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STELLRAM®

CUTTING TOOLS

# Stellram® Cutting Tools

## HIGH PERFORMANCE MILLING SOLUTIONS

KENNAMETAL®

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## Patented Breakthroughs for Difficult to Machine Materials:
**Cut Faster. Cut Longer. Cut More Profitably.**

These Kennametal Milling Systems are specifically designed and manufactured for machining high performance, difficult-to-machine materials.

This capability was developed after years of advanced R&D in materials science and machining Titanium and Titanium Alloys, Nickel Alloys and Superalloys, Stainless Steel and Specialty Alloys, and Hard Materials.

The result: These proven “Best in Class” machining solutions presented in this brochure.

Our strategy is to bring “game changing” cutting tool solutions that deliver industry leading metal removal rates. Higher metal removal rates mean you increase capacity, make more profit and deliver in shorter lead times.

Stellram® high performance cutting tools are known for cutting titanium like butter and have found wide application in the aerospace, defense, power generation, oil and gas, medical, transportation and construction and mining industries.

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# Application Guide

# Patented X-Grade Insert Technology

## 3-TIMES THE METAL REMOVAL RATE

Titanium and Nickel Based Alloys are some of the toughest machining jobs on earth.

And it is a rare element, a member of the platinum family, called Ruthenium, that is one of the key ingredients used in our patented X-Grade™ Technology cutting tools.

We combine Ruthenium with Cobalt to form an exclusive binder that cements our engineered carbide formulas in the making of these inserts.

*X-Grade Inserts provide unmatched performance in cutting difficult to machine materials.*



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# 7792 High Feed Milling

- Patented Cutter Designs
- Patented Insert Designs
- Patented Grades

## To remove the highest volume of metal in the shortest possible time



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# 7792: Increase Metal Removal Rate up to 90% or More!

**Modular**
16mm – 32mm

- Cutting diameters from 16mm to 160mm
- Modular, Weldon, Cylindrical and Shell Mill cutter configurations
- Modular Tungsten Extensions maintain stability in deep pocket applications
- All inserts feature 4 cutting edges

**Weldon**
25mm – 32mm

**Cylindrical**
16mm – 32mm

**Shell**
40mm – 160mm

## The Patented 7792 Insert

The unique 7792 insert design provides outstanding operational security and performance, with enhanced metal removal capability.

- Maximize tool life, versatility and performance
- Face, Pocket, Shoulder, Profile, Helical Interpolate, Ramp, Copy and Mill Turn with one tool
- 6 grades for materials from Aluminium to Superalloys
- 4 insert sizes available
- Depth of cut from 0,90mm to 3,50mm
- Coarse, medium and fine pitch cutters available for all machining conditions.



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## How High Feed Cutters Work

**The patented design of High Feed Cutters and Inserts combine to drive the cutting forces axially into the spindle. This allows even less rigid machines to outperform newer machines with conventional cutters by taking high feed, shallow cuts.**

- 5 times the feed rate of conventional face mills
- High feed, shallow cuts
- Dramatically reduced cycle times
- Reduced vibration
- Better quality parts in less than half the time
- Twice the tool life or more

## Hard Case: The Ti Alpha Barrier

The Alpha Casing, which forms during the cooling of the Titanium billet and varies in thickness and hardness, creates nearly impossible machining conditions. The previous most cost effective solution was to chemically remove it with acid.

An aerospace customer was using our X-Grade inserts with our top performing button cutter on several titanium applications. This was our benchmark to test the 7792.

Here's how the 7792VXD12 with X-500 Grade inserts performed on a Ti 6-4 Alpha Case …

- 24% less energy consumed
- 120% increase in material removal rate
- Nearly 3 times the tool life

The 7792 eliminated the need for highly toxic, dangerous chemicals and made effective Alpha Case machining a production reality.



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Cylindrical Shank

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXP06 Cylindrical Shank** | | | | | | | | | | | | |
| *031644* | 7792VXP06CA016Z2R140 | 16 | 188 | 25 | 16 | 0,90 | 2 | *031449* | FP2506T | *031452* | TP7 | 1,00 |
| *031629* | 7792VXP06CA020Z3R154 | 20 | 204 | 32 | 20 | 0,90 | 3 | *031449* | FP2506T | *031452* | TP7 | 1,00 |
| *031630* | 7792VXP06CA025Z4R154 | 25 | 210 | 40 | 25 | 0,90 | 4 | *031450* | FP2507T | *031452* | TP7 | 1,00 |
| *031631* | 7792VXP06CA032Z5R190 | 32 | 250 | 40 | 32 | 0,90 | 5 | *031450* | FP2507T | *031452* | TP7 | 1,00 |

Modular Head

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | M | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXP06 Modular Head - Medium and Fine Pitch** | | | | | | | | | | | | |
| *031632* | 7792VXP06SA016Z2R25 | 16 | 25 | M8 | 8,50 | 0,90 | 2 | *031449* | FP2506T | *031452* | TP7 | 1,00 |
| *031633* | 7792VXP06SA020Z2R35 | 20 | 35 | M10 | 10,50 | 0,90 | 2 | *031449* | FP2506T | *031452* | TP7 | 1,00 |
| *031634* | 7792VXP06SA020Z3R35 | 20 | 35 | M10 | 10,50 | 0,90 | 3 | *031449* | FP2506T | *031452* | TP7 | 1,00 |
| *031636* | 7792VXP06SA025Z3R35 | 25 | 35 | M12 | 12,50 | 0,90 | 3 | *031450* | FP2507T | *031452* | TP7 | 1,00 |
| *031637* | 7792VXP06SA025Z4R35 | 25 | 35 | M12 | 12,50 | 0,90 | 4 | *031450* | FP2507T | *031452* | TP7 | 1,00 |
| *031638* | 7792VXP06SA032Z5R43 | 32 | 43 | M16 | 17,00 | 0,90 | 5 | *031450* | FP2507T | *031452* | TP7 | 1,00 |

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

## 7792VXP06 Technical Information (mm)

| Product | | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle A ° | Ramping Angle B ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | $a_e$ max Plunging | Max RPM |
| *031644* | 7792VXP06CA016Z2R140 | 7,60 | 5.94 | 8.03 | 22 | 30 | 0,60 | 3,00 | 65000 |
| *031629* | 7792VXP06CA020Z3R154 | 11,60 | 3.42 | 6.12 | 30 | 38 | 0,60 | 3,00 | 57000 |
| *031630* | 7792VXP06CA025Z4R154 | 16,60 | 2.23 | 4.24 | 40 | 48 | 0,60 | 3,00 | 49000 |
| *031631* | 7792VXP06CA032Z5R190 | 23,60 | 1.39 | 2.60 | 54 | 62 | 0,60 | 3,00 | 41500 |
| *031632* | 7792VXP06SA016Z2R25 | 7,60 | 5.94 | 8.03 | 22 | 30 | 0,60 | 3,00 | 65000 |
| *031633* | 7792VXP06SA020Z2R35 | 11,60 | 3.42 | 6.12 | 30 | 38 | 0,60 | 3,00 | 57000 |
| *031634* | 7792VXP06SA020Z3R35 | 11,60 | 3.42 | 6.12 | 30 | 38 | 0,60 | 3,00 | 57000 |
| *031636* | 7792VXP06SA025Z3R35 | 16,60 | 2.84 | 4.24 | 40 | 48 | 0,60 | 3,00 | 49000 |
| *031637* | 7792VXP06SA025Z4R35 | 16,60 | 2.23 | 4.24 | 40 | 48 | 0,60 | 3,00 | 49000 |
| *031638* | 7792VXP06SA032Z5R43 | 23,60 | 1.39 | 2.60 | 54 | 62 | 0,60 | 3,00 | 41500 |

Ramp angle A uses one outside cutting edge only.

Ramp angle B uses two cutting edges (one outside and one inside edge).

A = max ramp angle utilising full face contact

**B = max ramp angle utilising full contact + internal corner radius**

Depth of Cut (ap)



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XPLT06-D41

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Facing | Slotting | Plunging | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max. 0,90 | $a_p$ max. 0,90 | $a_e$ max. 3,00 | d (IC) | l | s | r | $h_m$ min |
| 030403 | XPLT060308ER-D41 | X400 | ♦♦♦ | ♦♦♦ | ♦♦♦ | 7,00 | 7,00 | 3,18 | 0,80 | 0,04 |
| 030402 | XPLT060308ER-D41 | X500 | ■◊♦ | ■◊♦ | ■◊♦ | 7,00 | 7,00 | 3,18 | 0,80 | 0,04 |
| 031538 | XPLT060308ER-D41 | SP6519 | ●●◊□■♦■ | ●●◊□■♦■ | ●●◊□■♦■ | 7,00 | 7,00 | 3,18 | 0,80 | 0,04 |
| 033066 | XPLT060308ER-D41 | SC6525 | ■■♦ | ■■♦ | ■■♦ | 7,00 | 7,00 | 3,18 | 0,80 | 0,04 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

## 7792VXP06 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| ER-D41 | X400 | Facing | 0,20 - 1,10 | 0,20 - 0,90 | - | - | - | - | - | - | - | - | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 |
| ER-D41 | X400 | Slotting | 0,20 - 0,90 | 0,20 - 0,80 | - | - | - | - | - | - | - | - | - | - | - | 0,20 - 0,50 | 0,20 - 0,50 |
| ER-D41 | X400 | Plunging | 0,04 - 0,30 | 0,04 - 0,20 | - | - | - | - | - | - | - | - | - | - | - | 0,04 - 0,08 | 0,04 - 0,08 |
| ER-D41 | X500 | Facing | - | - | 0,15 - 1,00 | 0,15 - 0,90 | - | - | - | - | - | 0,15 - 0,50 | 0,15 - 0,50 | 0,15 - 0,50 | 0,15 - 0,60 | - | - |
| ER-D41 | X500 | Slotting | - | - | 0,15 - 0,80 | 0,15 - 0,75 | - | - | - | - | - | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,45 | - | - |
| ER-D41 | X500 | Plunging | - | - | 0,04 - 0,20 | 0,04 - 0,15 | - | - | - | - | - | 0,04 - 0,06 | 0,04 - 0,06 | 0,04 - 0,06 | 0,04 - 0,06 | - | - |
| ER-D41 | SP6519 | Facing | 0,20 - 1,00 | 0,20 - 0,80 | 0,15 - 0,90 | 0,15 - 0,80 | 0,20 - 1,20 | 0,20 - 1,00 | 0,20 - 0,90 | 0,20 - 0,70 | - | 0,15 - 0,50 | 0,15 - 0,50 | 0,15 - 0,50 | 0,15 - 0,60 | - | - |
| ER-D41 | SP6519 | Slotting | 0,20 - 0,80 | 0,20 - 0,75 | 0,15 - 0,80 | 0,15 - 0,70 | 0,20 - 1,00 | 0,20 - 0,90 | 0,20 - 0,80 | 0,20 - 0,70 | - | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,45 | - | - |
| ER-D41 | SP6519 | Plunging | 0,04 - 0,25 | 0,04 - 0,18 | 0,04 - 0,20 | 0,04 - 0,14 | 0,04 - 0,25 | 0,04 - 0,20 | 0,04 - 0,18 | 0,04 - 0,25 | - | 0,04 - 0,06 | 0,04 - 0,06 | 0,04 - 0,06 | 0,04 - 0,06 | - | - |
| ER-D41 | SC6525 | Facing | 0,20 - 0,95 | 0,20 - 0,78 | - | - | 0,20 - 1,20 | 0,20 - 1,00 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Slotting | 0,20 - 0,78 | 0,20 - 0,72 | - | - | 0,20 - 1,00 | 0,20 - 0,90 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Plunging | 0,04 - 0,23 | 0,04 - 0,17 | - | - | 0,04 - 0,25 | 0,04 - 0,20 | - | - | - | - | - | - | - | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.

STELLRAM

Weldon Shank

Cylindrical Shank

Shell Mill Fixation

Modular Head

Depth of Cut (ap)

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXD09 Weldon Shank** | | | | | | | | | | | | |
| *029461* | 7792VXD09WA025Z2R | 25 | 96 | 40 | 25 | 1,50 | 2 | *015269* | F3508T | *015240* | T15 | 2,10 |
| *029462* | 7792VXD09WA032Z3R | 32 | 100 | 40 | 32 | 1,50 | 3 | *015064* | F3510T | *015240* | T15 | 2,10 |
| **7792VXD09 Cylindrical Shank** | | | | | | | | | | | | |
| *031191* | 7792VXD09CA025Z2R50 | 25 | 200 | 50 | 25 | 1,50 | 2 | *015064* | F3510T | *015240* | T15 | 2,10 |
| *031192* | 7792VXD09CA032Z3R70 | 32 | 250 | 70 | 32 | 1,50 | 3 | *015064* | F3510T | *015240* | T15 | 2,10 |
| **7792VXD09 Shell Mill Fixation - Coarse, Medium and Fine Pitch** | | | | | | | | | | | | |
| *029463* | 7792VXD09-A040Z3R | 40 | 32 | - | 16 | 1,50 | 3 | *015064* | F3510T | *015240* | T15 | 2,10 |
| *029464* | 7792VXD09-A040Z4R | 40 | 32 | - | 16 | 1,50 | 4 | *015064* | F3510T | *015240* | T15 | 2,10 |
| *030434* | 7792VXD09-A040Z5R | 40 | 32 | - | 16 | 1,50 | 5 | *015064* | F3510T | *015240* | T15 | 2,10 |
| *030435* | 7792VXD09-A050Z5R | 50 | 40 | - | 22 | 1,50 | 5 | *015064* | F3510T | *015240* | T15 | 2,10 |
| *030436* | 7792VXD09-A050Z6R | 50 | 40 | - | 22 | 1,50 | 6 | *015064* | F3510T | *015240* | T15 | 2,10 |

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | M | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXD09 Modular Head** | | | | | | | | | | | | |
| *030613* | 7792VXD09SA025Z2R35 | 25 | 35 | M12 | 12,50 | 1,50 | 2 | *015269* | F3508T | *015240* | T15 | 2,10 |
| *030614* | 7792VXD09SA032Z3R43 | 32 | 43 | M16 | 17,00 | 1,50 | 3 | *015064* | F3510T | *015240* | T15 | 2,10 |

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

## 7792VXD09 Technical Information (mm)

| Product | | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle A ° | Ramping Angle B ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | $a_e$ max Plunging | Max RPM |
| *029461* | 7792VXD09WA025Z2R | 11,75 | 2.80 | 6.30 | 34 | 48 | 1,00 | 6,00 | 48500 |
| *029462* | 7792VXD09WA032Z3R | 18,75 | 1.50 | 5.00 | 48 | 62 | 1,00 | 6,00 | 40500 |
| *031191* | 7792VXD09CA025Z2R50 | 11,75 | 2.80 | 6.30 | 34 | 48 | 1,00 | 6,00 | 48500 |
| *031192* | 7792VXD09CA032Z3R70 | 18,75 | 1.50 | 5.00 | 48 | 62 | 1,00 | 6,00 | 40500 |
| *029463* | 7792VXD09-A040Z3R | 26,75 | 0.80 | 2.70 | 64 | 78 | 1,00 | 6,00 | 34500 |
| *029464* | 7792VXD09-A040Z4R | 26,75 | 0.80 | 2.70 | 64 | 78 | 1,00 | 6,00 | 34500 |
| *030434* | 7792VXD09-A040Z5R | 26,75 | 0.80 | 2.70 | 64 | 78 | 1,00 | 6,00 | 34500 |
| *030435* | 7792VXD09-A050Z5R | 36,75 | 0.71 | 2.31 | 84 | 98 | 1,00 | 6,00 | 30000 |
| *030436* | 7792VXD09-A050Z6R | 36,75 | 0.71 | 2.31 | 84 | 98 | 1,00 | 6,00 | 29500 |
| *030613* | 7792VXD09SA025Z2R35 | 11,75 | 2.80 | 6.30 | 34 | 48 | 1,00 | 6,00 | 48500 |
| *030614* | 7792VXD09SA032Z3R43 | 18,75 | 1.50 | 5.00 | 48 | 62 | 1,00 | 6,00 | 40500 |

Ramp angle A uses one outside cutting edge only.

Ramp angle B uses two cutting edges (one outside and one inside edge).

A = max ramp angle utilising full face contact

**B = max ramp angle utilising full contact + internal corner radius**

STELLRAM

XDLW09-D XDLT09-D41 XDLT09-D721 XDLT09-D411

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Facing | Slotting | Plunging | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max. 1,50 | $a_p$ max. 1,50 | $a_e$ max. 6,00 | d (IC) | l | s | r | $h_m$ min |
| 029487 | XDLW090408SR-D | X400 | ♦♦♦ | ♦♦♦ | ♦♦♦ | 9,52 | 9,52 | 4,76 | 0,80 | 0,10 |
| 029485 | XDLW090408SR-D | X500 | ●●● | ●●● | ●●● | 9,52 | 9,52 | 4,76 | 0,80 | 0,10 |
| 029486 | XDLW090408SR-D | SC3025 | ♦ | ♦ | ♦ | 9,52 | 9,52 | 4,76 | 0,80 | 0,10 |
| 029685 | XDLT090408ER-D41 | X500 | ■◇♦ | ■◇♦ | ■◇♦ | 9,52 | 9,52 | 4,76 | 0,80 | 0,05 |
| 031535 | XDLT090408ER-D41 | SP6519 | ●●◇□●■ | ●●◇□●■ | ●●◇□●■ | 9,52 | 9,52 | 4,76 | 0,80 | 0,05 |
| 033067 | XDLT090408ER-D41 | SC6525 | ■■■ | ■■■ | ■■■ | 9,52 | 9,52 | 4,76 | 0,80 | 0,05 |
| 029637 | XDLT090408ER-D721 | GH2 | ♦ | ♦ | ♦ | 9,52 | 9,52 | 4,76 | 0,80 | 0,04 |
| 030853 | XDLT090412ER-D411 | X500 | ■◇♦ | ■◇♦ | ■◇♦ | 9,52 | 9,52 | 4,76 | 1,20 | 0,05 |
| 030854 | XDLT090412ER-D411 | SP6519 | ●●◇□●■ | ●●◇□●■ | ●●◇□●■ | 9,52 | 9,52 | 4,76 | 1,20 | 0,05 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

XDLW090408SR-D X500 should be used for Alloyed Steel and Stainless Steel with heavy scale.

XDLT090412ER-D411 is a more positive geometry than the -D-41 with a larger radius which increases performance during smaller radial engagements or where chipping may occur when using the -D-41 geometry.

XDLT090412ER-D411 uses less power than the -D-41 geometry.

## 7792VXD09 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| SR-D | X400 | Facing | 0,30 - 2,00 | 0,30 - 1,90 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 1,00 | 0,30 - 1,00 |
| SR-D | X400 | Slotting | 0,30 - 1,50 | 0,30 - 1,45 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 0,60 | 0,30 - 0,80 |
| SR-D | X400 | Plunging | 0,10 - 0,25 | 0,10 - 0,23 | - | - | - | - | - | - | - | - | - | - | - | 0,10 - 0,12 | 0,10 - 0,12 |
| SR-D | X500 | Facing | - | 0,30 - 1,90 | 0,30 - 1,20 | 0,30 - 1,00 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | X500 | Slotting | - | 0,30 - 1,40 | 0,30 - 0,90 | 0,30 - 0,80 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | X500 | Plunging | - | 0,10 - 0,22 | 0,10 - 0,20 | 0,10 - 0,15 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Facing | - | - | - | - | 0,30 - 2,00 | 0,30 - 1,80 | 0,30 - 1,50 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Slotting | - | - | - | - | 0,30 - 1,70 | 0,30 - 1,50 | 0,30 - 1,30 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Plunging | - | - | - | - | 0,10 - 0,25 | 0,10 - 0,22 | 0,10 - 0,20 | - | - | - | - | - | - | - | - |
| ER-D41 | X500 | Facing | - | - | 0,20 - 1,00 | 0,20 - 0,80 | - | - | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D41 | X500 | Slotting | - | - | 0,20 - 0,80 | 0,15 - 0,70 | - | - | - | - | - | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,70 | - | - |
| ER-D41 | X500 | Plunging | - | - | 0,10 - 0,16 | 0,08 - 0,12 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | - | - |
| ER-D41 | SP6519 | Facing | 0,30 - 1,50 | 0,30 - 1,30 | 0,20 - 1,00 | 0,20 - 0,60 | 0,30 - 1,50 | 0,30 - 1,30 | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D41 | SP6519 | Slotting | 0,30 - 1,30 | 0,30 - 1,00 | 0,20 - 0,80 | 0,15 - 0,50 | 0,30 - 1,30 | 0,30 - 1,00 | - | - | - | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,70 | - | - |
| ER-D41 | SP6519 | Plunging | 0,10 - 0,20 | 0,10 - 0,16 | 0,10 - 0,16 | 0,05 - 0,08 | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | - | - |
| ER-D41 | SC6525 | Facing | 0,30 - 1,45 | 0,30 - 1,30 | - | - | 0,30 - 1,50 | 0,30 - 1,30 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Slotting | 0,30 - 1,25 | 0,30 - 1,00 | - | - | 0,30 - 1,30 | 0,30 - 1,00 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Plunging | 0,10 - 0,18 | 0,10 - 0,16 | - | - | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | - | - | - | - | - | - |
| ER-D721 | GH2 | Facing | - | - | - | - | - | - | - | 0,30 - 1,50 | 0,30 - 1,30 | - | - | - | - | - | - |
| ER-D721 | GH2 | Slotting | - | - | - | - | - | - | - | 0,30 - 1,30 | 0,30 - 1,00 | - | - | - | - | - | - |
| ER-D721 | GH2 | Plunging | - | - | - | - | - | - | - | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | - | - | - |
| ER-D411 | X500 | Facing | - | - | 0,20 - 1,00 | 0,20 - 0,80 | - | - | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D411 | X500 | Slotting | - | - | 0,20 - 0,80 | 0,15 - 0,70 | - | - | - | - | - | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,70 | - | - |
| ER-D411 | X500 | Plunging | - | - | 0,10 - 0,16 | 0,08 - 0,12 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | - | - |
| ER-D411 | SP6519 | Facing | 0,30 - 1,50 | 0,30 - 1,30 | 0,20 - 1,00 | 0,20 - 0,60 | 0,30 - 1,50 | 0,30 - 1,30 | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D411 | SP6519 | Slotting | 0,30 - 1,30 | 0,30 - 1,00 | 0,20 - 0,80 | 0,15 - 0,50 | 0,30 - 1,30 | 0,30 - 1,00 | - | - | - | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,50 | 0,10 - 0,70 | - | - |
| ER-D411 | SP6519 | Plunging | 0,10 - 0,20 | 0,10 - 0,16 | 0,10 - 0,16 | 0,05 - 0,08 | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.

STELLRAM

Cylindrical Shank

Shell Mill Fixation

Modular Head

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXD12 Cylindrical Shank** | | | | | | | | | | | | |
| *031195* | 7792VXD12CA032Z2R70 | 32 | 250 | 70 | 32 | 2,50 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| **7792VXD12 Shell Mill Fixation - Coarse, Medium and Fine Pitch** | | | | | | | | | | | | |
| *029467* | 7792VXD12-A052Z3R | 52 | 40 | - | 22 | 2,50 | 3 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *029468* | 7792VXD12-A052Z4R | 52 | 40 | - | 22 | 2,50 | 4 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030489* | 7792VXD12-A052Z5R | 52 | 40 | - | 22 | 2,50 | 5 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *029469* | 7792VXD12-A063Z4R | 63 | 40 | - | 22 | 2,50 | 4 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *029470* | 7792VXD12-A063Z5R | 63 | 40 | - | 22 | 2,50 | 5 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *031650* | 7792VXD12-A066Z4R | 66 | 45 | - | 27 | 2,50 | 4 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *031651* | 7792VXD12-A066Z5R | 66 | 45 | - | 27 | 2,50 | 5 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *029471* | 7792VXD12-A080Z5R | 80 | 50 | - | 27 | 2,50 | 5 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030490* | 7792VXD12-A080Z8R | 80 | 50 | - | 27 | 2,50 | 8 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030443* | 7792VXD12-A100Z6R | 100 | 50 | - | 32 | 2,50 | 6 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030444* | 7792VXD12-A100Z9R | 100 | 50 | - | 32 | 2,50 | 9 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030445* | 7792VXD12-A125Z8R | 125 | 63 | - | 40 | 2,50 | 8 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *030446* | 7792VXD12-A125Z11R | 125 | 63 | - | 40 | 2,50 | 11 | *015263* | D4012T | *015240* | T15 | 3,10 |
| *033216* | 7792VXD12-160Z07R | 160 | 63 | | 40 | 2.50 | 7 | *015263* | D4012T | *015240* | T15 | 3,10 |

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | M | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXD12 Modular Head** | | | | | | | | | | | | |
| 030994 | 7792VXD12SA032Z2R43 | 32 | 43 | M16 | 17,00 | 2,50 | 2 | 015262 | D4010T | 015240 | T15 | 3,10 |

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

Depth of Cut (ap)

## 7792VXD12 Technical Information (mm)

| Product | | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle A ° | Ramping Angle B ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | $a_e$ max Plunging | Max RPM |
| *031195* | 7792VXD12CA032Z2R70 | 10,60 | 1.80 | 2.60 | 42 | 62 | 1,80 | 9,00 | 31500 |
| *029467* | 7792VXD12-A052Z3R | 33,60 | 0.80 | 2.70 | 82 | 102 | 1,80 | 9,00 | 22000 |
| *029468* | 7792VXD12-A052Z4R | 33,60 | 0.80 | 2.70 | 82 | 102 | 1,80 | 9,00 | 22000 |
| *030489* | 7792VXD12-A052Z5R | 33,60 | 0.80 | 2.70 | 82 | 102 | 1,80 | 9,00 | 22000 |
| *029469* | 7792VXD12-A063Z4R | 44,60 | 0.60 | 1.80 | 104 | 124 | 1,80 | 9,00 | 19500 |
| *029470* | 7792VXD12-A063Z5R | 44,60 | 0.60 | 1.80 | 104 | 124 | 1,80 | 9,00 | 19500 |
| *031650* | 7792VXD12-A066Z4R | 47,60 | 0.45 | 1.80 | 110 | 130 | 1,80 | 9,00 | 19000 |
| *031651* | 7792VXD12-A066Z5R | 47,60 | 0.45 | 1.80 | 110 | 130 | 1,80 | 9,00 | 19000 |
| *029471* | 7792VXD12-A080Z5R | 61,60 | 0.45 | 0.90 | 138 | 158 | 1,80 | 9,00 | 17000 |
| *030490* | 7792VXD12-A080Z8R | 61,60 | 0.45 | 0.90 | 138 | 158 | 1,80 | 9,00 | 17000 |
| *030443* | 7792VXD12-A100Z6R | 81,60 | 0.32 | 1.45 | 178 | 198 | 1,80 | 9,00 | 15000 |
| *030444* | 7792VXD12-A100Z9R | 81,60 | 0.32 | 1.45 | 178 | 198 | 1,80 | 9,00 | 15000 |
| *030445* | 7792VXD12-A125Z8R | 106,60 | 0.24 | 1.06 | 228 | 248 | 1,80 | 9,00 | 13000 |
| *030446* | 7792VXD12-A125Z11R | 106,60 | 0.24 | 1.06 | 228 | 248 | 1,80 | 9,00 | 13000 |
| *033216* | 7792VXD12-160Z07R | 141,60 | 0.20 | 0.86 | 298 | 318 | 1,80 | 9,00 | 11500 |
| *030994* | 7792VXD12SA032Z2R43 | 10,60 | 1.80 | 2.60 | 42 | 62 | 1,80 | 9,00 | 31500 |

Helical Interpolation | Plunging

Ramp angle A uses one outside cutting edge only.

Ramp angle B uses two cutting edges (one outside and one inside edge).

A = max ramp angle utilizing full face contact

**B = max ramp angle utilizing full contact + internal corner radius**

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STELLRAM

XDLW12-D XDLT12-D41 XDLT12-D721 XDLT12-D411

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Facing | Slotting | Plunging | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max. 2,50 | $a_p$ max. 2,00 | $a_e$ max. 9,00 | d (IC) | l | s | r | $h_m$ min |
| 029490 | XDLW120508SR-D | X400 | ♦♦♦ | ♦♦♦ | ♦♦♦ | 12,70 | 12,70 | 5,56 | 0,80 | 0,10 |
| 029488 | XDLW120508SR-D | X500 | ●●● | ●●● | ●●● | 12,70 | 12,70 | 5,56 | 0,80 | 0,10 |
| 029489 | XDLW120508SR-D | SC3025 | ♦ | ♦ | ♦ | 12,70 | 12,70 | 5,56 | 0,80 | 0,10 |
| 029682 | XDLT120508ER-D41 | X500 | ■♦♦ | ■♦♦ | ■♦♦ | 12,70 | 12,70 | 5,56 | 0,80 | 0,05 |
| 031534 | XDLT120508ER-D41 | SP6519 | ●●♦■●■ | ●●♦■●■ | ●●♦■●■ | 12,70 | 12,70 | 5,56 | 0,80 | 0,05 |
| 033068 | XDLT120508ER-D41 | SC6525 | ■■■ | ■■■ | ■■■ | 12,70 | 12,70 | 5,56 | 0,80 | 0,05 |
| 029638 | XDLT120508ER-D721 | GH2 | ♦ | ♦ | ♦ | 12,70 | 12,70 | 5,56 | 0,80 | 0,04 |
| 030783 | XDLT120512ER-D411 | X500 | ■♦♦ | ■♦♦ | ■♦♦ | 12,70 | 12,70 | 5,56 | 1,20 | 0,05 |
| 030792 | XDLT120512ER-D411 | SP6519 | ●●♦■●■ | ●●♦■●■ | ●●♦■●■ | 12,70 | 12,70 | 5,56 | 1,20 | 0,05 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

XDLW120508SR-D X500 should be used for Alloyed Steel and Stainless Steel with heavy scale.

XDLT120512ER-D411 is a more positive geometry than the -D41 with a larger radius which increases performance during smaller radial engagements or where chipping may occur when using the -D41 geometry.

XDLT120512ER-D411 uses less power than the -D41 geometry.

## 7792VXD12 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| SR-D | X400 | Facing | 0,30 - 2,70 | 0,30 - 2,50 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 1,20 | 0,30 - 1,50 |
| SR-D | X400 | Slotting | 0,30 - 2,50 | 0,30 - 2,40 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 0,80 | 0,30 - 1,00 |
| SR-D | X400 | Plunging | 0,10 - 0,30 | 0,10 - 0,25 | - | - | - | - | - | - | - | - | - | - | - | 0,10 - 0,13 | 0,10 - 0,15 |
| SR-D | X500 | Facing | - | 0,30 - 2,50 | 0,20 - 1,70 | 0,20 -1,20 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | X500 | Slotting | - | 0,30 - 2,40 | 0,20 - 1,50 | 0,20 - 1,00 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | X500 | Plunging | - | 0,10 - 0,24 | 0,10 - 0,25 | 0,10 - 0,18 | - | - | - | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Facing | - | - | - | - | 0,30 - 3,00 | 0,30 - 2,80 | 0,30 - 2,50 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Slotting | - | - | - | - | 0,30 - 2,50 | 0,30 - 2,30 | 0,30 - 2,10 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Plunging | - | - | - | - | 0,10 - 0,30 | 0,10 - 0,28 | 0,10 - 0,25 | - | - | - | - | - | - | - | - |
| ER-D41 | X500 | Facing | - | - | 0,20 - 1,40 | 0,20 - 0,90 | - | - | - | - | - | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 1,00 | - | - |
| ER-D41 | X500 | Slotting | - | - | 0,20 - 1,10 | 0,20 - 0,80 | - | - | - | - | - | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,80 | - | - |
| ER-D41 | X500 | Plunging | - | - | 0,10 - 0,20 | 0,08 - 0,14 | - | - | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |
| ER-D41 | SP6519 | Facing | 0,30 - 2,50 | 0,30 - 2,00 | 0,20 - 1,20 | 0,20 - 0,75 | 0,30 - 2,50 | 0,30 - 2,30 | - | - | - | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 1,00 | - | - |
| ER-D41 | SP6519 | Slotting | 0,30 - 2,00 | 0,30 - 1,60 | 0,20 - 1,00 | 0,15 - 0,60 | 0,30 - 2,00 | 0,30 - 1,80 | - | - | - | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,80 | - | - |
| ER-D41 | SP6519 | Plunging | 0,10 - 0,22 | 0,10 - 0,18 | 0,10 - 0,18 | 0,05 - 0,10 | 0,10 - 0,22 | 0,10 - 0,18 | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |
| ER-D41 | SC6525 | Facing | 0,30 - 2,40 | 0,30 - 2,00 | - | - | 0,30 - 2,50 | 0,30 - 2,30 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Slotting | 0,30 - 1,90 | 0,30 - 1,60 | - | - | 0,30 - 2,00 | 0,30 - 1,80 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Plunging | 0,10 - 0,20 | 0,10 - 0,18 | - | - | 0,10 - 0,22 | 0,10 - 0,18 | - | - | - | - | - | - | - | - | - |
| ER-D721 | GH2 | Facing | - | - | - | - | - | - | - | 0,30 - 1,50 | 0,30 - 1,50 | - | - | - | - | - | - |
| ER-D721 | GH2 | Slotting | - | - | - | - | - | - | - | 0,30 - 1,50 | 0,30 - 1,50 | - | - | - | - | - | - |
| ER-D721 | GH2 | Plunging | - | - | - | - | - | - | - | 0,10 - 0,40 | 0,10 - 0,40 | - | - | - | - | - | - |
| ER-D411 | X500 | Facing | - | - | 0,20 - 1,40 | 0,20 - 0,90 | - | - | - | - | - | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 1,00 | - | - |
| ER-D411 | X500 | Slotting | - | - | 0,20 - 1,10 | 0,20 - 0,80 | - | - | - | - | - | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,80 | - | - |
| ER-D411 | X500 | Plunging | - | - | 0,10 - 0,20 | 0,08 - 0,14 | - | - | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |
| ER-D411 | SP6519 | Facing | 0,30 - 2,50 | 0,30 - 2,30 | 0,20 - 1,20 | 0,20 - 0,75 | 0,30 - 2,50 | 0,30 - 2,30 | - | - | - | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 0,85 | 0,20 - 1,00 | - | - |
| ER-D411 | SP6519 | Slotting | 0,30 - 2,00 | 0,30 - 1,80 | 0,20 - 1,00 | 0,15 - 0,60 | 0,30 - 2,00 | 0,30 - 1,80 | - | - | - | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,70 | 0,10 - 0,80 | - | - |
| ER-D411 | SP6519 | Plunging | 0,10 - 0,22 | 0,10 - 0,18 | 0,10 - 0,18 | 0,05 - 0,10 | 0,10 - 0,22 | 0,10 - 0,18 | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.



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STELLRAM

Cylindrical Shank

Shell Mill Fixation

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7792VXE16 Cylindrcal Shank** | | | | | | | | | | | | |
| *034851* | 7792VXE16CA040Z2R102 | 40 | 172 | 102 | 40 | 3,50 | 2 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| *034852* | 7792VXE16CA050Z3R102 | 50 | 172 | 102 | 40 | 3,50 | 3 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| **7792VXE16 Shell Mill Fixation** | | | | | | | | | | | | |
| *031277* | 7792VXE16-A063Z5R | 63 | 40 | - | 22 | 3,50 | 5 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| *031278* | 7792VXE16-A080Z6R | 80 | 50 | - | 27 | 3,50 | 6 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| *031279* | 7792VXE16-A100Z8R | 100 | 50 | - | 32 | 3,50 | 8 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| *031280* | 7792VXE16-A125Z10R | 125 | 63 | - | 40 | 3,50 | 10 | *031225* | DP5013T | *030819* | TP20 | 6,10 |
| *031281* | 7792VXE16-160Z12 | 160 | 63 | - | 40 | 3,50 | 12 | *031225* | DP5013T | *030819* | TP20 | 6,10 |

## 7792VXE16 Technical Information (mm)

| Product | | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle A ° | Ramping Angle B ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | $a_e$ max Plunging | Max RPM |
| *034851* | 7792VXE16CA040Z2R102 | 16,10 | 2.55 | 3.35 | 50 | 78 | 2.50 | 13.00 | 33000 |
| *034852* | 7792VXE16CA050Z3R102 | 25,83 | 1.36 | 2.85 | 70 | 98 | 2.50 | 13.00 | 27500 |
| *031277* | 7792VXE16-A063Z5R | 37,45 | 0.86 | 1.00 | 96 | 124 | 2.50 | 13,00 | 22000 |
| *031278* | 7792VXE16-A080Z6R | 54,45 | 0.58 | 0.65 | 130 | 158 | 2.50 | 13,00 | 19000 |
| *031279* | 7792VXE16-A100Z8R | 74,45 | 0.42 | 0.51 | 170 | 198 | 2.50 | 13,00 | 16500 |
| *031280* | 7792VXE16-A125Z10R | 99,45 | 0.32 | 0.37 | 220 | 248 | 2.50 | 13,00 | 14500 |
| *031281* | 7792VXE16-160Z12 | 134,50 | 0.23 | 0.27 | 290 | 318 | 2.50 | 13,00 | 12500 |

Helical Interpolation  Plunging

Ramp angle A uses one outside cutting edge only.

Ramp angle B uses two cutting edges (one outside and one inside edge).

A = max ramp angle utilising full face contact

**B = max ramp angle utilising full contact + internal corner radius**

Depth of Cut (ap)

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XELW16-D XELT16-D41

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Facing | Slotting | Plunging | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max. 3,50 | $a_p$ max. 3,00 | $a_e$ max.13,00 | d (IC) | l | s | r | $h_m$ min |
| 031291 | XELW160512SR-D | X400 | ♦♦♦ | ♦♦♦ | ♦♦♦ | 16,80 | 16,80 | 5,56 | 1,20 | 0,12 |
| 031292 | XELW160512SR-D | SC3025 | ♦ | ♦ | ♦ | 16,80 | 16,80 | 5,56 | 1,20 | 0,12 |
| 031293 | XELT160512ER-D41 | X500 | ■♦♦ | ■♦♦ | ■♦♦ | 16,80 | 16,80 | 5,56 | 1,20 | 0,12 |
| 031294 | XELT160512ER-D41 | SP6519 | ●●♦□●■ | ●●♦□●■ | ●●♦□●■ | 16,80 | 16,80 | 5,56 | 1,20 | 0,12 |
| 033069 | XELT160512ER-D41 | SC6525 | ■■■ | ■■■ | ■■■ | 16,80 | 16,80 | 5,56 | 1,20 | 0,12 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 19.

## 7792VXE16 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| SR-D | X400 | Facing | 0,30 - 2,00 | 0,30 - 1,80 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 0,80 | 0,30 - 1,00 |
| SR-D | X400 | Slotting | 0,30 - 1,70 | 0,30 - 1,50 | - | - | - | - | - | - | - | - | - | - | - | 0,30 - 0,50 | 0,30 - 0,60 |
| SR-D | X400 | Plunging | 0,10 - 0,27 | 0,10 - 0,22 | - | - | - | - | - | - | - | - | - | - | - | 0,10 - 0,10 | 0,10 - 0,12 |
| SR-D | SC3025 | Facing | - | - | - | - | 0,30 - 2,00 | 0,30 - 1,80 | 0,30 - 1,50 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Slotting | - | - | - | - | 0,30 - 1,50 | 0,30 - 1,30 | 0,30 - 1,20 | - | - | - | - | - | - | - | - |
| SR-D | SC3025 | Plunging | - | - | - | - | 0,10 - 0,20 | 0,10 - 0,18 | 0,10 - 0,15 | - | - | - | - | - | - | - | - |
| ER-D41 | X500 | Facing | - | - | 0,20 - 1,00 | 0,20 - 0,60 | - | - | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D41 | X500 | Slotting | - | - | 0,20 - 0,80 | 0,20 - 0,50 | - | - | - | - | - | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,50 | - | - |
| ER-D41 | X500 | Plunging | - | - | 0,12 - 0,16 | 0,07 - 0,13 | - | - | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |
| ER-D41 | SP6519 | Facing | 0,30 - 1,50 | 0,30 - 1,30 | 0,20 - 1,00 | 0,20 - 0,50 | 0,30 - 1,50 | 0,30 - 1,20 | - | - | - | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,60 | 0,20 - 0,80 | - | - |
| ER-D41 | SP6519 | Slotting | 0,30 - 1,30 | 0,30 - 1,20 | 0,20 - 0,80 | 0,20 - 0,45 | 0,30 - 1,20 | 0,30 - 1,10 | - | - | - | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,40 | 0,10 - 0,50 | - | - |
| ER-D41 | SP6519 | Plunging | 0,10 - 0,23 | 0,10 - 0,20 | 0,12 - 0,16 | 0,07 - 0,12 | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,12 | - | - |
| ER-D41 | SC6525 | Facing | 0,30 - 1,40 | 0,30 - 1,20 | - | - | 0,30 - 1,50 | 0,30 - 1,20 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Slotting | 0,30 - 1,20 | 0,30 - 1,10 | - | - | 0,30 - 1,20 | 0,30 - 1,10 | - | - | - | - | - | - | - | - | - |
| ER-D41 | SC6525 | Plunging | 0,10 - 0,20 | 0,10 - 0,18 | - | - | 0,10 - 0,20 | 0,10 - 0,16 | - | - | - | - | - | - | - | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 14.

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## Speed $v_c$ (m/min)

7792VX Series

Wear Resistance: – ⟷ +

Speed min. - max.

Coolant Recommendation
Recommended ● Possible ⦿

| ISO | Materials | Rm and Hardness | | | PVD X Grade | | | CVD X Grade | | | PVD Standard | | | Uncoated Micrograin | | | CVD Standard | | | CVD Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | X400 | | | X500 | | | SP6519 | | | GH2 | | | SC6525 | | | SC3025 |
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 120 - 260 | | | | ⦿ | ● | 130 - 295 | | | | ⦿ | ● | 140 - 370 | | | |
| | | <950 N/mm² <280 HBN | | | 105 - 230 | | | | | | 115 - 260 | | | | | | 120 - 325 | | | |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 95 - 200 | ⦿ | ● | 100 - 210 | ⦿ | ● | 100 - 230 | | | | ⦿ | ● | 105 - 290 | | | |
| | | 950-1200 N/mm² 280-355 HBN | | | 70 - 150 | | | 75 - 160 | | | 75 - 175 | | | | | | 80 - 210 | | | |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 45 - 95 | | ● | 50 - 100 | | ● | 50 - 110 | | | | | ● | 50 - 140 | | | |
| M | Stainless Steel | Austenitic + Ferritic 300 series | | | | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 270 | | | | | | | | | |
| | | Martensitic 400 series | | | | | | 100 - 220 | | | 105 - 235 | | | | | | | | | |
| | PH Stainless | Refractory P.H. | | | | ● | | 50 - 110 | ● | | 50 - 120 | | | | | | | | | |
| K | Cast Iron | Grey GG-Ft | | | | | | | | | 140 - 295 | | | | | | 145 - 390 | | | 150 - 395 |
| | | Spheroidal-Ductile GGG-FGS | | | | | | | ⦿ | ● | 110 - 240 | | | | | ● | 115 - 305 | | ● | 120 - 335 |
| | | Malleable GTS - MN/MP | | | | | | | | | 100 - 220 | | | | | | | | | 105 - 275 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | | | | | ● | | 305 - 2130 | ● | | 400 - 2745 | | | | | | |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | | | | | | | 245 - 1760 | | | 295 - 2135 | | | | | | |
| S | High Temperature Alloys | Iron Based | | | | | | 23 - 48 | | | 23 - 55 | | | | | | | | | |
| | | Cobalt Based | | | | ● | | 21 - 44 | ● | | 22 - 48 | | | | | | | | | |
| | | Nickel Based | | | | | | 24 - 51 | | | 25 - 55 | | | | | | | | | |
| | | Titanium Based | | | | | | 35 - 73 | | | 36 - 79 | | | | | | | | | |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | ● | 45 - 95 | | | | | | | | | | | | | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | 35 - 80 | | | | | | | | | | | | | | | |



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## Plunging

The cutting edge should not be in contact with the material face after machining to maintain the cutting edge quality.

The scallop height is calculated in relation to the step over.

The maximum radial engagement is directly in relation to insert cutting edge length.

For insert type: **XP…06 the $a_e$, max is 3mm.**

For insert type: **XD…09 the $a_e$, max is 6mm.**

For insert type: **XD…12 the $a_e$, max is 9mm.**

For insert type: **XE…16 the $a_e$, max is 13mm.**

Plunging Information (mm) tool definition-scallop height and step over

| | Tool definition (mm) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **7792VXP06** | | | | **7792VXD09** | | | | **7792VXD12** | | | | | | | | **7792VXE16** | | | | |
| Diameter | 16 | 20 | 25 | 32 | 25 | 32 | 40 | 50 | 32 | 52 | 63 | 66 | 80 | 100 | 125 | 160 | 63 | 80 | 100 | 125 | 160 |
| Insert size | 6 | 6 | 6 | 6 | 9 | 9 | 9 | 9 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 16 | 16 | 16 | 16 | 16 |
| $a_e$ max | 3 | 3 | 3 | 3 | 6 | 6 | 6 | 6 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 13 | 13 | 13 | 13 | 13 |
| Scallop height | Step over (mm) | | | | | | | | | | | | | | | | | | | | |
| 0,25 | 3,97 | 4,44 | 4,97 | 5,63 | 4,97 | 5,63 | 6,30 | 7,05 | 5,63 | 7,19 | 7,92 | 8,11 | 8,93 | 9,99 | 11,17 | 12,64 | 7,92 | 8,93 | 9,99 | 11,17 | 12,64 |
| 0,50 | 5,57 | 6,24 | 7,00 | 7,94 | 7,00 | 7,94 | 8,89 | 9,95 | 7,94 | 10,15 | 11,18 | 11,44 | 12,61 | 14,11 | 15,78 | 17,86 | 11,18 | 12,61 | 14,11 | 15,78 | 17,86 |
| 0,75 | 6,76 | 7,60 | 8,53 | 9,68 | 8,53 | 9,68 | 10,85 | 12,16 | 9,68 | 12,40 | 13,67 | 13,99 | 15,42 | 17,26 | 19,31 | 21,86 | 13,67 | 15,42 | 17,26 | 19,31 | 21,86 |
| 1,00 | 7,75 | 8,72 | 9,80 | 11,14 | 9,80 | 11,14 | 12,49 | 14,00 | 11,14 | 14,28 | 15,75 | 16,12 | 17,78 | 19,90 | 22,27 | 25,22 | 15,75 | 17,78 | 19,90 | 22,27 | 25,22 |
| 2,00 | 10,58 | 12,00 | 13,56 | 15,49 | 13,56 | 15,49 | 17,44 | 19,60 | 15,49 | 20,00 | 22,09 | 22,63 | 24,98 | 28,00 | 31,37 | 35,55 | 22,09 | 24,98 | 28,00 | 31,37 | 35,55 |
| 3,00 | 12,49 | 14,28 | 16,25 | 18,65 | 16,25 | 18,65 | 21,07 | 23,75 | 18,65 | 24,25 | 26,83 | 27,49 | 30,40 | 34,12 | 38,26 | 43,41 | 26,83 | 30,40 | 34,12 | 38,26 | 43,41 |
| 4,00 | | | | | 18,33 | 21,17 | 24,00 | 27,13 | 21,17 | 27,71 | 30,72 | 31,50 | 34,87 | 39,19 | 44,00 | 49,96 | 30,72 | 34,87 | 39,19 | 44,00 | 49,96 |
| 5,00 | | | | | 20,00 | 23,24 | 26,46 | 30,00 | 23,24 | 30,66 | 34,06 | 34,93 | 38,73 | 43,59 | 48,99 | 55,68 | 34,06 | 38,73 | 43,59 | 48,99 | 55,68 |
| 6,00 | | | | | 21,35 | 24,98 | 28,57 | 32,49 | 24,98 | 33,23 | 36,99 | 37,95 | 42,14 | 47,50 | 53,44 | 60,79 | 36,99 | 42,14 | 47,50 | 53,44 | 60,79 |
| 7,00 | | | | | | | | | 26,46 | 35,50 | 39,60 | 40,64 | 45,21 | 51,03 | 57,48 | 65,45 | 39,60 | 45,21 | 51,03 | 57,48 | 65,45 |
| 8,00 | | | | | | | | | 27,71 | 37,52 | 41,95 | 43,08 | 48,00 | 54,26 | 61,19 | 69,74 | 41,95 | 48,00 | 54,26 | 61,19 | 69,74 |
| 9,00 | | | | | | | | | 28,77 | 39,34 | 44,09 | 45,30 | 50,56 | 57,24 | 64,62 | 73,73 | 44,09 | 50,56 | 57,24 | 64,62 | 73,73 |
| 10,00 | | | | | | | | | | | | | | | | | 46,04 | 52,92 | 60,00 | 67,82 | 77,46 |
| 11,00 | | | | | | | | | | | | | | | | | 47,83 | 55,10 | 62,58 | 70,82 | 80,97 |
| 12,00 | | | | | | | | | | | | | | | | | 49,48 | 57,13 | 64,99 | 73,65 | 84,29 |
| 13,00 | | | | | | | | | | | | | | | | | 50,99 | 59,03 | 67,26 | 76,32 | 87,43 |

**Max. flat surface** (mm)

| Insert size | Cutter dia. | Pitch |
|---|---|---|
| 06 | 16 | 7,60 |
| | 20 | 11,60 |
| | 25 | 16,60 |
| | 32 | 23,60 |
| 09 | 25 | 11,75 |
| | 32 | 18,75 |
| | 40 | 26,75 |
| | 50 | 36,75 |
| 12 | 32 | 10,60 |
| | 52 | 33,60 |
| | 63 | 44,60 |
| | 66 | 47,60 |
| | 80 | 61,60 |
| | 100 | 81,60 |
| | 125 | 106,60 |
| | 160 | 141,60 |
| 16 | 63 | 37,45 |
| | 80 | 54,45 |
| | 100 | 74,45 |
| | 125 | 99,45 |
| | 160 | 134,50 |

Helical Interpolation

Facing Pitch

**Helical interpolation capacity for 7792VX** (mm)

| Insert Size | Cutter dia. | Hole min. | Hole max. |
|---|---|---|---|
| 06 | 16 | 22 | 30 |
| | 20 | 30 | 38 |
| | 25 | 40 | 48 |
| | 32 | 54 | 62 |
| 09 | 25 | 34 | 48 |
| | 32 | 48 | 62 |
| | 40 | 64 | 78 |
| | 50 | 84 | 98 |
| 12 | 32 | 42 | 62 |
| | 52 | 82 | 102 |
| | 63 | 104 | 124 |
| | 66 | 110 | 130 |
| | 80 | 138 | 158 |
| | 100 | 178 | 198 |
| | 125 | 228 | 248 |
| | 160 | 298 | 318 |
| 16 | 63 | 96 | 124 |
| | 80 | 130 | 158 |
| | 100 | 170 | 198 |
| | 125 | 220 | 248 |
| | 160 | 290 | 318 |

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The advantages of face milling and producing cavities with Stellram's high feed face mill are numerous.

The unique design of the insert, approach angle and the cutter body ensure the cutting forces are predominantly directed in the axial direction. The example shown with a round insert tool shows complex forces which result in high levels of vibration and damage to the cutting edge.

### 7792VX

- Cutting forces predominantly axial
- Relationship between cutting edge and work piece is at its most stable.
- Results in high feed rates and consistent tool life.

### Round Insert Tools

- Tangential forces act around the radius
- Leads to vibration and damage of the cutting edge
- Leads to reduced feed and lower productivity

The 7792VX machines with a constant volume of chip throughout all aspects of producing cavities and produces a side wall that is close to profile.

Round insert tools have increasing chip volume through the process.

### 7792VX

- Constant cutting section (chip volume) irrespective of position in cavity.
- Producing a close to profile side wall.
- Near-square side walls possible.

### Round insert

- Greater surface contact.
- Increased chip section for side wall machining.
- Vibration in corners.
- Undulating side wall cusps.



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## CNC Program - Corner Radius Definition

The use of common CAD / CAM systems requires a round insert dimension to be known for cavity machining. This is available with 7792VX cutters as shown to the right and in the reference table.

### For finish pass applications:

Wiper Facet for finishing use max. feed 0,80mm/Revolution

**Programming Data** (mm)

| Insert size (mm) | Radius | R | L |
|---|---|---|---|
| 06 | 0,80 | 1,37 | 0,40 |
| 09 | 0,80 | 2,01 | 0,73 |
| | 1,20 | 2,27 | 0,67 |
| 12 | 0,80 | 2,50 | 1,02 |
| | 1,20 | 2,73 | 0,97 |
| 16 | 1,20 | 4,18 | 1,46 |

## Calculation of the average chip thickness in relation with the D.O.C. (Axial)

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

$h_m$ = Average chip thickness
$a_p$ = Depth of cut
$f_z$ = Feed per tooth
$d$ = Insert diameter 45mm

Theoretical Diameter for all high feed insert sizes = 45mm

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

## Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of Dia.

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

$h_m$ = Average chip thickness
$a_e$ = Radial engagement
$f_z$ = Feed per tooth
$d$ = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$



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# 7792 Case Histories

Material: 4140 steel – 280 - 320 HBN
Industry: Die/Mold
Job: 17 holes – 51,59mm diameter, 67,74mm deep
Cycle time: 4.5 hours

**7792 Solution:**
Cutter: Modular 7792VXD09 (25mm Cutter)
Extension: Anti-vibration, heavy-alloy Modular Shank
Insert Grade: X400
Process: High Feed Helical Interpolation
Cycle time: 1 minute 45 seconds per hole
Total Cycle time: 30 minutes

***90% Reduction in Cycle Time***

**Material: 6-4 Titanium**
Job: Machine pockets in aerospace component
Cycle time: 5.5 hours

**7792 Solution:**
Cutter: 7792VXD12 (160mm Cutter)
Insert Grade: X500
Cycle time: 1 hour 20 minutes

***75% Reduction in Cycle Time***

**Material: 6-4 Titanium**
Job: Turn a 1463mm diameter by 340mm deep ring
Industry: Aerospace
Turning Cycle time: 4 hours 35 minutes

**7792 Solution:**
Cutter: 7792VXE16 (125mm Cutter)
Insert Grade: X500
Process: Mill turning
Workpiece rotates on B axis at 0,26 RPM
Spiral milling feed rate of 60mm per revolution
Cycle time: 2 hours 24 minutes

***Spiral Milling Cuts Cycle Time 48%***



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## High Feed Geometries

### -D P P K H

Fully ground with flat top and variable hone.
Hardened Materials up to 480HBN.

### -D41 M M S

Positive geometry that reduces power consumption.

### -D411 M M S

Positive geometry with larger corner radius (1,2mm) reduces cutting energy and provides better edge protection during lower radial engagement applications.

### -D721 N

Positive, periphery ground, polished top rake face and sharp edge allows a freer cutting action and reduces built-up edge.

**Material Guide –** Key to Recommended Inserts

| Material Designation | | | | | | |
|---|---|---|---|---|---|---|
| P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials |

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# High Feed Grades

## GH2 N

Uncoated Micrograin – Tough and able to handle high pressure, vibration and shock.

## X400 P P H

Coating Type: PVD, TiAlN – Designed for high metal removal rates and interrupted cuts.

## X500 M S

Coating Type: CVD, TiN-TiC-TiN – High level of shock resistance; operates at low to medium cutting speeds; high metal removal rates.

## SC3025 K

Coating Type: CVD, TiN - TiCN - $Al_2O_3$ – Multi-layer CVD coating offers wear and abrasion resistance.

## SC6525 P P K

Coating Type: CVD, TiN-TiCN-$Al_2O_3$ – High Performance Machining at elevated surface speeds.

## SP6519 M

Coating Type: PVD, TiAlN – Super nano coating is extremely hard for unmatched performance and virtually eliminates residual stress.

**Material Guide –** Key to Recommended Inserts

| Material Designation | | | | | | | |
|---|---|---|---|---|---|---|---|
| P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials |



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# The 77 Family

- Patented Cutter Designs
- Patented Insert Designs
- Patented Grades

## Excellent for roughing, semi-finishing and finishing of high-performance materials



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# The 77 Family

**Modular**
16mm – 40mm

**Weldon**
25mm

**Cylindrical**
16mm – 32mm

**Shell**
40mm – 160mm

## Three Families of Cutters are Featured:

- **7700VR08** small diameter standard button cutters (Cylindrical, Weldon and Modular: 16mm to 32mm)
- **7710VRD20** Anti-Rotation Shell Mill cutters (63mm to 160mm)
- **7713VR10 and 12** Patented Anti-Rotation Cutters (Cylindrical, Modular and Shell: 20mm to 80mm)

This collection of cutters shows the dynamics of Kennametal technology—taking the conventional to the highest level to machine the toughest high performance alloys.

## Continuous Cutting Under the Toughest Conditions

- Cutter diameters from 16mm to 160mm
- Maximum number of teeth for heavy feed operations
- Medium and close pitch cutters available
- Round button insert for maximum strength
- 8mm to 20mm insert diameters
- Low cutting forces
- Flute design maximizes chip evacuation
- Satin Silver coating extends cutter body life (only 7713VR series)
- Modular tools feature an Anti-Vibration Tungsten Extension with Through Coolant



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# VRD / VR Anti-Rotation Technology

***Maximum Chip Evacuation***

***Maximum Tool Life***

## The High Flute Indexing Cutter

The 7710 and 7713 series cutters feature a unique patented pocket system that locks the inserts into position to prevent inserts from moving during heavy machining.

- Through Coolant and unique flow through pocket design maximise chip evacuation and increase tool life

7713 Patented series cutter bodies are armored with Satin Silver plating to protect body integrity in milling high performance materials.

## The Positive Indexing Round Insert

The Anti-Rotation insert features four, five or eight locking positions which mate with the pocket of the cutter body.

- Positive positioning of the insert throughout the heaviest cuts
- Maximum indexes to optimize tool life and reduce tooling costs

STELLRAM

**Weldon Shank**

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | $D_a$* | D | L/H | $l_1$ | $d_1$ | ap max | No. of teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7700VR08 Weldon Shank** | | | | | | | | | | | | | |
| *021732* | 7700VR08WA025R070-M3 | 25 | 17 | 126 | 70 | 25 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *021733* | 7700VR08WA025R124-M3 | 25 | 17 | 180 | 124 | 25 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| **7700VR08 Cylindrical Shank - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *031134* | 7700VR08CA020Z3R40 | 20 | 12 | 180 | 40 | 20 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031135* | 7700VR08CA025Z3R50 | 25 | 17 | 200 | 50 | 25 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031602* | 7700VR08CA025Z4R50 | 25 | 17 | 200 | 50 | 25 | 4 | 4 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031137* | 7700VR08CA032Z4R70 | 32 | 24 | 250 | 70 | 32 | 4 | 4 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031081* | 7700VR08CA032Z5R70 | 32 | 24 | 250 | 70 | 32 | 4 | 5 | *015062* | F3006T | *013214* | T9 | 1,40 |

D = Effective Diameter (Axis) from insert centreline to centreline.

$D_a$* = Outside Diameter

**Cylindrical Shank**

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | $D_a$* | D | L/H | M | $d_1$ | ap max | No. of teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7700VR08 Modular Head - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *031124* | 7700VR08SA016Z2R25 | 16 | 8 | 25 | M8 | 8.5 | 4 | 2 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031125* | 7700VR08SA020Z3R25 | 20 | 12 | 25 | M10 | 10.5 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031126* | 7700VR08SA025Z3R35 | 25 | 17 | 35 | M12 | 12.5 | 4 | 3 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031127* | 7700VR08SA025Z4R35 | 25 | 17 | 35 | M12 | 12.5 | 4 | 4 | *015062* | F3006T | *013214* | T9 | 1,40 |
| *031080* | 7700VR08SA032Z5R35 | 32 | 24 | 35 | M16 | 17.0 | 4 | 5 | *015062* | F3006T | *013214* | T9 | 1,40 |

D = Effective Diameter (Axis) from insert centreline to centreline.

$D_a$* = Outside Diameter

Note: For Cylindrical Shank extensions in high density alloy with through coolant refer to page 45.

**Modular Head**

**Depth of Cut (ap)**

### 7700VR08 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | ap max Helical / Linear | Max RPM |
| *021732* | 7700VR08WA025R070-M3 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *021733* | 7700VR08WA025R124-M3 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *031134* | 7700VR08CA020Z3R40 | 12 | 9.10 | 26 | 38 | 2,67 | 81000 |
| *031135* | 7700VR08CA025Z3R50 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *031602* | 7700VR08CA025Z4R50 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *031137* | 7700VR08CA032Z4R70 | 24 | 6.75 | 50 | 62 | 2,67 | 57000 |
| *031081* | 7700VR08CA032Z5R70 | 24 | 6.75 | 50 | 62 | 2,67 | 57000 |
| *031124* | 7700VR08SA016Z2R25 | 8 | 32.60 | 18 | 30 | 2,67 | 99000 |
| *031125* | 7700VR08SA020Z3R25 | 12 | 12.70 | 26 | 38 | 2,67 | 81000 |
| *031126* | 7700VR08SA025Z3R35 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *031127* | 7700VR08SA025Z4R35 | 17 | 7.85 | 36 | 48 | 2,67 | 68000 |
| *031080* | 7700VR08SA032Z5R35 | 24 | 7.20 | 50 | 62 | 2,67 | 57000 |

STELLRAM

RPEX08-701 RPMT08-41 RPHT08-422

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max - | $a_p$ min - max 0.,80 - 1,50 | $a_p$ min - max 0,10 - 0,80 | d (IC) | l | s | r | $h_m$ min |
| 034544 | RPEX0803M3F-701 | SP4019 | - | ■ | ■■ | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 023315 | RPEX0803M3F-701 | GH1 | - | ♦ | ♦ | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 031312 | RPEX0803M3E-701 | X500 | - | ● | - | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 034543 | RPEX0803M3E-701 | SP6519 | - | - | ♦♦♦ | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 015220 | RPMT0803M3E-41 | X500 | - | ●● | | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 031473 | RPMT0803M3E-41 | SP6519 | - | ■■● | ■■●●■ | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 017308 | RPMT0803M3E-41 | MP91M | - | ●♦ | ●♦ | 8,00 | - | 3,18 | 4,00 | 0,02 |
| 031186 | RPHT0803M3E-422 | X500 | - | ●■♦♦ | ● | 8,00 | - | 3,18 | 4,00 | 0,03 |
| 031187 | RPHT0803M3E-422 | SP6519 | - | ♦♦♦■■ | ♦♦■●● | 8,00 | - | 3,18 | 4,00 | 0,03 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

## 7700VR08 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| F-701 | SP4019 | Contouring | - | - | - | - | - | - | - | 0,02 - 0,08 | 0,02 - 0,06 | 0,02 - 0,06 | 0,02 - 0,06 | 0,02 - 0,07 | 0,02 - 0,09 | - | - |
| F-701 | GH1 | Contouring | - | - | - | - | - | - | - | 0,02 - 0,08 | 0,02 - 0,06 | - | - | - | - | - | - |
| E-701 | X500 | Contouring | - | - | - | - | - | - | - | - | - | 0,02 - 0,06 | 0,02 - 0,06 | 0,02 - 0,07 | 0,02 - 0,09 | - | - |
| E-701 | SP6519 | Contouring | - | - | 0,02 - 0,10 | 0,02 - 0,08 | - | - | - | - | - | 0,02 - 0,06 | 0,02 - 0,06 | 0,02 - 0,07 | 0,02 - 0,09 | - | - |
| E-41 | X500 | Contouring | - | - | 0,03 - 0,12 | 0,03 - 0,10 | - | - | - | - | - | - | - | - | - | - | - |
| E-41 | SP6519 | Contouring | 0,03 - 0,14 | 0,03 - 0,12 | 0,03 - 0,12 | 0,03 - 0,10 | 0,03 - 0,14 | 0,03 - 0,14 | 0,03 - 0,12 | - | - | - | - | - | - | - | - |
| E-41 | MP91M | Contouring | 0,03 - 0,13 | - | - | - | 0,03 - 0,13 | 0,03 - 0,13 | 0,03 - 0,11 | - | - | - | - | - | - | - | - |
| E-422 | X500 | Contouring | - | 0,03 - 0,12 | 0,03 - 0,14 | 0,03 - 0,11 | - | - | - | - | - | 0,03- 0,08 | 0,03 - 0,08 | 0,03 - 0,09 | 0,03 - 0,11 | - | - |
| E-422 | SP6519 | Contouring | 0,03 - 0,14 | 0,03 - 0,12 | 0,03 - 0,14 | 0,03 - 0,11 | 0,03 - 0,14 | 0,03 - 0,14 | 0,03 - 0,12 | - | - | 0,03 - 0,08 | 0,03 - 0,08 | 0,03 - 0,09 | 0,03 - 0,11 | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 26.

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## Speed $v_c$ (m/min)

7700VR Series

Wear Resistance: – ⟷ +

Speed min. - max.

Coolant Recommendation: Recommended ● Possible ⦿

| ISO | Materials | Rm and Hardness | | | CVD X Grade X500 | | | PVD X Grade X700 | | | PVD Standard SP6519 | | | Uncoated Micrograin GH2 | | | PVD Standard SP4019 | | | CVD Standard MP91M | | | Uncoated Micrograin GH1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 130 - 270 | | | | ⦿ | ● | 130 - 295 | | | | | ● | 140 - 315 | | ● | 140 - 345 | | | |
| | | <950 N/mm² <280 HBN | | | 115 - 240 | | | | | | 115 - 260 | | | | | | 120 - 275 | | | 120 - 305 | | | |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 100 - 210 | | | | ⦿ | ● | 100 - 230 | | | | | ● | 105 - 245 | | ● | 105 - 270 | | | |
| | | 950-1200 N/mm² 280-355 HBN | | | 75 - 160 | | | | | | 75 - 175 | | | | | | 80 - 190 | | | 80 - 205 | | | |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 50 - 100 | | | | | ● | 50 - 110 | | | | | ● | 50 - 120 | | ● | 50 - 130 | | | |
| M | Stainless Steel | Austenitic + Ferritic 300 series | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 260 | ⦿ | ● | 115 - 270 | | | | ⦿ | ● | 120 - 280 | | | | | | |
| | | Martensitic 400 series | | | 100 - 220 | | | 105 - 230 | | | 105 - 235 | | | | | | 110 - 250 | | | | | | |
| | PH Stainless | Refractory P.H. | ● | | 50 - 110 | ● | | 50 - 115 | ● | | 50 - 120 | | | | ● | | 50 - 130 | | | | | | |
| K | Cast Iron | Grey GG-Ft | ⦿ | ● | 120 - 280 | | | | ⦿ | ● | 140 - 295 | | | | | ● | 145 - 330 | | ● | 145 - 365 | | | |
| | | Spheroidal-Ductile GGG-FGS | | | 105 - 205 | | | | | | 110 - 240 | | | | | | 115 - 255 | | | 115 - 285 | | | |
| | | Malleable GTS - MN/MP | | | 95 - 170 | | | | | | 100 - 220 | | | | | | 105 - 235 | | | 105 - 260 | | | |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | | | | | | | | ● | | 400 - 2745 | ● | | 400 - 2895 | | | | ● | | 400 - 3050 |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | | | | | | | | | | 295 - 2135 | | | 295 - 2320 | | | | | | 295 - 2440 |
| S | High Temperature Alloys | Iron Based | ● | | 23 - 48 | ● | | 23 - 52 | ● | | 23 - 55 | | | | ● | | 24 - 63 | | | | | | |
| | | Cobalt Based | | | 21 - 44 | | | 22 - 46 | | | 22 - 48 | | | | | | 23 - 52 | | | | | | |
| | | Nickel Based | | | 24 - 51 | | | 25 - 53 | | | 25 - 55 | | | | | | 26 - 59 | | | | | | |
| | | Titanium Based | | | 35 - 73 | | | 36 - 75 | | | 36 - 79 | | | | | | 37 - 84 | | | | | | |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | | | | | | | | | | | | | | | | | | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | | | | | | | | | | | | | | | | | | | |



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## 7700VR Technical Information

### Working Diameter:

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

**where:**

- $D_w$ = Working Diameter
- $D_2$ = Diameter of cutter insert centre to centre
- $r$ = Insert radius
- $a_p$ = Axial Depth of Cut

## 7710VR Technical Information

**where:**

- $f_z$ = Feed per tooth
- $h_m$ = Average chip thickness
- $r$ = Insert radius
- $a_e$ = Radial Depth of Cut
- $a_p$ = Axial Depth of Cut

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2-(r-a_e)^2}}{r} \times \frac{\sqrt{r^2-(r-a_p)^2}}{r}}$$

Formula to calculate the average chip thickness $h_m$ in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2-(r-a_e)^2}}{r} \times \frac{\sqrt{r^2-(r-a_p)^2}}{r}$$

Simplified formulas to evaluate $h_m$ and $f_z$ based on radial engagement or depth of cut.

### Calculation of the average chip thickness in relation with the D.O.C. (Axial)

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

- $h_m$ = Average chip thickness
- $a_p$ = Depth of cut
- $f_z$ = Feed per tooth
- $d$ = Insert diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

### Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of Dia.

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

- $h_m$ = Average chip thickness
- $a_e$ = Radial engagement
- $f_z$ = Feed per tooth
- $d$ = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$



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With round inserts, the thickness of the chip varies depending on the axial depth of cut ($a_p$) and is related to the size of the cutting edge-preparation.
For best tool life it is important to maintain the proper chip thickness as shown below.

### 7700VR08 Inserts RP..0803..

| Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|
| Inserts Geometry | Insert Size | $a_p$ Axial d.o.c. | $h_m$ min. | $h_m$ max. | $f_z$ min. | $f_z$ max. |
| F-701 | 8,00 | 0,25 | 0,02 | 0,05 | 0,11 | 0,28 |
| | 8,00 | 0,50 | 0,02 | 0,05 | 0,08 | 0,20 |
| | 8,00 | 0,75 | 0,02 | 0,05 | 0,07 | 0,16 |
| | 8,00 | 1,00 | 0,02 | 0,05 | 0,06 | 0,14 |
| | 8,00 | 1,25 | 0,02 | 0,05 | 0,05 | 0,13 |
| | 8,00 | 1,50 | 0,02 | 0,05 | 0,05 | 0,12 |
| E-701 | 8,00 | 0,25 | 0,02 | 0,05 | 0,11 | 0,28 |
| | 8,00 | 0,50 | 0,02 | 0,05 | 0,08 | 0,20 |
| | 8,00 | 0,75 | 0,02 | 0,05 | 0,07 | 0,16 |
| | 8,00 | 1,00 | 0,02 | 0,05 | 0,06 | 0,14 |
| | 8,00 | 1,25 | 0,02 | 0,05 | 0,05 | 0,13 |
| | 8,00 | 1,50 | 0,02 | 0,05 | 0,05 | 0,12 |
| E-41 | 8,00 | 0,25 | 0,03 | 0,06 | 0,17 | 0,34 |
| | 8,00 | 0,50 | 0,03 | 0,06 | 0,12 | 0,24 |
| | 8,00 | 0,75 | 0,03 | 0,06 | 0,10 | 0,20 |
| | 8,00 | 1,00 | 0,03 | 0,06 | 0,08 | 0,17 |
| | 8,00 | 1,25 | 0,03 | 0,06 | 0,08 | 0,15 |
| | 8,00 | 1,50 | 0,03 | 0,06 | 0,07 | 0,14 |
| E-422 | 8,00 | 0,25 | 0,03 | 0,07 | 0,17 | 0,40 |
| | 8,00 | 0,50 | 0,03 | 0,07 | 0,12 | 0,28 |
| | 8,00 | 0,75 | 0,03 | 0,07 | 0,10 | 0,23 |
| | 8,00 | 1,00 | 0,03 | 0,07 | 0,08 | 0,20 |
| | 8,00 | 1,25 | 0,03 | 0,07 | 0,08 | 0,18 |
| | 8,00 | 1,50 | 0,03 | 0,07 | 0,07 | 0,16 |



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Shell Mill Fixation

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | $D_a$* | D Effective Cutting Diameter | H | l1 | d1 | ap max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7710VRD20 Shell Mill Fixation** | | | | | | | | | | | | | |
| *031443* | 7710VRD20-A063Z4R | 63 | 43 | 40 | 40 | 22 | 10 | 4 | *029640* | D6014T | *015241* | T20 | 10,50 |
| *031444* | 7710VRD20-A080Z5R | 80 | 60 | 50 | 50 | 27 | 10 | 5 | | | | | |
| *031445* | 7710VRD20-A100Z6R | 100 | 80 | 50 | 50 | 32 | 10 | 6 | | | | | |
| *031446* | 7710VRD20-A125Z7R | 125 | 105 | 63 | 63 | 40 | 10 | 7 | | | | | |
| *031447* | 7710VRD20-160Z08R | 160 | 140 | 63 | 63 | 40 | 10 | 8 | | | | | |

D = Effective Diameter (Axis) from Insert centreline to centreline

$D_a$* = Outside Diameter

## 7710VRD20 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | ap max Helical / Linear | Max RPM |
| *031443* | 7710VRD20-A063Z4R | 43 | 8.30 | 88 | 124 | 6,60 | 14850 |
| *031444* | 7710VRD20-A080Z5R | 60 | 5.40 | 122 | 158 | 6,60 | 18500 |
| *031445* | 7710VRD20-A100Z6R | 80 | 3.80 | 162 | 198 | 6,60 | 16000 |
| *031446* | 7710VRD20-A125Z7R | 105 | 2.80 | 212 | 248 | 6,60 | 14000 |
| *031447* | 7710VRD20-160Z08R | 140 | 2.20 | 282 | 318 | 6,60 | 12100 |

Depth of Cut ($a_p$)

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RDHT20-42-X8 RDHW20-E-X8 RDHW20-S-X8 RDHW20-25-X8

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EDP | Item Description | Grade | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | d (IC) | l | s | r | hm min |
| | | | Depth of Cut (mm) | | | | | | | |
| | | | ap max 10,0* | ap min. - max. 1,0 - 3,0 | ap min. - max. 0,2 - 1,0 | | | | | |
| *029310* | RDHT2006M0E-42-X8 | X500 | ■◆■ | ■◆■ | - | 20,00 | - | 6,35 | 10,00 | 0,08 |
| *031533* | RDHT2006M0E-42-X8 | SP6519 | ◆□● | ◆□● | - | 20,00 | - | 6,35 | 10,00 | 0,08 |
| *029309* | RDHW2006M0E-X8 | X500 | - | ●●○○●◆ | - | 20,00 | - | 6,35 | 10,00 | 0,10 |
| *031661* | RDHW2006M0S-X8 | X500 | ○○◆ | ■■■ | - | 20.00 | - | 6.35 | 10.00 | 0,15 |
| *031662* | RDHW2006M0S-X8 | SP6519 | ■■■ | ◆◆◆ | - | 20.00 | - | 6.35 | 10.00 | 0,15 |
| *031660* | RDHW2006M0S-25-X8 | X500 | ●●● | - | - | 20,00 | - | 6,35 | 10,00 | 0,25 |
| *031576* | RDHW2006M0S-25-X8 | SP6519 | ◆◆◆ | - | - | 20,00 | - | 6,35 | 10,00 | 0,25 |

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

* Max. recommended $a_p$ = 7,5mm (depending on the application)

**INSERT APPLICATION NOTES:**

RDHW2006MOE-X8 X500 should be your first choice for medium roughing application when machining Titanium without heavy scale.
RDHW2006M0S-X8 SP6519 should be used when machining Stainless Steel with heavy scale.
RDHW2006M0S-X8 X500 should be used when machining High Temperature Alloys with heavy scale.
RDHT2006M0E-42-X8 should be used when the machine tool has low power available and when the conditions are stable.
RDHW2006M0S-25-X8 should be used for heavy duty applications.

## 7710VRD20 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| E-42-X8 | X500 | Facing | - | - | 0,15 - 0,35 | 0,15 - 0,30 | - | - | - | - | - | 0,12 - 0,25 | 0,12 - 0,25 | 0,12 - 0,25 | 0,12 - 0,30 | - | - |
| E-42-X8 | SP6519 | Facing | - | - | 0,15 - 0,35 | 0,15 - 0,28 | - | - | - | - | - | 0,12 - 0,25 | 0,12 - 0,25 | 0,12 - 0,25 | 0,12 - 0,30 | - | - |
| E-X8 | X500 | Facing | 0,20 - 0,30 | 0,18 - 0,28 | 0,20 - 0,40 | 0,20 - 0,30 | 0,20 - 0,35 | 0,20 - 0,35 | 0,20 - 0,30 | - | - | 0,20 - 0,28 | 0,20 - 0,28 | 0,20 - 0,28 | 0,20 - 0,32 | - | - |
| S-X8 | X500 | Facing | 0,25 - 0,45 | 0,25 - 0,35 | 0,25 - 0,45 | 0,25 - 0,32 | 0,25 - 0,45 | 0,25 - 0,45 | 0,25 - 0,40 | - | - | 0,25 - 0,32 | 0,25 - 0,32 | 0,25 - 0,32 | 0,25 - 0,35 | - | - |
| S-X8 | SP6519 | Facing | 0,25 - 0,45 | 0,25 - 0,35 | - | - | 0,25 - 0,45 | 0,25 - 0,45 | 0,25 - 0,40 | - | - | - | - | - | - | - | - |
| S-25-X8 | X500 | Facing | 0,35 - 0,60 | 0,35 - 0,50 | - | - | 0,35 - 0,60 | 0,35 - 0,55 | 0,35 - 0,45 | - | - | - | - | - | - | - | - |
| S-25-X8 | SP6519 | Facing | 0,35 - 0,55 | 0,35 - 0,45 | - | - | 0,35 - 0,55 | 0,35 - 0,50 | 0,35 - 0,40 | - | - | - | - | - | - | - | - |

Note: HTA = High Temperature Alloys

Note: Speed recommendations can be found on page 32.

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## Speed $v_c$ (m/min)

| 7710VRD20 Series | | | Wear Resistance – ⟷ + | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Speed min. - max. | | | | | |
| Coolant Recommendation<br>Recommended ● Possible ⦿ | | | | | CVD<br>X Grade | | | PVD<br>Standard |
| **ISO** | **Materials** | **Rm and Hardness** | 💧 | 🚫 | X500 | 💧 | 🚫 | SP6519 |
| **P** | Unalloyed Steel | <600 N/mm$^2$<br><180 HBN | ⦿ | ● | 130 - 270 | ⦿ | ● | 130 - 295 |
| | | <950 N/mm$^2$<br><280 HBN | | | 115 - 240 | | | 115 - 260 |
| | Alloyed Steel | 700-950 N/mm$^2$<br>200-280 HBN | ⦿ | ● | 100 - 210 | ⦿ | ● | 100 - 230 |
| | | 950-1200 N/mm$^2$<br>280-355 HBN | | | 75 - 160 | | | 75 - 175 |
| | | 1200-1400 N/mm$^2$<br>355-415 HBN | | ● | 50 - 100 | | ● | 50 - 110 |
| **M** | Stainless Steel | Austenitic + Ferritic<br>300 series | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 270 |
| | | Martensitic<br>400 series | | | 100 - 220 | | | 105 - 235 |
| | PH Stainless | Refractory<br>P.H. | ● | | 50 - 110 | ● | | 50 - 120 |
| **K** | Cast Iron | Grey<br>GG-Ft | ⦿ | ● | 120 - 280 | ⦿ | ● | 140 - 295 |
| | | Spheroidal-Ductile<br>GGG-FGS | | | 105 - 205 | | | 110 - 240 |
| | | Malleable<br>GTS - MN/MP | | | 95 - 170 | | | 100 - 220 |
| **N** | Aluminium & Alloys | Aluminium & Alloys<br>< 16% Si 116 HBN | | | | | | |
| | | Aluminium + Silicon<br>> 16% Si 92 HBN | | | | | | |
| **S** | High Temperature Alloys | Iron Based | ● | | 23 - 48 | ● | | 23 - 55 |
| | | Cobalt Based | | | 21 - 44 | | | 22 - 48 |
| | | Nickel Based | | | 24 - 51 | | | 25 - 55 |
| | | Titanium Based | | | 35 - 73 | | | 36 - 79 |
| **H** | Hard Materials | Hard Steel<br>>1400 N/mm$^2$<br>>415 HBN | | | | | | |
| | | Chilled Cast Iron<br>>1400 N/mm$^2$<br>> 400 HBN | | | | | | |

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## 7710VRD20 Technical Information

### Working Diameter:

Formula to evaluate the correct working diameter based on axial depth of cut ($a_p$).

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

**where:**

- $D_w$ = Working Diameter
- $D_2$ = Diameter of cutter insert centre to centre
- $r$ = Insert radius
- $a_p$ = Axial Depth of Cut

## 7710VRD20 Technical Information

**where:**

- $f_z$ = Feed per tooth
- $h_m$ = Average chip thickness
- $r$ = Insert radius
- $a_e$ = Radial Depth of Cut
- $a_p$ = Axial Depth of Cut

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

Formula to calculate the average chip thickness $h_m$ in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$



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Simplified formulas to evaluate $h_m$ and $f_z$ based on axial depth of cut ($a_p$) or radial engagement ($a_e$).

### Calculation of the average chip thickness in relation with the D.O.C. (Axial)

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

**$h_m$** = Average chip thickness
**$a_p$** = Depth of cut
**$f_z$** = Feed per tooth
**d** = Insert diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

### Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of dia.

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

**$h_m$** = Average chip thickness
**$a_e$** = Radial engagement
**$f_z$** = Feed per tooth
**d** = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

With round inserts, the thickness of the chip varies depending on the axial depth of cut ($a_p$) and is related to the size of the cutting edge-preparation. For best tool life it is important to maintain the proper chip thickness as shown below. This chart calculates in relation with axial depth of cut ($a_p$) only and not radial cut ($a_e$).

### RD..2006..insert

| Insert | Insert size (mm) | $a_p$ d.o.c. (mm) | $h_m$ (mm) | | $f_z$ (mm/Z) | |
|---|---|---|---|---|---|---|
| | | | min. | max. | min. | max. |
| RDHT2006M0E-42-X8 | 20,00 | 1,00 | 0,08 | 0,18 | 0,36 | 0,80 |
| | 20,00 | 2,00 | 0,08 | 0,18 | 0,25 | 0,57 |
| | 20,00 | 3,00 | 0,08 | 0,18 | 0,21 | 0,46 |
| | 20,00 | 4,00 | 0,08 | 0,18 | 0,18 | 0,40 |
| | 20,00 | 5,00 | 0,08 | 0,18 | 0,16 | 0,36 |
| | 20,00 | 6,00 | 0,08 | 0,18 | 0,15 | 0,33 |
| | 20,00 | 8,00 | 0,08 | 0,18 | 0,13 | 0,28 |
| | 20,00 | 10,00 | 0,08 | 0,18 | 0,11 | 0,25 |
| RDHW2006M0E-X8 | 20,00 | 1,00 | 0,10 | 0,20 | 0,45 | 0,89 |
| | 20,00 | 2,00 | 0,10 | 0,20 | 0,32 | 0,63 |
| | 20,00 | 3,00 | 0,10 | 0,20 | 0,26 | 0,52 |
| | 20,00 | 4,00 | 0,10 | 0,20 | 0,22 | 0,45 |
| | 20,00 | 5,00 | 0,10 | 0,20 | 0,20 | 0,40 |
| | 20,00 | 6,00 | 0,10 | 0,20 | 0,18 | 0,37 |
| | 20,00 | 8,00 | 0,10 | 0,20 | 0,16 | 0,32 |
| | 20,00 | 10,00 | 0,10 | 0,20 | 0,14 | 0,28 |
| RDHW2006M0S-X8 | 20,00 | 2,00 | 0,15 | 0,25 | 0,47 | 0,79 |
| | 20,00 | 3,00 | 0,15 | 0,25 | 0,39 | 0,65 |
| | 20,00 | 4,00 | 0,15 | 0,25 | 0,34 | 0,56 |
| | 20,00 | 5,00 | 0,15 | 0,25 | 0,30 | 0,50 |
| | 20,00 | 6,00 | 0,15 | 0,25 | 0,27 | 0,46 |
| | 20,00 | 8,00 | 0,15 | 0,25 | 0,24 | 0,40 |
| | 20,00 | 10,00 | 0,15 | 0,25 | 0,21 | 0,35 |
| RDHW2006M0S-25-X8 | 20,00 | 4,00 | 0,25 | 0,30 | 0,56 | 0,67 |
| | 20,00 | 5,00 | 0,25 | 0,30 | 0,50 | 0,60 |
| | 20,00 | 6,00 | 0,25 | 0,30 | 0,46 | 0,55 |
| | 20,00 | 8,00 | 0,25 | 0,30 | 0,40 | 0,47 |
| | 20,00 | 10,00 | 0,25 | 0,30 | 0,35 | 0,42 |



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# 77 Family Case Histories

## 7710 Case History

Material: 600 Series High Temperature Alloy
Cutter: 7710VRD20 (100mm Cutter)
Component: Heat Exchanger Pump Housing
Industry: Power Generation - Nuclear
Insert Grade: X500
RPM: 105
Cutting Speed $V_c$: 33,5 m/min
Feed per Tooth $f_z$: 0,323mm
Feed Rate: 203 mm/min
Depth of Cut $a_p$: 6,35mm

***60% Reduction in Cycle Time***

- 150% Productivity Increase
- 60% Reduction in Tooling Costs
- Zero Failures
- Zero Defects
- Finishing Operation Eliminated

## 7713 Case History

Material: Stainless Steel 300 Series
Cutter: 7713VR12 (63mm Cutter)
Component: Turbine Blade
Industry: Power Generation
Insert Grade: SP6519
RPM: 909
Cutting Speed $V_c$: 180 m/min
Feed per Tooth $f_z$: 0,3mm
Feed Rate: 1,636 m/min
Depth of Cut $a_p$: 2,2mm

***80% Increase in Tool Life!***



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STELLRAM

**Cylindrical Shank**

**Shell Mill Fixation**

**Modular Head**

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Da* | D Effective Diameter | L/H | $l_1$ | $d_1$ | ap max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7713VR10 Cylindrical Shank - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *033100* | 7713VR10CA020Z2R40 | 20 | 10 | 180 | 40 | 20 | 5 | 2 | *031233* | D4007T | *031654* | TB15 | 3,10 |
| *033101* | 7713VR10CA025Z3R50 | 25 | 15 | 200 | 50 | 25 | 5 | 3 | *031233* | D4007T | *031654* | TB15 | 3,10 |
| *033102* | 7713VR10CA032Z3R70 | 32 | 22 | 250 | 70 | 32 | 5 | 3 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033103* | 7713VR10CA032Z4R70 | 32 | 22 | 250 | 70 | 32 | 5 | 4 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| **7713VR10 Shell Mill Fixation - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *033104* | 7713VR10-A040Z05R | 40 | 30 | 40 | - | 16 | 5 | 5 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033105* | 7713VR10-A042Z06R | 42 | 32 | 40 | - | 16 | 5 | 6 | *018481* | D4006T | *031654* | TB15 | 3,10 |
| *033106* | 7713VR10-A050Z06R | 50 | 40 | 40 | - | 22 | 5 | 6 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033107* | 7713VR10-A050Z07R | 50 | 40 | 40 | - | 22 | 5 | 7 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033108* | 7713VR10-A063Z08R | 63 | 53 | 40 | - | 22 | 5 | 8 | *015260* | D4008T | *031654* | TB15 | 3,10 |

D = Effective Diameter (Axis) from Insert centreline to centreline

Da* = Outside Diameter

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Da* | D Effective Diameter | L | M | $d_1$ | ap max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7713VR10 Modular Head - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *033109* | 7713VR10SA020Z2R25 | 20 | 10 | 25 | M10 | 10.5 | 5 | 2 | *031233* | D4007T | *031654* | TB15 | 3,10 |
| *033110* | 7713VR10SA025Z2R35 | 25 | 15 | 35 | M12 | 12.5 | 5 | 2 | *031233* | D4007T | *031654* | TB15 | 3,10 |
| *033111* | 7713VR10SA025Z3R35 | 25 | 15 | 35 | M12 | 12.5 | 5 | 3 | *031233* | D4007T | *031654* | TB15 | 3,10 |
| *033112* | 7713VR10SA032Z3R35 | 32 | 22 | 35 | M16 | 17.0 | 5 | 3 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033113* | 7713VR10SA032Z4R35 | 32 | 22 | 35 | M16 | 17.0 | 5 | 4 | *015260* | D4008T | *031654* | TB15 | 3,10 |
| *033114* | 7713VR10SA035Z5R35 | 35 | 25 | 35 | M16 | 17.00 | 5 | 5 | *031233* | D4007T | *031654* | TB15 | 3,10 |

D = Effective Diameter (Axis) from Insert centreline to centreline

Da* = Outside Diameter

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.
The 7713VR10 series with anti-rotation pocket ensures a precise number of indexes per insert.

This unique patented pocket design prevents the inserts from rotating in the pocket during heavy feed machining and unstable conditions.

**Depth of Cut (ap)**

### 7713VR10 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. | Helical Hole max. | ap max Helical / Linear | Max RPM |
| *033100* | 7713VR10CA020Z2R40 | 10 | 1.89 | 22 | 38 | 3,33 | 64500 |
| *033101* | 7713VR10CA025Z3R50 | 15 | 5.22 | 32 | 48 | 3,33 | 53500 |
| *033102* | 7713VR10CA032Z3R70 | 22 | 8.64 | 46 | 62 | 3,33 | 53500 |
| *033103* | 7713VR10CA032Z4R70 | 22 | 8.64 | 46 | 62 | 3,33 | 53500 |
| *033104* | 7713VR10-A040Z05R | 30 | 7.28 | 62 | 78 | 3,33 | 47000 |
| *033105* | 7713VR10-A042Z06R | 32 | 6.71 | 66 | 82 | 3,33 | 39500 |
| *033106* | 7713VR10-A050Z06R | 40 | 5.22 | 82 | 98 | 3,33 | 39500 |
| *033107* | 7713VR10-A050Z07R | 40 | 5.31 | 82 | 98 | 3,33 | 39500 |
| *033108* | 7713VR10-A063Z08R | 53 | 3.79 | 108 | 124 | 3,33 | 34000 |
| *033109* | 7713VR10SA020Z2R25 | 10 | 1.89 | 22 | 38 | 3,33 | 64000 |
| *033110* | 7713VR10SA025Z2R35 | 15 | 5.22 | 32 | 48 | 3,33 | 64000 |
| *033111* | 7713VR10SA025Z3R35 | 15 | 5.22 | 32 | 48 | 3,33 | 64000 |
| *033112* | 7713VR10SA032Z3R35 | 22 | 8.64 | 46 | 62 | 3,33 | 64000 |
| *033113* | 7713VR10SA032Z4R35 | 22 | 8.64 | 46 | 62 | 3,33 | 53500 |
| *033114* | 7713VR10SA035Z5R35 | 25 | 7.20 | 52 | 68 | 3,33 | 53500 |

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RPEX10-701 RPHT10-421 RPMT10-41 RPHT10-422 RPHT10-T RPMW10-T

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | ap max 5,00* | ap min. - max. 1,00 - 2,0 | ap min. - max. 0,20 - 1,00 | d (IC) | l | s | r | hm min |
| 034546 | RPEX10T3M0F-701-X4 | SP4019 | ■ | ■ | ■♦ | 10,00 | - | 3,97 | 5,00 | 0,02 |
| 030456 | RPEX10T3M0F-701-X4 | GH1 | ♦ | ♦ | ♦ | 10,00 | - | 3,97 | 5,00 | 0,02 |
| 034545 | RPEX10T3M0E-701-X4 | SP6519 | - | - | ■ | 10,00 | - | 3,97 | 5,00 | 0,02 |
| 030449 | RPHT10T3M0E-421-X4 | X500 | - | ● | - | 10,00 | - | 3,97 | 5,00 | 0,04 |
| 030410 | RPHT10T3M0E-421-X4 | X700 | - | - | ● | 10,00 | - | 3,97 | 5,00 | 0,04 |
| 030452 | RPMT10T3M0E-41-X4 | X500 | - | ● | - | 10,00 | - | 3,97 | 5,00 | 0,04 |
| 031539 | RPMT10T3M0E-41-X4 | SP6519 | - | - | ■■●● | 10,00 | - | 3,97 | 5,00 | 0,04 |
| 030451 | RPMT10T3M0E-41-X4 | MP91M | - | ■ | ●●♦ | 10,00 | - | 3,97 | 5,00 | 0,04 |
| 030697 | RPHT10T3M0E422-X4 | X500 | ■♦♦ | ■♦♦ | ● | 10,00 | - | 3,97 | 5,00 | 0,03 |
| 030767 | RPHT10T3M0E-422-X4 | X700 | ●●● | ● | ♦♦ | 10,00 | - | 3,97 | 5,00 | 0,03 |
| 030862 | RPHT10T3M0E-422-X4 | SP6519 | ●●♦■●■ | ●●♦■●■ | ♦♦■■■ | 10,00 | - | 3,97 | 5,00 | 0,03 |
| 030329 | RPHT10T3M0T-X4 | X500 | ■■ | ■■ | - | 10,00 | - | 3,97 | 5,00 | 0,08 |
| 031555 | RPHT10T3M0T-X4 | SP6519 | ♦♦♦ | ♦♦♦ | - | 10,00 | - | 3,97 | 5,00 | 0,08 |
| 030454 | RPMW10T3M0T-X4 | X500 | ♦♦♦♦♦ | ♦♦♦♦♦ | - | 10,00 | - | 3,97 | 5,00 | 0,13 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

RPMW10T3MOT-X4 X500 is recommended for materials with heavy scale.

*Max. recommended ap = 2,5mm (depending on the application)

## 7713VR10 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| F-701-X4 | SP4019 | Contouring | - | - | - | - | - | - | - | 0,02 - 0,10 | 0,02 - 0,08 | 0,02 - 0,07 | 0,02 - 0,07 | 0,03 - 0,08 | 0,03 - 0,09 | - | - |
| F-701-X4 | GH1 | Contouring | - | - | - | - | - | - | - | 0,02 - 0,10 | 0,02 - 0,08 | - | - | - | - | - | - |
| E-701-X4 | SP6519 | Contouring | - | - | - | - | - | - | - | - | - | 0,02 - 0,07 | 0,02 - 0,07 | 0,03 - 0,08 | 0,03 - 0,09 | - | - |
| E-421-X4 | X500 | Contouring | - | - | - | - | - | - | - | - | - | 0,04 - 0,08 | 0,04 - 0,08 | 0,04 - 0,09 | 0,04 - 0,11 | - | - |
| E-421-X4 | X700 | Contouring | - | - | - | - | - | - | - | - | - | 0,04 - 0,08 | 0,04 - 0,08 | 0,04 - 0,09 | 0,04 - 0,11 | - | - |
| E-41-X4 | X500 | Contouring | - | - | 0,04 - 0,18 | - | - | - | - | - | - | - | - | - | - | - | - |
| E-41-X4 | SP6519 | Contouring | 0,04 - 0,18 | 0,04 - 0,16 | 0,04 - 0,18 | - | 0,04 - 0,18 | 0,04 - 0,18 | 0,04 - 0,16 | - | - | - | - | - | - | - | - |
| E-41-X4 | MP91M | Contouring | 0,04 - 0,18 | 0,04 - 0,16 | - | - | 0,04 - 0,16 | 0,04 - 0,16 | 0,04 - 0,14 | - | - | - | - | - | - | - | - |
| E-422-X4 | X500 | Contouring | - | - | 0,06 - 0,30 | 0,06 - 0,25 | - | - | - | - | - | 0,06 - 0,14 | 0,06 - 0,14 | 0,06 - 0,16 | 0,06 - 0,18 | - | - |
| E-422-X4 | X700 | Contouring | - | - | 0,06 - 0,28 | 0,06 - 0,22 | - | - | - | - | - | 0,06 - 0,12 | 0,06 - 0,12 | 0,06 - 0,14 | 0,06 - 0,16 | - | - |
| E-422-X4 | SP6519 | Contouring | 0,06 - 0,30 | 0,06 - 0,25 | 0,06 - 0,28 | 0,03 - 0,22 | 0,06 - 0,25 | 0,06 - 0,25 | 0,06 - 0,22 | - | - | 0,06 - 0,12 | 0,06 - 0,12 | 0,06 - 0,14 | 0,06 - 0,16 | - | - |
| T-X4 | X500 | Contouring | 0,08 - 0,33 | 0,08 - 0,28 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| T-X4 | SP6519 | Contouring | 0,08 - 0,32 | 0,08 - 0,27 | - | - | 0,08 - 0,30 | 0,08 - 0,30 | 0,08 - 0,28 | - | - | - | - | - | - | - | - |
| T-X4 | X500 | Contouring | 0,13 - 0,35 | 0,13 - 0,33 | 0,13 - 0,35 | 0,13 - 0,30 | - | - | - | - | - | 0,13- 0,18 | 0,13 - 0,18 | 0,13 - 0,20 | 0,13 - 0,22 | - | - |

Note: HTA = High Temperature Alloys

Speed recommendations can be found on page 41.

STELLRAM

**Cylindrical Shank**

**Shell Mill Fixation**

**Modular Head**

**Depth of Cut ($a_p$)**

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Da* | D Effective Diameter | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7713VR12 Cylindrcal Shank** | | | | | | | | | | | | | |
| *033126* | 7713VR12CA025Z2R50 | 25 | 13 | 200 | 50 | 25 | 6 | 2 | *015260* | D4008T | *015240* | T15 | 3,10 |
| *033127* | 7713VR12CA032Z3R70 | 32 | 20 | 250 | 70 | 32 | 6 | 3 | *015260* | D4008T | *015240* | T15 | 3,10 |
| **7713VR12 Shell Mill Fixation - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *033115* | 7713VR12-A040Z04R | 40 | 28 | 40 | - | 16 | 6 | 4 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033116* | 7713VR12-A040Z05R | 40 | 28 | 40 | - | 16 | 6 | 5 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033117* | 7713VR12-A050Z05R | 50 | 38 | 40 | - | 22 | 6 | 5 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033118* | 7713VR12-A050Z06R | 50 | 38 | 40 | - | 22 | 6 | 6 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033119* | 7713VR12-A052Z05R | 52 | 40 | 40 | - | 22 | 6 | 5 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033120* | 7713VR12-A052Z06R | 52 | 40 | 40 | - | 22 | 6 | 6 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033121* | 7713VR12-A063Z06R | 63 | 51 | 50 | - | 22 | 6 | 6 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033122* | 7713VR12-A063Z07R | 63 | 51 | 50 | - | 22 | 6 | 7 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033123* | 7713VR12-A066Z06R | 66 | 54 | 50 | - | 27 | 6 | 6 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033124* | 7713VR12-A066Z07R | 66 | 54 | 50 | - | 27 | 6 | 7 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *033125* | 7713VR12-A080Z08R | 80 | 68 | 50 | - | 27 | 6 | 8 | *015262* | D4010T | *015240* | T15 | 3,10 |

D = Effective Diameter (Axis) from Insert centreline to centreline

Da* = Outside Diameter

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Da* | D Effective Diameter | L | M | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **7713VR12 Modular Head - Medium and Fine Pitch** | | | | | | | | | | | | | |
| *033128* | 7713VR12SA025Z2R35 | 25 | 13 | 35 | M12 | 12,50 | 6 | 2 | *015260* | D4008T | *015240* | T15 | 3,10 |
| *033129* | 7713VR12SA032Z3R35 | 32 | 20 | 35 | M16 | 17,00 | 6 | 3 | *015260* | D4008T | *015240* | T15 | 3,10 |
| *033130* | 7713VR12SA040Z4R43 | 40 | 28 | 43 | M16 | 17,00 | 6 | 4 | *015260* | D4008T | *015240* | T15 | 3,10 |
| *033131* | 7713VR12SA040Z5R43 | 40 | 28 | 43 | M16 | 17,00 | 6 | 5 | *015260* | D4008T | *015240* | T15 | 3,10 |

D = Effective Diameter (Axis) from Insert centreline to centreline

Da* = Outside Diameter

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 45.

The 7713VR12 series with anti-rotation pocket ensures a precise number of indexes per insert.

This unique patented pocket design prevents the inserts from rotating in the pocket during heavy feed machining and unstable conditions.

## 7713VR12 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | Max RPM |
| *033126* | 7713VR12CA025Z2R50 | 13 | 11.20 | 28 | 48 | 4,00 | 50000 |
| *033127* | 7713VR12CA032Z3R70 | 20 | 10.80 | 42 | 62 | 4,00 | 40000 |
| *033115* | 7713VR12-A040Z04R | 28 | 7.90 | 58 | 78 | 4,00 | 34000 |
| *033116* | 7713VR12-A040Z05R | 28 | 7.90 | 58 | 78 | 4,00 | 34000 |
| *033117* | 7713VR12-A050Z05R | 38 | 5.50 | 78 | 98 | 4,00 | 29000 |
| *033118* | 7713VR12-A050Z06R | 38 | 5.50 | 78 | 98 | 4,00 | 29000 |
| *033119* | 7713VR12-A052Z05R | 40 | 5.15 | 82 | 102 | 4,00 | 28500 |
| *033120* | 7713VR12-A052Z06R | 40 | 5.15 | 82 | 102 | 4,00 | 28500 |
| *033121* | 7713VR12-A063Z06R | 51 | 3.85 | 104 | 124 | 4,00 | 25000 |
| *033122* | 7713VR12-A063Z07R | 51 | 3.85 | 104 | 124 | 4,00 | 25000 |
| *033123* | 7713VR12-A066Z06R | 54 | 3.60 | 110 | 130 | 4,00 | 24500 |
| *033124* | 7713VR12-A066Z07R | 54 | 3.60 | 110 | 130 | 4,00 | 24500 |
| *033125* | 7713VR12-A080Z08R | 68 | 2.75 | 138 | 158 | 4,00 | 21500 |
| *033128* | 7713VR12SA025Z2R35 | 13 | 11.20 | 28 | 48 | 4,00 | 50000 |
| *033129* | 7713VR12SA032Z3R35 | 20 | 10.80 | 42 | 62 | 4,00 | 40000 |
| *033130* | 7713VR12SA040Z4R43 | 28 | 7.90 | 58 | 78 | 4,00 | 34000 |
| *033131* | 7713VR12SA040Z5R43 | 28 | 7.90 | 58 | 78 | 4,00 | 34000 |

STELLRAM

RPEX12-701 RPHT12-421 RPMT12-41 RPHT12-442 RPHT12-T RPMW12-T

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max 6,00* | $a_p$ min. - max. 1,00 - 2,50 | $a_p$ min. - max. 0,20 - 1,00 | d (IC) | l | s | r | $h_m$ min |
| 029284 | RPEX1204M0F-701-X4 | GH1 | ♦ | ♦ | ♦ | 12,00 | | 4,76 | 6,00 | 0,02 |
| 029282 | RPEX1204M0E-701-X4 | X500 | - | - | ● | 12,00 | - | 4,76 | 6,00 | 0,03 |
| 029286 | RPHT1204M0E-421-X4 | X500 | - | ● | ■ | 12,00 | - | 4,76 | 6,00 | 0,04 |
| 029700 | RPHT1204M0E-421-X4 | X700 | - | - | ♦ | 12,00 | - | 4,76 | 6,00 | 0,04 |
| 029272 | RPMT1204M0E-41-X4 | X500 | ● | ● | - | 12,00 | - | 4,76 | 6,00 | 0,05 |
| 031517 | RPMT1204M0E-41-X4 | SP6519 | - | ■ ■ ● | ● ● ● | 12,00 | - | 4,76 | 6,00 | 0,05 |
| 029291 | RPMT1204M0E-41-X4 | MP91M | - | ■ | ● ● ■ | 12,00 | - | 4,76 | 6,00 | 0,05 |
| 032129 | RPHT1204M0E-442-X4 | X500 | ■ ♦ | ■ ♦ | - | 12,00 | - | 4,76 | 6,00 | 0,04 |
| 032130 | RPHT1204M0E-442-X4 | X700 | ● | ● ● | ● ● | 12,00 | - | 4,76 | 6,00 | 0,04 |
| 032128 | RPHT1204M0E-442-X4 | SP6519 | ♦ ■ | ♦ ♦ ♦ ■ ♦ ■ | ♦ ♦ ■ ■ ♦ | 12,00 | - | 4,76 | 6,00 | 0,04 |
| 029034 | RPHT1204M0T-X4 | X500 | ● | - | - | 12,00 | - | 4,76 | 6,00 | 0,10 |
| 029699 | RPHT1204M0T-X4 | X700 | ● | - | - | 12,00 | - | 4,76 | 6,00 | 0,10 |
| 031516 | RPHT1204M0T-X4 | SP6519 | ● ■ ● | - | - | 12,00 | - | 4,76 | 6,0 | 0,10 |
| 029295 | RPMW1204M0T-X4 | X500 | ♦ ♦ | - | - | 12,00 | - | 4,76 | 6,00 | 0,13 |
| 031518 | RPMW1204M0T-X4 | SP6519 | ■ ♦ ■ | - | - | 12,00 | - | 4,76 | 6,00 | 0,13 |
| 029294 | RPMW1204M0T-X4 | MP91M | ♦ ♦ | - | ♦ | 12,00 | - | 4,76 | 6,00 | 0,13 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 46.

RPMW1204M0T-X4 should be used for materials with heavy scale

* Max. recommended $a_p$ = 3,5mm (depending on the application)

Note: Feed recommendations can be found on page 40. Speed recommendations can be found on page 41.

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STELLRAM

## 7713VR12 Feeds $f_z$ (mm/tooth)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| F-701-X4 | GH1 | Contouring | - | - | - | - | - | - | - | 0,03 - 0,12 | 0,03 - 0,10 | - | - | - | - | - | - |
| E-701-X4 | X500 | Contouring | - | - | - | - | - | - | - | - | - | 0,03 - 0,08 | 0,03 - 0,08 | 0,03 - 0,10 | 0,03 - 0,11 | - | - |
| E-421-X4 | X500 | Contouring | - | - | - | - | - | - | - | - | - | 0,04 - 0,20 | 0,04 - 0,20 | 0,04 - 0,22 | 0,04 - 0,24 | - | - |
| E-421-X4 | X700 | Contouring | - | - | 0,05 - 0,25 | 0,04 - 0,12 | - | - | - | - | - | 0,04 - 0,20 | 0,04 - 0,20 | 0,04 - 0,21 | 0,04 - 0,23 | - | - |
| E-41-X4 | X500 | Contouring | - | 0,05 - 0,22 | 0,05 - 0,25 | - | - | - | - | - | - | - | - | - | - | - | - |
| E-41-X4 | SP6519 | Contouring | 0,05 - 0,25 | 0,05 - 0,22 | - | - | 0,05 - 0,25 | 0,05 - 0,25 | 0,05 - 0,20 | - | - | - | - | - | - | - | - |
| E-41-X4 | MP91M | Contouring | 0,05 - 0,25 | 0,05 - 0,22 | - | - | 0,05 - 0,25 | 0,05 - 0,25 | 0,05 - 0,20 | - | - | - | - | - | - | - | - |
| E-442-X4 | X500 | Contouring | - | - | 0,06 - 0,40 | 0,06 - 0,33 | - | - | - | - | - | 0,06 - 0,24 | 0,06 - 0,24 | 0,06 - 0,24 | 0,06 - 0,26 | - | - |
| E-442-X4 | X700 | Contouring | - | - | 0,06 - 0,38 | 0,06 - 0,31 | - | - | - | - | - | 0,06 - 0,23 | 0,06 - 0,23 | 0,06 - 0,23 | 0,06 - 0,25 | - | - |
| E-442-X4 | SP6519 | Contouring | 0,06 - 0,45 | 0,06 - 0,38 | 0,06 - 0,38 | 0,06 - 0,31 | 0,06 - 0,40 | 0,06 - 0,40 | 0,06 - 0,35 | - | - | 0,06 - 0,23 | 0,06 - 0,23 | 0,06 - 0,23 | 0,06 - 0,25 | - | - |
| RPHT-T-X4 | X500 | Contouring | - | 0,15 - 0,40 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| RPHT-T-X4 | X700 | Contouring | - | - | - | 0,15 - 0,35 | - | - | - | - | - | - | - | - | - | - | - |
| RPHT-T-X4 | SP6519 | Contouring | 0,15 - 0,45 | 0,15 - 0,40 | - | - | 0,15 - 0,45 | 0,15 - 0,45 | 0,15 - 0,40 | - | - | - | - | - | - | - | - |
| RPMW-T-X4 | X500 | Contouring | - | - | 0,13 - 0,35 | 0,13 - 0,30 | - | - | - | - | - | 0,13 - 0,25 | 0,13 - 0,25 | 0,13 - 0,27 | 0,13 - 0,29 | - | - |
| RPMW-T-X4 | SP6519 | Contouring | 0,13 - 0,45 | 0,13 - 0,40 | - | - | 0,13 - 0,45 | 0,13 - 0,45 | 0,13 - 0,40 | - | - | - | - | - | - | - | - |
| RPMW-T-X4 | MP91M | Contouring | 0,13 -0,42 | - | - | - | 0,13 - 0,42 | 0,13 - 0,42 | 0,13 - 0,35 | - | - | - | - | - | - | 0,09 - 0,15 | 0,09 - 0,15 |

Note: HTA = High Temperature Alloys

Speed recommendations can be found on page 41.



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## Speed $v_c$ (m/min)

7713VR Series

Wear Resistance: – ⟵ ⟶ +

Speed min. - max.

Coolant Recommendation: Recommended ● Possible ⦿

| ISO | Materials | Rm and Hardness | | | CVD X Grade X500 | | | PVD X Grade X700 | | | PVD Standard SP6519 | | | PVD Standard SP4019 | | | CVD Standard MP91M | | | Uncoated Micrograin GH1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 130 - 270 | | | | ⦿ | ● | 130 - 295 | | | | | ● | 140 - 345 | | | |
| | | <950 N/mm² <280 HBN | | | 115 - 240 | | | | | | 115 - 260 | | | | | | 120 - 305 | | | |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 100 - 210 | | | | ⦿ | ● | 100 - 230 | | | | | ● | 105 - 270 | | | |
| | | 950-1200 N/mm² 280-355 HBN | | | 75 - 160 | | | | | | 75 - 175 | | | | | | 80 - 205 | | | |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 50 - 100 | | | | | ● | 50 - 110 | | | | | ● | 50 - 130 | | | |
| M | Stainless Steel | Austenitic + Ferritic 300 series | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 260 | ⦿ | ● | 115 - 270 | | | | | | | | | |
| | | Martensitic 400 series | | | 100 - 220 | | | 105 - 230 | | | 105 - 235 | | | | | | | | | |
| | PH Stainless | Refractory P.H. | ● | | 50 - 110 | ● | | 50 - 115 | ● | | 50 - 120 | | | | | | | | | |
| K | Cast Iron | Grey GG-Ft | | | | | | | | | 140 - 295 | | | | | | 145 - 365 | | | |
| | | Spheroidal-Ductile GGG-FGS | | | | | | | ⦿ | ● | 110 - 240 | | | | | ● | 115 - 285 | | | |
| | | Malleable GTS - MN/MP | | | | | | | | | 100 - 220 | | | | | | 105 - 260 | | | |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | | | | | | | | ● | | 400 - 2895 | | | | ● | | 400 - 3050 |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | | | | | | | | | | 295 - 2320 | | | | | | 295 - 2440 |
| S | High Temperature Alloys | Iron Based | ● | | 23 - 48 | ● | | 23 - 52 | ● | | 23 - 55 | ● | | 24 - 63 | | | | | | |
| | | Cobalt Based | | | 21 - 44 | | | 22 - 46 | | | 22 - 48 | | | 23 - 52 | | | | | | |
| | | Nickel Based | | | 24 - 51 | | | 25 - 53 | | | 25 - 55 | | | 26 - 59 | | | | | | |
| | | Titanium Based | | | 35 - 73 | | | 36 - 75 | | | 36 - 79 | | | 37 - 84 | | | | | | |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | | | | | | | | | | | | | ● | 50 - 105 | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | | | | | | | | | | | | | 40 - 95 | | | |

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## 7713VR Technical Information

### Working Diameter:

Formula to evaluate the correct working diameter based on axial depth of cut ($a_p$).

$$D_w = D_2 + 2 \times \sqrt{r^2 - (r - a_p)^2}$$

**where:**

- $D_w$ = Working Diameter
- $D_2$ = Diameter of cutter insert centre to centre
- $r$ = Insert radius
- $a_p$ = Axial Depth of Cut

## 7713VR Technical Information

**where:**

- $f_z$ = Feed per tooth
- $h_m$ = Average chip thickness
- $r$ = Insert radius
- $a_e$ = Radial Depth of Cut
- $a_p$ = Axial Depth of Cut

Formula to find programmed feed rate based on radial engagement and axial depth of cut.

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

Formula to calculate the average chip thickness $h_m$ in relation with radial engagement and depth of cut.

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$

Simplified formulas to evaluate $h_m$ and $f_z$ based on axial depth of cut or radial engagement.

### Calculation of the average chip thickness in relation with the D.O.C. (Axial)

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_p}}$$

- $h_m$ = Average chip thickness
- $a_p$ = Depth of cut
- $f_z$ = Feed per tooth
- $d$ = Insert diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_p}{d}}$$

### Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of Dia.

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

- $h_m$ = Average chip thickness
- $a_e$ = Radial engagement
- $f_z$ = Feed per tooth
- $d$ = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$



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With round inserts, the thickness of the chip varies depending on the axial depth of cut and is related to the size of the cutting edge preparation. For best tool-life it is important to maintain the proper chip thickness as shown below.

### Inserts RP..10T3..

| Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|
| Inserts Geometry | Insert Size | $a_p$ Axial d.o.c. | $h_m$ min. | $h_m$ max. | $f_z$ min. | $f_z$ max. |
| F-701-X4 | 10,00 | 0,25 | 0,02 | 0,08 | 0,13 | 0,51 |
| | 10,00 | 0,50 | 0,02 | 0,08 | 0,09 | 0,36 |
| | 10,00 | 0,75 | 0,02 | 0,08 | 0,07 | 0,29 |
| | 10,00 | 1,00 | 0,02 | 0,08 | 0,06 | 0,25 |
| | 10,00 | 1,25 | 0,02 | 0,08 | 0,06 | 0,23 |
| | 10,00 | 1,50 | 0,02 | 0,08 | 0,05 | 0,21 |
| | 10,00 | 2,00 | 0,02 | 0,08 | 0,04 | 0,18 |
| | 10,00 | 2,50 | 0,02 | 0,08 | 0,04 | 0,16 |
| E-701-X4 | 10,00 | 0,25 | 0,03 | 0,09 | 0,19 | 0,57 |
| | 10,00 | 0,50 | 0,03 | 0,09 | 0,13 | 0,40 |
| | 10,00 | 0,75 | 0,03 | 0,09 | 0,11 | 0,33 |
| | 10,00 | 1,00 | 0,03 | 0,09 | 0,09 | 0,28 |
| | 10,00 | 1,25 | 0,03 | 0,09 | 0,08 | 0,25 |
| | 10,00 | 1,50 | 0,03 | 0,09 | 0,08 | 0,23 |
| | 10,00 | 2,00 | 0,03 | 0,09 | 0,07 | 0,20 |
| | 10,00 | 2,50 | 0,03 | 0,09 | 0,06 | 0,18 |
| E-421-X4 | 10,00 | 0,25 | 0,04 | 0,10 | 0,25 | 0,63 |
| | 10,00 | 0,50 | 0,04 | 0,10 | 0,18 | 0,45 |
| | 10,00 | 0,75 | 0,04 | 0,10 | 0,15 | 0,37 |
| | 10,00 | 1,00 | 0,04 | 0,10 | 0,13 | 0,32 |
| | 10,00 | 1,25 | 0,04 | 0,10 | 0,11 | 0,28 |
| | 10,00 | 1,50 | 0,04 | 0,10 | 0,10 | 0,26 |
| | 10,00 | 2,00 | 0,04 | 0,10 | 0,09 | 0,22 |
| | 10,00 | 2,50 | 0,04 | 0,10 | 0,08 | 0,20 |
| E-41-X4 | 10,00 | 0,25 | 0,04 | 0,12 | 0,25 | 0,76 |
| | 10,00 | 0,50 | 0,04 | 0,12 | 0,18 | 0,54 |
| | 10,00 | 0,75 | 0,04 | 0,12 | 0,15 | 0,44 |
| | 10,00 | 1,00 | 0,04 | 0,12 | 0,13 | 0,38 |
| | 10,00 | 1,25 | 0,04 | 0,12 | 0,11 | 0,34 |
| | 10,00 | 1,50 | 0,04 | 0,12 | 0,10 | 0,31 |
| | 10,00 | 2,00 | 0,04 | 0,12 | 0,09 | 0,27 |
| | 10,00 | 2,50 | 0,04 | 0,12 | 0,08 | 0,24 |
| E-422-X4 | 10,00 | 0,25 | 0,04 | 0,16 | 0,25 | 1,01 |
| | 10,00 | 0,50 | 0,04 | 0,16 | 0,18 | 0,72 |
| | 10,00 | 0,75 | 0,04 | 0,16 | 0,15 | 0,58 |
| | 10,00 | 1,00 | 0,04 | 0,16 | 0,13 | 0,51 |
| | 10,00 | 1,25 | 0,04 | 0,16 | 0,11 | 0,45 |
| | 10,00 | 1,50 | 0,04 | 0,16 | 0,10 | 0,41 |
| | 10,00 | 2,00 | 0,04 | 0,16 | 0,09 | 0,36 |
| | 10,00 | 2,50 | 0,04 | 0,16 | 0,08 | 0,32 |
| RPHT-T-X4 | 10,00 | 0,25 | 0,08 | 0,18 | 0,51 | 1,14 |
| | 10,00 | 0,50 | 0,08 | 0,18 | 0,36 | 0,80 |
| | 10,00 | 0,75 | 0,08 | 0,18 | 0,29 | 0,66 |
| | 10,00 | 1,00 | 0,08 | 0,18 | 0,25 | 0,57 |
| | 10,00 | 1,25 | 0,08 | 0,18 | 0,23 | 0,51 |
| | 10,00 | 1,50 | 0,08 | 0,18 | 0,21 | 0,46 |
| | 10,00 | 2,00 | 0,08 | 0,18 | 0,18 | 0,40 |
| | 10,00 | 2,50 | 0,08 | 0,18 | 0,16 | 0,36 |
| RPMW-T-X4 | 10,00 | 0,25 | 0,13 | 0,19 | 0,82 | 1,20 |
| | 10,00 | 0,50 | 0,13 | 0,19 | 0,58 | 0,85 |
| | 10,00 | 0,75 | 0,13 | 0,19 | 0,47 | 0,69 |
| | 10,00 | 1,00 | 0,13 | 0,19 | 0,41 | 0,60 |
| | 10,00 | 1,25 | 0,13 | 0,19 | 0,37 | 0,54 |
| | 10,00 | 1,50 | 0,13 | 0,19 | 0,34 | 0,49 |
| | 10,00 | 2,00 | 0,13 | 0,19 | 0,29 | 0,42 |
| | 10,00 | 2,50 | 0,13 | 0,19 | 0,26 | 0,38 |

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With round inserts, the thickness of the chip varies depending on the axial depth of cut and is related to the size of the cutting edge preparation. For best tool-life it is important to maintain the proper chip thickness as shown below.

### Inserts RP..1204..

| Dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|
| Inserts Geometry | Insert Size | $a_p$ Axial d.o.c. | $h_m$ min. | $h_m$ max. | $f_z$ min. | $f_z$ max. |
| F-701-X4 | 12,00 | 0,25 | 0,02 | 0,11 | 0,14 | 0,76 |
| | 12,00 | 0,50 | 0,02 | 0,11 | 0,10 | 0,54 |
| | 12,00 | 1,00 | 0,02 | 0,11 | 0,07 | 0,38 |
| | 12,00 | 1,50 | 0,02 | 0,11 | 0,06 | 0,31 |
| | 12,00 | 2,00 | 0,02 | 0,11 | 0,05 | 0,27 |
| | 12,00 | 2,50 | 0,02 | 0,11 | 0,04 | 0,24 |
| | 12,00 | 3,00 | 0,02 | 0,11 | 0,04 | 0,22 |
| | 12,00 | 3,50 | 0,02 | 0,11 | 0,04 | 0,20 |
| E-701-X4 | 12,00 | 0,25 | 0,03 | 0,12 | 0,21 | 0,83 |
| | 12,00 | 0,50 | 0,03 | 0,12 | 0,15 | 0,59 |
| | 12,00 | 1,00 | 0,03 | 0,12 | 0,10 | 0,42 |
| | 12,00 | 1,50 | 0,03 | 0,12 | 0,08 | 0,34 |
| | 12,00 | 2,00 | 0,03 | 0,12 | 0,07 | 0,29 |
| | 12,00 | 2,50 | 0,03 | 0,12 | 0,07 | 0,26 |
| | 12,00 | 3,00 | 0,03 | 0,12 | 0,06 | 0,24 |
| | 12,00 | 3,50 | 0,03 | 0,12 | 0,06 | 0,22 |
| E-421-X4 | 12,00 | 0,25 | 0,04 | 0,14 | 0,28 | 0,97 |
| | 12,00 | 0,50 | 0,04 | 0,14 | 0,20 | 0,69 |
| | 12,00 | 1,00 | 0,04 | 0,14 | 0,14 | 0,48 |
| | 12,00 | 1,50 | 0,04 | 0,14 | 0,11 | 0,40 |
| | 12,00 | 2,00 | 0,04 | 0,14 | 0,10 | 0,34 |
| | 12,00 | 2,50 | 0,04 | 0,14 | 0,09 | 0,31 |
| | 12,00 | 3,00 | 0,04 | 0,14 | 0,08 | 0,28 |
| | 12,00 | 3,50 | 0,04 | 0,14 | 0,07 | 0,26 |
| E-41-X4 | 12,00 | 0,25 | 0,05 | 0,16 | 0,35 | 1,11 |
| | 12,00 | 0,50 | 0,05 | 0,16 | 0,24 | 0,78 |
| | 12,00 | 1,00 | 0,05 | 0,16 | 0,00 | 0,55 |
| | 12,00 | 1,50 | 0,05 | 0,16 | 0,14 | 0,45 |
| | 12,00 | 2,00 | 0,05 | 0,16 | 0,12 | 0,39 |
| | 12,00 | 2,50 | 0,05 | 0,16 | 0,11 | 0,35 |
| | 12,00 | 3,00 | 0,05 | 0,16 | 0,10 | 0,32 |
| | 12,00 | 3,50 | 0,05 | 0,16 | 0,09 | 0,30 |
| E-442-X4 | 12,00 | 0,25 | 0,06 | 0,20 | 0,42 | 1,39 |
| | 12,00 | 0,50 | 0,06 | 0,20 | 0,29 | 0,98 |
| | 12,00 | 1,00 | 0,06 | 0,20 | 0,21 | 0,69 |
| | 12,00 | 1,50 | 0,06 | 0,20 | 0,17 | 0,57 |
| | 12,00 | 2,00 | 0,06 | 0,20 | 0,15 | 0,49 |
| | 12,00 | 2,50 | 0,06 | 0,20 | 0,13 | 0,44 |
| | 12,00 | 3,00 | 0,06 | 0,20 | 0,12 | 0,40 |
| | 12,00 | 3,50 | 0,06 | 0,20 | 0,11 | 0,37 |
| RPHT-T-X4 | 12,00 | 0,25 | 0,10 | 0,21 | 0,69 | 1,45 |
| | 12,00 | 0,50 | 0,10 | 0,21 | 0,49 | 1,03 |
| | 12,00 | 1,00 | 0,10 | 0,21 | 0,35 | 0,73 |
| | 12,00 | 1,50 | 0,10 | 0,21 | 0,28 | 0,59 |
| | 12,00 | 2,00 | 0,10 | 0,21 | 0,24 | 0,51 |
| | 12,00 | 2,50 | 0,10 | 0,21 | 0,22 | 0,46 |
| | 12,00 | 3,00 | 0,10 | 0,21 | 0,20 | 0,42 |
| | 12,00 | 3,50 | 0,10 | 0,21 | 0,19 | 0,39 |
| RPMW-T-X4 | 12,00 | 0,25 | 0,13 | 0,22 | 0,90 | 1,52 |
| | 12,00 | 0,50 | 0,13 | 0,22 | 0,64 | 1,08 |
| | 12,00 | 1,00 | 0,13 | 0,22 | 0,45 | 0.76 |
| | 12,00 | 1,50 | 0,13 | 0,22 | 0,37 | 0.62 |
| | 12,00 | 2,00 | 0,13 | 0,22 | 0,32 | 0.54 |
| | 12,00 | 2,50 | 0,13 | 0,22 | 0,28 | 0.48 |
| | 12,00 | 3,00 | 0,13 | 0,22 | 0,26 | 0.44 |
| | 12,00 | 3,50 | 0,13 | 0,22 | 0,24 | 0.41 |



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**Shank Extension**

| Product | | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| EDP | Item Description | L | $L_1$ | $D_2$ | D | $D_1$ | M |
| 030624 | M-13-M8-CA16-090 | 90 | 40 | 16 | 13 | 8,50 | M8 |
| 030625 | M-13-M8-CA16-110 | 110 | 60 | 16 | 13 | 8,50 | M8 |
| 030626 | M-13-M8-CA16-130 | 130 | 80 | 16 | 13 | 8,50 | M8 |
| 030627 | M-13-M8-CA16-170 | 170 | 120 | 16 | 13 | 8,50 | M8 |
| 030628 | M-18-M10-CA20-110 | 110 | 60 | 20 | 18 | 10,50 | M10 |
| 030629 | M-18-M10-CA20-130 | 130 | 80 | 20 | 18 | 10,50 | M10 |
| 030630 | M-18-M10-CA20-170 | 170 | 120 | 20 | 18 | 10,50 | M10 |
| 030631 | M-18-M10-CA20-190 | 190 | 140 | 20 | 18 | 10,50 | M10 |
| 030632 | M-21-M12-CA25-131 | 131 | 75 | 25 | 21 | 12,50 | M12 |
| 030633 | M-21-M12-CA25-156 | 156 | 100 | 25 | 21 | 12,50 | M12 |
| 030634 | M-21-M12-CA25-181 | 181 | 125 | 25 | 21 | 12,50 | M12 |
| 030635 | M-21-M12-CA25-206 | 206 | 150 | 25 | 21 | 12,50 | M12 |
| 030636 | M-21-M12-CA25-231 | 231 | 175 | 25 | 21 | 12,50 | M12 |
| 030637 | M-29-M16-CA32-160 | 160 | 100 | 32 | 29 | 17,00 | M16 |
| 030638 | M-29-M16-CA32-210 | 210 | 150 | 32 | 29 | 17,00 | M16 |
| 030639 | M-29-M16-CA32-260 | 260 | 200 | 32 | 29 | 17,00 | M16 |
| 030640 | M-29-M16-CA32-310 | 310 | 250 | 32 | 29 | 17,00 | M16 |

Note: Order example with cylindrical shank: M-13-M8-CA16-090

Cylindrical shank extensions can be used with all modular heads found in several product family series within this catalogue.

These extensions have the industry standard of metric threads.

## Technical Advice

| | |
|---|---|
| M | Modular adapter |
| 13 | Diameter in front of the modular shank (D) |
| M8 | Metric Thread (M) |
| CA16 | Cylindrical shank diameter 16mm with through coolant |
| 90 | Total length of the body |

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# 77 Family Geometries

## -25 P P K

This geometry is specifically designed for heavy roughing applications and is the first choice for Steels and Cast Iron.

## -422 P P M M K S

This positive geometry features an 11º chip angle and an “E” edge preparation for roughing and semi finishing applications in difficult to machine materials.

## -41 K

This general purpose utility geometry has a positive cutting action and reinforced cutting edge for medium roughing and semi-finishing applications.

## -442 P P M M K S

This NEW positive roughing and semi-finishing geometry features an 11º chip angle and an “E” edge preparation to minimize the pressure from chip formation.

## -42 M M

This general purpose roughing and semi-finishing geometry features a positive rake and T-land to create a strong cutting edge designed to withstand high cutting forces and interrupted cuts.

## -701 M M N S

This precision ground extreme high positive geometry is especially suitable for finishing a wide range of materials at low feed rates and delivers excellent performance when machining thin-walled components.

## -421 M M S

This high positive geometry features high accuracy periphery grinding for precise control of the cutting edge. For semi-finishing and finishing applications.

| Tool | -25 | -41 | -42 | -421 | -422 | -442 | -701 |
|---|---|---|---|---|---|---|---|
| 7700VR08 | | ● | | | ● | | ● |
| 7710VRD20 | ● | | ● | | | | |
| 7713VR10 | | ● | | ● | ● | | ● |
| 7713VR12 | | ● | | ● | | ● | ● |

## Material Guide – Key to Recommended Inserts

**Material Designation**

P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials



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# 77 Family Grades

| Tool | GH1 | MP91M | SP4019 | SP6519 | X500 | X700 |
|---|---|---|---|---|---|---|
| 7700VR08 | ● | ● | ● | ● | ● | |
| 7710VRD20 | | | | ● | ● | |
| 7713VR10 | ● | ● | ● | ● | ● | ● |
| 7713VR12 | ● | ● | | ● | ● | ● |

## GH1 N

*Uncoated, Micrograin*

This micrograin grade works well with or without coolant with low cutting pressure at high speeds due to sharp cutting edge.

## SP6519 P P M M K S

*Coating Type: PVD, TiAlN*

This grade features a combination of a tough substrate with a new generation of TiAlN super nano coating, making it virtually free of residual stress and extremely hard for unmatched performance.

## MP91M K

*Coating Type: CVD, TiN-MT-TiCN-Al2O3*

With its aluminium oxide coating, this grade is recommended every time wear characteristics are more important than toughness.

## X500 P P M M S

*Coating Type: CVD, TiN-TiC-TiN, X-Grade™ Technology*

High level of shock resistance; operates at low to medium cutting speeds; high metal removal rates while retaining a secure cutting edge.

## SP4019 S

*Coating Type: PVD, TiAlN Micrograin*

This hard grade is designed for light roughing and finishing operations with lower chip sections.

## X700 M M S

*Coating Type: PVD, TiAlN, X-Grade™ Technology*

This combination of a highly durable TiAlN PVD coating and specially developed carbide substrate delivers excellent tool life during long contact times of the cutting edge.

## Material Guide – Key to Recommended Inserts

**Material Designation**

P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials



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# 5230 Chevron Long Edge Milling

## Setting New Standards of Productivity

- Unique insert alignment reduces cutting forces
- Each insert has its own coolant jet for maximum chip evacuation
- Continuous engagement for maximum material removal



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# The 5230VS Series: Cut Machining Time by up to 50% or More

**Shell**
50mm – 100mm

- 90 degree roughing
- High Metal Removal Rates
- High Stability and Rigidity
- Square inserts, 4 cutting edges
- Three grades, four geometries
- Shell and Cylindrical construction
- Standard and long series available
- Cutting diameters from 50mm to 100mm
- Insert sizes 9,52mm and 12,70mm
- Depth of cut from 51mm to 133mm

## 5230 Case Histories

Material: Titanium 555-3
Cutter: 5230VS12 (63mm Cutter)
Component: Landing Gear
Industry: Aerospace
Insert Grade: X500
RPM: 150
Cutting Speed $V_C$: 29,7 m/min
Feed per Tooth $f_Z$: 0,1 mm/min
Feed Rate: 60 mm/min
Depth of Cut $a_p$: 50mm

***Increased Metal Removal Rate by 300%!***

Material: Titanium 6-4
Cutter: 5230VS12 (80mm Cutter)
Component: Bulkhead
Industry: Aerospace
Insert Grade: X500
RPM: 275
Cutting Speed $V_C$: 69,0 m/min
Feed per Tooth $f_Z$: 0,1 mm/min
Feed Rate: 148 mm/min
Depth of Cut $a_p$: 60mm

***Incredible Metal Removal Rate of 43 in³ / min.***



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# Engineered from the Inside Out

## *Axial Engagement is the Key*

The advanced Chevron Design ensures that one cutting point is always in contact with the material during entrance and exit. This provides optimum harmonic stability, reducing power consumption and maximizing tool life.

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**Shell Mill Fixation**

| Product | | Dimensions (mm) | | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | $a_p$ max Slotting* | No. of flutes | No. of inserts | *EDP* | | *EDP* | | Screw Tightening Nm |
| **5230VS09 Shell Mill Fixation** | | | | | | | | | | | | | | |
| *031419* | 5230VS09-A050Z4R51 | 50 | 76 | - | 27 | 51 | 44 | 4 | 28 | *015269* | F3508T | *015240* | T15 | 2,10 |
| *031603* | 5230VS09-A050Z4R80 | 50 | 106 | - | 27 | 80 | - | 4 | 44 | *015269* | F3508T | *015240* | T15 | 2,10 |

* Note: Please do not surpass the recommended max. $a_p$ for slotting.

Shell Mills are supplied with inserts screws, coolant control screws, steel coolant plug, nord-lock washer and mounting screw.

## 5230VS09 Spare Parts

| Cutter | Coolant Control Screw | | | *Screwdriver EDP* | | Steel Coolant Plug | | Coolant Plug tightening Nm |
|---|---|---|---|---|---|---|---|---|
| | *Screw EDP* | Screw | Qty. | | | *EDP* | Description | |
| 5230VS09-A050Z4R51 | *015062* | F3006T | 8 | *013214* | T9 | *031436* | SB-3413 | 34 |
| 5230VS09-A050Z4R80 | | | 12 | | | *031582* | SB-3621 | |

## 5230VS09 Torque Values and Spare Parts

| Cutter | Nord Lock Washer | | Mounting Bolt | | **Torque Values in Nm | |
|---|---|---|---|---|---|---|
| | *EDP* | Description | *EDP* | Description | Normal Condition | Excessive Condition |
| 5230VS09-A050Z4R51<br>5230VS09-A050Z4R80 | *031258* | NLW-0.375 | *031268* | M12-1.75 ISO x 30mm SHCS | 80 | 100 |

** Torque values for mounting bolts. Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

## 5230VS09 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | Max RPM |
| *031419* | 5230VS09-A050Z4R51 | 50 | - | - | - | - | 32500 |
| *031603* | 5230VS09-A050Z4R80 | 50 | - | - | - | - | 32500 |

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SDHT09-422

SDHT09-423

SDMT09-41

SDMW09-TN

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max* or $a_e$ max.* | $a_p$ max. and $a_e$ max. 15% D** | $a_p$ min. - max. | d (IC) | l | s | r | $h_m$ min |
| 031261 | SDHT09T308EN-422 | X500 | ◆ ■ | ● ● ● | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,03 |
| 033075 | SDHT09T308EN-422 | SP6519 | ◆ ● | ◆ ◆ ■ | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,03 |
| 031260 | SDHT09T308EN-423 | X500 | ■ ◆ | - | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,04 |
| 033074 | SDHT09T308EN-423 | SP6519 | ■ ● | ■ ■ ◆ | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,04 |
| 014410 | SDMT09T308EN-41 | X500 | ● | ■ ■ ● | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,04 |
| 031479 | SDMT09T308EN-41 | SP6519 | ■ ■ ● | ■ | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,04 |
| 017325 | SDMT09T308EN-41 | MP91M | ■ | ● ● ◆ | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,04 |
| 015232 | SDMW09T308TN | X500 | ● ● | - | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,15 |
| 031482 | SDMW09T308TN | SP6519 | ◆ ◆ | - | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,15 |
| 017327 | SDMW09T308TN | MP91M | ◆ | - | - | 9,52 | 9,52 | 3,97 | 0,80 | 0,15 |

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 63.

* Note: Please do not surpass the recommended max. $a_p$ for slotting as shown on the steel body page 52.

* Note: $a_p$ max. for profiling is only possible when $a_e$ < 75% of the Diameter.

** Note: For semi finishing, axial engagement **$a_p$** for slotting and radial engagement **$a_e$** for profiling should be max. 15% of the Diameter. SDHT09T308EN-423 to be used in unstable conditions.

Note: Feed recommendations can be found on page 54. Speed recommendations can be found on page 55.

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## 5230VS09 Feeds $f_z$ (mm/flute)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| EN-422 | X500 | Shoulder/ Profiling | - | - | 0,05 - 0,13 | 0,05 - 0,12 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | 0,05 - 0,11 | - | - |
| | | Slotting | - | - | 0,04 - 0,11 | 0,04 - 0,10 | - | - | - | - | - | 0,05 - 0,07 | 0,05 - 0,07 | 0,05 - 0,08 | 0,05 - 0,09 | - | - |
| EN-422 | SP6519 | Shoulder/ Profiling | - | - | 0,05 - 0,12 | 0,05 - 0,11 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | 0,05 - 0,11 | - | - |
| | | Slotting | - | - | 0,04 - 0,10 | 0,04 - 0,09 | - | - | - | - | - | 0,05 - 0,07 | 0,05 - 0,07 | 0,05 - 0,08 | 0,05 - 0,09 | - | - |
| EN-423 | X500 | Shoulder/ Profiling | - | - | - | 0,05 - 0,12 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | 0,05 - 0,11 | - | - |
| | | Slotting | - | - | - | 0,05 - 0,10 | - | - | - | - | - | 0,05 - 0,07 | 0,05 - 0,07 | 0,05 - 0,08 | 0,05 - 0,09 | - | - |
| EN-423 | SP6519 | Shoulder/ Profiling | - | - | 0,05 - 0,13 | 0,05 - 0,11 | - | - | - | - | - | 0,05 - 0,08 | 0,05 - 0,08 | 0,05 - 0,10 | 0,05 - 0,11 | - | - |
| | | Slotting | - | - | 0,04 - 0,10 | 0,04 - 0,09 | - | - | - | - | - | 0,05 - 0,07 | 0,05 - 0,07 | 0,05 - 0,08 | 0,05 - 0,09 | - | - |
| EN-41 | X500 | Shoulder/ Profiling | 0,05 - 0,15 | 0,05 - 0,14 | 0,05 - 0,13 | - | 0,05 - 0,15 | 0,05 - 0,15 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,12 | 0,05 - 0,11 | 0,05 - 0,11 | - | 0,05 - 0,12 | 0,05 - 0,12 | 0,05 - 0,11 | - | - | - | - | - | - | - | - |
| EN-41 | SP6519 | Shoulder/ Profiling | 0,05 - 0,15 | 0,05 - 0,14 | - | - | 0,05 - 0,15 | 0,05 - 0,15 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,12 | 0,05 - 0,11 | - | - | 0,05 - 0,12 | 0,05 - 0,12 | 0,05 - 0,11 | - | - | - | - | - | - | - | - |
| EN-41 | MP91M | Shoulder/ Profiling | 0,05 - 0,13 | 0,05 - 0,13 | - | - | 0,05 - 0,15 | 0,05 - 0,15 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,11 | 0,05 - 0,10 | - | - | 0,05 - 0,12 | 0,05 - 0,12 | 0,05 - 0,11 | - | - | - | - | - | - | - | - |
| TN | X500 | Shoulder/ Profiling | 0,15 - 0,18 | 0,15 -0,17 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TN | SP6519 | Shoulder/ Profiling | 0,15 - 0,18 | 0,15 - 0,17 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TN | MP91M | Shoulder/ Profiling | - | - | - | - | 0,15 - 0,18 | 0,15 - 0,18 | 0,15 - 0,17 | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Note: HTA = High Temperature Alloys

Note: Above feed rates are calculated on centreline.

Speed recommendations can be found on page 55.



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## Speed $v_c$ (m/min)

| 5230VS Series | | | Wear Resistance – + | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Speed min. - max. | | | | | | | | |
| Coolant Recommendation<br>Recommended ● Possible ⦿ | | | | | CVD<br>X Grade | | | PVD<br>Standard | | | CVD<br>Standard |
| ISO | Materials | Rm and Hardness | | | X500 | | | SP6519 | | | MP91M |
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 130 - 270 | ⦿ | ● | 130 - 295 | | ● | 140 - 345 |
| | | <950 N/mm² <280 HBN | | | 115 - 240 | | | 115 - 260 | | | 120 - 305 |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 100 - 210 | ⦿ | ● | 100 - 230 | | ● | 105 - 270 |
| | | 950-1200 N/mm² 280-355 HBN | | | 75 - 160 | | | 75 - 175 | | | 80 - 205 |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 50 - 100 | | ● | 50 - 110 | | ● | 50 - 130 |
| M | Stainless Steel | Austenitic + Ferritic 300 series | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 270 | | | |
| | | Martensitic 400 series | | | 100 - 220 | | | 105 - 235 | | | |
| | PH Stainless | Refractory P.H. | ● | | 50 - 110 | ● | | 50 - 120 | | | |
| K | Cast Iron | Grey GG-Ft | ⦿ | ● | 120 - 280 | ⦿ | ● | 140 - 295 | | ● | 145 - 365 |
| | | Spheroidal-Ductile GGG-FGS | | | 105 - 205 | | | 110 - 240 | | | 115 - 285 |
| | | Malleable GTS - MN/MP | | | 95 - 170 | | | 100 - 220 | | | 105 - 260 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | | | | | | | |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | | | | | | | |
| S | High Temperature Alloys | Iron Based | ● | | 23 - 48 | ● | | 23 - 55 | | | |
| | | Cobalt Based | | | 21 - 44 | | | 22 - 48 | | | |
| | | Nickel Based | | | 24 - 51 | | | 25 - 55 | | | |
| | | Titanium Based | | | 35 - 73 | | | 36 - 79 | | | |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | | | | | | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | | | | | | | |

# 5230VS12
## Chevron Long Edge Milling Cutter (Porcupine)

Shell Mill Fixation

| Product | | Dimensions (mm) | | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | ap max | ap max Slotting* | No. of flutes | No. of inserts | *EDP* | | *EDP* | | Screw Tightening Nm |
| **5230VS12 Shell Mill Fixation** | | | | | | | | | | | | | | |
| *031228* | 5230VS12-A063Z4R57 | 63 | 85 | - | 27 | 57 | 52 | 4 | 24 | *015270* | F4011T | *015241* | T20 | 3,10 |
| *031229* | 5230VS12-A063Z4R94 | 63 | 124 | - | 27 | 94 | - | 4 | 40 | *015270* | F4011T | *015241* | T20 | 3,10 |
| *031604* | 5230VS12-A080Z5R65 | 80 | 95 | - | 32 | 65 | 60 | 5 | 35 | *015270* | F4011T | *015241* | T20 | 3,10 |
| *031605* | 5230VS12-A080Z5R110 | 80 | 143 | - | 32 | 110 | - | 5 | 60 | *015270* | F4011T | *015241* | T20 | 3,10 |
| *031232* | 5230VS12-A100Z6R76 | 100 | 106 | - | 40 | 76 | 70 | 6 | 48 | *015270* | F4011T | *015241* | T20 | 3,10 |
| *031233* | 5230VS12-A100Z6R133 | 100 | 165 | - | 40 | 133 | - | 6 | 84 | *015270* | F4011T | *015241* | T20 | 3,10 |

* Note: Please do not surpass the recommended max. $a_p$ for slotting.

Shell Mills are supplied with inserts screws, coolant control screws, steel coolant plug, nord-lock washer and mounting screw.

### 5230VS12 Spare Parts

| Cutter | Coolant control screw | | | *Screwdriver EDP* | | Steel Coolant Plug | | Coolant Plug tightening Nm |
|---|---|---|---|---|---|---|---|---|
| | *Screw EDP* | Screw | Qty. | | | *EDP* | Description | |
| 5230VS12-A063Z4R57 | *015062* | F3006T | 8 | *013214* | T9 | *031262* | SB-3229 | 34 |
| 5230VS12-A063Z4R94 | | | 12 | | | *031263* | SB-3230 | |
| 5230VS12-A080Z5R65 | | | 10 | | | *031264* | SB-3231 | 61 |
| 5230VS12-A080Z5R110 | | | 15 | | | *031265* | SB-3232 | |
| 5230VS12-A100Z6R76 | | | 12 | | | *031266* | SB-3233 | 61 |
| 5230VS12-A100Z6R133 | | | 18 | | | *031267* | SB-3234 | |

### 5230VS12 Torque Values and Spare Parts

| Cutter | Nord Lock Washer | | Mounting Bolt | | **Torque Values in Nm | |
|---|---|---|---|---|---|---|
| | *EDP* | Description | *EDP* | Description | Normal Condition | Excessive Condition |
| 5230VS12-A063Z4R57 | *031258* | NLW-0.375 | *031268* | M12-1.75 ISO x 30mm SHCS | 80 | 100 |
| 5230VS12-A063Z4R94 | | | | | | |
| 5230VS12-A080Z5R65 | *031226* | NLW-12SP | *031269* | M16-2 ISO x 40mm SHCS | 110 | 150 |
| 5230VS12-A080Z5R110 | | | | | | |
| 5230VS12-A100Z6R76 | *031259* | NLW-16SP | *031270* | M20-2.5 ISO x 50mm SHCS | 120 | 180 |
| 5230VS12-A100Z6R133 | | | | | | |

** Torque values for mounting bolts. Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

### 5230VS12 Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | ap max Helical / Linear | Max RPM |
| *031228* | 5230VS12-A063Z4R57 | 63 | - | - | - | - | 21000 |
| *031229* | 5230VS12-A063Z4R94 | 63 | - | - | - | - | 21000 |
| *031604* | 5230VS12-A080Z5R65 | 80 | - | - | - | - | 18500 |
| *031605* | 5230VS12-A080Z5R110 | 80 | - | - | - | - | 18500 |
| *031232* | 5230VS12-A100Z6R76 | 100 | - | - | - | - | 16000 |
| *031233* | 5230VS12-A100Z6R133 | 100 | - | - | - | - | 16000 |

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SDHT12-422

SDHT12-423

SDMT12-41

SDMW12

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max* or $a_e$ max.* | $a_p$ max. and $a_e$ max. 15% D** | $a_p$ min. - max. | d (IC) | l | s | r | $h_m$ min |
| 030717 | SDHT120412EN-422 | X500 | ◆◆ | ●●● | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,05 |
| 030728 | SDHT120412EN-422 | SP6519 | ◆● | ◆◆◆ | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,05 |
| 031218 | SDHT120412EN-423 | X500 | ■■ | - | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,06 |
| 031321 | SDHT120412EN-423 | SP6519 | ■● | ■■■ | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,06 |
| 014411 | SDMT120412EN-41 | X500 | ● | ■■● | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,05 |
| 031480 | SDMT120412EN-41 | SP6519 | ■■● | ◆◆■ | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,05 |
| 017326 | SDMT120412EN-41 | MP91M | ■ | ●●◆ | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,05 |
| 015233 | SDMW120412TN | X500 | ●● | - | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,15 |
| 034518 | SDMW120412TN | SP6519 | ◆◆ | - | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,15 |
| 017328 | SDMW120412TN | MP91M | ◆ | - | - | 12,70 | 12,70 | 4,76 | 1,20 | 0,15 |

Machining Choice: ◆ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 63.

* Note: Please do not surpass the recommended max. $a_p$ for slotting as shown on the steel body page 56.

* Note: $a_p$ max. for profiling is only possible when $a_e$ < 75% of the Diameter.

** Note: For semi finishing, axial engagement **$a_p$** for slotting and radial engagement **$a_e$** for profiling should be max. 15% of the Diameter. SDHT120412EN-423 to be used in unstable conditions.

Note: Feed recommendations can be found on page 58. Speed recommendations can be found on page 59.

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## 5230VS12 Feeds $f_z$ (mm/flute)

| Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chilled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| EN-422 | X500 | Shoulder/ Profiling | - | - | 0,05 - 0,15 | 0,05 - 0,14 | - | - | | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,11 | 0,05 - 0,14 | - | - |
| | | Slotting | - | - | 0,05 - 0,12 | 0,05 - 0,11 | - | - | | - | - | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,11 | - | - |
| EN-422 | SP6519 | Shoulder/ Profiling | - | - | 0,05 - 0,15 | 0,05 - 0,14 | - | - | | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,11 | 0,05 - 0,14 | - | - |
| | | Slotting | - | - | 0,05 - 0,12 | 0,05 - 0,11 | - | - | | - | - | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,11 | - | - |
| EN-423 | X500 | Shoulder/ Profiling | - | - | - | 0,05 - 0,14 | - | - | | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,11 | 0,05 - 0,14 | - | - |
| | | Slotting | - | - | - | 0,05 - 0,11 | - | - | | - | - | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,11 | - | - |
| EN-423 | SP6519 | Shoulder/ Profiling | - | - | 0,05 - 0,15 | 0,05 - 0,14 | - | - | | - | - | 0,05 - 0,10 | 0,05 - 0,10 | 0,05 - 0,11 | 0,05 - 0,14 | - | - |
| | | Slotting | - | - | 0,05 - 0,12 | 0,05 - 0,11 | - | - | | - | - | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,09 | 0,05 - 0,11 | - | - |
| EN-41 | X500 | Shoulder/ Profiling | 0,05 - 0,17 | 0,05 - 0,16 | 0,05 - 0,15 | - | 0,05 - 0,17 | 0,05 - 0,17 | 0,05 - 0,16 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,14 | 0,05 - 0,13 | 0,05 - 0,12 | - | 0,05 - 0,14 | 0,05 - 0,14 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| EN-41 | SP6519 | Shoulder/ Profiling | 0,05 - 0,17 | 0,05 - 0,16 | - | - | 0,05 - 0,17 | 0,05 - 0,17 | 0,05 - 0,16 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,14 | 0,05 - 0,13 | - | - | 0,05 - 0,14 | 0,05 - 0,14 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| EN-41 | MP91M | Shoulder/ Profiling | 0,05 - 0,17 | 0,05 - 0,16 | - | - | 0,05 - 0,17 | 0,05 - 0,17 | 0,05 - 0,16 | - | - | - | - | - | - | - | - |
| | | Slotting | 0,05 - 0,14 | 0,05 - 0,13 | - | - | 0,05 - 0,14 | 0,05 - 0,14 | 0,05 - 0,13 | - | - | - | - | - | - | - | - |
| TN | X500 | Shoulder/ Profiling | 0,15 - 0,20 | 0,15 - 0,18 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TN | SP6519 | Shoulder/ Profiling | 0,15 - 0,20 | 0,15 - 0,18 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TN | MP91M | Shoulder/ Profiling | - | - | - | - | 0,15 - 0,20 | 0,15 - 0,20 | 0,15 - 0,18 | - | - | - | - | - | - | - | - |
| | | Slotting | - | - | - | - | - | - | - | - | - | - | - | - | - | | |

Note: HTA = High Temperature Alloys

Note: Above feed rates are calculated on centreline.

Speed recommendations can be found on page 59.



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## Speed $v_c$ (m/min)

| 5230VS Series | | | Wear Resistance – + | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Speed min. - max. | | | | | | | | |
| Coolant Recommendation<br>Recommended ● Possible ⦿ | | | | | CVD<br>X Grade | | | PVD<br>Standard | | | CVD<br>Standard |
| ISO | Materials | Rm and Hardness | | | X500 | | | SP6519 | | | MP91M |
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 130 - 270 | ⦿ | ● | 130 - 295 | | ● | 140 - 345 |
| | | <950 N/mm² <280 HBN | | | 115 - 240 | | | 115 - 260 | | | 120 - 305 |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 100 - 210 | ⦿ | ● | 100 - 230 | | ● | 105 - 270 |
| | | 950-1200 N/mm² 280-355 HBN | | | 75 - 160 | | | 75 - 175 | | | 80 - 205 |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 50 - 100 | | ● | 50 - 110 | | ● | 50 - 130 |
| M | Stainless Steel | Austenitic + Ferritic 300 series | ⦿ | ● | 115 - 250 | ⦿ | ● | 115 - 270 | | | |
| | | Martensitic 400 series | | | 100 - 220 | | | 105 - 235 | | | |
| | PH Stainless | Refractory P.H. | ● | | 50 - 110 | ● | | 50 - 120 | | | |
| K | Cast Iron | Grey GG-Ft | ⦿ | ● | 120 - 280 | ⦿ | ● | 140 - 295 | | ● | 145 - 365 |
| | | Spheroidal-Ductile GGG-FGS | | | 105 - 205 | | | 110 - 240 | | | 115 - 285 |
| | | Malleable GTS - MN/MP | | | 95 - 170 | | | 100 - 220 | | | 105 - 260 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | | | | | | | |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | | | | | | | |
| S | High Temperature Alloys | Iron Based | ● | | 23 - 48 | ● | | 23 - 55 | | | |
| | | Cobalt Based | | | 21 - 44 | | | 22 - 48 | | | |
| | | Nickel Based | | | 24 - 51 | | | 25 - 55 | | | |
| | | Titanium Based | | | 35 - 73 | | | 36 - 79 | | | |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | | | | | | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | | | | | | | |

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**Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of dia.**

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

$h_m$ = Average chip thickness
$a_e$ = Radial engagement
$f_z$ = Feed per tooth
$d$ = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

**$h_m$ Correction Coefficient Chart**

| Cutter Ø 50mm | | | Cutter Ø 63mm | | | Cutter Ø 80mm | | | Cutter Ø 100mm | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $a_e$% | $a_e$ (mm) | Coefficient Factor | $a_e$% | $a_e$ (mm) | Coefficient Factor | $a_e$% | $a_e$ (mm) | Coefficient Factor | $a_e$% | $a_e$ (mm) | Coefficient Factor |
| 5 | 2,50 | 2,30 | 5 | 3,15 | 2,30 | 5 | 4,00 | 2,30 | 5 | 5,00 | 2,30 |
| 10 | 5,00 | 1,66 | 10 | 6,30 | 1,66 | 10 | 8,00 | 1,66 | 10 | 10,00 | 1,66 |
| 15 | 7,5 | 1,40 | 15 | 9,45 | 1,40 | 15 | 12,00 | 1,40 | 15 | 15,00 | 1,40 |
| 20 | 10,00 | 1,25 | 20 | 12,60 | 1,25 | 20 | 16,00 | 1,25 | 20 | 20,00 | 1,25 |
| 25 | 12,50 | 1,16 | 25 | 15,75 | 1,16 | 25 | 20,00 | 1,16 | 25 | 25,00 | 1,16 |
| 35 | 17,50 | 1,05 | 35 | 22,05 | 1,05 | 35 | 28,00 | 1,05 | 35 | 35,00 | 1,05 |
| 50 - 100 | 25,00 - 50,00 | 1,00 | 50 - 100 | 31,50 - 63,00 | 1,00 | 50 - 100 | 40,00 - 80,00 | 1,00 | 50 - 100 | 50,00 - 100,00 | 1,00 |

Example: A 50mm diameter cutter using 5,00mm radial engagement ($a_e$) = 10% of the cutter diameter.

At 10%, your coefficient is 1,66 (see above table); therefore you must multiply your feed rate by 1,66 for correcting the feed for profiling.

The chart above shows the multiplication factor for the feed rate based on the percentage of the radial engagement of the cutter diameter.

Wiper pockets are identified with a **W** engraved on the face of the body.

The 5230VS cutter series is designed with wiper pockets which provide a much better face surface finish. The non-wiper pockets generate the 90° corner. The same inserts can be utilised in all pockets.

Pockets setting difference between wiper and non-wiper inserts.

Note: The true cutter diameter is measured at the non-wiper pockets.

Non wiper pocket positions are set back & square to axis to give a true 90 degree approach.

Wiper pocket positions are in front and angled to allow facing.

| Cutter Diameter (mm) | No. of Wiper Inserts |
|---|---|
| 50 | 2 |
| 63 | 2 |
| 80 | 3 |
| 100 | 3 |



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## 5230VS09 and VS12 Fitting Instructions for Shell Mill Cutters

**NOTE:** All Shell Mill 5230VS09 and VS12 Chevron Porcupine Cutters are supplied assembled with mounting bolt, nord lock washer and steel coolant plug.

Please follow the instructions below to disassemble the cutter, attach the cutter to a shell mill adapter and reassemble coolant plug. It is very important to use the proper torque when reassembling the cutter with the mounting bolt, nord lock washer and coolant plug.

### Example of cutter: 5230VS12-A063Z4R94 assembly

1. Remove coolant plug. *(Note: Ensure the nord lock washer is retained to the bottom of the coolant plug.)*

2. Fit the cutter body to the shell mill adapter and secure using the mounting bolt supplied with the cutter.
   Note: The mounting bolt must be properly torqued to the specified torque setting shown in the above chart in (page 62) Detail 1.

3. Refit coolant plug ensuring nord lock washer is present and in the proper location on the bottom of the coolant plug.
   A small amount of grease can be used to hold the nord lock washer in place.

4. Tighten coolant plug with specified torque setting shown in the above chart in (page 62) Detail 2.

5. Note: If axial depth of cut ($a_p$) is less then maximum $a_p$ of the cutter, then F3006T coolant control screws supplied separately can be used to block coolant holes forcing more coolant to the front of the cutter. If these screws are used, please secure with loctite or similar product.



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**Torque values for mounting bolts**
Excessive condition is when long reach extensions are required or when cutting parameters are elevated to extreme parameters.

| 5230VS09 | Detail 1 | | | Detail 2 | |
|---|---|---|---|---|---|
| Cutter | Mounting Bolt Description | **Torque Values in Nm for Mounting Bolt | | Coolant Plug Description | Coolant Plug tightening Nm |
| | | Normal Condition | Excessive Condition | | |
| 5230VS09-A050Z4R51 | M12-1.75 ISO x 30mm SHCS | 80 | 100 | SB-3413 | 34 |
| 5230VS09-A050Z4R80 | | | | SB-3621 | |

| 5230VS12 | Detail 1 | | | Detail 2 | |
|---|---|---|---|---|---|
| Cutter | Mounting Bolt Description | **Torque Values in Nm for Mounting Bolt | | Coolant Plug Description | Coolant Plug tightening Nm |
| | | Normal Condition | Excessive Condition | | |
| 5230VS12-A063Z4R57 | M12-1.75 ISO x 30mm SHCS | 80 | 100 | SB-3229 | 34 |
| 5230VS12-A063Z4R94 | | | | SB-3230 | |
| 5230VS12-A080Z5R65 | M16-2 ISO x 40mm SHCS | 110 | 150 | SB-3231 | 61 |
| 5230VS12-A080Z5R110 | | | | SB-3232 | |
| 5230VS12-A100Z6R76 | M20-2.5 ISO x 50mm SHCS | 120 | 180 | SB-3233 | 61 |
| 5230VS12-A100Z6R133 | | | | SB-3234 | |

| Hex Keys |
|---|
| |
| M12 = Hex Key Size 10 |
| M16 = Hex Key Size 14 |
| M20 = Hex Key Size 17 |



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## 5230 Geometries

### -41 P P K

This general purpose utility geometry has a positive cutting action and reinforced cutting edge for medium roughing and semi-finishing applications.

### -423 S

A strong positive geometry featuring a smaller primary angle and a small controlled hone to reduce cutting pressures, followed by a higher secondary angle to allow free cutting of the chip without rubbing on the insert rake face. Chip flow compresses the chip for easy evacuation.

### -422 M M S

This positive geometry features an 11º chip angle and an "E" edge preparation for roughing and semi-finishing applications in difficult to machine materials.

### -TN P P K

This geometry is a flat top design with a strong T-land edge preparation for preventing chipping in unstable conditions. It has a smaller edge preparation which reduces machine power consumption.

## 5230 Grades

### X500 M S

*Coating Type: CVD, TiN-TiC-TiN, X-Grade™ Technology*

High level of shock resistance; operates at the low to medium cutting speeds; high metal removal rates while retaining a secure cutting edge.

### SP6519 P P M M S

*Coating Type: PVD, TiAlN*

This grade features a combination of a tough substrate with a new generation of TiAlN super nano coating, making it virtually free of residual stress and extremely hard for unmatched performance.

### MP91M K

*Coating Type: CVD, TiN-MT-TiCN-Al2O3*

With its Aluminium Oxide coating, this grade is recommended every time wear characteristics are more important than toughness.

**Material Guide –** Key to Recommended Inserts

| Material Designation | | | | | | | |
|---|---|---|---|---|---|---|---|
| P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials |



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# 5505 Ball Nose Contour Milling

## Contour Milling of Mild Steels to High Temperature Superalloys



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# 5505VX State of the Art Ball Nose Cutters

**Weldon**
20mm – 50mm

- Reinforced design for heavy machining
- High volume of chip cutting
- Excellent chip control and evacuation

**Cylindrical**
16mm – 32mm

5505VX Ball Nose Cutters are ideal for roughing and semi-finishing of profiles and complex contours in Steel, Alloyed Steel, Stainless Steel, High Temperature Alloys and Cast Iron.

- One grade, one geometry does it all
- Helical insert design and rigid fixation for increased speeds and feeds
- Double edge insert is indexable for reduced inventory
- Slotting to full radius

**Modular**
16mm – 32mm

## Case History

Material: Stainless Steel 403
Cutter: 5505VX (25mm Cutter)
Component: Turbine Blade
Industry: Power Generation
Insert Grade: SP6519
RPM: 2293
Cutting Speed $V_C$: 183 m/min
Feed per Tooth $f_Z$: 0,28mm
Feed Rate: 1285 mm/min
Depth of cut $a_p$: 3,18mm

***40% Increase in Productivity***



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# 5505VX Heavy Duty Ball Nose Cutters

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Weldon Shank

Cylindrical Shank

Modular Head

Depth of Cut ($a_p$)

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **5505VX Weldon Shank** | | | | | | | | | | | | |
| *032133* | 5505VX20WA020R34 | 20 | 106 | 34 | 25 | 20 | 2 | *030672* | FP3007T | *031451* | TP8 | 1,80 |
| *030840* | 5505VX25WA025R60 | 25 | 116 | 60 | 25 | 25 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *032132* | 5505VX25WA025R69 | 25 | 150 | 69 | 32 | 25 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *030842* | 5505VX32WA032R75 | 32 | 130 | 75 | 32 | 32 | 2 | *015266* | D5013T | *015241* | T20 | 6,00 |
| *030843* | 5505VX32WA032R100 | 32 | 160 | 100 | 32 | 32 | 2 | *015266* | D5013T | *015241* | T20 | 6,00 |
| *030844* | 5505VX40WA040R100 | 40 | 170 | 100 | 40 | 40 | 2 | *029640* | D6014T | *015241* | T20 | 10,50 |
| *030845* | 5505VX40WA040R150 | 40 | 220 | 150 | 40 | 40 | 2 | *029640* | D6014T | *015241* | T20 | 10,50 |
| *030846* | 5505VX50WA050R100 | 50 | 170 | 100 | 40 | 50 | 2 | *029641* | F8017S | *018288* | KH5005 | 24,50 |
| *030847* | 5505VX50WA050R150 | 50 | 230 | 150 | 50 | 50 | 2 | *029641* | F8017S | *018288* | KH5005 | 24,50 |
| **5505VX Cylindrical Shank** | | | | | | | | | | | | |
| *030982* | 5505VX16CA20/016R30 | 16 | 180 | 30 | 20 | 16 | 2 | *031448* | FP3006T | *031451* | TP8 | 1,80 |
| *030983* | 5505VX20CA25/020R40 | 20 | 200 | 40 | 25 | 20 | 2 | *030672* | FP3007T | *031451* | TP8 | 1,80 |
| *030984* | 5505VX25CA025R55 | 25 | 250 | 55 | 25 | 25 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *030985* | 5505VX25CA32/025R55 | 25 | 250 | 55 | 32 | 25 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *030986* | 5505VX32CA032R65 | 32 | 250 | 65 | 32 | 32 | 2 | *015266* | D5013T | *015241* | T20 | 6,00 |

| Product | | Dimensions (mm) | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | M | $d_1$ | $a_p$ max | No. of Teeth | *EDP* | | *EDP* | | Screw Tightening Nm |
| **5505VX Modular Head** | | | | | | | | | | | | |
| *030849* | 5505VX16SA016R25 | 16 | 25 | M8 | 8.5 | 16 | 2 | *031448* | FP3006T | *031451* | TP8 | 1,80 |
| *030850* | 5505VX20SA020R35 | 20 | 35 | M10 | 10.5 | 20 | 2 | *030672* | FP3007T | *031451* | TP8 | 1,80 |
| *030851* | 5505VX25SA025R40 | 25 | 40 | M12 | 12.5 | 25 | 2 | *015262* | D4010T | *015240* | T15 | 3,10 |
| *030852* | 5505VX32SA032R50 | 32 | 50 | M16 | 17.0 | 32 | 2 | *015266* | D5013T | *015241* | T20 | 6,00 |

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 74.

Note: Do not remove the radial screw; this is a fixed location for the insert see page 72.



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## 5505VX Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | Max RPM |
| *032133* | 5505VX20WA020R34 | - | 85 | - | - | - | 34750 |
| *030840* | 5505VX25WA025R60 | - | 85 | - | - | - | 30500 |
| *032132* | 5505VX25WA025R69 | - | 85 | - | - | - | 30500 |
| *030842* | 5505VX32WA032R75 | - | 85 | - | - | - | 23250 |
| *030843* | 5505VX32WA032R100 | - | 85 | - | - | - | 23250 |
| *030844* | 5505VX40WA040R100 | - | 85 | - | - | - | 17250 |
| *030845* | 5505VX40WA040R150 | - | 85 | - | - | - | 17250 |
| *030846* | 5505VX50WA050R100 | - | 85 | - | - | - | 17250 |
| *030847* | 5505VX50WA050R150 | - | 85 | - | - | - | 17250 |
| *030982* | 5505VX16CA20/016R30 | - | 85 | - | - | - | 54000 |
| *030983* | 5505VX20CA25/020R40 | - | 85 | - | - | - | 34750 |
| *030984* | 5505VX25CA025R55 | - | 85 | - | - | - | 30500 |
| *030985* | 5505VX25CA32/025R55 | - | 85 | - | - | - | 30500 |
| *030986* | 5505VX32CA032R65 | - | 85 | - | - | - | 23250 |
| *030849* | 5505VX16SA016R25 | - | 85 | - | - | - | 54000 |
| *030850* | 5505VX20SA020R35 | - | 85 | - | - | - | 34750 |
| *030851* | 5505VX25SA025R40 | - | 85 | - | - | - | 30500 |
| *030852* | 5505VX32SA032R50 | - | 85 | - | - | - | 23250 |

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XPNT-F

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| *EDP* | Item Description | Grade | $a_p$ max.* | $a_e$ / $a_p$ max. 10% of the cutter diameter | $a_e$ / $a_p$ max. - | d (IC) | l | s | r | $h_m$ min |
| *030737* | XPNT16/160308.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 7,40 | 17,40 | 3,18 | 8,00 | 0,04 |
| *030743* | XPNT20/20T306.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 9,00 | 20,85 | 3,97 | 10,00 | 0,04 |
| *030746* | XPNT25/250408.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 11,00 | 26,00 | 4,76 | 12,50 | 0,04 |
| *030749* | XPNT32/320612.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 14,10 | 33,40 | 6,35 | 16,00 | 0,04 |
| *030755* | XPNT40/40T716.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 18,00 | 41,84 | 7,95 | 20,00 | 0,04 |
| *030758* | XPNT50/50T716.R-F | SP6519 | ♦♦♦♦♦♦ | ♦♦♦♦♦♦ | - | 22,25 | 52,86 | 7,95 | 25,00 | 0,04 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 73.

* Note: $a_p$ max. is dependent on several insert sizes, see steel cutter page 84 for $a_p$ max.

## 5505VX Feeds $f_z$ (mm/tooth)

| Tool Diameter | Geometry | Grade | Operation | Unalloyed Steel | Alloyed Steel | Stainless Steel | Stainless Steel Refractory PH | Gray Iron | Spheroidal-Ductile Iron | Malleable Iron | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN | HTA Iron Based Alloys | HTA Cobalt Based Alloys | HTA Nickel Based Alloys | HTA Titanium Based Alloys | Hard Steel >1400 N/mm² >415 HBN | Chiled Cast Iron >1400 N/mm² >400 HBN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. | Min. - Max. |
| 16 | R-F | SP6519 | Contouring | 0,06 - 0,15 | 0,06 - 0,13 | 0,04 - 0,11 | 0,04 - 0,10 | 0,06 - 0,15 | 0,06 - 0,15 | 0,06 - 0,15 | - | - | 0,04 - 0,08 | 0,04 - 0,08 | 0,04 - 0,08 | 0,04 - 0,10 | - | - |
| 20 | R-F | SP6519 | Contouring | 0,06 - 0,17 | 0,06 - 0,15 | 0,04 - 0,13 | 0,04 - 0,12 | 0,06 - 0,17 | 0,06 - 0,17 | 0,06 - 0,17 | - | - | 0,04 - 0,10 | 0,04 - 0,10 | 0,04 - 0,10 | 0,04 - 0,12 | - | - |
| 25 | R-F | SP6519 | Contouring | 0,06 - 0,20 | 0,06 - 0,18 | 0,04 - 0,16 | 0,04 - 0,15 | 0,06 - 0,20 | 0,06 - 0,20 | 0,06 - 0,20 | - | - | 0,04 - 0,13 | 0,04 - 0,13 | 0,04 - 0,13 | 0,04 - 0,15 | - | - |
| 32 | R-F | SP6519 | Contouring | 0,06 - 0,22 | 0,06 - 0,20 | 0,04 - 0,18 | 0,04 - 0,17 | 0,06 - 0,22 | 0,06 - 0,22 | 0,06 - 0,22 | - | - | 0,04 - 0,15 | 0,04 - 0,15 | 0,04 - 0,15 | 0,04 - 0,17 | - | - |
| 40 | R-F | SP6519 | Contouring | 0,06 - 0,24 | 0,06 - 0,22 | 0,04 - 0,20 | 0,04 - 0,19 | 0,06 - 0,24 | 0,06 - 0,24 | 0,06 - 0,24 | - | - | 0,04 - 0,17 | 0,04 - 0,17 | 0,04 - 0,17 | 0,04 - 0,19 | - | - |
| 50 | R-F | SP6519 | Contouring | 0,06 - 0,27 | 0,06 - 0,25 | 0,04 - 0,23 | 0,04 - 0,22 | 0,06 - 0,27 | 0,06 - 0,27 | 0,06 - 0,27 | - | - | 0,04 - 0,20 | 0,04 - 0,20 | 0,04 - 0,20 | 0,04 - 0,22 | - | - |

Note: HTA = High Temperature Alloys

Speed recommendations can be found on page 71.

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## Speed $v_c$ (m/min)

| 5505VX Series | | | | | |
|---|---|---|---|---|---|
| | | | Speed min. - max. | | |
| Coolant Recommendation<br>Recommended ● Possible ⦿ | | | | | PVD Standard |
| ISO | Materials | Rm and Hardness | 💧 | 🚫 | SP6519 |
| P | Unalloyed Steel | <600 N/mm² <180 HBN | ⦿ | ● | 130 - 295 |
| | | <950 N/mm² <280 HBN | | | 115 - 260 |
| | Alloyed Steel | 700-950 N/mm² 200-280 HBN | ⦿ | ● | 100 - 230 |
| | | 950-1200 N/mm² 280-355 HBN | | | 75 - 175 |
| | | 1200-1400 N/mm² 355-415 HBN | | ● | 50 - 110 |
| M | Stainless Steel | Austenitic + Ferritic 300 series | ⦿ | ● | 115 - 270 |
| | | Martensitic 400 series | | | 105 - 235 |
| | PH Stainless | Refractory P.H. | ● | | 50 - 120 |
| K | Cast Iron | Grey GG-Ft | ⦿ | ● | 140 - 295 |
| | | Spheroidal-Ductile GGG-FGS | | | 110 - 240 |
| | | Malleable GTS - MN/MP | | | 100 - 220 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | | | |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | |
| S | High Temperature Alloys | Iron Based | ● | | 23 - 55 |
| | | Cobalt Based | | | 22 - 48 |
| | | Nickel Based | | | 25 - 55 |
| | | Titanium Based | | | 36 - 79 |
| H | Hard Materials | Hard Steel >1400 N/mm² >415 HBN | | | |
| | | Chilled Cast Iron >1400 N/mm² > 400 HBN | | | |



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## 5505VX Technical Information

### Working Diameter:

$$D_e = 2 \times \sqrt{r^2 - (r - a_p)^2}$$

**where:**
**$D_e$** = Working Diameter
**r** = Cutter radius
**$a_p$** = Axial Depth of Cut

## 5505VX Technical Information

**where:**
**$f_z$** = Feed per tooth
**$h_m$** = Average chip thickness
**r** = Insert radius
**$a_e$** = Radial Depth of Cut
**$a_p$** = Axial Depth of Cut

### Average chip thickness: $h_m$

$$h_m = f_z \times \frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}$$

### To find programmed feedrate: $f_z$

$$f_z = \frac{h_m}{\frac{\sqrt{r^2 - (r - a_e)^2}}{r} \times \frac{\sqrt{r^2 - (r - a_p)^2}}{r}}$$

***Please do not try to remove this screw. This screw is glued into the body to keep the inserts in the correct position.***



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## Case History

Material: Titanium 6-4
Component: Valve Body
Industry: Oil & Gas
Cutter: 5505VX (25mm Cutter)
Insert Grade: SP6519
RPM: 1469
Cutting Speed $V_C$: 115 m/min
Feed per Tooth $f_Z$: 0,135mm
Feed Rate: 395,3 mm/min
Depth of cut $a_p$: 1,5mm

***Helical Interpolation Doubled Productivity***

## Ball Nose Geometry

### -F P P M M K S

This geometry is a roughing ball nose fully ground insert for roughing and semi-finishing of all materials except Aluminium. This geometry is designed with chip grooves for better chip control.

## Ball Nose Grade

### SP6519 P P M M K S

*Coating Type: PVD, TiAlN*

The combination of a tough substrate with a new generation of TiAlN super nano coating, makes this new PVD coating virtually free of residual stress and extremely hard for unmatched performance.

Primarily used in Stainless Steel, High Temperature Alloys & Titanium with stable conditions. Also can be used in Steel, Steel Alloys and Cast Irons.

**Material Guide –** Key to Recommended Inserts

**Material Designation**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials |



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# **Cylindrical Shank Extensions** for Modular Heads
## Anti-Vibration Tungsten Alloy with Through Coolant

**Shank Extension**

| Product | | Dimensions (mm) | | | | | |
|---|---|---|---|---|---|---|---|
| EDP | Item Description | L | $L_1$ | $D_2$ | D | $D_1$ | M |
| 030624 | M-13-M8-CA16-090 | 90 | 40 | 16 | 13 | 8,50 | M8 |
| 030625 | M-13-M8-CA16-110 | 110 | 60 | 16 | 13 | 8,50 | M8 |
| 030626 | M-13-M8-CA16-130 | 130 | 80 | 16 | 13 | 8,50 | M8 |
| 030627 | M-13-M8-CA16-170 | 170 | 120 | 16 | 13 | 8,50 | M8 |
| 030628 | M-18-M10-CA20-110 | 110 | 60 | 20 | 18 | 10,50 | M10 |
| 030629 | M-18-M10-CA20-130 | 130 | 80 | 20 | 18 | 10,50 | M10 |
| 030630 | M-18-M10-CA20-170 | 170 | 120 | 20 | 18 | 10,50 | M10 |
| 030631 | M-18-M10-CA20-190 | 190 | 140 | 20 | 18 | 10,50 | M10 |
| 030632 | M-21-M12-CA25-131 | 131 | 75 | 25 | 21 | 12,50 | M12 |
| 030633 | M-21-M12-CA25-156 | 156 | 100 | 25 | 21 | 12,50 | M12 |
| 030634 | M-21-M12-CA25-181 | 181 | 125 | 25 | 21 | 12,50 | M12 |
| 030635 | M-21-M12-CA25-206 | 206 | 150 | 25 | 21 | 12,50 | M12 |
| 030636 | M-21-M12-CA25-231 | 231 | 175 | 25 | 21 | 12,50 | M12 |
| 030637 | M-29-M16-CA32-160 | 160 | 100 | 32 | 29 | 17,00 | M16 |
| 030638 | M-29-M16-CA32-210 | 210 | 150 | 32 | 29 | 17,00 | M16 |
| 030639 | M-29-M16-CA32-260 | 260 | 200 | 32 | 29 | 17,00 | M16 |
| 030640 | M-29-M16-CA32-310 | 310 | 250 | 32 | 29 | 17,00 | M16 |

Note: Order example with cylindrical shank: M-13-M8-CA16-090

Cylindrical shank extensions can be used with all modular heads found in several product family series within this catalogue.

These extensions have the industry standard of metric threads.

## Technical Advice

| | |
|---|---|
| M | Modular adapter |
| 13 | Diameter in front of the modular shank (D) |
| M8 | Metric Thread (M) |
| CA16 | Cylindrical shank diameter 16mm with through coolant |
| 90 | Total length of the body |

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# 5720 Patented Profile Pocket Milling: Aluminium

## Taking extreme high speed aluminium machining to the highest level



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# 5720 Patented Series High Speed Aluminium Cutters

**5720 Up to 51000 RPM**

**Cylindrical**

25mm – 32mm

**Shell**

40mm – 80mm

**Modular**

25mm – 32mm

## Extreme Metal Removal to fit your application

- Especially designed for machining pockets and profiles on Aluminium and Aluminium Alloys
- The 5720 is designed, manufactured and tested in accordance with EN ISO 15641:2001 to ensure maximum stability in high speed applications
- Each features internal coolant allowing better chip evacuation and higher feed rates
- The pockets are reinforced to allow for heavy feeding and safe ramping during machining
- Excellent tools for thin-walled machining
- HSK specials available upon request

Cylindrical Shank and special HSK Integral Shanks are balanced to G6.3 @ 30000 RPM for diameters up to 50mm. Diameters larger than 50mm are balanced to G6.3 @ 24000 RPM.

5720 inserts: 12 different radii are available, each with the same cutting depth capacity of 16mm



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# 5720 Patented Series Extreme High Speed Aluminium Cutters

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Cylindrical Shank

Shell Mill Fixation

Modular Head

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | Insert radius range | *EDP* | | *EDP* | | Screw Tightening Nm* |
| **5720VZ16 Cylindrical Shank - Coarse and Medium Pitch** | | | | | | | | | | | | | |
| 034614 | 5720VZ16CA025Z2R75 | 25 | 131 | 75 | 25 | 16 | 2 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 034617 | 5720VZ16CA032Z2R75 | 32 | 135 | 75 | 32 | 16 | 2 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 034640 | 5720VZ16CA032Z3R75 | 32 | 135 | 75 | 32 | 16 | 3 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| **5720VZ16 Shell Mill Fixation - Coarse and Medium Pitch** | | | | | | | | | | | | | |
| 034619 | 5720VZ16-A040Z03R | 40 | 45 | - | 16 | 16 | 3 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031325 | 5720VZ16-A050Z03R | 50 | 45 | - | 22 | 16 | 3 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031326 | 5720VZ16-A050Z04R | 50 | 45 | - | 22 | 16 | 4 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031328 | 5720VZ16-A063Z05R | 63 | 45 | - | 22 | 16 | 4 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031327 | 5720VZ16-A063Z04R | 63 | 45 | - | 22 | 16 | 5 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031329 | 5720VZ16-A080Z04R | 80 | 50 | - | 27 | 16 | 4 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031330 | 5720VZ16-A080Z05R | 80 | 50 | - | 27 | 16 | 5 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |

*** It is important to change the screw each time the insert is changed to ensure the highest security.**
**A dynamometric key and the right torque value are important. See above for the correct torque information.**

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | M | $d_1$ | $a_p$ max | No. of Teeth | Insert radius range | *EDP* | | *EDP* | | Screw Tightening Nm* |
| **5720VZ16 Modular Head - Coarse and Medium Pitch** | | | | | | | | | | | | | |
| 034616 | 5720VZ16SA025Z2R50 | 25 | 50 | M12 | 12,50 | 16 | 2 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 034618 | 5720VZ16SA032Z2R50 | 32 | 50 | M16 | 17 | 16 | 2 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |
| 031639 | 5720VZ16SA032Z3R50 | 32 | 50 | M16 | 17 | 16 | 3 | Facet to 6,00 | 030820 | DP5009A | 030819 | TP20 | 6,00 |

*** It is important to change the screw each time the insert is changed to ensure the highest security.**
**A dynamometric key and the right torque value are important. See above for the correct torque information.**

Note: For cylindrical shank extensions in high density alloy with through coolant refer to page 74.

Depth of Cut (ap)

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## 5720VZ Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | Max RPM |
| *034614* | 5720VZ16CA025Z2R75 | 25 | 14.5* | 29,5 | 48,0 | 4,00 | 50000 |
| *034617* | 5720VZ16CA032Z2R75 | 32 | 11.4* | 43,5 | 62,0 | 4,00 | 41500 |
| *034640* | 5720VZ16CA032Z3R75 | 32 | 11.4* | 43,5 | 62,0 | 4,00 | 41500 |
| *034619* | 5720VZ16-A040Z3R | 40 | 7.6* | 59,5 | 78,0 | 4,00 | 36500 |
| *031325* | 5720VZ16-A050Z03R | 50 | 7.9* | 79,5 | 98,0 | 4,00 | 30000 |
| *031326* | 5720VZ16-A050Z4R | 50 | 7.9* | 79,5 | 98,0 | 4,00 | 30000 |
| *031328* | 5720VZ16-A063Z05R | 63 | 5.9* | 105,5 | 124,0 | 4,00 | 26000 |
| *031327* | 5720VZ16-A063Z4R | 63 | 5.9* | 105,5 | 124,0 | 4,00 | 26000 |
| *031329* | 5720VZ16-A080Z04R | 80 | 4.4* | 139,5 | 158,0 | 4,00 | 23000 |
| *031330* | 5720VZ16-A080Z05R | 80 | 4.4* | 139,5 | 158,0 | 4,00 | 23000 |
| *034616* | 5720VZ16SA025Z2R50 | 25 | 14.5* | 29,5 | 48,0 | 4,00 | 50000 |
| *034618* | 5720VZ16SA032Z2R50 | 32 | 11.4* | 43,5 | 62,0 | 4,00 | 41500 |
| *031639* | 5720VZ16SA032Z3R50 | 32 | 11.4* | 43,5 | 62,0 | 4,00 | 41500 |

* Max. ramping angle for insert is calculated with facet

Find the different ramping angles for all available insert radii on technical information page 81.

Radial depth of cut 0,20mm up to full cutter diameter.

These tools have been designed, manufactured and tested in accordance with EN ISO standard 15641:2001.

These tools are stocked without an electronic chip.

Note: If using a insert with radius, then the facing pitch for the 5702VZ cutter is equal to the cutting diameter (D) minus 2 x chosen radius.

**Cylindrical Shanks or Special HSK Integral Shanks** are designed and balanced to G6.3 at 30,000 RPM for diameters 50mm and below. Diameters larger then 50mm are balanced to G6.3 at 24,000 rpm.

**Cylindrical Shank** tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance as an assembly by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

**Shell Mills and Modular Heads** are not balanced. These tools must be re-inspected for balance as an assembly, cutter + adapter + inserts + screws by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Additional Balancing and Torque values can be found in the technical section pages 82.



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ZDET16-721

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | | | | | |
| | | | Depth of Cut (mm) | | | | | | | |
| EDP | Item Description | Grade | $a_p$ max. 16* | $a_p$ min. - max. 1,00 - 5,00 | $a_p$ min. - max. 0,20 - 1,00 | d (IC) | l | s | r | $h_m$ min |
| 030927 | ZDET16M5PDFR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | Facet | 0,02 |
| 031384 | ZDET16M504FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 0,40 | 0,02 |
| 030928 | ZDET16M508FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 0,80 | 0,02 |
| 031385 | ZDET16M512FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 1,20 | 0,02 |
| 030929 | ZDET16M516FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 1,60 | 0,02 |
| 030930 | ZDET16M520FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 2,00 | 0,02 |
| 030931 | ZDET16M525FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 2,50 | 0,02 |
| 030932 | ZDET16M530FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 3,00 | 0,02 |
| 030933 | ZDET16M532FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 3,20 | 0,02 |
| 030934 | ZDET16M540FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 4,00 | 0,02 |
| 030935 | ZDET16M550FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 5,00 | 0,02 |
| 030936 | ZDET16M560FR-721 | GH1 | ♦ | ♦ | ♦ | 11,30 | 22,92 | 5,00 | 6,00 | 0,02 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 84.

* Max. possible $a_p$ of 16mm and $a_e$ the full diameter (depending on the application).

* For Slotting applications with 5720VZ16 series please see recommendations for maximum $a_p$ on page 81 .

## 5720VZ Feeds $f_z$ (mm/tooth)

| Size | Geometry | Grade | Operation | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN |
|---|---|---|---|---|---|
| | | | | Min. - Max. | Min. - Max. |
| 14mm | FR-721 | GH1 | Profile/ Pocketing | 0,02 - 0,25 | 0,02 - 0,20 |

## Speed $v_c$ (m/min)

| 5720VZ Series | | | K10-K20/C3 - C2 ISO / ANSI | | |
|---|---|---|---|---|---|
| | | | Speed min. - max. | | |
| Coolant Recommendation<br>Recommended ● Possible ⦿ | | | | | Uncoated Micrograin |
| ISO | Materials | Rm and Hardness | 💧 | 🚫 | GH1 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | ● | | 400 - 3050 |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | 295 - 2440 |

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**Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of Dia.**

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

**$h_m$** = Average chip thickness
**$a_e$** = Radial engagement
**$f_z$** = Feed per tooth
**d** = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

**5720VZ16 Ramp Angle °**

| | Insert ZDET16M5…FR-721 (Radius mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Cutter Dia. (mm) | PDFR to R1,20 | R1,60 | R2,00 | R2,50 | R3,00 | R3,20 | R4,00 | R5,00 | R6,00 |
| 25,0 | 14.50 | 17.30 | 9.40 | 9.60 | 18.80 | 18.90 | 9.00 | 11.20 | 7.30 |
| 32.0 | 11.40 | 11.90 | 11.90 | 12.20 | 12.40 | 12.40 | 13.10 | 13.80 | 13.40 |
| 40,0 | 7.60 | 7.80 | 7.80 | 8.00 | 8.10 | 8.10 | 8.50 | 8.80 | 9.10 |
| 50,0 | 7.90 | 7.20 | 7.30 | 7.90 | 7.60 | 7.60 | 8.90 | 9.00 | 9.25 |
| 63,0 | 5.90 | 5.40 | 5.50 | 5.80 | 5.60 | 5.60 | 6.90 | 6.60 | 6.65 |
| 80,0 | 4.40 | 4.00 | 4.10 | 4.30 | 4.20 | 4.20 | 5.10 | 4.80 | 4.90 |

**Possible Max. $a_p$ Slotting**

Chart for maxium $a_p$ when slotting with 5720VZ16 series

| Diameter (mm) | No. of Inserts | $a_p$ max (mm) |
|---|---|---|
| 25 | 2 | 7,50 |
| 32 | 2 | 11,00 |
| 32 | 3 | 6,00 |
| 40 | 3 | 9,00 |
| 50 | 3 | 11,00 |
| 50 | 4 | 9,00 |
| 63 | 4 | 11,00 |
| 63 | 5 | 9,00 |
| 80 | 4 | 11,00 |
| 80 | 5 | 11,00 |

**Possible Metal Removal**

Calculated with 24000 RPM

| Cutter dia. | Z | $Qcm^3/min$ |
|---|---|---|
| 25 | 2 | 1560 |
| 32 | 2 | 3226 |
| 32 | 3 | 2056 |
| 40 | 3 | 5184 |
| 50 | 3 | 7921 |
| 50 | 4 | 8641 |
| 63 | 4 | 13307 |
| 63 | 5 | 13609 |
| 80 | 4 | 16898 |
| 80 | 5 | 21123 |

$a_p$ max in connection with: The cutter diameter, rigidity of the cutter, rigidity of the machine and the size of the flute.

The chart above shows total metal removal capacity (based on 24,000 RPM) by cutter diameter and number of teeth.

The maximum RPM is engraved on all cutter bodies.

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## Machinability by Materials (Aluminium)

| Alloy Group | Alloy Designation | CHEMICAL COMPOSITION LIMITS (WT%) | | | | | | | | | | | | Typical tremper | Rm (Mpa) | Machinability Chip formation | Machinability | Typical Applications | $v_c$ m/min min. - max. | $f_z$ mm/Z max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cu | Si | Fe | Mn | Mg | Zn | Cr | Ti | Pb | Bi | Al | Others | | | | | | | |
| Al | 1050 | 0.05 | 0.25 | 0.4 | 0.5 | 0.05 | 0.05 | - | - | - | - | 99.50min | - | H14 | 105 | D | A | Chemical equipment Sheet metal work Coiled tube | 600 - 3000 | 0,2 |
| | 1100 | 0.05~0.20 | Si+Fe1.0max | | 0.05 | - | 0.1 | - | - | - | - | 99.00min | - | H14 | 90 | D | A | | | |
| Al-Cu | 2011 | 50.~60. | 0.4 | 0.7 | - | - | 0.3 | - | - | 0.2 | 0.6 | remaining | - | T3 | 310 | A | A | Screw machine products. Tuck frame. Aircraft structure. Jet engine impellers. Aircraft engine cylinder heads. | 400 - 2500 | 0,25 |
| | 2014 | 3.9~5.0 | 0.5~1.2 | 0.7 | 0.4~1.2 | 0.2~0.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T6 | 430 | B | A | | | |
| | 2017 | 3.5~4.5 | 0.2~0.8 | 0.7 | 0.4~1.0 | 0.4~0.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T4 | 390 | B | A | | | |
| | 2024 | 3.8~4.9 | 0.5 | 0.5 | 0.3~0.9 | 1.2~1.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T4 | 465 | B | A | | | |
| | 2218 | 3.5~4.5 | 0.9 | 1 | 0.2 | 1.2~1.8 | 0.25 | 0.1 | - | - | - | remaining | Ni1.7~2.3 | T72 | 331 | B | B | | | |
| | 2224 | 3.8~4.4 | 0.12 | 0.15 | 0.30~0.9 | 1.2~1.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | | | A | A | | | |
| Al-Mn | 3003 | 0.05~0.20 | 0.6 | 0.7 | 1.0~1.5 | - | 0.1 | - | - | - | - | remaining | - | H14 | 140 | D | B | Cooking utensils. Chemical equipment. | 200 - 2500 | 0,2 |
| Al-Si | 4032 | 0.5~1.3 | 11.0~13.5 | 1 | - | 0.8~1.3 | 0.25 | 0.1 | - | - | - | remaining | Ni0.5~1.3 | T6 | 379 | B | D | Pistons. | 200 - 1000 | 0,18 |
| Al-Mg | 5052 | 0.1 | 0.25 | 0.4 | 0.1 | 2.2~2.8 | 0.1 | 0.15~0.35 | - | - | - | remaining | - | H14 | 260 | C | A | Architectural. Cable Sheeting. Welded pressure vessels. Hydraulic tubes. Transportation equipment. | 400 - 3000 | 0,25 |
| | | | | | | | | | | | | | H34 | | | | | | | |
| | 5056 | 0.1 | 0.3 | 0.4 | 0.05~0.20 | 4.5~5.6 | 0.1 | 0.05~0.20 | - | - | - | remaining | - | H12 | 300 | C | A | | | |
| | | | | | | | | | | | | | H32 | | | | | | | |
| | 5083 | 0.1 | 0.4 | 0.4 | 0.4~1.0 | 4.0~4.9 | 0.25 | 0.05~0.25 | 0.15 | - | - | remaining | - | H112 | 335 | C | A | | | |
| | 5086 | 0.1 | 0.4 | 0.5 | 0.20~0.7 | 3.5~4.5 | 0.25 | 0.05~0.25 | 0.15 | - | - | remaining | - | H32 | 300 | C | A | | | |
| | | | | | | | | | | | | | H116 | | | | | | | |
| Al-Mg-Si | 6061 | 0.15~0.40 | 0.4~0.8 | 0.7 | 0.15 | 0.8~1.2 | 0.25 | 0.04~0.35 | 0.15 | - | - | remaining | - | T6 | 300 | C | B | Heavy duty structure. Furniture. Architectural. Heavy duty welded structure. Pipeline. Heat Sink. | 400 - 2500 | 0,2 |
| | 6063 | 0.1 | 0.2~0.6 | 0.35 | 0.1 | 0.45~0.9 | 0.1 | 0.1 | 0.1 | - | - | remaining | - | T5 | 200 | C | B | | | |
| | 6070 | 0.15~0.40 | 1.0~1.7 | 0.5 | 0.40~1.0 | 0.50~1.2 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T6 | 379 | C | C | | | |
| | 6151 | 0.35 | 0.6~1.2 | 1 | 0.2 | 0.45~0.8 | 0.25 | 0.15~0.35 | 0.15 | - | - | remaining | - | T6 | | C | C | | | |
| | 6262 | 0.15~0.40 | 0.4~0.8 | 0.7 | 0.15 | 0.8~1.2 | 0.25 | 0.04~0.14 | 0.15 | 0.4 | 0.7 | remaining | - | T9 | 400 | B | B | | | |
| | 6351 | 0.1 | 0.7~1.3 | 0.5 | 0.4~0.8 | 0.40~0.8 | 0.2 | - | 0.2 | - | - | remaining | - | T6 | 310 | D | C | | | |
| | 6463 | 0.2 | 0.20~0.6 | 0.15 | 0.05 | 0.45~0.9 | 0.05 | - | - | - | - | remaining | - | T6 | 241 | C | B | | | |
| Al-Zn | 7001 | 1.6~2.6 | 0.35 | 0.4 | 0.2 | 2.6~3.4 | 6.8~8.0 | 0.18~0.35 | 0.2 | - | - | remaining | - | O | | B | A | High strength structure. Aircraft structure. Bat. | 400 - 3000 | 0,25 |
| | 7003 | 0.2 | 0.3 | 0.35 | 0.3 | 0.50~1.0 | 5.0~6.5 | 0.2 | 0.2 | - | - | remaining | Zr0.05~0.25 | T5 | 400 | B | A | | | |
| | 7050 | 2.0~2.6 | 0.12 | 0.15 | 0.1 | 1.9~2.6 | 5.7~6.7 | 0.04 | 0.06 | - | - | remaining | Zr0.08~0.15 | T73 | 530 | B | A | | | |
| | 7075 | 1.2~2.0 | 0.4 | 0.5 | 0.3 | 2.1~2.9 | 5.1~6.1 | 0.18~0.28 | 0.2 | - | - | remaining | - | T6 | 570 | B | A | | | |
| | 7178 | 1.6~2.4 | 0.4 | 0.5 | 0.3 | 2.4~3.1 | 6.3~7.3 | 0.18~0.35 | 0.2 | - | - | remaining | - | T6 | 600 | B | A | | | |
| | 7475 | 1.2~1.9 | 0.1 | 0.12 | 0.06 | 1.9~2.6 | 5.2~6.2 | 0.18~0.25 | 0.06 | - | - | remaining | - | T61 | 565 | B | A | | | |

**Machinability**

**A** EXCELLENT
**B** GOOD-TO-EXCELLENT
**C** GOOD
**D** NOT GOOD

$V_C = \pi \times D \times n / 1000$ m/min = mm x RPM

D: Tool diameter, N: RPM, $V_C$: Cutting speed, $\pi = 3.1416$

Choose a cutting speed in the range of values, compatible with the cutter max rotation capacity (engraved on the body) and your spindle stability.



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## Recommendations for High Speed Machining at 8,000 rpm or above.

- Check spindle condition:
  Runout
  Balancing
  Clamping of the attachment in traction
  Marking and cleanliness

- Check that the tool is suitable for the required use.

- Inserts must be locked positively in the pocket and secured using the torx screw provided. The screw must be torqued to the correct value as indicated in our charts on the steel product page 78.

For security use a new screw each time.

- Check the balancing of the – assembled tool – cutter body, inserts and attachment.

- Before start up, note the maximum RPM engraved on the tool or in our technical documents. The maximum RPM is linked to a precise balancing value.

- Ensure that the field of application of the tool shown in our technical documents and technological parameters is observed:

| | |
|---|---|
| $a_e$ (mm) | width of cut, lateral engagement (radial) |
| $a_p$ (mm) | Axial depth of cut |
| $f_z$ (mm/tooth) | Feed per tooth |
| n (rpm) | RPM |

**Stellram cannot accept responsibility for misuse of this product:**

- Non observance of the above instructions
- Machine without casing
- Incorrect clamping of workpieces
- No safety device on the machine
- Any misuse or incorrect clamping

The optimum rotation must be determined by condition of the spindle. The spindle must be rigid to run at these higher RPMs.

Under no circumstances must any attempt be made to repair this tool. The only permitted maintenance is the indexing or replacement of the inserts. Use a new screw for each insert replacement.

When assembling the cutter to a shrink fit holder, the maximum protrusion can not exceed 10% of the reach of tool.

### The Cutter Nomenclature Code:

**Example:** 5702VZD14CA020R58-2

| | | |
|---|---|---|
| 5702 | = | Stellram Product Family |
| V | = | Screw fixation |
| Z | = | Insert shape (parallelogram) |
| D | = | ISO insert clearance (D = 15°) |
| 14 | = | Insert edge length (mm) |
| C | = | Plain straight shank (No flats) |
| A | = | Through the tool coolant |
| 020 | = | Cutting diameter (mm) |
| R | = | Right hand tool |
| 58 | = | Reach of tool in mm |
| -2 | = | Maximum value of the insert radius in 1/10mm increments |

This tool must only be used for the following applications: Face milling, shoulder milling, slotting and pocketing.

**Cylindrical shanks & HSK shanks (special):** 5702VZD14 and 5720VZ16 are designed and balanced to G6.3 at 30,000 rpm for diameters 50mm and below. Diameters larger then 50mm are balanced to G6.3 at 24,000 rpm. Cylindrical shank tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance by the end user when exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

**Shell Mills and Modular Heads:** 5720VZ16 Shell Mills and Modular Heads are not balanced. These tools must be re-inspected for balance as an assembly, cutter + adapter + inserts + screws by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Balancing requires removing some material by drilling or milling operations. To avoid making modular heads weaker, limit these operations by avoiding high rpm.

For each new modular head added to the same extension, re-balance the assembly. For each new Shell Mill installed on the same toolholder, re-balance the assembly.

Tighten the Modular Head to the Extension, with lubricant, apply the torque value of:

| Thread sizes (mm) | Torque Values Nm |
|---|---|
| M6 | 10 |
| M8 | 30 |
| M10 | 50 |
| M12 | 80 |
| M16 | 110 |

Tighten the bolt between the shell mill and tool holder, with lubricant apply the torque value of:

| Thread sizes (mm) | Cutter Bore Size (mm) | Torque Values Nm |
|---|---|---|
| M6 | 13 | 10 |
| M8 | 16 | 30 |
| M10 | 22 | 50 |
| M12 | 27 | 80 |
| M16 | 32 | 110 |
| M20 | 40 | 120 |



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## 5720 Case History

Material: Aluminium 2024
Cutter: 5720VZ (32mm Cutter)
Component: Seat Support
Industry Segment: Aerospace
Insert Grade: GH1
Spindle Speed: 17,491 RPM
Cutting Speed $V_C$: 1758 m/min
Feed per Tooth $f_Z$: 0,25mm
Feed rate: 8745 mm/min
Depth of Cut: 2,5mm

***Result: 400% Increase in Productivity***

## 5720 High Speed Geometry

### -721 N

This extreme high positive geometry is highly suitable for machining Aluminium Alloys, Copper and Brass. This geometry is periphery ground with a pressed, polished top rake face reducing built up edge. Especially qualified when machining thin-walled components.

## High Speed Grade

### GH1 N

*Uncoated, Micrograin*

This micrograin grade is designed for use on Aluminium Alloys, Copper, Brass and Kevlar etc. The grade GH1 works well with or without coolant with low cutting pressure at high speeds due to sharp cutting edge.

**Material Guide –** Key to Recommended Inserts

| Material Designation | | | | | | | |
|---|---|---|---|---|---|---|---|
| P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials |



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# 5702 High Speed Aluminium Cutters

## Outstanding performance in a 20mm cutter



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# 5702 Series High Speed Aluminium Cutters

**5702 Up to 43000 RPM**
**Cylindrical**
20mm

## Extreme Metal Removal to fit your application

- Especially designed for machining pockets and profiles on Aluminium and Aluminium Alloys
- Desiged, manufactured and tested in accordance with EN ISO 15641:2001 to ensure maximum stability in high speed applications
- Through-tool coolant allowing better chip evacuation and higher feed rates
- Pockets are reinforced to allow for heavy feeding and safe ramping during machining
- Excellent tools for thin-walled machining
- HSK specials available upon request
- 12mm depth of cut
- 5 radii available
- -701 fully ground geometry ideal for high speed Aluminium milling
- Balanced to G6.3 @ 30000 RPM

## 5702 Case History

Material: Aluminium Alloy 7175
Component: Airframe
Industry Segment: Aerospace
Tool: 5702VZD (20mm Cutter)
Insert Grade: GH2
Cutting Speed $V_C$: 754 m/min
Spindle Speed: 12000 RPM
Feed per Tooth $f_Z$: 0,25mm
Feedrate: 6000 mm/min

***Precision inserts provide excellent results in thin-wall machining applications while yielding superior surface finishes***



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# 5702 Precision High Speed Aluminium Cutter

## 5702 Geometry

### -701 N

This extreme high positive geometry is highly suitable for machining Aluminium Alloys, Copper and Brass. The -701 geometry is precision ground and gives excellent performance when machining thin-walled components.

## 5702 Grade

### GH1 N

*Uncoated, Micrograin*

This micrograin grade is designed for use on Aluminium Alloys, Copper, Brass and Kevlar, etc. The grade GH1 works well with or without coolant with low cutting pressure at high speeds due to sharp cutting edge.

**Material Guide –** Key to Recommended Inserts

**Material Designation**

P Unalloyed Steels | P Alloyed Steels | M Stainless Steels | M PH Stainless | K Cast Irons | N Aluminum & Alloys | S High Temp. Alloys | H Hard Materials



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Cylindrical Shank

| Product | | Dimensions (mm) | | | | | | | Spares | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | D | L/H | $l_1$ | $d_1$ | $a_p$ max | No. of Teeth | Insert radius range | *EDP* | | *EDP* | | Screw Tightening Nm* |
| **5702VZD14 Cylindrical Shank** | | | | | | | | | | | | | |
| 028998 | 5702VZD14CA020R58-2 | 20 | 108 | 58 | 20 | 12 | 2 | < 2,00 | 015060 | F2505T | 018488 | T7 | 0,80 |
| 028999 | 5702VZD14CA020R58-4 | 20 | 108 | 58 | 20 | 12 | 2 | 2,50 to 4,00 | 015060 | F2505T | 018488 | T7 | 0,80 |

*** It is important to change the screw each time the insert is changed to ensure the highest security.**
**A dynamometric key and the right torque value are important. See above for the correct torque information.**

## 5702VZD Technical Information (mm)

| Product | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| *EDP* | Item Description | Facing Pitch | Ramping Angle ° | Helical Hole min. - max. | | $a_p$ max Helical / Linear | Max RPM |
| *028998* | 5702VZD14CA020R58-2 | 20 | 11.0* | 26,8 | 38,0 | 3,00 | 43000 |
| *028999* | 5702VZD14CA020R58-4 | 20 | 11.0* | 26,8 | 38,0 | 3,00 | 43000 |

* Max. ramping angle for insert is calculated with facet

Find the different ramping angles for all available insert radii on technical information page 90.

Radial depth of cut 0,20mm up to full cutter diameter.

These tools have been designed, manufactured and tested in accordance with EN ISO standard 15641:2001.

These tools are stocked without an electronic chip.

Note: If using a insert with radius, then the facing pitch for the 5702VZD cutter is equal to the cutting diameter (D) minus 2 x chosen radius.

**Cylindrical Shanks or Special HSK Integral Shanks** are designed and balanced to G6.3 at 30,000 RPM for diameters 50mm and below. Diameters larger then 50mm are balanced to G6.3 at 24,000 rpm.

**Cylindrical Shank** tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance as an assembly by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Additional Balancing and Torque values can be found in the technical section pages 91.

Depth of Cut (ap)



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ZDCX14-701

| Product | | | Application & Material | | | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EDP | Item Description | Grade | Roughing ▼ | Semi-Finishing ▼▼ | Finishing ▼▼▼ | d (IC) | l | s | r | $h_m$ min |
| | | | Depth of Cut (mm) | | | | | | | |
| | | | $a_p$ max. 12* | $a_p$ min. - max. 1,00 - 4,00 | $a_p$ min. - max. 0,20 - 1,00 | | | | | |
| 029027 | ZDCX1403PDFR-701 | GH1 | ♦ | ♦ | ♦ | 7,59 | 16,83 | 3,18 | Facet | 0,02 |
| 029028 | ZDCX140320FR-701 | GH1 | ♦ | ♦ | ♦ | 7,59 | 16,83 | 3,18 | 2,0 | 0,02 |
| 026019 | ZDCX140325FR-701 | GH1 | ♦ | ♦ | ♦ | 7,59 | 16,83 | 3,18 | 2,5 | 0,02 |
| 029029 | ZDCX140330FR-701 | GH1 | ♦ | ♦ | ♦ | 7,59 | 16,83 | 3,18 | 3,0 | 0,02 |
| 026020 | ZDCX140340FR-701 | GH1 | ♦ | ♦ | ♦ | 7,59 | 16,83 | 3,18 | 4,0 | 0,02 |

Machining Choice: ♦ 1st Choice ■ 2nd Choice ● 3rd Choice | Material Guide Key descriptions found on page 87.

* Max. possible $a_p$ of 12mm and $a_e$ the full diameter (depending on the application).
* For Slotting applications with 5702VZD14 series the maximum $a_p$ is 6mm.

## 5702VZD Feeds $f_z$ (mm/tooth)

| Size | Geometry | Grade | Operation | Aluminium & Alloys <16% Si 116 HBN | Aluminium & Silicon >16% Si 92 HBN |
|---|---|---|---|---|---|
| | | | | Min. - Max. | Min. - Max. |
| 14mm | FR-701 | GH1 | Profile/ Pocketing | 0,02 - 0,25 | 0,02 - 0,20 |

## Speed $v_c$ (m/min)

| 5702VZD Series | | | K10-K20/C3 - C2 ISO / ANSI | | |
|---|---|---|---|---|---|
| | | | Speed min. - max. | | |
| Coolant Recommendation Recommended ● Possible ◉ | | | | | Uncoated Micrograin |
| ISO | Materials | Rm and Hardness | 💧 | 🚫 | GH1 |
| N | Aluminium & Alloys | Aluminium & Alloys < 16% Si 116 HBN | ● | | 400 - 3050 |
| | | Aluminium + Silicon > 16% Si 92 HBN | | | 295 - 2440 |

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**Calculation of the average chip thickness in relation with the $a_e$ (Radial Engagement) if $a_e$ is less than 50% of Dia.**

**Formula: Programme Feed Rate ($f_z$)**

$$f_z = h_m \times \sqrt{\frac{d}{a_e}}$$

**$h_m$** = Average chip thickness
**$a_e$** = Radial engagement
**$f_z$** = Feed per tooth
**d** = Cutter diameter

**Formula: Average Chip Thickness ($h_m$)**

$$h_m = f_z \times \sqrt{\frac{a_e}{d}}$$

| 5702VZD14 Ramp Angle ° | | | | | |
|---|---|---|---|---|---|
| Insert ZDCX1403...FR-701 (Radius mm) | | | | | |
| Cutter dia. | Facet | 2,0mm | 2,50mm | 3,00mm | 4,00mm |
| 20mm | 11.0 | 9.8 | 9.0 | 8.0 | 6.3 |

*For Slotting applications with 5702VZD14 series the maximum $a_p$ is 6mm.

These tools are designed, manufactured, tested and balanced in accordance with EN ISO 15641:2001 for maximum stability in high speed applications.

| Metal Removal | | |
|---|---|---|
| Calculated with 24000 RPM | | |
| Cutter | Z | Qmax - $cm^3$/min |
| **20** | **2** | **720** |

The chart above shows total metal removal capacity (based on 24,000 RPM) by cutter diameter and number of teeth (2).

The maximum RPM is engraved on all cutter bodies.



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## Machinability by Materials (Aluminium)

| Alloy Group | Alloy Designation | CHEMICAL COMPOSITION LIMITS (WT%) | | | | | | | | | | | | Typical tremper | Rm (Mpa) | Machinability Chip formation | Machinability | Typical Applications | $v_c$ m/min min. - max. | $f_z$ mm/Z max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cu | Si | Fe | Mn | Mg | Zn | Cr | Ti | Pb | Bi | Al | Others | | | | | | | |
| Al | 1050 | 0.05 | 0.25 | 0.4 | 0.5 | 0.05 | 0.05 | - | - | - | - | 99.50min | - | H14 | 105 | D | A | Chemical equipment Sheet metal work Coiled tube | 600 - 3000 | 0,2 |
| | 1100 | 0.05~0.20 | Si+Fe1.0max | | 0.05 | - | 0.1 | - | - | - | - | 99.00min | - | H14 | 90 | D | A | | | |
| Al-Cu | 2011 | 50.~60. | 0.4 | 0.7 | - | - | 0.3 | - | - | 0.2 | 0.6 | remaining | - | T3 | 310 | A | A | Screw machine products. Tuck frame. Aircraft structure. Jet engine impellers. Aircraft engine cylinder heads. | 400 - 2500 | 0,25 |
| | 2014 | 3.9~5.0 | 0.5~1.2 | 0.7 | 0.4~1.2 | 0.2~0.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T6 | 430 | B | A | | | |
| | 2017 | 3.5~4.5 | 0.2~0.8 | 0.7 | 0.4~1.0 | 0.4~0.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T4 | 390 | B | A | | | |
| | 2024 | 3.8~4.9 | 0.5 | 0.5 | 0.3~0.9 | 1.2~1.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T4 | 465 | B | A | | | |
| | 2218 | 3.5~4.5 | 0.9 | 1 | 0.2 | 1.2~1.8 | 0.25 | 0.1 | - | - | - | remaining | Ni1.7~2.3 | T72 | 331 | B | B | | | |
| | 2224 | 3.8~4.4 | 0.12 | 0.15 | 0.30~0.9 | 1.2~1.8 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | | | A | A | | | |
| Al-Mn | 3003 | 0.05~0.20 | 0.6 | 0.7 | 1.0~1.5 | - | 0.1 | - | - | - | - | remaining | - | H14 | 140 | D | B | Cooking utensils. Chemical equipment. | 200 - 2500 | 0,2 |
| Al-Si | 4032 | 0.5~1.3 | 11.0~13.5 | 1 | - | 0.8~1.3 | 0.25 | 0.1 | - | - | - | remaining | Ni0.5~1.3 | T6 | 379 | B | D | Pistons. | 200 - 1000 | 0,18 |
| Al-Mg | 5052 | 0.1 | 0.25 | 0.4 | 0.1 | 2.2~2.8 | 0.1 | 0.15~0.35 | - | - | - | remaining | - H34 | H14 | 260 | C | A | Architectural. Cable Sheeting. Welded pressure vessels. Hydraulic tubes. Transportation equipment. | 400 - 3000 | 0,25 |
| | 5056 | 0.1 | 0.3 | 0.4 | 0.05~0.20 | 4.5~5.6 | 0.1 | 0.05~0.20 | - | - | - | remaining | - H32 | H12 | 300 | C | A | | | |
| | 5083 | 0.1 | 0.4 | 0.4 | 0.4~1.0 | 4.0~4.9 | 0.25 | 0.05~0.25 | 0.15 | - | - | remaining | - | H112 | 335 | C | A | | | |
| | 5086 | 0.1 | 0.4 | 0.5 | 0.20~0.7 | 3.5~4.5 | 0.25 | 0.05~0.25 | 0.15 | - | - | remaining | - H116 | H32 | 300 | C | A | | | |
| Al-Mg-Si | 6061 | 0.15~0.40 | 0.4~0.8 | 0.7 | 0.15 | 0.8~1.2 | 0.25 | 0.04~0.35 | 0.15 | - | - | remaining | - | T6 | 300 | C | B | Heavy duty structure. Furniture. Architectural. Heavy duty welded structure. Pipeline. Heat Sink. | 400 - 2500 | 0,2 |
| | 6063 | 0.1 | 0.2~0.6 | 0.35 | 0.1 | 0.45~0.9 | 0.1 | 0.1 | 0.1 | - | - | remaining | - | T5 | 200 | C | B | | | |
| | 6070 | 0.15~0.40 | 1.0~1.7 | 0.5 | 0.40~1.0 | 0.50~1.2 | 0.25 | 0.1 | 0.15 | - | - | remaining | - | T6 | 379 | C | C | | | |
| | 6151 | 0.35 | 0.6~1.2 | 1 | 0.2 | 0.45~0.8 | 0.25 | 0.15~0.35 | 0.15 | - | - | remaining | - | T6 | | C | C | | | |
| | 6262 | 0.15~0.40 | 0.4~0.8 | 0.7 | 0.15 | 0.8~1.2 | 0.25 | 0.04~0.14 | 0.15 | 0.4 | 0.7 | remaining | - | T9 | 400 | B | B | | | |
| | 6351 | 0.1 | 0.7~1.3 | 0.5 | 0.4~0.8 | 0.40~0.8 | 0.2 | - | 0.2 | - | - | remaining | - | T6 | 310 | D | C | | | |
| | 6463 | 0.2 | 0.20~0.6 | 0.15 | 0.05 | 0.45~0.9 | 0.05 | - | - | - | - | remaining | - | T6 | 241 | C | B | | | |
| Al-Zn | 7001 | 1.6~2.6 | 0.35 | 0.4 | 0.2 | 2.6~3.4 | 6.8~8.0 | 0.18~0.35 | 0.2 | - | - | remaining | - | O | | B | A | High strength structure. Aircraft structure. Bat. | 400 - 3000 | 0,25 |
| | 7003 | 0.2 | 0.3 | 0.35 | 0.3 | 0.50~1.0 | 5.0~6.5 | 0.2 | 0.2 | - | - | remaining | Zr0.05~0.25 | T5 | 400 | B | A | | | |
| | 7050 | 2.0~2.6 | 0.12 | 0.15 | 0.1 | 1.9~2.6 | 5.7~6.7 | 0.04 | 0.06 | - | - | remaining | Zr0.08~0.15 | T73 | 530 | B | A | | | |
| | 7075 | 1.2~2.0 | 0.4 | 0.5 | 0.3 | 2.1~2.9 | 5.1~6.1 | 0.18~0.28 | 0.2 | - | - | remaining | - | T6 | 570 | B | A | | | |
| | 7178 | 1.6~2.4 | 0.4 | 0.5 | 0.3 | 2.4~3.1 | 6.3~7.3 | 0.18~0.35 | 0.2 | - | - | remaining | - | T6 | 600 | B | A | | | |
| | 7475 | 1.2~1.9 | 0.1 | 0.12 | 0.06 | 1.9~2.6 | 5.2~6.2 | 0.18~0.25 | 0.06 | - | - | remaining | - | T61 | 565 | B | A | | | |

**Machinability**

**A** EXCELLENT
**B** GOOD-TO-EXCELLENT
**C** GOOD
**D** NOT GOOD

$V_C = \pi \times D \times n / 1000$ m/min = mm x RPM

D: Tool diameter, N: RPM, $V_C$: Cutting speed, $\pi = 3.1416$

Choose a cutting speed in the range of values, compatible with the cutter max rotation capacity (engraved on the body) and your spindle stability.

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## Recommendations for High Speed Machining at 8,000 rpm or above.

- Check spindle condition:
  Runout
  Balancing
  Clamping of the attachment in traction
  Marking and cleanliness

- Check that the tool is suitable for the required use.

- Inserts must be locked positively in the pocket and secured using the torx screw provided. The screw must be torqued to the correct value as indicated in our charts on the steel product page 88. For security use a new screw each time.

- Check the balancing of the – assembled tool – cutter body, inserts and attachment.

- Before start up, note the maximum RPM engraved on the tool or in our technical documents. The maximum RPM is linked to a precise balancing value.

- Ensure that the field of application of the tool shown in our technical documents and technological parameters is observed:

| | |
|---|---|
| $a_e$ (mm) | width of cut, lateral engagement (radial) |
| $a_p$ (mm) | Axial depth of cut |
| $f_z$ (mm/tooth) | Feed per tooth |
| n (rpm) | RPM |

**Stellram cannot accept responsibility for misuse of this product:**

- Non observance of the above instructions
- Machine without casing
- Incorrect clamping of workpieces
- No safety device on the machine
- Any misuse or incorrect clamping

The optimum rotation must be determined by condition of the spindle. The spindle must be rigid to run at these higher RPMs.

Under no circumstances must any attempt be made to repair this tool. The only permitted maintenance is the indexing or replacement of the inserts. Use a new screw for each insert replacement.

When assembling the cutter to a shrink fit holder, the maximum protrusion can not exceed 10% of the reach of tool.

### The Cutter Nomenclature Code:

**Example:** 5702VZD14CA020R58-2

| | | |
|---|---|---|
| 5702 | = | Stellram Product Family |
| V | = | Screw fixation |
| Z | = | Insert shape (parallelogram) |
| D | = | ISO insert clearance (D = 15°) |
| 14 | = | Insert edge length (mm) |
| C | = | Plain straight shank (No flats) |
| A | = | Through the tool coolant |
| 020 | = | Cutting diameter (mm) |
| R | = | Right hand tool |
| 58 | = | Reach of tool in mm |
| -2 | = | Maximum value of the insert radius in 1/10mm increments |

This tool must only be used for the following applications: Face milling, shoulder milling, slotting and pocketing.

**Cylindrical shanks & HSK shanks (special):** 5702VZD14 and 5720VZ16 are designed and balanced to G6.3 at 30,000 rpm for diameters 50mm and below. Diameters larger then 50mm are balanced to G6.3 at 24,000 rpm. Cylindrical shank tools mounted in a shrink fit holder or any other mill chuck holder + inserts + screws must be re-inspected for balance by the end user when exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

**Shell Mills and Modular Heads:** 5720VZ16 Shell Mills and Modular Heads are not balanced. These tools must be re-inspected for balance as an assembly, cutter + adapter + inserts + screws by the end user when at or exceeding 8,000 rpm. End user must balance the assembly to a G6.3 value minimum.

Balancing requires removing some material by drilling or milling operations. To avoid making modular heads weaker, limit these operations by avoiding high rpm.

For each new modular head added to the same extension, re-balance the assembly. For each new Shell Mill installed on the same toolholder, re-balance the assembly.

Tighten the Modular Head to the Extension, with lubricant, apply the torque value of:

| Thread sizes (mm) | Torque Values Nm |
|---|---|
| M6 | 10 |
| M8 | 30 |
| M10 | 50 |
| M12 | 80 |
| M16 | 110 |

Tighten the bolt between the shell mill and tool holder, with lubricant apply the torque value of:

| Thread sizes (mm) | Cutter Bore Size (mm) | Torque Values Nm |
|---|---|---|
| M6 | 13 | 10 |
| M8 | 16 | 30 |
| M10 | 22 | 50 |
| M12 | 27 | 80 |
| M16 | 32 | 110 |
| M20 | 40 | 120 |



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# Metalcutting Safety

**IMPORTANT SAFETY INSTRUCTIONS**
Read before using the tools in this catalog!
Projectile and Fragmentation Hazards:

Modern metalcutting operations involve high spindle and cutter speeds and high temperatures and cutting forces. Hot metal chips may fly off the workpiece during metalcutting. Although cutting tools are designed and manufactured to withstand high cutting forces and temperatures, they can sometimes fragment, particularly if they are subjected to over-stress, severe impact, or other abuse.

**To avoid injury:**

- Always wear appropriate personal protective equipment, including safety goggles, when operating metalcutting machines or working nearby.
- Always make sure all machine guards are in place.

**Breathing and Skin Contact Hazards:**
Grinding carbide or other advanced cutting tool materials produces dust or mist containing metallic particles. Breathing this dust or mist — especially over an extended period — can cause temporary or permanent lung disease or make existing medical conditions worse. Contact with this dust or mist can irritate eyes, skin, and mucous membranes and may make existing skin conditions worse.

**To avoid injury:**

- Always wear breathing protection and safety goggles when grinding.
- Provide ventilation control and collect and properly dispose of dust, mist, or sludge from grinding.
- Avoid skin contact with dust or mist.

For more information, read the applicable Material Safety Data Sheet provided by Kennametal and consult General Industry Safety and Health Regulations, Part 1910, Title 29 of the Code of Federal Regulations.

These safety instructions are general guidelines. Many variables affect machining operations. It is impossible to cover every specific situation. The technical information included in this catalog and recommendations on machining practices may not apply to your particular operation. For more information, consult Kennametal's Metalcutting Safety booklet, available free from Kennametal at 724.539.5747 or fax 724.539.5439. For specific product safety and environmental questions, contact our Corporate Environmental Health and Safety Office at 724.539.5066 or fax 724.539.5372.

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