  | 87,7 | KM40TS           | 0,60 |
| 3861151      | KM32TSTCHS039050 | 39,000-50,000  | 63,7 | KM32TS           | 0,70 |
| 3861173      | KM40TSTCHS039050 | 39,000-50,000  | 83,7 | KM40TS           | 1,00 |
| 3861174      | KM40TSTCHS050067 | 50,000-67,000  | 78,2 | KM40TS           | 1,10 |
| 3861175      | KM50TSTCHS050067 | 50,000-67,000  | 88,2 | KM50TS           | 1,20 |
| 3861176      | KM50TSTCHS067088 | 67,000-88,000  | 95,7 | KM50TS           | 1,40 |
| 3861177      | KM63TSTCHS067088 | 67,000-88,000  | 95,7 | KM63TS           | 1,80 |
| 3861178      | KM63TSTCHS088115 | 88,000-115,000 | 93,7 | KM63TS           | 2,40 |

### ■ Spare Parts

| catalogue number | fixing screw | disc washer |
|------------------|--------------|-------------|
| KM32TSTCHS022030 | 12147602700  | 12147600100 |
| KM32TSTCHS030039 | 12147602300  | 12147603900 |
| KM32TSTCHS039050 | 12147602400  | 12147600200 |
| KM40TSTCHS030039 | 12147602300  | 12147603900 |
| KM40TSTCHS039050 | 12147602400  | 12147600200 |
| KM40TSTCHS050067 | 12147602500  | 12147604000 |
| KM50TSTCHS050067 | 12147602500  | 12147604000 |
| KM50TSTCHS067088 | 12147602600  | 12147600300 |
| KM63TSTCHS067088 | 12147602600  | 12147600300 |
| KM63TSTCHS088115 | 12147602800  | 12147600400 |

- For use with shell mill adaptors; please order separately.
- Bridge body shipped without insert holder, slides, or micro-adjustable cartridges.
- Order insert holder separately for rough boring and slides for fine boring.
- Order micro-adjustable cartridges separately for fine boring.



## ■ Bridge Tool • Small

| order number | catalogue number | BR1 bore range  | D  | L1   | kg   |
|--------------|------------------|-----------------|----|------|------|
| 2006019      | 12600208800      | 87.000-110.000  | 27 | 40,3 | 1,70 |
| 2005500      | 12600210900      | 109.000-133.000 | 27 | 40,3 | 1,90 |
| 2005553      | 12600213200      | 132.000-156.000 | 27 | 40,3 | 2,10 |
| 2005556      | 12600215500      | 155.000-179.000 | 27 | 40,3 | 2,30 |
| 2005560      | 12600217800      | 178.000-202.000 | 27 | 40,3 | 2,50 |

NOTE: Use of ISO cartridges SCLCL12CA12, STGCL12CA16, or SSRCL12CA12 is recommended.

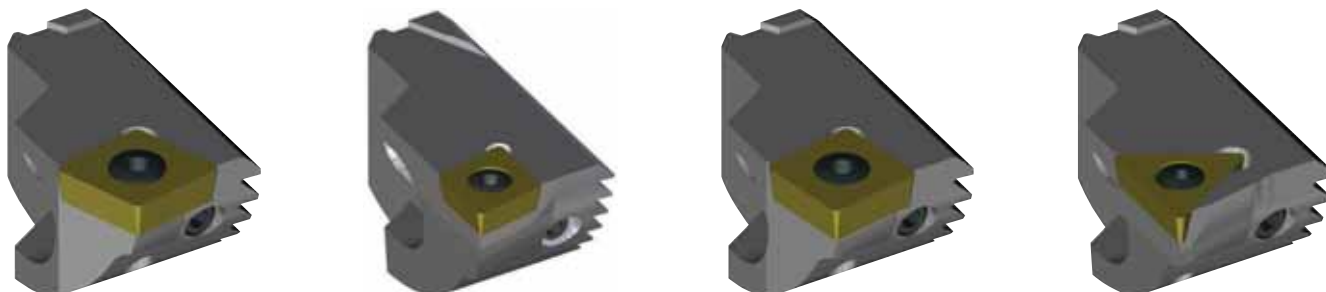
## ■ Spare Parts

| catalogue number |  fixing screw |  fixing screw |  fixing screw |  disc washer |  disc washer |
|------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 12600208800      | —                                                                                                | 12346233000                                                                                      | 12147519100                                                                                      | 12147600300                                                                                       | —                                                                                                 |
| 12600210900      | 12147613500                                                                                      | —                                                                                                | 12147519100                                                                                      | 12147600300                                                                                       | 12147740200                                                                                       |
| 12600213200      | 12147613500                                                                                      | —                                                                                                | 12147519100                                                                                      | 12147600300                                                                                       | 12147740200                                                                                       |
| 12600215500      | 12147613500                                                                                      | —                                                                                                | 12147519100                                                                                      | 12147600300                                                                                       | 12147740200                                                                                       |
| 12600217800      | 12147613500                                                                                      | —                                                                                                | 12147519100                                                                                      | 12147600300                                                                                       | 12147740200                                                                                       |

(continued)

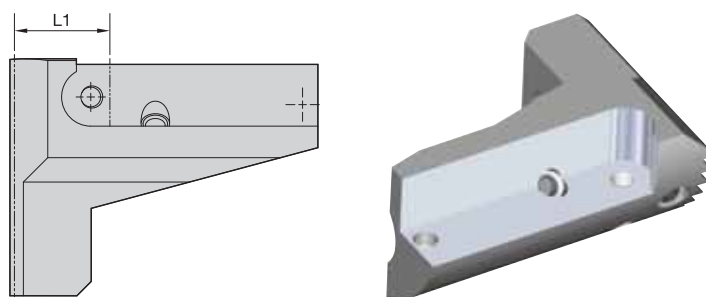


(continued)



■ Insert Holder Reference Chart

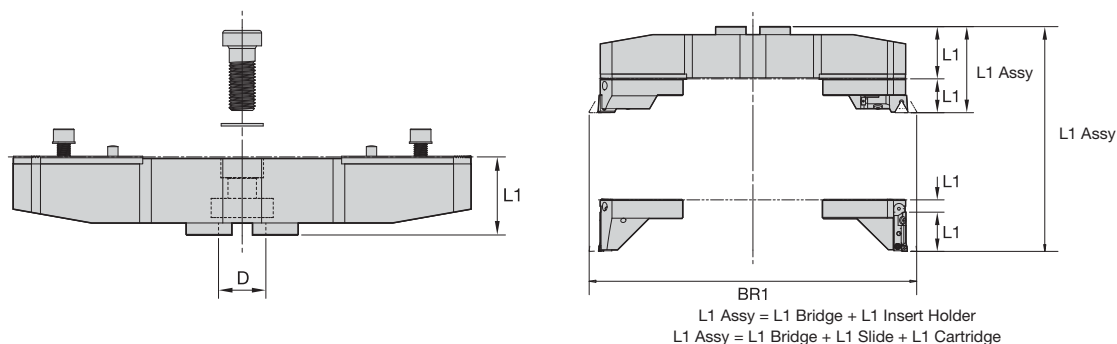
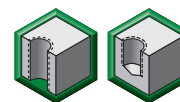
| C-Style 70° | C-Style 90° | S-Style 80° | T-Style 90° |
|-------------|-------------|-------------|-------------|
| 12625906700 | 12625706700 | 12626006700 | 12625806800 |



■ Slide for Micro-Adjustable Cartridges

| order number | catalogue number | L1   |  adjusting screw |  fixing screw |  hex wrench |
|--------------|------------------|------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 3864647      | SMAC087          | 19,2 | 12147665000                                                                                         | 12147519100                                                                                        | 12148041100                                                                                      |

- For use with shell mill adaptors; please order separately.
- Bridge body shipped without ISO cartridges, slides, or micro-adjustable cartridges.
- Order ISO cartridges separately for rough boring.
- Order micro-adjustable cartridges separately for fine boring.



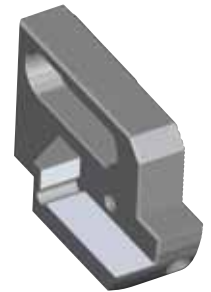
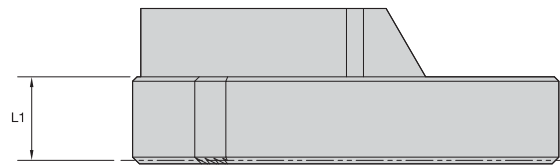
### ■ Bridge Tool • Large

| order number | catalogue number | BR1 bore range  | D  | L1   | kg   |
|--------------|------------------|-----------------|----|------|------|
| 2005574      | 12600020000      | 200.000-280.000 | 40 | 50,6 | 2,00 |
| 2005602      | 12600027800      | 278.000-360.000 | 40 | 50,6 | 2,80 |
| 2005656      | 12600035800      | 358.000-440.000 | 40 | 61,6 | 2,50 |
| 2005722      | 12600043800      | 438.000-520.000 | 40 | 61,6 | 3,50 |

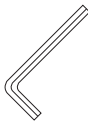
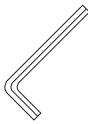
NOTE: Use of ISO cartridges SCLCL12CA12, STGCL12CA16, or SSRCL12CA12 is recommended.

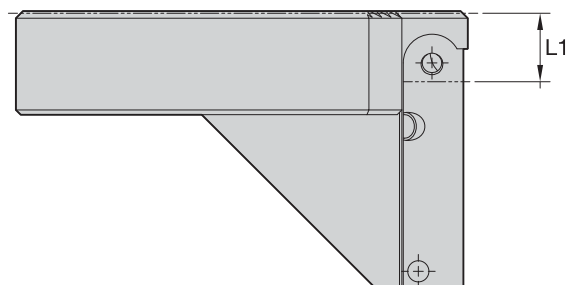
### ■ Spare Parts

| catalogue number | fixing screw | fixing screw | disc washer | hex wrench  |
|------------------|--------------|--------------|-------------|-------------|
| 12600020000      | 12147739900  | 12147625400  | 12147600300 | 12147666700 |
| 12600027800      | 12147739900  | 12147625400  | 12147600300 | 12147666700 |
| 12600035800      | 12147739900  | 12147625400  | 12147600300 | 12147666700 |
| 12600043800      | 12147739900  | 12147625400  | 12147600300 | 12147666700 |



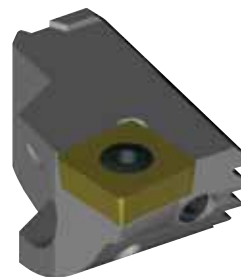
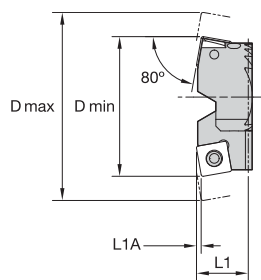
■ Slide for ISO Cartridges

| order number | catalogue number | L1   | fixing screw                                                                      | adjusting screw                                                                    | hex wrench                                                                          | hex wrench                                                                          |
|--------------|------------------|------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 2005576      | 12614020100      | 19,4 |  |  |  |  |
|              |                  |      | 12147625200                                                                       | 12147739800                                                                        | 12148041300                                                                         | 12148041200                                                                         |



■ Slide for Micro-Adjustable Cartridges

| order number | catalogue number | L1   | fixing screw                                                                        | adjusting screw                                                                       | hex wrench                                                                            |
|--------------|------------------|------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 3860905      | SMAC200          | 13,9 |  |  |  |
|              |                  |      | 12147519100                                                                         | 12147739800                                                                           | 12148041200                                                                           |

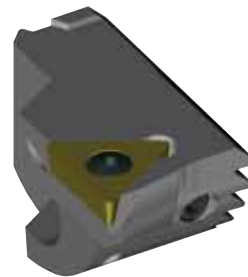
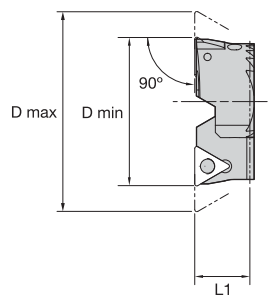


### ■ 80° Lead Insert Holder • S-Style

| order number | catalogue number | D min | D max | L1    | L1A  | gage insert     |
|--------------|------------------|-------|-------|-------|------|-----------------|
| 2005620      | 12626003000      | 30,00 | 39,00 | 12,35 | 1,30 | SP..0703..      |
| 2005676      | 12626004000      | 39,00 | 50,00 | 16,30 | 1,50 | SC../SP..09T3.. |
| 2005814      | 12626005000      | 50,00 | 67,00 | 21,80 | 2,10 | SC../SP..1204.. |
| 2005941      | 12626006700      | 67,00 | 88,00 | 24,30 | 2,10 | SC../SP..1204.. |

### ■ Spare Parts

| catalogue number |  clamping screw |  adjusting screw |  adjusting screw | Nm  |  Torx wrench |  hex wrench |
|------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 12626003000      | 12148067200                                                                                        | 12148069600                                                                                         | —                                                                                                   | 1,0 | 12148086600                                                                                       | 12148040900                                                                                      |
| 12626004000      | 12148038800                                                                                        | 12148069600                                                                                         | —                                                                                                   | 3,0 | 12148082400                                                                                       | 12148040900                                                                                      |
| 12626005000      | 12148007200                                                                                        | 12147602200                                                                                         | —                                                                                                   | 3,5 | 12148099400                                                                                       | 12148041000                                                                                      |
| 12626006700      | 12148007200                                                                                        | —                                                                                                   | 12147665000                                                                                         | 3,5 | 12148099400                                                                                       | 12148041100                                                                                      |

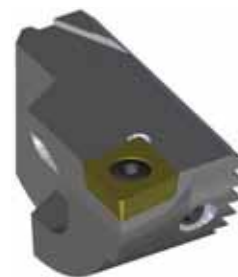
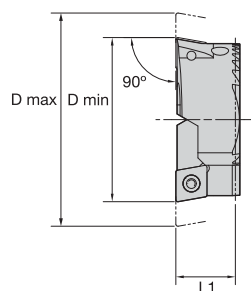


### ■ 90° Lead Insert Holder • T-Style

| order number | catalogue number | D min | D max | L1    | gage insert      |
|--------------|------------------|-------|-------|-------|------------------|
| 2005674      | 12625804000      | 39,00 | 50,00 | 16,30 | TC../TP../1102.. |
| 2005802      | 12625805100      | 50,00 | 67,00 | 21,80 | TC../TP../16T3.. |
| 2005939      | 12625806800      | 67,00 | 88,00 | 24,30 | TC../TP../16T3.. |

### ■ Spare Parts

| catalogue number | clamping screw | adjusting screw | adjusting screw | Nm  | Torx wrench | hex wrench  |
|------------------|----------------|-----------------|-----------------|-----|-------------|-------------|
| 12625804000      | 12148068700    | 12148069600     | —               | 1,0 | 12148086600 | 12148040900 |
| 12625805100      | 12148038800    | 12147602200     | —               | 3,0 | 12148099400 | 12148041000 |
| 12625806800      | 12148038800    | —               | 12147665000     | 3,5 | 12148099400 | 12148041100 |

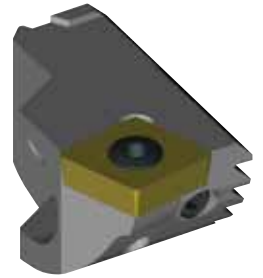
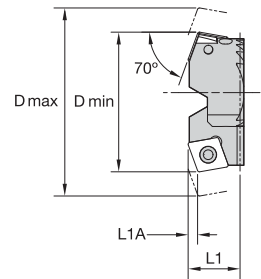


### ■ 90° Lead Insert Holder • C-Style

| order number | catalogue number | D min | D max  | L1    | gage insert     |
|--------------|------------------|-------|--------|-------|-----------------|
| 2005580      | 12625702200      | 22,50 | 30,00  | 12,05 | CC../CP..0602.. |
| 2005618      | 12625703000      | 30,00 | 39,00  | 12,35 | CC../CP..0602.. |
| 2005673      | 12625704000      | 39,00 | 50,00  | 16,30 | CC../CP..09T3.. |
| 2005801      | 12625705000      | 50,00 | 67,00  | 21,80 | CC../CP..1204.. |
| 2005938      | 12625706700      | 67,00 | 88,00  | 24,30 | CC../CP..1204.. |
| 2006041      | 12625708986      | 88,00 | 115,00 | 36,30 | CC../CP..1204.. |

### ■ Spare Parts

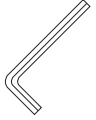
| catalogue number |  clamping screw |  adjusting screw |  adjusting screw | Nm  |  Torx wrench |  hex wrench |
|------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 12625702200      | 12148086600                                                                                        | 12147579300                                                                                         | —                                                                                                   | 1,0 | 12148086600                                                                                       | 12148046000                                                                                      |
| 12625703000      | 12148086600                                                                                        | 12148069600                                                                                         | —                                                                                                   | 1,0 | 12148086600                                                                                       | 12148040900                                                                                      |
| 12625704000      | 12148082400                                                                                        | 12148069600                                                                                         | —                                                                                                   | 3,0 | 12148082400                                                                                       | 12148040900                                                                                      |
| 12625705000      | 12148099400                                                                                        | 12147602200                                                                                         | —                                                                                                   | 3,5 | 12148099400                                                                                       | 12148041000                                                                                      |
| 12625706700      | 12148099400                                                                                        | —                                                                                                   | 12147665000                                                                                         | 3,5 | 12148099400                                                                                       | 12148041100                                                                                      |
| 12625708900      | 12148099400                                                                                        | 12148541600                                                                                         | —                                                                                                   | 3,5 | 12148099400                                                                                       | 12148041100                                                                                      |



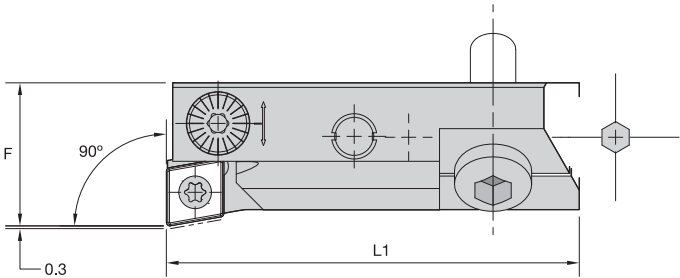
### ■ 70° Lead Insert Holder • C-Style

| order number | catalogue number | D min | D max  | L1    | L1A  | gage insert     |
|--------------|------------------|-------|--------|-------|------|-----------------|
| 2005581      | 12625902200      | 22,50 | 30,00  | 12,35 | 1,60 | CC../CP..0602.. |
| 2005619      | 12625903000      | 30,00 | 39,00  | 12,35 | 1,60 | CC../CP..0602.. |
| 2005675      | 12625904000      | 39,00 | 50,00  | 16,30 | 2,30 | CC../CP..09T3.. |
| 2005813      | 12625905000      | 50,00 | 67,00  | 21,80 | 3,10 | CC../CP..1204.. |
| 2005940      | 12625906700      | 67,00 | 88,00  | 24,30 | 3,10 | CC../CP..1204.. |
| 2006054      | 12625908986      | 88,00 | 115,00 | 36,30 | 3,10 | CC../CP..1204.. |

### ■ Spare Parts

| catalogue number |  clamping screw |  adjusting screw |  adjusting screw | Nm  |  Torx wrench |  hex wrench |
|------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 12625902200      | 12148068700                                                                                        | 12147579300                                                                                         | —                                                                                                   | 1,0 | 12148086600                                                                                       | 12148046000                                                                                      |
| 12625903000      | 12148068700                                                                                        | 12148069600                                                                                         | —                                                                                                   | 1,0 | 12148086600                                                                                       | 12148040900                                                                                      |
| 12625904000      | —                                                                                                  | 12148069600                                                                                         | —                                                                                                   | 3,0 | 12148082400                                                                                       | 12148040900                                                                                      |
| 12625905000      | 12148007200                                                                                        | 12147602200                                                                                         | —                                                                                                   | 3,5 | 12148099400                                                                                       | 12148041000                                                                                      |
| 12625906700      | 12148007200                                                                                        | —                                                                                                   | 12147665000                                                                                         | 3,5 | 12148099400                                                                                       | 12148041100                                                                                      |
| 12625908900      | —                                                                                                  | 12147602200                                                                                         | —                                                                                                   | 3,5 | 12148099400                                                                                       | 12148041100                                                                                      |

- All cartridges have internal coolant supply directed to the cutting edge.
- 0,01mm diameter adjustment within a range of 0,3mm.
- Radial adjustment without influence on axial position.
- Axial adjustment range of 1mm.

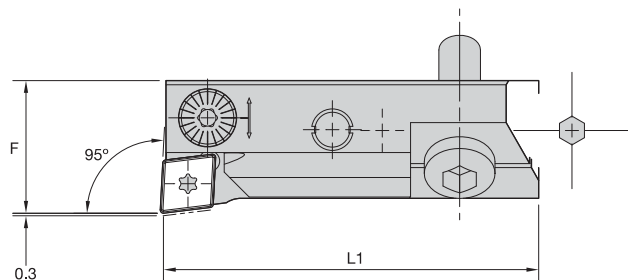
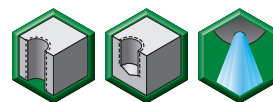


■ 90° Lead Micro-Adjustable Cartridge • C-Style

| order number | catalogue number | F     | L1    | gage insert | <div>            insert clamping screw         </div> | <div>            Torx wrench         </div> | Nm  |
|--------------|------------------|-------|-------|-------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----|
| 3860908      | MASCFR09CA06F    | 16,00 | 45,50 | CC..0602..  | 12148068700                                                                                                                              | 12148086600                                                                                                                    | 1,0 |



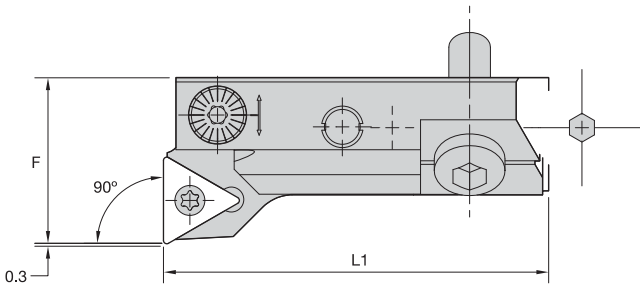
- All cartridges have internal coolant supply directed to the cutting edge.
- 0,01mm diameter adjustment within a range of 0,3mm.
- Radial adjustment without influence on axial position.
- Axial adjustment range of 1mm.



### ■ 95° Lead Micro-Adjustable Cartridge • C-Style

| order number | catalogue number | F     | L1    | gage insert | insert clamping screw | Torx wrench | Nm  |
|--------------|------------------|-------|-------|-------------|-----------------------|-------------|-----|
| 3860909      | MASCLCR09CA06F   | 16,00 | 45,50 | CC..0602..  | 12148068700           | 12148086600 | 1,0 |

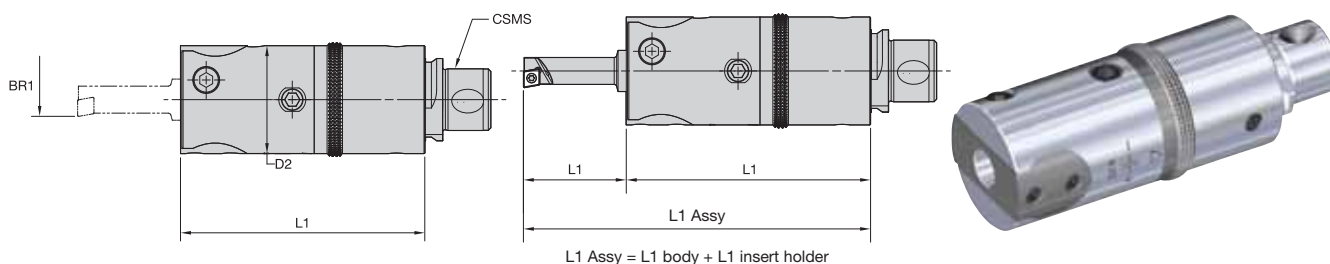
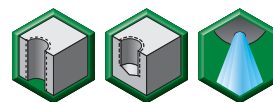
- All cartridges have internal coolant supply directed to the cutting edge.
- 0,01mm diameter adjustment within a range of 0,3mm.
- Radial adjustment without influence on axial position.
- Axial adjustment range of 1mm.



■ 90° Lead Micro-Adjustable Cartridge • T-Style

| order number | catalogue number | F     | L1    | gage insert | <div>  </div> insert clamping screw | <div>  </div> Torx wrench | Nm  |
|--------------|------------------|-------|-------|-------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----|
| 3860910      | MASTFCR09CA11F   | 20,00 | 45,50 | TC..1102..  | 12148068700                                                                                                            | 12148086600                                                                                                  | 1,0 |

- 0,01mm diameter adjustment.
- Basic body shipped without boring bars.



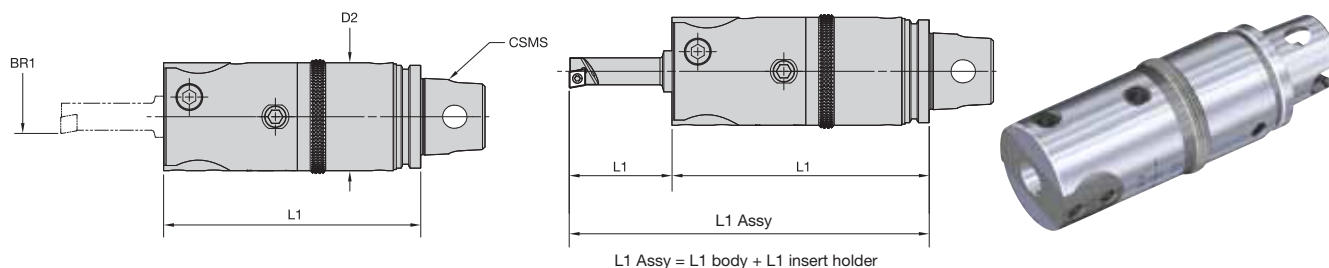
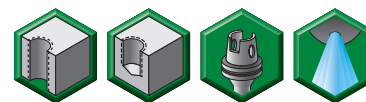
### ■ FBHBB • RFX Series Shank

| order number | catalogue number  | BR1 bore range | D2    | L1    | CSMS system size | kg   |
|--------------|-------------------|----------------|-------|-------|------------------|------|
| 3860906      | RFX420FBHBB006022 | 6,000-22,000   | 42,00 | 95,00 | RFX420           | 1,10 |

### ■ Spare Parts

| catalogue number  | front clamping screw 1 | front clamping screw 2 | adjustment locking screw | hex wrench  | hex wrench  |
|-------------------|------------------------|------------------------|--------------------------|-------------|-------------|
| RFX420FBHBB006022 | 12148068700            | 12148042400            | 12147680500              | 12148041100 | 12148041300 |

- 0,01mm diameter adjustment.
- Basic body shipped without boring bars.



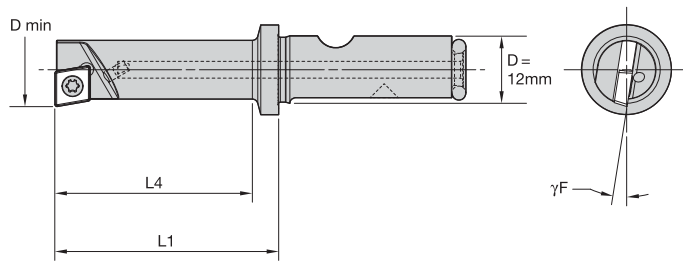
## ■ FBHBB KM-TS™ Series Shank

| order number | catalogue number  | BR1 bore range | D2    | L1     | CSMS system size | kg   |
|--------------|-------------------|----------------|-------|--------|------------------|------|
| 3860907      | KM40TSFBHBB006022 | 6,000-22,000   | 42,00 | 105,00 | KM40TS           | 1,10 |

## ■ Spare Parts

| catalogue number  | front clamping screw 1 | front clamping screw 2 | adjustment locking screw | hex wrench  | hex wrench  |
|-------------------|------------------------|------------------------|--------------------------|-------------|-------------|
| KM40TSFBHBB006022 | 12147617400            | 12148042400            | 12147680500              | 12148041100 | 12148041300 |

- All boring bars have internal coolant supply directed to the cutting edge.



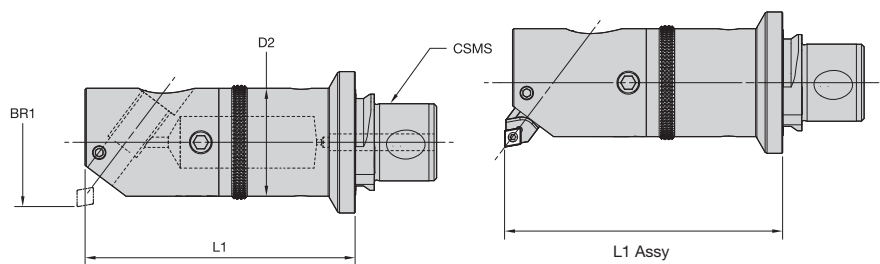
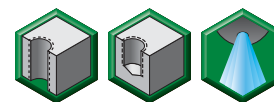
### ■ Boring Bars for Precision Fine Boring Heads (FBHBB)

| order number | catalogue number | D min | D max | L1    | L4    | γF°    | kg   |
|--------------|------------------|-------|-------|-------|-------|--------|------|
| 2005954      | 12627006200      | 6,00  | 8,00  | 30,00 | 24,00 | -5.00  | 0,10 |
| 2006015      | 12627008200      | 8,00  | 10,00 | 30,00 | 25,00 | -3.00  | 0,10 |
| 2005499      | 12627010200      | 10,00 | 13,00 | 35,00 | 30,00 | -11.00 | 0,10 |
| 2005542      | 12627013200      | 13,00 | 16,00 | 40,00 | 35,00 | -9.00  | 0,10 |
| 2005558      | 12627016200      | 16,00 | 19,00 | 45,00 | 40,00 | -6.00  | 0,10 |
| 2005573      | 12627019300      | 19,00 | 22,00 | 55,00 | 55,00 | -6.00  | 0,20 |

### ■ Spare Parts

| catalogue number | gage insert     | clamping screw | Torx wrench | Nm  |
|------------------|-----------------|----------------|-------------|-----|
| 12627006200      | CP..04T1..      | 12148005800    | 12148005900 | 0,3 |
| 12627008200      | CP..04T1..      | 12148005800    | 12148005900 | 0,3 |
| 12627010200      | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 12627013200      | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 12627016200      | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 12627019300      | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |

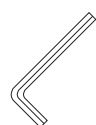
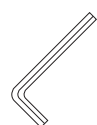
- 0,01mm diameter adjustment.
- Basic body shipped without boring bars.



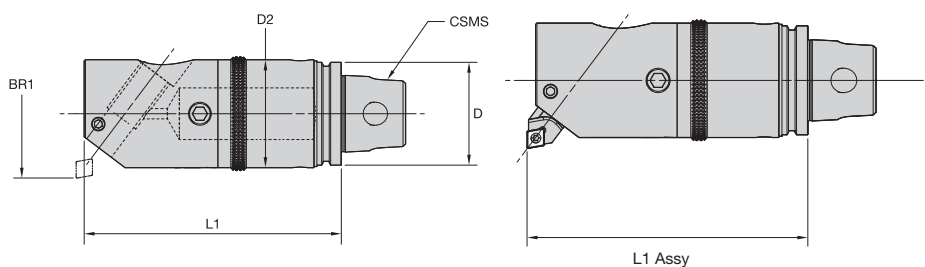
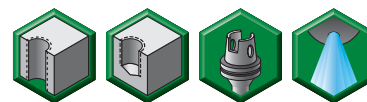
## ■ FBH • RFX Series Shank

| order number | catalogue number | BR1 bore range | D2    | L1     | L1 assy | CSMS system size | kg   |
|--------------|------------------|----------------|-------|--------|---------|------------------|------|
| 3861143      | RFX185FBH022029  | 22,000-29,000  | 18,50 | 55,00  | 56,00   | RFX185           | 0,20 |
| 3861144      | RFX245FBH029038  | 29,000-38,000  | 24,50 | 60,00  | 62,00   | RFX245           | 0,20 |
| 3861145      | RFX320FBH038050  | 38,000-50,000  | 32,00 | 75,00  | 77,00   | RFX320           | 0,50 |
| 3861146      | RFX420FBH050065  | 50,000-65,000  | 42,00 | 95,00  | 98,00   | RFX420           | 1,10 |
| 3861147      | RFX550FBH065088  | 65,000-88,000  | 55,00 | 115,00 | 120,00  | RFX550           | 2,10 |
| 3861148      | RFX720FBH088115  | 88,000-115,000 | 72,00 | 155,00 | 160,00  | RFX720           | 4,90 |

## ■ Spare Parts

| catalogue number |  adjusting screw |  adjustment locking screw |  fixing screw | wedge       |  hex wrench |  hex wrench |
|------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| RFX185FBH022029  | 12147620000                                                                                         | 12147680200                                                                                                  | 12346292100                                                                                      | 12147621100 | 12148041100                                                                                      | 12148040900                                                                                      |
| RFX245FBH029038  | 12147620000                                                                                         | 12147680300                                                                                                  | 12346292200                                                                                      | 12147621200 | 12148041100                                                                                      | 12148040900                                                                                      |
| RFX320FBH038050  | 12147620300                                                                                         | 12147680400                                                                                                  | 12147622300                                                                                      | 12147621300 | 12148041200                                                                                      | 12148041000                                                                                      |
| RFX420FBH050065  | 12147620400                                                                                         | 12147680500                                                                                                  | 12148575900                                                                                      | 12147621400 | 12148041300                                                                                      | 12148041100                                                                                      |
| RFX550FBH065088  | 12147620500                                                                                         | 12147680600                                                                                                  | 12148087100                                                                                      | 12147621500 | 12148041400                                                                                      | 12148041100                                                                                      |
| RFX720FBH088115  | 12147620600                                                                                         | 12147680700                                                                                                  | 12148087100                                                                                      | 12147621600 | 12148079000                                                                                      | —                                                                                                |

- 0,01mm diameter adjustment.
- Basic body shipped without boring bars.

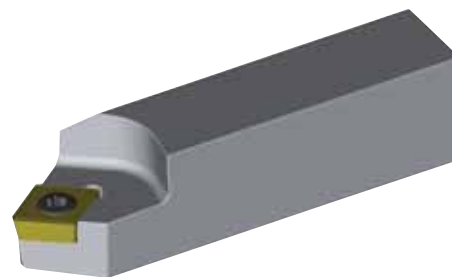
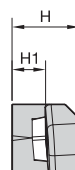
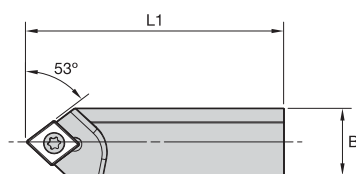


### ■ FBH • KM™ Series Shank

| order number | catalogue number | BR1 bore range | D2    | L1     | L1 assy | CSMS system size | kg   |
|--------------|------------------|----------------|-------|--------|---------|------------------|------|
| 3861123      | KM32TSFBH022029  | 22,000-29,000  | 18,50 | 60,00  | 62,00   | KM32TS           | 0,20 |
| 3861124      | KM32TSFBH029038  | 29,000-38,000  | 24,50 | 70,00  | 72,00   | KM32TS           | 0,20 |
| 3861125      | KM32TSFBH038050  | 38,000-50,000  | 32,00 | 80,00  | 82,00   | KM32TS           | 0,50 |
| 3861126      | KM40TSFBH029038  | 29,000-38,000  | 24,50 | 90,00  | 92,00   | KM40TS           | 0,50 |
| 3861127      | KM40TSFBH038050  | 38,000-50,000  | 32,00 | 100,00 | 103,00  | KM40TS           | 0,90 |
| 3861128      | KM40TSFBH050065  | 50,000-65,000  | 42,00 | 105,00 | 108,00  | KM40TS           | 1,10 |
| 3861129      | KM50TSFBH050065  | 50,000-65,000  | 42,00 | 110,00 | 115,00  | KM50TS           | 1,20 |
| 3861130      | KM50TSFBH065088  | 65,000-88,000  | 55,00 | 125,00 | 130,00  | KM50TS           | 1,70 |
| 3861131      | KM63TSFBH065088  | 65,000-88,000  | 55,00 | 130,00 | 135,00  | KM63TS           | 2,50 |
| 3861132      | KM63TSFBH088115  | 88,000-115,000 | 63,00 | 130,00 | 135,00  | KM63TS           | 2,00 |

### ■ Spare Parts

| catalogue number | adjusting screw | adjustment locking screw | fixing screw | wedge       | hex wrench  | hex wrench  |
|------------------|-----------------|--------------------------|--------------|-------------|-------------|-------------|
| KM32TSFBH022029  | 12147620000     | 12147680200              | 12346292100  | 12147621100 | 12148041100 | 12148040900 |
| KM32TSFBH029038  | 12147620000     | 12147680300              | 12346292200  | 12147621200 | 12148041100 | 12148040900 |
| KM32TSFBH038050  | 12147620300     | 12147680400              | 12147622300  | 12147621300 | 12148041200 | 12148041000 |
| KM40TSFBH029038  | 12147620000     | 12147680300              | 12346292200  | 12147621200 | 12148041100 | 12148040900 |
| KM40TSFBH038050  | 12147620300     | 12147680400              | 12147622300  | 12147621300 | 12148041200 | 12148041000 |
| KM40TSFBH050065  | 12147620400     | 12147680500              | 12148575900  | 12147621400 | 12148041100 | 12148041300 |
| KM50TSFBH050065  | 12147620400     | 12147680500              | 12148575900  | 12147621400 | 12148041100 | 12148041300 |
| KM50TSFBH065088  | 12147620500     | 12147680600              | 12148087100  | 12147621500 | 12148041200 | 12148041400 |
| KM63TSFBH065088  | 12147620500     | 12147680600              | 12148087100  | 12147621500 | 12148041200 | 12148041400 |
| KM63TSFBH088115  | 12147620600     | 12147680700              | 12148087100  | 12147621600 | 12148041200 | 12148079000 |

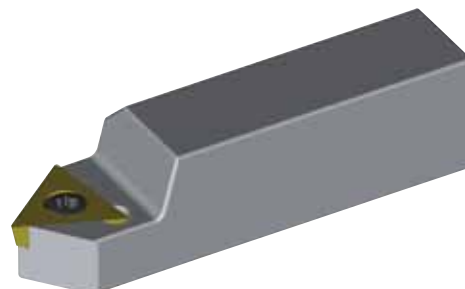
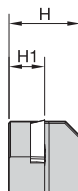
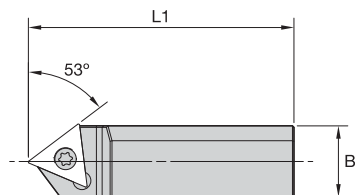


■ Precision Head Insert Holder • C-Style

| order number | catalogue number | D min | D max  | L1    | H     | H1   | B     | gage insert     | clamping screw | Torx wrench | Nm  |
|--------------|------------------|-------|--------|-------|-------|------|-------|-----------------|----------------|-------------|-----|
| 2004781      | 12627270300      | 22,00 | 29,00  | 19,00 | 8,00  | 4,50 | 8,00  | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 2004782      | 12627275300      | 29,00 | 38,00  | 27,00 | 8,00  | 4,50 | 8,00  | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 2004133      | 12627270700      | 38,00 | 50,00  | 35,00 | 10,00 | 5,50 | 10,00 | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 2004140      | 12627276500      | 50,00 | 65,00  | 46,00 | 12,00 | 6,50 | 12,00 | CC../CP..0602.. | 12148068700    | 12148086600 | 1,0 |
| 2004161      | 12627277700      | 65,00 | 88,00  | 60,00 | 16,00 | 8,00 | 16,00 | CC../CP..09T3.. | 12148038800    | 12148082400 | 3,0 |
| 2004177      | 12627278700      | 88,00 | 115,00 | 84,00 | 16,00 | 8,00 | 16,00 | CC../CP..09T3.. | 12148038800    | 12148082400 | 3,0 |

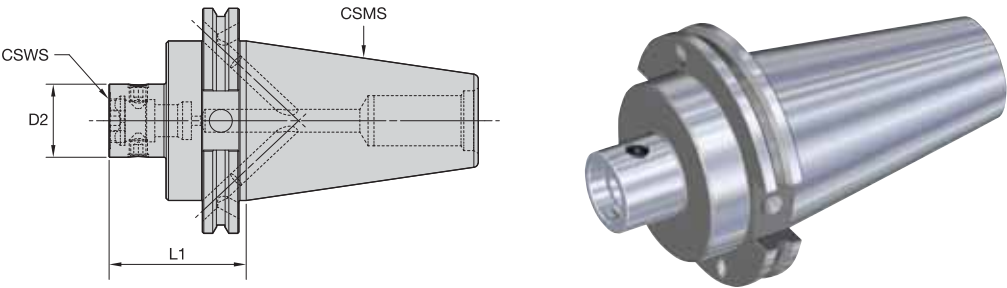






### ■ Precision Head Insert Holder • T-Style

| order number | catalogue number | D min | D max  | L1    | H     | H1   | B     | gage insert     | clamping screw | Torx wrench | Nm  |
|--------------|------------------|-------|--------|-------|-------|------|-------|-----------------|----------------|-------------|-----|
| 2004134      | 12627270800      | 38,00 | 50,00  | 35,00 | 10,00 | 5,50 | 10,00 | TC../TP..1102.. | 12148068700    | 12148086600 | 1,0 |
| 2004141      | 12627276800      | 50,00 | 65,00  | 46,00 | 12,00 | 6,50 | 12,00 | TC../TP..1102.. | 12148068700    | 12148086600 | 1,0 |
| 2004162      | 12627277800      | 65,00 | 88,00  | 60,00 | 16,00 | 8,00 | 16,00 | TC../TP..1102.. | 12148038800    | 12148082400 | 3,0 |
| 2004178      | 12627278800      | 86,00 | 115,00 | 84,00 | 16,00 | 8,00 | 16,00 | TC../TP..1102.. | 12148038800    | 12148082400 | 3,0 |



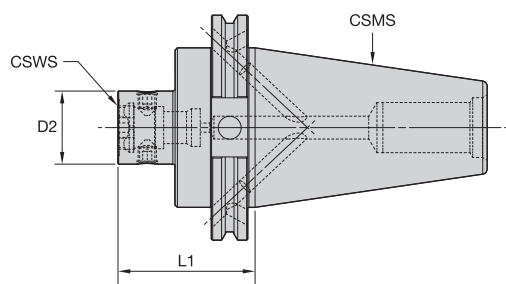
RFX • CV40 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860896      | CV40BRFX185236   | CV40                | RFX185              | 18,5 | 60,0 | 1,1 | RFX185LS   | 12148041100   | 6,0  |
| 3860897      | CV40BRFX245236   | CV40                | RFX245              | 24,5 | 60,0 | 1,1 | RFX245LS   | 12148041100   | 8,0  |
| 3860898      | CV40BRFX320236   | CV40                | RFX320              | 32,0 | 60,0 | 1,1 | RFX320LS   | 12148041200   | 14,0 |
| 3860899      | CV40BRFX420236   | CV40                | RFX420              | 42,0 | 60,0 | 1,1 | RFX420LS   | 12148041300   | 16,0 |
| 3860900      | CV40BRFX550256   | CV40                | RFX550              | 55,0 | 65,0 | 1,2 | RFX550LS   | 12148041400   | 20,0 |

NOTE: Lock screws included. Order retention knobs separately.

Hole Finishing

|         |  |  |  |  |  |
|---------|--|--|--|--|--|
| Form AD |  |  |  |  |  |
| Form B  |  |  |  |  |  |
|         |  |  |  |  |  |
|         |  |  |  |  |  |

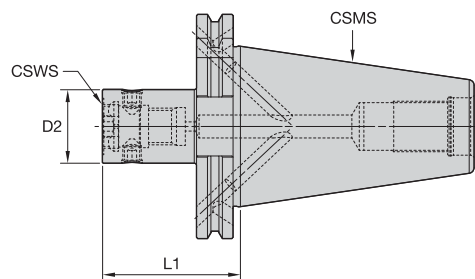


■ RFX • CV50 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860901      | CV50BRFX320236   | CV50                | RFX320              | 32,0 | 60,0 | 3,1 | RFX320LS   | 12148041200   | 12,0 |
| 3860902      | CV50BRFX420236   | CV50                | RFX420              | 42,0 | 60,0 | 3,2 | RFX420LS   | 12148041300   | 20,0 |
| 3860903      | CV50BRFX550236   | CV50                | RFX550              | 55,0 | 60,0 | 3,4 | RFX550LS   | 12148041400   | 25,0 |
| 3860904      | CV50BRFX720276   | CV50                | RFX720              | 72,0 | 70,0 | 3,6 | RFX720LS   | 12148041400   | 25,0 |

NOTE: Lock screws included. Order retention knobs separately.

|         |  |  |    |              |       |
|---------|--|--|----|--------------|-------|
| Form AD |  |  |    |              |       |
| Form B  |  |  |    |              |       |
|         |  |  | 40 | (2x) MS2221S | 2,5mm |
|         |  |  | 50 | (2x) MS1296S | 3mm   |

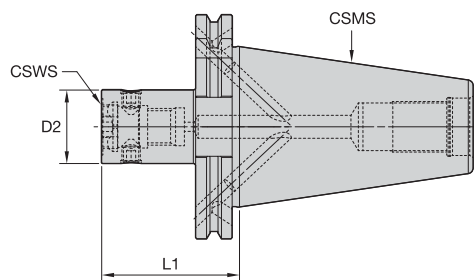


■ RFX • DV40 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860696      | DV40BRFX185060M  | DV40                | RFX185              | 18,5 | 60,0 | 1,1 | RFX185LS   | 12148041100   | 6,0  |
| 3860697      | DV40BRFX245060M  | DV40                | RFX245              | 24,5 | 60,0 | 1,1 | RFX245LS   | 12148041100   | 8,0  |
| 3860698      | DV40BRFX320060M  | DV40                | RFX320              | 32,0 | 60,0 | 1,1 | RFX320LS   | 12148041200   | 14,0 |
| 3860699      | DV40BRFX420060M  | DV40                | RFX420              | 42,0 | 60,0 | 1,1 | RFX420LS   | 12148041300   | 16,0 |
| 3860700      | DV40BRFX550065M  | DV40                | RFX550              | 55,0 | 65,0 | 1,2 | RFX550LS   | 12148041400   | 20,0 |

NOTE: Lock screws included. Order retention knobs separately.

|                                                                                     |         |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  | Form AD |  |  |  |  |  |
|  | Form B  |  |  | 40                                                                                    | (2x) MS2221S                                                                          | 2,5mm                                                                                 |
|                                                                                     |         |                                                                                     |                                                                                       | 50                                                                                    | (2x) MS1296S                                                                          | 3mm                                                                                   |

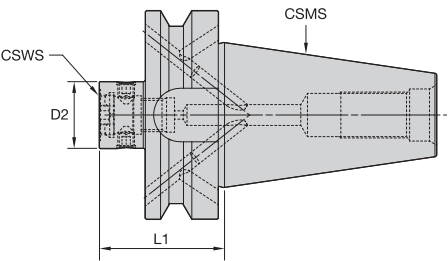


■ RFX • DV50 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860701      | DV50BRFX320060M  | DV50                | RFX320              | 32,0 | 60,0 | 3,1 | RFX320LS   | 12148041200   | 14,0 |
| 3860702      | DV50BRFX420060M  | DV50                | RFX420              | 42,0 | 60,0 | 3,2 | RFX420LS   | 12148041300   | 16,0 |
| 3860853      | DV50BRFX550060M  | DV50                | RFX550              | 55,0 | 60,0 | 3,4 | RFX550LS   | 12148041400   | 20,0 |
| 3860854      | DV50BRFX720065M  | DV50                | RFX720              | 72,0 | 65,0 | 3,6 | RFX720LS   | 12148041400   | 20,0 |

NOTE: Lock screws included. Order retention knobs separately.

|         |  |  |    |              |       |
|---------|--|--|----|--------------|-------|
| Form AD |  |  |    |              |       |
| Form B  |  |  |    |              |       |
|         |  |  | 40 | (2x) MS2221S | 2,5mm |
|         |  |  | 50 | (2x) MS1296S | 3mm   |

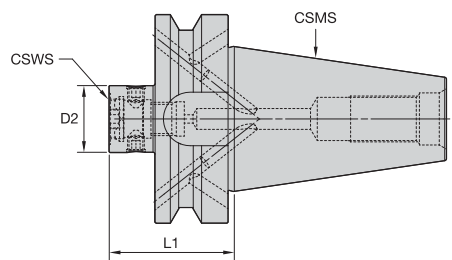


■ RFX • BT40 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860676      | BT40BRFX185060M  | BT40                | RFX185              | 18,5 | 60,0 | 1,0 | RFX185LS   | 12148041100   | 8,0  |
| 3860677      | BT40BRFX245060M  | BT40                | RFX245              | 24,5 | 60,0 | 1,1 | RFX245LS   | 12148041100   | 8,0  |
| 3860678      | BT40BRFX320060M  | BT40                | RFX320              | 32,0 | 60,0 | 1,1 | RFX320LS   | 12148041200   | 12,0 |
| 3860679      | BT40BRFX420060M  | BT40                | RFX420              | 42,0 | 60,0 | 1,2 | RFX420LS   | 12148041300   | 20,0 |
| 3860680      | BT40BRFX550065M  | BT40                | RFX550              | 55,0 | 65,0 | 1,3 | RFX550LS   | 12148041400   | 25,0 |

NOTE: Lock screws included. Order retention knobs separately.

|         |  |  |    |              |       |
|---------|--|--|----|--------------|-------|
| Form AD |  |  |    |              |       |
| Form B  |  |  | 40 | (2x) MS2221S | 2,5mm |
|         |  |  | 50 | (2x) MS1296S | 3mm   |

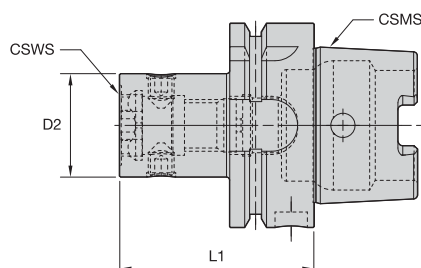


### ■ RFX • BT50 Taper Shank Form B/AD

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860681      | BT50BRFX320060M  | BT50                | RFX320              | 32,0 | 60,0 | 3,5 | RFX320LS   | 12148041200   | 14,0 |
| 3860682      | BT50BRFX420060M  | BT50                | RFX420              | 42,0 | 60,0 | 3,9 | RFX420LS   | 12148041300   | 16,0 |
| 3860693      | BT50BRFX550065M  | BT50                | RFX550              | 55,0 | 65,0 | 4,2 | RFX550LS   | 12148041400   | 25,0 |
| 3860694      | BT50BRFX720070M  | BT50                | RFX720              | 72,0 | 70,0 | 4,5 | RFX720LS   | 12148041400   | 25,0 |

NOTE: Lock screws included. Order retention knobs separately.

|         |  |  |    |              |       |  |
|---------|--|--|----|--------------|-------|--|
| Form AD |  |  |    |              |       |  |
| Form B  |  |  |    |              |       |  |
|         |  |  | 40 | (2x) MS2221S | 2,5mm |  |
|         |  |  | 50 | (2x) MS1296S | 3mm   |  |

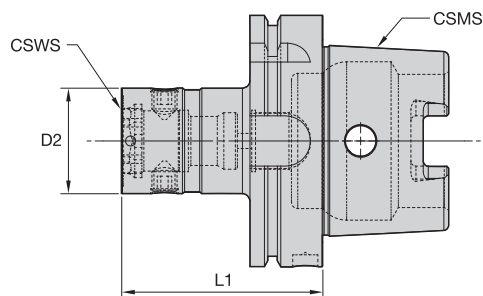


■ RFX • HSK63 Form A

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|-----|------------|---------------|------|
| 3860549      | HSK63ARFX185060M | HSK63A              | RFX185              | 18,5 | 60,0 | 0,7 | RFX185LS   | 12148041100   | 6,0  |
| 3860550      | HSK63ARFX245060M | HSK63A              | RFX245              | 24,5 | 60,0 | 0,7 | RFX245LS   | 12148041100   | 8,0  |
| 3860551      | HSK63ARFX320060M | HSK63A              | RFX320              | 32,0 | 60,0 | 0,8 | RFX320LS   | 12148041200   | 14,0 |
| 3860552      | HSK63ARFX420070M | HSK63A              | RFX420              | 42,0 | 70,0 | 1,0 | RFX420LS   | 12148041300   | 16,0 |
| 3860623      | HSK63ARFX550080M | HSK63A              | RFX550              | 55,0 | 80,0 | 1,4 | RFX550LS   | 12148041400   | 20,0 |
| 3860624      | HSK63ARFX720095M | HSK63A              | RFX720              | 72,0 | 95,0 | 2,0 | RFX720LS   | 12148041400   | 20,0 |

NOTE: Lock screws included. HSK coolant unit and wrench are available but must be ordered separately.

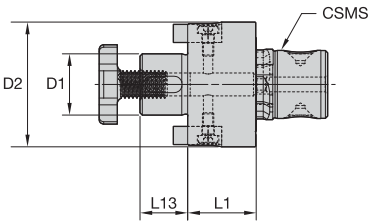




■ RFX • HSK100 Form A

| order number | catalogue number  | CSMS<br>system size | CSWS<br>system size | D2   | L1    | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|-------------------|---------------------|---------------------|------|-------|-----|------------|---------------|------|
| 3881208      | HSK100ARFX420080M | HSK100A             | RFX420              | 42,0 | 80,0  | 1,0 | RFX420LS   | 12148041300   | 20,0 |
| 3881209      | HSK100ARFX550090M | HSK100A             | RFX550              | 55,0 | 90,0  | 2,2 | RFX550LS   | 12148041400   | 25,0 |
| 3881210      | HSK100ARFX720105M | HSK100A             | RFX720              | 72,0 | 105,0 | 2,5 | RFX720LS   | 12148041400   | 25,0 |

NOTE: Lock screws included. HSK coolant unit and wrench are available but must be ordered separately.



■

CS-RFX Adaptor • Lock Screw Design

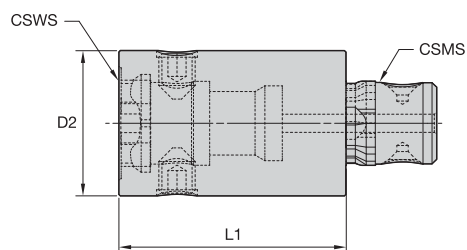
| order number | catalogue number | CSMS<br>system size | D1   | D2   | L1   | L13  | kg  |
|--------------|------------------|---------------------|------|------|------|------|-----|
| 3860547      | RFX550CS27030M   | RFX550              | 27,0 | 55,0 | 30,0 | 21,0 | 0,9 |
| 3860548      | RFX720CS40035M   | RFX720              | 40,0 | 72,0 | 35,0 | 27,0 | 1,8 |

■

Spare Parts

| catalogue number | lock screw  |
|------------------|-------------|
| RFX550CS27030M   | 12147522400 |
| RFX720CS40035M   | KLS40M      |

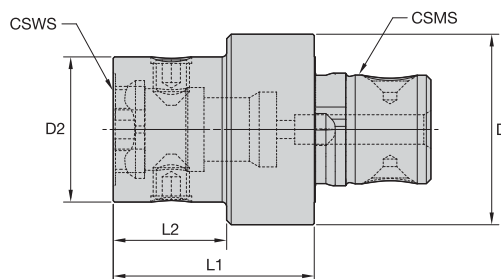




### ■ RFX Extensions

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D2   | L1    | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|-------|-----|------------|---------------|------|
| 3860450      | RFX185RFX185030M | RFX185              | RFX185              | 18,5 | 30,0  | 0,1 | RFX185LS   | 12148041100   | 6,0  |
| 3860451      | RFX245RFX245035M | RFX245              | RFX245              | 24,5 | 35,0  | 0,2 | RFX245LS   | 12148041100   | 8,0  |
| 3860452      | RFX320RFX320050M | RFX320              | RFX320              | 32,0 | 50,0  | 0,3 | RFX320LS   | 12148041200   | 14,0 |
| 3860473      | RFX420RFX420060M | RFX420              | RFX420              | 42,0 | 60,0  | 0,8 | RFX420LS   | 12148041300   | 16,0 |
| 3860474      | RFX550RFX550090M | RFX550              | RFX550              | 55,0 | 90,0  | 1,6 | RFX550LS   | 12148041400   | 20,0 |
| 3860475      | RFX720RFX720100M | RFX720              | RFX720              | 72,0 | 100,0 | 3,1 | RFX720LS   | 12148041400   | 25,0 |

NOTE: Lock screws included.



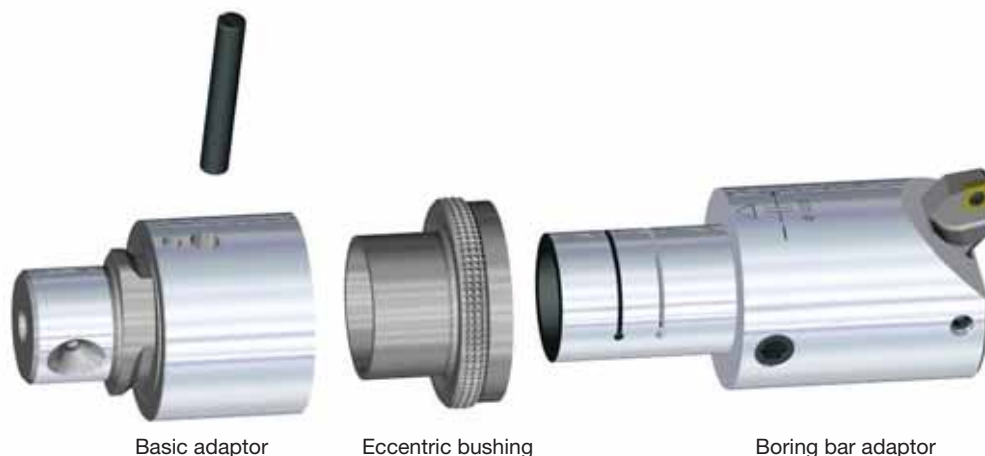
■ **RFX Reducers**

| order number | catalogue number | CSMS<br>system size | CSWS<br>system size | D    | D2   | L1   | L2   | kg  | lock screw | hex<br>wrench | Nm   |
|--------------|------------------|---------------------|---------------------|------|------|------|------|-----|------------|---------------|------|
| 3860419      | RFX320RFX185030M | RFX320              | RFX185              | 32,0 | 18,5 | 30,0 | 15,0 | 0,2 | RFX185LS   | 12148041100   | 6,0  |
| 3860420      | RFX320RFX245040M | RFX320              | RFX245              | 32,0 | 24,5 | 40,0 | 25,0 | 0,2 | RFX245LS   | 12148041100   | 8,0  |
| 3860421      | RFX420RFX185035M | RFX420              | RFX185              | 42,0 | 18,5 | 35,0 | 15,0 | 0,4 | RFX185LS   | 12148041100   | 6,0  |
| 3860422      | RFX420RFX245045M | RFX420              | RFX245              | 42,0 | 24,5 | 45,0 | 25,0 | 0,4 | RFX245LS   | 12148041100   | 8,0  |
| 3860443      | RFX420RFX320045M | RFX420              | RFX320              | 42,0 | 32,0 | 45,0 | 25,0 | 0,6 | RFX320LS   | 12148041200   | 14,0 |
| 3860444      | RFX550RFX185040M | RFX550              | RFX185              | 55,0 | 18,5 | 40,0 | 15,0 | 0,7 | RFX185LS   | 12148041100   | 6,0  |
| 3860445      | RFX550RFX245050M | RFX550              | RFX245              | 55,0 | 24,5 | 50,0 | 25,0 | 0,8 | RFX245LS   | 12148041100   | 8,0  |
| 3860446      | RFX550RFX320050M | RFX550              | RFX320              | 55,0 | 32,0 | 50,0 | 25,0 | 0,8 | RFX320LS   | 12148041200   | 14,0 |
| 3860447      | RFX550RFX420055M | RFX550              | RFX420              | 55,0 | 42,0 | 55,0 | 30,0 | 0,9 | RFX420LS   | 12148041300   | 16,0 |
| 3860448      | RFX720RFX420060M | RFX720              | RFX420              | 72,0 | 42,0 | 60,0 | 30,0 | 1,6 | RFX420LS   | 12148041300   | 16,0 |
| 3860449      | RFX720RFX550060M | RFX720              | RFX550              | 72,0 | 55,0 | 60,0 | 30,0 | 1,8 | RFX550LS   | 12148041400   | 20,0 |

NOTE: Lock screws included.



## Design Principle



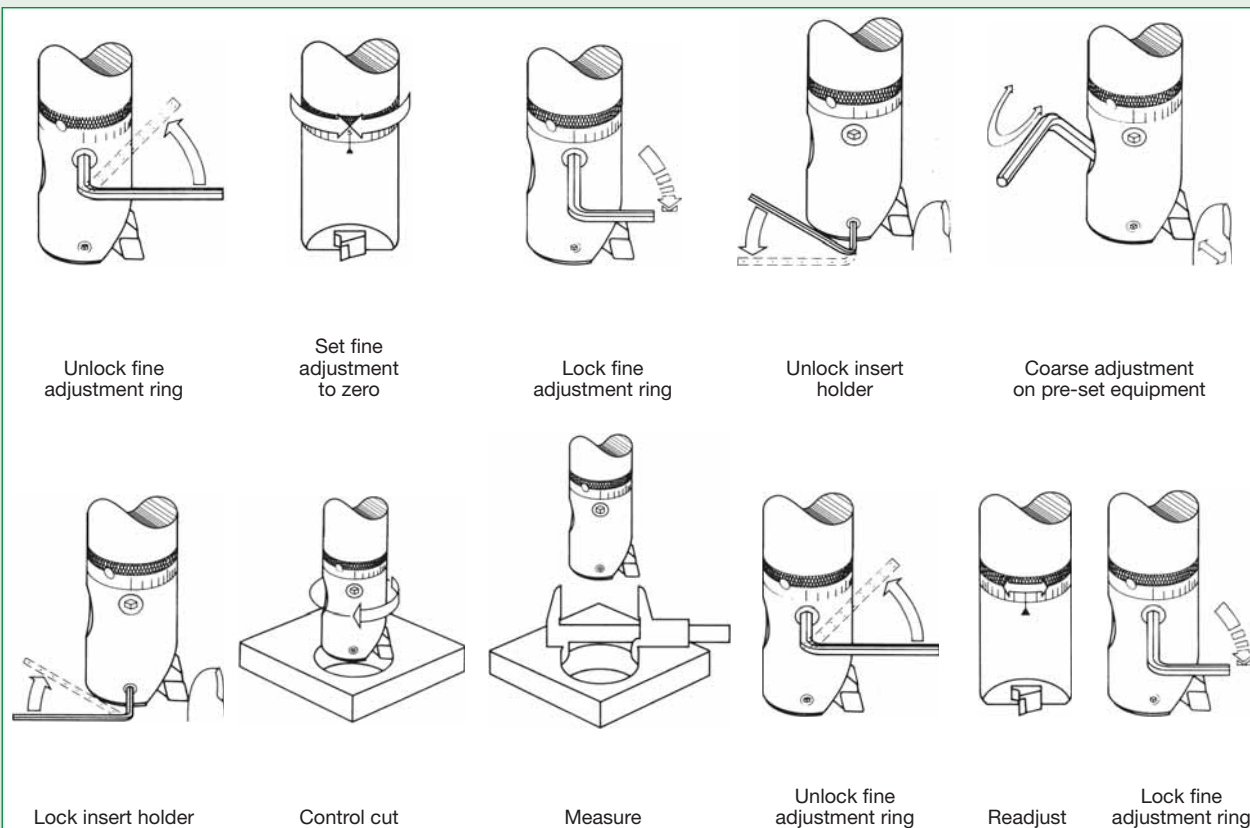
### Eccentric bushing for fine adjustment

Regular fine boring heads have a threaded spindle as an adjustment mechanism. In this situation, spindle inaccuracy can cause backlash and require extra effort during setup. The ROTAFLEX eccentric bushing is easy to use, and machining forces are transmitted via a larger surface, ensuring a consistent diameter during machining.

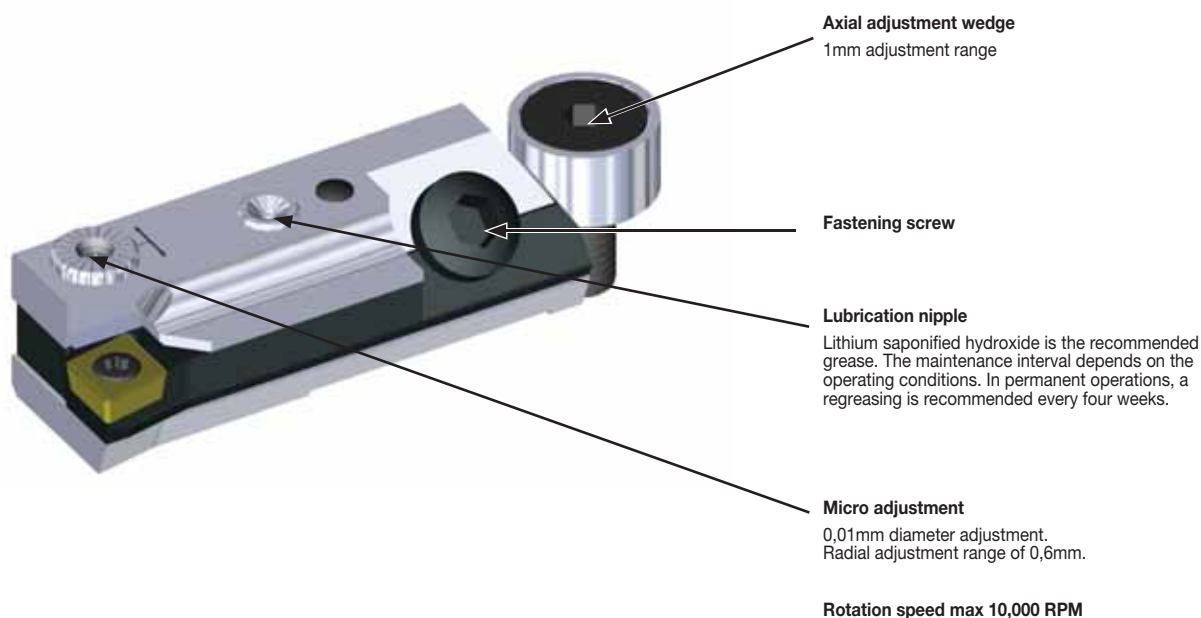


After rough adjustment of the insert holder, the easy-to-read scale enables fine adjustment to reach precisely the diameter needed. Here, no parallax errors occur when reading the scale.

## Adjustment

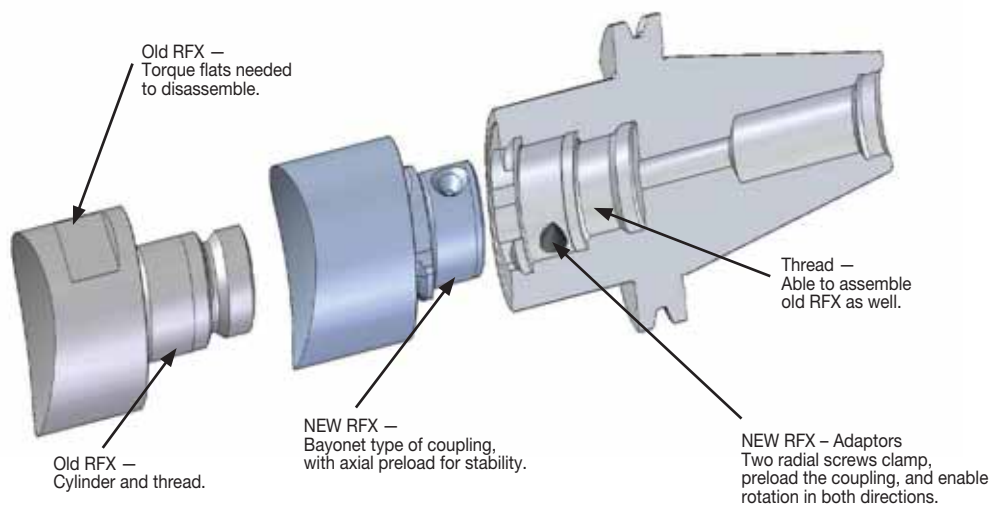


### Application Hints • Micro-Adjustable Cartridges



### Application Hints • RFX Coupling

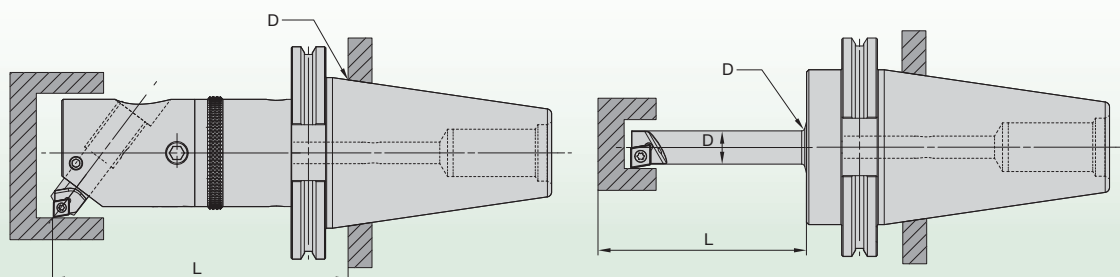
Old RFX screw-type coupling can be mounted into new RFX bayonet-type adaptors as well.



## General Application Hints

- Identify your critical diameter (D).
- Identify the maximum distance cutting edge (L) to critical diameter.

Here are some examples:



Refer to this table for first investigation of application:

| Type of Tooling                           | Stable                                                                           | Unstable                                                                           | Tests Necessary                                          |
|-------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------|
| Twin Cutter Solid Tools                   | $<3,5 \times D$                                                                  | $3,5-6,5 \times D$                                                                 | $>6,5 \times D$                                          |
| Twin Cutter Bridge Tools                  | $<3,5 \times D$                                                                  | $3,5-6,5 \times D$                                                                 | $>6,5 \times D$                                          |
| Fine-Boring Heads with Boring Bar (FBHBB) | $<3,5 \times D$                                                                  | $3,5-5,0 \times D$                                                                 | $>5,0 \times D$                                          |
| Fine-Boring Heads (FBH)                   | $<3,5 \times D$                                                                  | $3,5-5,0 \times D$                                                                 | $>5,0 \times D$                                          |
| Fine-Boring Bridge Tools                  | $<3,5 \times D$                                                                  | $3,5-5,0 \times D$                                                                 | $>5,0 \times D$                                          |
|                                           | Function of the tool is expected without issues within recommended cutting data. | Application may require reduced feeds and/or speeds compared to stable conditions. | Machining test may be required to identify cutting data. |

## Causes of and remedies for rough and fine boring problems

It is generally assumed that the tools have been properly mounted as per the technical recommendations in this catalogue.

| Problem                         | Cause                                                                                                                            | Possible Remedy                                                                                                                                                                                                                                                                           |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vibration tendency              | <ol style="list-style-type: none"> <li>1. Overhang</li> <li>2. Choice of insert</li> <li>3. Cutting data</li> </ol>              | <ul style="list-style-type: none"> <li>• Adjust L/D ratio</li> <li>• Select 90° lead angle on rough boring tools</li> <li>• Select inserts with positive geometry</li> <li>• Select inserts with smaller corner radius</li> <li>• Reduce depth of cut</li> <li>• Increase feed</li> </ul> |
| Slight chatter marks on surface | <ol style="list-style-type: none"> <li>1. Choice of insert</li> <li>2. Cutting data</li> <li>3. Machining environment</li> </ol> | <ul style="list-style-type: none"> <li>• Select 90° lead angle</li> <li>• Select ground inserts with small edge preparation</li> <li>• Select inserts with smaller corner radius</li> <li>• Increase feed</li> <li>• Increase coolant</li> </ul>                                          |
| Conical bores                   | <ol style="list-style-type: none"> <li>1. Choice of insert</li> <li>2. Cutting data</li> <li>3. Machining environment</li> </ol> | <ul style="list-style-type: none"> <li>• Select a more wear-resistant insert grade</li> <li>• Increase cutting speed</li> <li>• Check whether all screws have been tightened to recommended torque</li> </ul>                                                                             |



### Inserts Overview

| Geometry                                                                          | Application                   | ANSI catalogue number | ISO catalogue number | P      |        |        | M      |        | K      |        | S      |        |
|-----------------------------------------------------------------------------------|-------------------------------|-----------------------|----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                                                                                   |                               |                       |                      | WP15CT | WP25CT | WP35CT | WM15CT | WM25CT | WK05CT | WK20CT | WS10PT | WS25PT |
|  | CCMT-FP • Fine Finishing      | CCMT2151FP            | CCMT060204FP         | •      | •      |        | •      | •      |        | •      | •      | •      |
|                                                                                   |                               | CCMT3251FP            | CCMT09T304FP         | •      | •      |        | •      | •      |        | •      | •      | •      |
|  | CCMT-MU • Medium to Finishing | CCMT2152MU            | CCMT060208MU         |        |        |        |        | •      |        | •      |        |        |
|                                                                                   |                               | CCMT3251MU            | CCMT09T304MU         | •      | •      |        |        | •      | •      | •      | •      | •      |
|                                                                                   |                               | CCMT3252MU            | CCMT09T308MU         | •      | •      | •      |        | •      |        | •      | •      | •      |
|                                                                                   |                               | CCMT432MU             | CCMT120408MU         | •      | •      |        |        | •      |        | •      |        | •      |
|  | CCMT-MP • Roughing to Medium  | CCMT2151MP            | CCMT060204MP         | •      | •      |        | •      | •      |        | •      | •      |        |
|                                                                                   |                               | CCMT3251MP            | CCMT09T304MP         | •      | •      |        | •      | •      |        | •      | •      |        |
|                                                                                   |                               | CCMT3252MP            | CCMT09T308MP         | •      | •      |        | •      | •      |        | •      | •      |        |
|                                                                                   |                               | CCMT432MP             | CCMT120408MP         | •      | •      |        | •      | •      |        | •      | •      |        |
|                                                                                   |                               | CCMT433MP             | CCMT120412MP         |        | •      |        | •      | •      |        | •      |        |        |

## Hole Finishing Capabilities and Custom Solutions

With our state-of-the-art CNC equipment and engineering processes, we can design complex geometries for reaming and countersinking. Special countersinks for pre-working and finishing operations minimise machine time and rationalise production. Our custom solution reamers deliver proven performance in applications that demand high surface qualities, narrow fit, alignment tolerances, and long tool life.



# Hole Finishing Capabilities and Custom Solutions

### Hole Finishing Custom Solution Tool Styles:

- Reaming
- Boring
- Countersinking
- PCD Round Tools

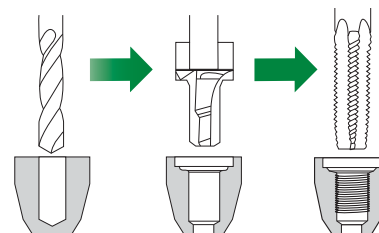
## Hole Finishing Capabilities and Custom Solution Services

- Development, design, and production of different types of cutting tools for reaming, boring, and countersinking.
- Services provided by one engineering department fully integrated with all WIDIA™ focused factories.
- Capabilities with all common cutting materials such as high-speed steel (HSS-E), powdered metal, solid carbide, carbide-tipped, cermet, and PCD, with or without internal coolant.
- Complete tool competence from one source, from construction, application engineering, development, and production through tool reconditioning services.



## Port Contour Cutters • For Fluid-Powered Standard Ports

- Each component has entry and exit points for the fluid involved called ports.
- Port shapes and forms are standardised.
- WIDIA™ offers porting tools to finish these ports in one-shot operations.



# Port Contour Cutters

| Standard Port | Available Cutters                                                                               |
|---------------|-------------------------------------------------------------------------------------------------|
| JDS-G173.1    | 169-0XXX WITH GROOVE & 169-1XXX WITHOUT GROOVE & 269-0XXX WITH GROOVE & 269-1XXX WITHOUT GROOVE |
| AS5202        | 169-0XXX WITH GROOVE & 169-1XXX WITHOUT GROOVE & 269-0XXX WITH GROOVE & 269-1XXX WITHOUT GROOVE |
| ISO-6149-1    | 169-0XXX WITH GROOVE & 169-1XXX WITHOUT GROOVE & 269-0XXX WITH GROOVE & 269-1XXX WITHOUT GROOVE |
| SAE J2241/1   | 169-0XXX WITH GROOVE & 169-1XXX WITHOUT GROOVE & 269-0XXX WITH GROOVE & 269-1XXX WITHOUT GROOVE |
| NPTF/NPT      | 186, 187 & 287                                                                                  |
| MS 16142      | 163, 253, 263, 267, 367 & 467                                                                   |
| CAT.IE2554    | 163, 253, 263, 267, 367 & 467                                                                   |
| SAE J1926-1   | 163, 253, 263, 267, 367 & 467                                                                   |
| BSPP/BSPF     | 265                                                                                             |
| AS1300        | RCT SERIES/CUSTOM SOLUTION                                                                      |
| MS33659       | 164, 264 & 268                                                                                  |
| AND10050      | 164, 264 & 268                                                                                  |
| ISO-1179-1    | 255 STD. LGHT. & 265 EXT. LGTH. REAMER                                                          |
| DIN-3852-2    | 225 SMALL, 235 LARGE & 245 EXT. LGTH. REAMER                                                    |

### Port Contour Cutters

- Dura-bar 65-45-12.
- Component: General cavity.
- Ream SAE#8.
- Surface finish below Ra 32 (inch).

#### CHALLENGE

- Cermet-tipped port cutting tool.

#### SOLUTION

- 2100 RPM-20 IPM.
- Flood coolant.
- Machining centre.

#### CUTTING DATA

- Surface finish of 7-15 RA (inch).

#### RESULT

- Increase productivity by one-shot finishing of port.

#### BENEFIT



## Custom Solutions • Countersinking and Reaming

With our state-of-the-art equipment and engineering processes, we can design complex geometries for reaming and countersinking. Special countersinks for pre-working and finishing operations minimise machining time and rationalise production. Our custom solution reamers deliver proven performance in applications that demand high surface qualities, narrow fit, alignment tolerances, and long tool life.



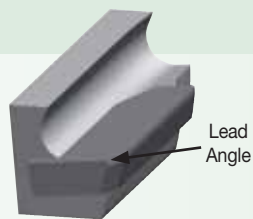
# Reamer Custom Solutions



## Diameter

- 1,4mm–50mm (.055–1.968").
- Up to tolerance IT6 depending on application.
- Diameter steps.

## Leads

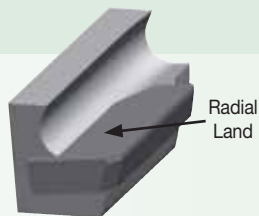


- 25–90° leads for smoother cutting or better positioning.
- Double leads for better surface quality.
- Radius leads for optimal CI machining.

## Grades

- Various grades available tailored to your specific application.

## Radial Land



- Cylindrical for better guiding and form.
- Upsharp (no land) for best surface finishes and less passive forces.
- Narrow land to reduce forces.

## TRM™ – TOP REAM MODULAR

- Tube holes  $\varnothing$  25,25mm (.994").
- Tolerance range 100  $\mu$ m.
- Alloy steel, long-chipping.
- Machining centre with internal coolant.

### CHALLENGE

- Six cutting edges.
- Coated cermet.
- Standard 5 x D body clamped into hydraulic chuck.

### SOLUTION

- $vc = 295$  SFM (90 m/min).
- $f = .019$  IPR (0,48 mm/rev).

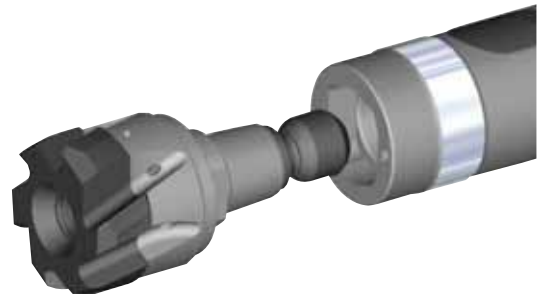
### CUTTING DATA

- After more than 30 minutes only minor wear visible.

### RESULT

- Reduction of machining time in total to less than 60 minutes per plate with 180 holes.
- Predictable tool life as only 2  $\mu$ m diameter deviation after 30 minutes tool life.

### BENEFIT





### PCD STEP REAMER

- Bearing bore  $\varnothing$  130mm.
- Tolerance range 25  $\mu$ m S6.
- Aluminium AlSi8Cu3.
- Varying depth of cut ca. 0,5–5mm.
- Machining centre with internal coolant.

### CHALLENGE

- PCD tipped, steel-based tool with HSK interface and internal coolant.
- Six effective cutting and chamfering teeth in positive cutting position.

### SOLUTION

- $vc = 1.148$  SFM (350 m/min).
- $f = .024$  IPR (0,60 mm/rev).

### CUTTING DATA

- Tool life increase versus previous solution.
- Surface finish Ra 0.2  $\mu$ m.

### RESULT

- Secure process.
- Most productive solution at large diameter.
- Very long tool life.
- Reconditionable.

### BENEFIT

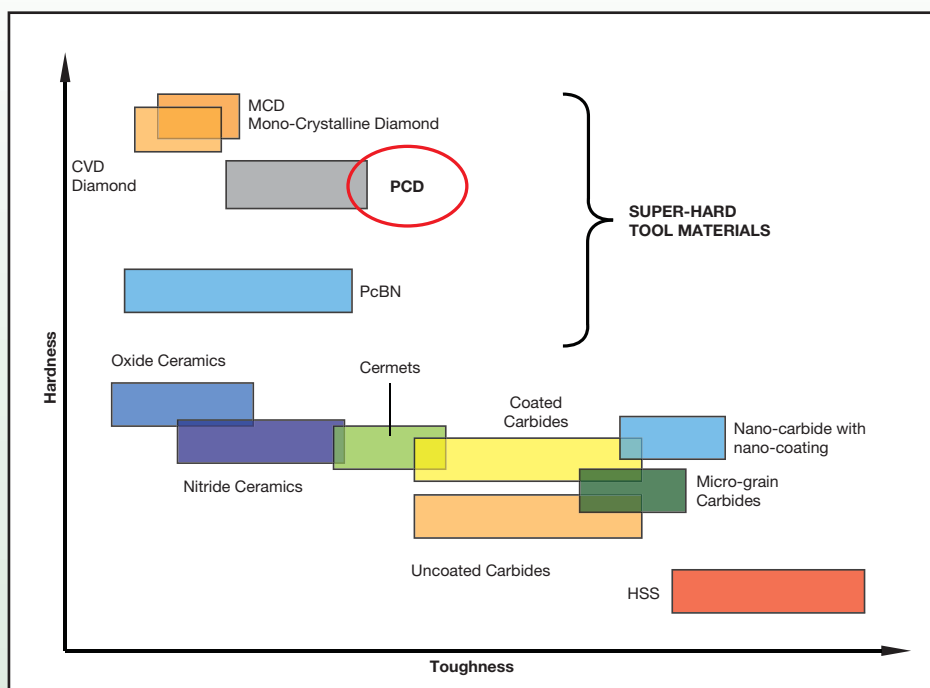


Highly uneven flute design reduces vibrations.



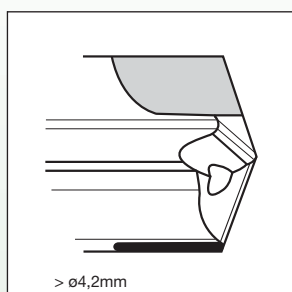
## PCD • Round Tools for Holemaking

### Cutting Materials • Hardness vs. Toughness



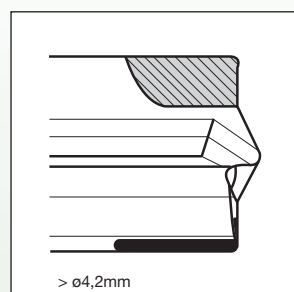
### WIDIA™ PCD Drill-Pointed Geometries

Type: CT  
Corner tipped



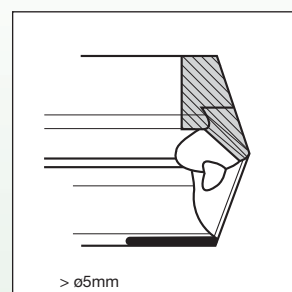
For general applications.

Type: CTE  
Corner tipped with centre point



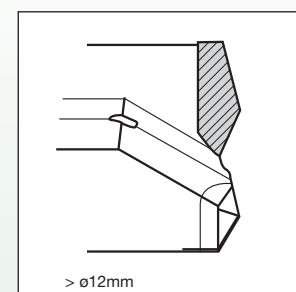
For precasted bores.

Type: SW  
Sandwich



For highly abrasive materials.

Type: MT  
For body = steel

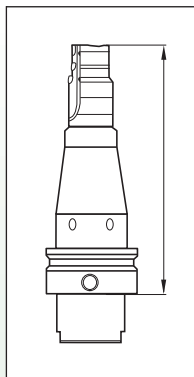


For breaking through the casting skin.

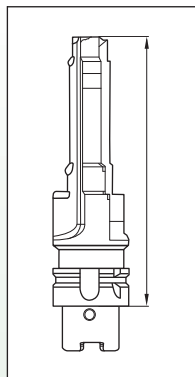
## Non-Ferrous Materials

|           |                                                                              |
|-----------|------------------------------------------------------------------------------|
| <b>N2</b> | Low-Silicon Aluminium Alloys (Hypoeutectic <12.2% Si) and Magnesium Alloys   |
| <b>N3</b> | High-Silicon Aluminium Alloys (Hypereutectic >12.2% Si) and Magnesium Alloys |
| <b>N4</b> | Copper, Brass, Zinc-Based Materials                                          |
| <b>N5</b> | Nylon, Plastics, Rubber, Phenolics, Resins, Fibreglass, Glass                |
| <b>N6</b> | Carbon and Graphite Composites: Brush Alloys, Kevlar, Graphite               |
| <b>N7</b> | MMCs — Aluminium Based Metal Matrix Composites                               |

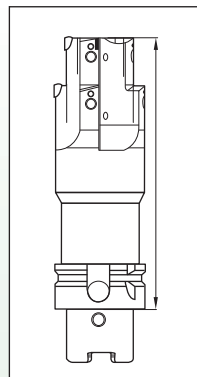
## WIDIA™ PCD Styles for Reamers/CS



**PKD ST —**  
Steel Shank



**PKD STM —**  
Monoblock



**PKD STMJ —**  
Adjustable  
Cutting Edges

**PKD SC —**  
Solid Carbide  
Shank

| Material  | Coolant Style<br>Grade | Coolant Style<br>Grade        | Coolant Style<br>Grade |
|-----------|------------------------|-------------------------------|------------------------|
| Al <7%    | MQL,<br>Emulsion       | PCD SC<br>PCD STM<br>PCD STMJ | WBK45U                 |
| Al <12%   | MQL,<br>Emulsion       |                               | WBK45U                 |
| Al <12%   | Emulsion               | PCD SC                        | WBK45U                 |
| Mg Alloys | Emulsion               | PCD SC                        | WBK45U                 |
| CFK       | Dry                    | PCD SC                        | WBK45U                 |