

AFFORDABLE PERFORMANCE



**WCE**

Versatile Solid Carbide End Mills

**WIDIA** 

# WCE END MILLS



## AFFORDABLE PERFORMANCE

The WCE solid end milling line features an advanced geometry wrapped into a versatile tool to enable material versatility for small-to-medium shops seeking a cost-effective solution to machine small batches.



#### WCE4

Metric: 3mm–20mm

- Sharp Edges
- Ball Nose
- Radiused
- Chamfered



#### WCE5

Metric: 4mm–20mm

- Chamfered
- Corner Radii

# WCE End Mill

Versatile Solid Carbide End Mills • WCE4 & WCE5

The WCE platform packs a combination of high-performance and general-purpose features into one end mill family offered at an affordable price point in both 4- and 5-flute geometries.



WCE4 4-flute geometry combines the asymmetrical index and variable helix features at an affordable price while ensuring material and application versatility, including demanding operations like full slots and heavy cuts.



WCE5 5-flute geometry combines the unequal index with an elevated 38-degree helix feature at an affordable price for use in primarily Carbon Steel and Stainless Steel shouldering and side milling applications.

## WCE End Mill Family Shared Features:

### **ECCENTRIC RELIEF**

to provide vibration dampening and increase tool life on stainless steels.

6mm+ = eccentric relief

6mm- = faceted relief

### **CORE TAPER**

for improved chip evacuation and tool stability.

# AFFORDABLE PERFORMANCE

## PRODUCT

### GRADE

WU20PD

### FLUTES

4, 5

### DIAMETER RANGE

#### WCE4

3–20mm

#### WCE5

4–20mm

## CORNER CONDITIONS

### WCE4

Sharp Edges  
Chamfered  
Radiused  
Ball Nose

### WCE5

Chamfered  
Corner Radii

## INDUSTRY



## MATERIALS

### FIRST CHOICE



### SECOND CHOICE



## APPLICATIONS

### WCE4



SIDE/  
SHOULDER  
MILLING  
ROUGHING



SLOTTING  
SQUARE  
END



HELICAL  
MILLING



RAMPING  
BLANK



PLUNGE  
MILLING



3D  
PROFILING

### WCE5



SIDE/  
SHOULDER  
MILLING  
ROUGHING



HELICAL  
MILLING



RAMPING  
BLANK



TROCHOIDAL  
MILLING

### WCE4

## VARIABLE HELIX

and asymmetrical index to  
reduce vibrations and increase  
overall cutting stability.

### WCE5

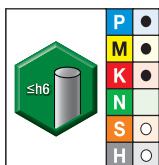
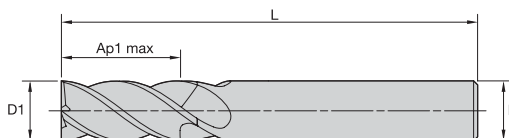
## UNEQUAL INDEX

to reduce vibration/chatter

## 38° HELIX

to increase performance in a  
variety of applications.

## WCE4 • Series W401 • Sharp Edge • 4 Flute • Cylindrical Shank • Metric

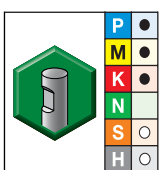
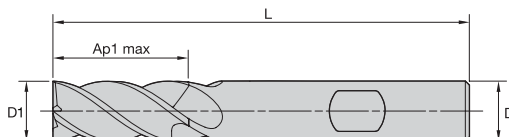


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | Z U |
|---------|---------------|------|----|--------------------------|-------------|-----|
| 6945502 | W401M03003SZT | 3,0  | 6  | 8,00                     | 57          | 4   |
| 6945503 | W401M04003SZT | 4,0  | 6  | 11,00                    | 57          | 4   |
| 6945504 | W401M05003SZT | 5,0  | 6  | 13,00                    | 57          | 4   |
| 6945505 | W401M06003SZT | 6,0  | 6  | 13,00                    | 57          | 4   |
| 6945548 | W401M08004SZT | 8,0  | 8  | 19,00                    | 63          | 4   |
| 6945549 | W401M10005SZT | 10,0 | 10 | 22,00                    | 72          | 4   |
| 6945684 | W401M12006SZT | 12,0 | 12 | 26,00                    | 83          | 4   |
| 6945685 | W401M16008SZT | 16,0 | 16 | 32,00                    | 92          | 4   |
| 6945686 | W401M20009SZT | 20,0 | 20 | 38,00                    | 104         | 4   |

## WCE4 • Series W401 • Sharp Edge • 4 Flute • Weldon® Shank • Metric

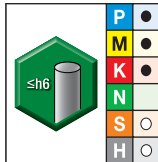
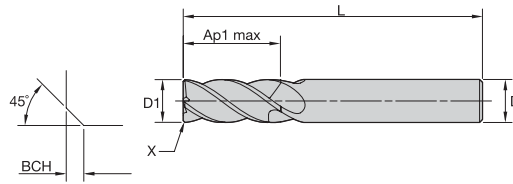


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | Z U |
|---------|---------------|------|----|--------------------------|-------------|-----|
| 6945510 | W401M03003SZW | 3,0  | 6  | 8,00                     | 57          | 4   |
| 6945541 | W401M04003SZW | 4,0  | 6  | 11,00                    | 57          | 4   |
| 6945542 | W401M05003SZW | 5,0  | 6  | 13,00                    | 57          | 4   |
| 6945543 | W401M06003SZW | 6,0  | 6  | 13,00                    | 57          | 4   |
| 6945562 | W401M08004SZW | 8,0  | 8  | 19,00                    | 63          | 4   |
| 6945563 | W401M10005SZW | 10,0 | 10 | 22,00                    | 72          | 4   |
| 6945690 | W401M12006SZW | 12,0 | 12 | 26,00                    | 83          | 4   |
| 6945691 | W401M16008SZW | 16,0 | 16 | 32,00                    | 92          | 4   |
| 6945692 | W401M20009SZW | 20,0 | 20 | 38,00                    | 104         | 4   |

## WCE4 • Series W401 • Chamfered • 4 Flute • Cylindrical Shank • Metric

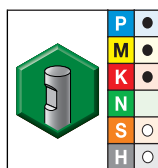
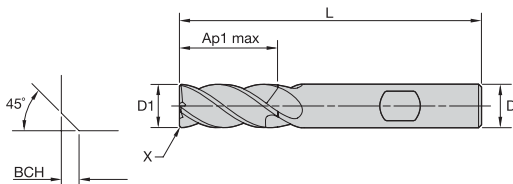


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | BCH  | Z U |
|---------|---------------|------|----|--------------------------|-------------|------|-----|
| 6945506 | W401M03003CAT | 3,0  | 6  | 8,00                     | 57          | 0,20 | 4   |
| 6945507 | W401M04003CAT | 4,0  | 6  | 11,00                    | 57          | 0,20 | 4   |
| 6945508 | W401M05003CAT | 5,0  | 6  | 13,00                    | 57          | 0,30 | 4   |
| 6945509 | W401M06003CAT | 6,0  | 6  | 13,00                    | 57          | 0,40 | 4   |
| 6945550 | W401M08004CAT | 8,0  | 8  | 19,00                    | 63          | 0,40 | 4   |
| 6945561 | W401M10005CET | 10,0 | 10 | 22,00                    | 72          | 0,50 | 4   |
| 6945687 | W401M12006CET | 12,0 | 12 | 26,00                    | 83          | 0,50 | 4   |
| 6945688 | W401M16008CET | 16,0 | 16 | 32,00                    | 92          | 0,50 | 4   |
| 6945689 | W401M20009CET | 20,0 | 20 | 38,00                    | 104         | 0,50 | 4   |

## WCE4 • Series W401 • Chamfered • 4 Flute • Weldon® Shank • Metric

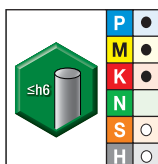
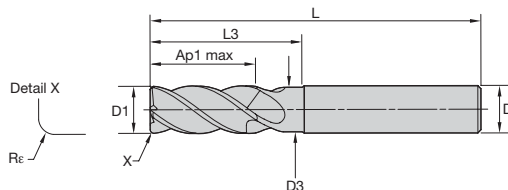


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | BCH  | Z U |
|---------|---------------|------|----|--------------------------|-------------|------|-----|
| 6945544 | W401M03003CAW | 3,0  | 6  | 8,00                     | 57          | 0,20 | 4   |
| 6945545 | W401M04003CAW | 4,0  | 6  | 11,00                    | 57          | 0,20 | 4   |
| 6945546 | W401M05003CAW | 5,0  | 6  | 13,00                    | 57          | 0,30 | 4   |
| 6945547 | W401M06003CAW | 6,0  | 6  | 13,00                    | 57          | 0,40 | 4   |
| 6945564 | W401M08004CAW | 8,0  | 8  | 19,00                    | 63          | 0,40 | 4   |
| 6945565 | W401M10005CEW | 10,0 | 10 | 22,00                    | 72          | 0,50 | 4   |
| 6945693 | W401M12006CEW | 12,0 | 12 | 26,00                    | 83          | 0,50 | 4   |
| 6945694 | W401M16008CEW | 16,0 | 16 | 32,00                    | 92          | 0,50 | 4   |
| 6945695 | W401M20009CEW | 20,0 | 20 | 38,00                    | 104         | 0,50 | 4   |

## WCE4 • Series W4N1 • Radiused • 4 Flute • Necked • Cylindrical Shank • Metric

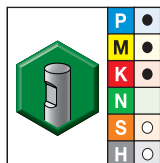
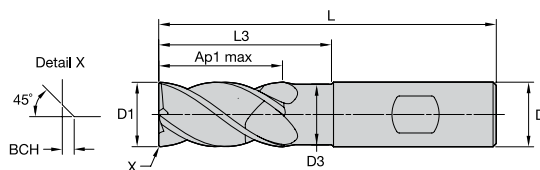


● first choice  
○ alternate choice

WU20PE

| order # | catalogue #   | D1   | D  | D3    | length of cut<br>Ap1 max | length<br>L | L3    | Rε   | Z U |
|---------|---------------|------|----|-------|--------------------------|-------------|-------|------|-----|
| 6945620 | W4N1M03003RAT | 3,0  | 6  | 2,82  | 8,00                     | 57          | 15,00 | 0,20 | 4   |
| 6945631 | W4N1M04003RAT | 4,0  | 6  | 3,76  | 11,00                    | 57          | 16,00 | 0,20 | 4   |
| 6945632 | W4N1M04003RET | 4,0  | 6  | 3,76  | 11,00                    | 57          | 16,00 | 0,50 | 4   |
| 6945633 | W4N1M05003RAT | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 0,20 | 4   |
| 6945634 | W4N1M05003RET | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 0,50 | 4   |
| 6945635 | W4N1M05003RJT | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 1,00 | 4   |
| 6945636 | W4N1M06003RET | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 0,50 | 4   |
| 6945638 | W4N1M06003RHT | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 1,50 | 4   |
| 6945637 | W4N1M06003RJT | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 1,00 | 4   |
| 6945640 | W4N1M08004RET | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 0,50 | 4   |
| 6945642 | W4N1M08004RHT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 1,50 | 4   |
| 6945641 | W4N1M08004RJT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 1,00 | 4   |
| 6945643 | W4N1M08004RKT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 2,00 | 4   |
| 6945644 | W4N1M10005RET | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 0,50 | 4   |
| 6945646 | W4N1M10005RHT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 1,50 | 4   |
| 6945645 | W4N1M10005RJT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 1,00 | 4   |
| 6945647 | W4N1M10005RKT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 2,00 | 4   |
| 6945128 | W4N1M12006RET | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 0,50 | 4   |
| 6945130 | W4N1M12006RHT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 1,50 | 4   |
| 6945129 | W4N1M12006RJT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 1,00 | 4   |
| 6945481 | W4N1M12006RKT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 2,00 | 4   |
| 6945482 | W4N1M12006RQT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 4,00 | 4   |
| 6945483 | W4N1M16008RJT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 1,00 | 4   |
| 6945484 | W4N1M16008RKT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 2,00 | 4   |
| 6945485 | W4N1M16008RPT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 3,00 | 4   |
| 6945486 | W4N1M16008RQT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 4,00 | 4   |
| 6945487 | W4N1M20009RJT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 53,00 | 1,00 | 4   |
| 6945488 | W4N1M20009RKT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 53,00 | 2,00 | 4   |
| 6945489 | W4N1M20009RPT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 53,00 | 3,00 | 4   |
| 6945490 | W4N1M20009RQT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 53,00 | 4,00 | 4   |

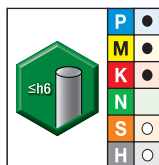
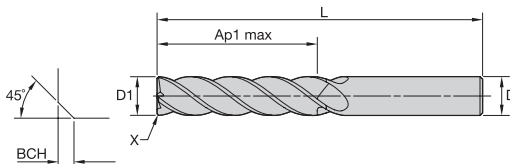
## WCE4 • Series W4N1 • Chamfered • 4 Flute • Necked • Weldon® Shank • Metric



WU20PE

| order # | catalogue #   | D1   | D  | D3    | length of cut<br>Ap1 max | length<br>L | L3    | BCH  | Z U |
|---------|---------------|------|----|-------|--------------------------|-------------|-------|------|-----|
| 7006950 | W4N1M03003CAW | 3,0  | 6  | 2,82  | 8,00                     | 57          | 15,00 | 0,15 | 4   |
| 7007001 | W4N1M04003CAW | 4,0  | 6  | 3,76  | 11,00                    | 57          | 16,00 | 0,15 | 4   |
| 7007002 | W4N1M05003CAW | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 0,15 | 4   |
| 7007003 | W4N1M06003CAW | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 0,15 | 4   |
| 7007004 | W4N1M08004CAW | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 0,20 | 4   |
| 7007005 | W4N1M10005CAW | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 0,20 | 4   |
| 7006070 | W4N1M12006CAW | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 0,20 | 4   |
| 7006091 | W4N1M16008CYW | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 0,35 | 4   |
| 7006092 | W4N1M20009CYW | 20,0 | 20 | 18,80 | 38,00                    | 104         | 53,00 | 0,35 | 4   |
| 7006093 | W4N1M2500ACYW | 25,0 | 25 | 23,50 | 45,00                    | 121         | 75,00 | 0,35 | 4   |

## WCE4 • Series W411 • Chamfered • 4 Flute • Long Length • Cylindrical Shank • Metric

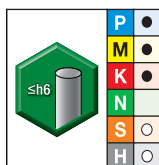
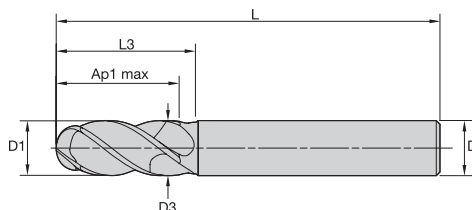


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | BCH  | Z U |
|---------|---------------|------|----|--------------------------|-------------|------|-----|
| 6946013 | W411M06013CAT | 6,0  | 6  | 32,00                    | 76          | 0,40 | 4   |
| 6946014 | W411M08014CAT | 8,0  | 8  | 32,00                    | 87          | 0,40 | 4   |
| 6946015 | W411M10015CET | 10,0 | 10 | 38,00                    | 89          | 0,50 | 4   |
| 6946046 | W411M12016CET | 12,0 | 12 | 51,00                    | 100         | 0,50 | 4   |
| 6946047 | W411M16018CET | 16,0 | 16 | 57,00                    | 125         | 0,50 | 4   |
| 6946048 | W411M20019CET | 20,0 | 20 | 57,00                    | 125         | 0,50 | 4   |

## WCE4 • Series W4NB • Ball Nose • 4 Flute • Cylindrical Shank • Metric

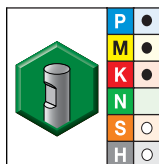
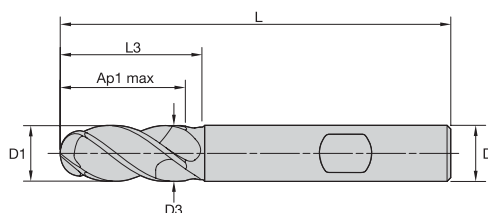


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | D3    | length of cut<br>Ap1 max | length<br>L | L3    | Z U |
|---------|---------------|------|----|-------|--------------------------|-------------|-------|-----|
| 6945882 | W4NBM05003RBT | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 4   |
| 6945883 | W4NBM06003RBT | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 4   |
| 6945886 | W4NBM08004RBT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 4   |
| 6945887 | W4NBM10005RBT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 4   |
| 6945895 | W4NBM12006RBT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 30,00 | 4   |
| 6945896 | W4NBM16008RBT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 38,00 | 4   |
| 6945897 | W4NBM20009RBT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 50,00 | 4   |

## WCE4 • Series W4NB • Ball Nose • 4 Flute • Weldon® Shank • Metric



WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | D3    | length of cut<br>Ap1 max | length<br>L | L3    | Z U |
|---------|---------------|------|----|-------|--------------------------|-------------|-------|-----|
| 6945884 | W4NBM05003RBW | 5,0  | 6  | 4,70  | 13,00                    | 57          | 18,00 | 4   |
| 6945885 | W4NBM06003RBW | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 4   |
| 6945888 | W4NBM08004RBW | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 4   |
| 6945889 | W4NBM10005RBW | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 4   |
| 6945898 | W4NBM12006RBW | 12,0 | 12 | 11,28 | 26,00                    | 83          | 30,00 | 4   |
| 6945899 | W4NBM16008RBW | 16,0 | 16 | 15,04 | 32,00                    | 92          | 38,00 | 4   |
| 6945900 | W4NBM20009RBW | 20,0 | 20 | 18,80 | 38,00                    | 104         | 50,00 | 4   |

## Application Data • WCE4 Side Milling • Slotting • Metric

| Material Group |   |  |  |  |     |                                                                                                      |     |               |       |       |       |       |       |       |       |       |       |       |       |       |
|----------------|---|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------|-----|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                |   | Side Milling                                                                      | Slotting                                                                          | WU20PE                                                                             |     | Recommended feed per tooth (fz = mm/th) for side milling (A).<br>For slotting (B), reduce fz by 20%. |     |               |       |       |       |       |       |       |       |       |       |       |       |       |
|                |   |                                                                                   |                                                                                   | Cutting Speed – Vc<br>m/min                                                        |     |                                                                                                      | mm  | D1 – Diameter |       |       |       |       |       |       |       |       |       |       |       |       |
|                |   |                                                                                   |                                                                                   | ap                                                                                 | ae  | ap                                                                                                   |     | min           | Start | max   | 3,0   | 4,0   | 5,0   | 6,0   | 8,0   | 10,0  | 12,0  | 14,0  | 16,0  | 18,0  |
| P              | 0 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 150 | 175                                                                                                  | 200 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 1 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 150 | 175                                                                                                  | 200 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 2 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 140 | 165                                                                                                  | 190 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 3 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 120 | 140                                                                                                  | 160 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 4 | ap1max                                                                            | 0,4 x D1                                                                          | 0,75 x D1                                                                          | 90  | 120                                                                                                  | 150 | fz            | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |
|                | 5 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 60  | 80                                                                                                   | 100 | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
|                | 6 | ap1max                                                                            | 0,4 x D1                                                                          | 0,75 x D1                                                                          | 50  | 65                                                                                                   | 75  | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |
| M              | 1 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 90  | 100                                                                                                  | 115 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 2 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 60  | 70                                                                                                   | 80  | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
|                | 3 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 60  | 65                                                                                                   | 70  | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |
| K              | 1 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 120 | 135                                                                                                  | 150 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 2 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 110 | 125                                                                                                  | 140 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 3 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 110 | 120                                                                                                  | 130 | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
| S              | 1 | ap1max                                                                            | 0,4 x D1                                                                          | 0,3 x D1                                                                           | 50  | 70                                                                                                   | 90  | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 2 | ap1max                                                                            | 0,4 x D1                                                                          | 0,3 x D1                                                                           | 25  | 30                                                                                                   | 40  | fz            | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |
|                | 3 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 25  | 30                                                                                                   | 40  | fz            | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |
|                | 4 | ap1max                                                                            | 0,4 x D1                                                                          | 1,0 x D1                                                                           | 50  | 55                                                                                                   | 60  | fz            | 0,011 | 0,016 | 0,021 | 0,026 | 0,037 | 0,045 | 0,052 | 0,058 | 0,064 | 0,069 | 0,074 | 0,084 |
| H              | 1 | ap1max                                                                            | 0,4 x D1                                                                          | 0,75 x D1                                                                          | 80  | 110                                                                                                  | 140 | fz            | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |
|                | 2 | ap1max                                                                            | 0,4 x D1                                                                          | 0,5 x D1                                                                           | 70  | 90                                                                                                   | 120 | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |

## Application Data • WCE4 Side Milling • Slotting BN • Metric

| Material Group |   |  |  |  |     |                                                                                                      |     |               |       |       |       |       |       |       |       |       |       |       |       |       |      |      |
|----------------|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------|-----|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
|                |   | Side Milling                                                                        | Slotting                                                                            | WU20PE                                                                               |     | Recommended feed per tooth (fz = mm/th) for side milling (A).<br>For slotting (B), reduce fz by 20%. |     |               |       |       |       |       |       |       |       |       |       |       |       |       |      |      |
|                |   |                                                                                     |                                                                                     | Cutting Speed – Vc<br>m/min                                                          |     |                                                                                                      | mm  | D1 – Diameter |       |       |       |       |       |       |       |       |       |       |       |       |      |      |
|                |   |                                                                                     |                                                                                     | ap                                                                                   | ae  | ap                                                                                                   |     | min           | Start | max   | 3,0   | 4,0   | 5,0   | 6,0   | 8,0   | 10,0  | 12,0  | 14,0  | 16,0  | 18,0  | 20,0 | 25,0 |
| P              | 0 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 150 | 175                                                                                                  | 200 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |      |      |
|                | 1 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 150 | 175                                                                                                  | 200 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |      |      |
|                | 2 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 140 | 165                                                                                                  | 190 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |      |      |
|                | 3 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 120 | 140                                                                                                  | 160 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |      |      |
|                | 4 | ap1max                                                                              | 0,4 x D1                                                                            | 0,75 x D1                                                                            | 90  | 120                                                                                                  | 150 | fz            | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |      |      |
|                | 5 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 60  | 80                                                                                                   | 100 | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |      |      |
|                | 6 | ap1max                                                                              | 0,4 x D1                                                                            | 0,75 x D1                                                                            | 50  | 65                                                                                                   | 75  | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |      |      |
| M              | 1 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 90  | 100                                                                                                  | 115 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |      |      |
|                | 2 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 60  | 70                                                                                                   | 80  | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |      |      |
|                | 3 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 60  | 65                                                                                                   | 70  | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |      |      |
| K              | 1 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 120 | 135                                                                                                  | 150 | fz            | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |      |      |
|                | 2 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 110 | 125                                                                                                  | 140 | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |      |      |
|                | 3 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 110 | 120                                                                                                  | 130 | fz            | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |      |      |
| S              | 1 | ap1max                                                                              | 0,4 x D1                                                                            | 0,3 x D1                                                                             | 50  | 70                                                                                                   | 90  | fz            | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |      |      |
|                | 2 | ap1max                                                                              | 0,4 x D1                                                                            | 0,3 x D1                                                                             | 25  | 30                                                                                                   | 40  | fz            | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |      |      |
|                | 3 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 25  | 30                                                                                                   | 40  | fz            | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |      |      |
|                | 4 | ap1max                                                                              | 0,4 x D1                                                                            | 1,0 x D1                                                                             | 50  | 55                                                                                                   | 60  | fz            | 0,011 | 0,016 | 0,021 | 0,026 | 0,037 | 0,045 | 0,052 | 0,058 | 0,064 | 0,069 | 0,074 | 0,084 |      |      |
| H              | 1 | ap1max                                                                              | 0,4 x D1                                                                            | 0,75 x D1                                                                            | 80  | 110                                                                                                  | 140 | fz            | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |      |      |
|                | 2 | ap1max                                                                              | 0,4 x D1                                                                            | 0,5 x D1                                                                             | 70  | 90                                                                                                   | 120 | fz            | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |      |      |

## Application Data • WCE4 Side Milling • Long • Metric

| Material Group |   |  |           |  |                                                                                                 |               |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|----------------|---|-----------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|                |   |                                                                                   |           |                                                                                    |                                                                                                 |               |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   |                                                                                   |           |                                                                                    |                                                                                                 |               |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   |                                                                                   |           |                                                                                    |                                                                                                 |               |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
| Side Milling   |   | WU20PE                                                                            |           |                                                                                    | Recommended feed per tooth (fz = mm/z) for side milling.<br>No slotting operations recommended. |               |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   | Cutting Speed — Vc<br>m/min                                                       |           |                                                                                    | mm                                                                                              | D1 — Diameter |     |       |       |       |       |       |       |       |       |       |       |       |       |  |
|                |   | ap                                                                                | ae        | min                                                                                |                                                                                                 | Start         | max | 3,0   | 4,0   | 5,0   | 6,0   | 8,0   | 10,0  | 12,0  | 14,0  | 16,0  | 18,0  | 20,0  | 25,0  |  |
| P              | 0 | ap1max                                                                            | 0,2 x D1  | 150                                                                                | 175                                                                                             | 200           | fz  | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |  |
|                | 1 | ap1max                                                                            | 0,2 x D1  | 150                                                                                | 175                                                                                             | 200           | fz  | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |  |
|                | 2 | ap1max                                                                            | 0,2 x D1  | 140                                                                                | 165                                                                                             | 190           | fz  | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |  |
|                | 3 | ap1max                                                                            | 0,2 x D1  | 120                                                                                | 140                                                                                             | 160           | fz  | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |  |
|                | 4 | ap1max                                                                            | 0,2 x D1  | 90                                                                                 | 120                                                                                             | 150           | fz  | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |  |
|                | 5 | ap1max                                                                            | 0,2 x D1  | 60                                                                                 | 80                                                                                              | 100           | fz  | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |  |
|                | 6 | ap1max                                                                            | 0,15 x D1 | 50                                                                                 | 65                                                                                              | 75            | fz  | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |  |
| M              | 1 | ap1max                                                                            | 0,2 x D1  | 90                                                                                 | 100                                                                                             | 115           | fz  | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |  |
|                | 2 | ap1max                                                                            | 0,2 x D1  | 60                                                                                 | 70                                                                                              | 80            | fz  | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |  |
|                | 3 | ap1max                                                                            | 0,2 x D1  | 60                                                                                 | 65                                                                                              | 70            | fz  | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |  |
| K              | 1 | ap1max                                                                            | 0,2 x D1  | 120                                                                                | 135                                                                                             | 150           | fz  | 0,021 | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |  |
|                | 2 | ap1max                                                                            | 0,2 x D1  | 110                                                                                | 125                                                                                             | 140           | fz  | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |  |
|                | 3 | ap1max                                                                            | 0,2 x D1  | 110                                                                                | 120                                                                                             | 130           | fz  | 0,014 | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |  |
| S              | 1 | ap1max                                                                            | 0,1 x D1  | 50                                                                                 | 70                                                                                              | 90            | fz  | 0,017 | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |  |
|                | 2 | ap1max                                                                            | 0,1 x D1  | 25                                                                                 | 30                                                                                              | 40            | fz  | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |  |
|                | 3 | ap1max                                                                            | 0,15 x D1 | 25                                                                                 | 30                                                                                              | 40            | fz  | 0,009 | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |  |
|                | 4 | ap1max                                                                            | 0,15 x D1 | 50                                                                                 | 55                                                                                              | 60            | fz  | 0,011 | 0,016 | 0,021 | 0,026 | 0,037 | 0,045 | 0,052 | 0,058 | 0,064 | 0,069 | 0,074 | 0,084 |  |
| H              | 1 | ap1max                                                                            | 0,15 x D1 | 80                                                                                 | 110                                                                                             | 140           | fz  | 0,016 | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |  |
|                | 2 | ap1max                                                                            | 0,15 x D1 | 70                                                                                 | 90                                                                                              | 120           | fz  | 0,012 | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |  |

## WCE • Adjustment Factor Table for Feed Calculation

To calculate application-specific cutting data, please use Kv coefficient table to the right for adaptation of cutting speed and KFz for feed, respectively.

$$V_{c \text{ new}} = V_c \cdot K_v$$

$$F_z \text{ new} = IPT \cdot K_{Fz}$$

Calculation example:

Application: D = 20mm; M2 material group;

Ae = 2mm

Cutting data recommendation: Vc = 80 m/min;

Fz = 0,089 mm/th

Adjustment coefficients: Ae = 2mm equals 10,0%;

Kv = 1,3; KFz = 1,64

Final cutting data recommendation:

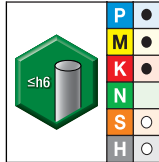
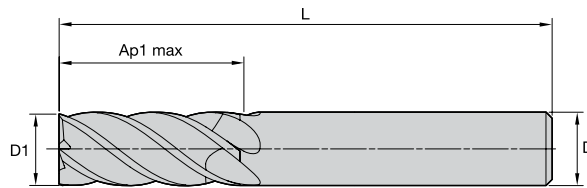
Vc new = 80 \* 1,3 = 104 m/min

Fz new = 0,089 \* 1,64 = 0,146 mm/m

### Metric

|              | Ae/D | 2%      | 4%       | 5%       | 8%   | 10%  | 12%  | 20%  | 30%  | 40%  | 50%  | 100% |
|--------------|------|---------|----------|----------|------|------|------|------|------|------|------|------|
| Speed Factor | Kv   | 1,9–3,3 | 1,45–2,7 | 1,45–2,3 | 1,45 | 1,3  | 1,3  | 1,2  | 1,1  | 1,0  | 0,9  | 0,8  |
| Feed Factor  | KFz  | 3,51    | 2,51     | 2,25     | 1,80 | 1,64 | 1,51 | 1,23 | 1,07 | 1,00 | 0,98 | 0,98 |

## WCE5 • Series W501 • Sharp Edge • 5-Flute • Straight Shank • Metric

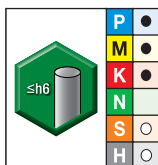
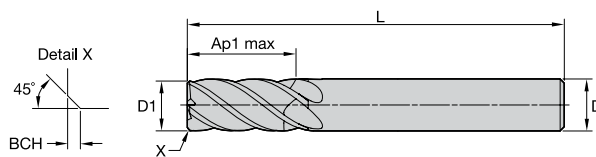


● first choice  
○ alternate choice

WU20PE

| order # | catalogue #   | D1 | D  | length of cut<br>Ap1 max | length<br>L | Z U |
|---------|---------------|----|----|--------------------------|-------------|-----|
| 7109237 | W501M04003SZT | 4  | 6  | 11                       | 57          | 5   |
| 7109238 | W501M05003SZT | 5  | 6  | 13                       | 57          | 5   |
| 7109239 | W501M06003SZT | 6  | 6  | 13                       | 57          | 5   |
| 7108706 | W501M08004SZT | 8  | 8  | 19                       | 63          | 5   |
| 7108707 | W501M10005SZT | 10 | 10 | 22                       | 72          | 5   |
| 7109599 | W501M12006SZT | 12 | 12 | 26                       | 83          | 5   |
| 7109600 | W501M16008SZT | 16 | 16 | 32                       | 92          | 5   |
| 7109641 | W501M20009SZT | 20 | 20 | 38                       | 104         | 5   |
| 7109642 | W501M2500ASZT | 25 | 25 | 50                       | 121         | 5   |

## WCE5 • Series W501 • Chamfered • 5 Flute • Straight Shank • Metric

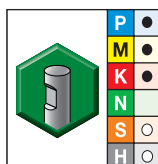
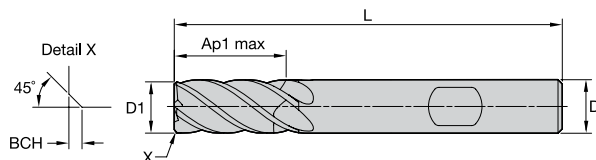


WU20PE

● first choice  
○ alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | BCH  | Z U |
|---------|---------------|------|----|--------------------------|-------------|------|-----|
| 7006956 | W501M04003CAT | 4,0  | 6  | 11,00                    | 57          | 0,20 | 5   |
| 7006957 | W501M05003CAT | 5,0  | 6  | 13,00                    | 57          | 0,30 | 5   |
| 7006958 | W501M06003CAT | 6,0  | 6  | 13,00                    | 57          | 0,40 | 5   |
| 7007602 | W501M08004CAT | 8,0  | 8  | 19,00                    | 63          | 0,40 | 5   |
| 7007603 | W501M10005CET | 10,0 | 10 | 22,00                    | 72          | 0,50 | 5   |
| 7008716 | W501M12006CET | 12,0 | 12 | 26,00                    | 83          | 0,50 | 5   |
| 7008717 | W501M16008CET | 16,0 | 16 | 32,00                    | 92          | 0,50 | 5   |
| 7008718 | W501M20009CET | 20,0 | 20 | 38,00                    | 104         | 0,50 | 5   |

## WCE5 • Series W501 • Chamfered • 5 Flute • Weldon® Shank • Metric

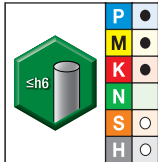
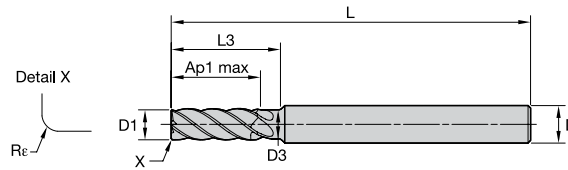


WU20PE

● first choice  
○ alternate choice

| order # | catalogue #   | D1   | D  | length of cut<br>Ap1 max | length<br>L | BCH  | Z U |
|---------|---------------|------|----|--------------------------|-------------|------|-----|
| 7006959 | W501M04003CAW | 4,0  | 6  | 11,00                    | 57          | 0,20 | 5   |
| 7006960 | W501M05003CAW | 5,0  | 6  | 13,00                    | 57          | 0,30 | 5   |
| 7007081 | W501M06003CAW | 6,0  | 6  | 13,00                    | 57          | 0,40 | 5   |
| 7007604 | W501M08004CAW | 8,0  | 8  | 19,00                    | 63          | 0,40 | 5   |
| 7007605 | W501M10005CEW | 10,0 | 10 | 22,00                    | 72          | 0,50 | 5   |
| 7008719 | W501M12006CEW | 12,0 | 12 | 26,00                    | 83          | 0,50 | 5   |
| 7008720 | W501M16008CEW | 16,0 | 16 | 32,00                    | 92          | 0,50 | 5   |
| 7008731 | W501M20009CEW | 20,0 | 20 | 38,00                    | 104         | 0,50 | 5   |

## WCE5 • Series W5N1 • Radiused • 5 Flute • Necked • Straight Shank • Metric

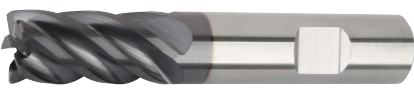


WU20PE

- first choice
- alternate choice

| order # | catalogue #   | D1   | D  | D3    | length of cut<br>Ap1 max | length<br>L | L3    | Re   | Z U |
|---------|---------------|------|----|-------|--------------------------|-------------|-------|------|-----|
| 7007606 | W5N1M04003RAT | 4,0  | 6  | 3,76  | 11,00                    | 57          | 15,00 | 0,20 | 5   |
| 7007607 | W5N1M04003RET | 4,0  | 6  | 3,76  | 11,00                    | 57          | 15,00 | 0,50 | 5   |
| 7007608 | W5N1M05003RAT | 5,0  | 6  | 4,70  | 13,00                    | 57          | 17,00 | 0,20 | 5   |
| 7007609 | W5N1M05003RET | 5,0  | 6  | 4,70  | 13,00                    | 57          | 17,00 | 0,50 | 5   |
| 7007610 | W5N1M05003RJT | 5,0  | 6  | 4,70  | 13,00                    | 57          | 17,00 | 1,00 | 5   |
| 7007611 | W5N1M06003RET | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 0,50 | 5   |
| 7007613 | W5N1M06003RHT | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 1,50 | 5   |
| 7007612 | W5N1M06003RJT | 6,0  | 6  | 5,64  | 13,00                    | 57          | 21,00 | 1,00 | 5   |
| 7007614 | W5N1M08004RET | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 0,50 | 5   |
| 7007616 | W5N1M08004RHT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 1,50 | 5   |
| 7007615 | W5N1M08004RJT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 1,00 | 5   |
| 7007617 | W5N1M08004RKT | 8,0  | 8  | 7,52  | 19,00                    | 63          | 27,00 | 2,00 | 5   |
| 7007618 | W5N1M10005RET | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 0,50 | 5   |
| 7007620 | W5N1M10005RHT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 1,50 | 5   |
| 7007619 | W5N1M10005RJT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 1,00 | 5   |
| 7007621 | W5N1M10005RKT | 10,0 | 10 | 9,40  | 22,00                    | 72          | 32,00 | 2,00 | 5   |
| 7008732 | W5N1M12006RET | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 0,50 | 5   |
| 7008734 | W5N1M12006RHT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 1,50 | 5   |
| 7008733 | W5N1M12006RJT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 1,00 | 5   |
| 7008735 | W5N1M12006RKT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 2,00 | 5   |
| 7008736 | W5N1M12006RQT | 12,0 | 12 | 11,28 | 26,00                    | 83          | 38,00 | 4,00 | 5   |
| 7008737 | W5N1M16008RJT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 1,00 | 5   |
| 7008738 | W5N1M16008RKT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 2,00 | 5   |
| 7008739 | W5N1M16008RPT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 3,00 | 5   |
| 7008740 | W5N1M16008RQT | 16,0 | 16 | 15,04 | 32,00                    | 92          | 44,00 | 4,00 | 5   |
| 7008741 | W5N1M20009RJT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 55,00 | 1,00 | 5   |
| 7008742 | W5N1M20009RKT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 55,00 | 2,00 | 5   |
| 7008743 | W5N1M20009RPT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 55,00 | 3,00 | 5   |
| 7008744 | W5N1M20009RQT | 20,0 | 20 | 18,80 | 38,00                    | 104         | 55,00 | 4,00 | 5   |

## Application Data • WCE5 Side Milling • Slotting • Metric

| Material Group |  |        |  |         |  |       |     |                                                                                                      |       |       |       |       |       |       |       |       |       |       |       |
|----------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------|-------|-----|------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                | Side Milling                                                                      |        | Slotting                                                                          |         | WU20PE                                                                             |       |     | Recommended feed per tooth (fz = mm/th) for side milling (A).<br>For slotting (B), reduce fz by 20%. |       |       |       |       |       |       |       |       |       |       |       |
|                |                                                                                   |        |                                                                                   |         | Cutting Speed — Vc<br>m/min                                                        |       |     | D1 — Diameter                                                                                        |       |       |       |       |       |       |       |       |       |       |       |
|                | ap                                                                                | ae     | ap                                                                                |         | min                                                                                | Start | max | mm                                                                                                   | 4,0   | 5,0   | 6,0   | 8,0   | 10,0  | 12,0  | 14,0  | 16,0  | 18,0  | 20,0  | 25,0  |
| P              | 0                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 150                                                                                | —     | 200 | fz                                                                                                   | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 1                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 150                                                                                | —     | 200 | fz                                                                                                   | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 2                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 140                                                                                | —     | 190 | fz                                                                                                   | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 3                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 120                                                                                | —     | 160 | fz                                                                                                   | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 4                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 90                                                                                 | —     | 150 | fz                                                                                                   | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |
|                | 5                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 60                                                                                 | —     | 100 | fz                                                                                                   | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
| M              | 6                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 50                                                                                 | —     | 75  | fz                                                                                                   | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |
|                | 1                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 90                                                                                 | —     | 115 | fz                                                                                                   | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 2                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 60                                                                                 | —     | 80  | fz                                                                                                   | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
| K              | 3                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 60                                                                                 | —     | 70  | fz                                                                                                   | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |
|                | 1                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 120                                                                                | —     | 150 | fz                                                                                                   | 0,028 | 0,036 | 0,044 | 0,060 | 0,072 | 0,083 | 0,092 | 0,101 | 0,108 | 0,114 | 0,124 |
|                | 2                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 110                                                                                | —     | 140 | fz                                                                                                   | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
| S              | 3                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 110                                                                                | —     | 130 | fz                                                                                                   | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
|                | 1                                                                                 | ap1max | 0,3 x D                                                                           | 0,2 x D | 50                                                                                 | —     | 90  | fz                                                                                                   | 0,023 | 0,030 | 0,036 | 0,050 | 0,061 | 0,070 | 0,079 | 0,087 | 0,095 | 0,101 | 0,114 |
|                | 2                                                                                 | ap1max | 0,3 x D                                                                           | 0,2 x D | 25                                                                                 | —     | 40  | fz                                                                                                   | 0,013 | 0,016 | 0,019 | 0,026 | 0,032 | 0,037 | 0,042 | 0,046 | 0,050 | 0,054 | 0,061 |
| H              | 3                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 60                                                                                 | —     | 80  | fz                                                                                                   | 0,019 | 0,024 | 0,029 | 0,040 | 0,048 | 0,056 | 0,063 | 0,070 | 0,076 | 0,081 | 0,091 |
|                | 4                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 50                                                                                 | —     | 60  | fz                                                                                                   | 0,016 | 0,021 | 0,026 | 0,037 | 0,045 | 0,052 | 0,058 | 0,064 | 0,069 | 0,074 | 0,084 |
|                | 1                                                                                 | ap1max | 0,4 x D                                                                           | 0,3 x D | 80                                                                                 | —     | 140 | fz                                                                                                   | 0,021 | 0,027 | 0,033 | 0,045 | 0,054 | 0,062 | 0,070 | 0,077 | 0,083 | 0,088 | 0,098 |
| H              | 2                                                                                 | ap1max | 0,2 x D                                                                           | 0,3 x D | 70                                                                                 | —     | 120 | fz                                                                                                   | 0,016 | 0,020 | 0,025 | 0,034 | 0,040 | 0,047 | 0,052 | 0,057 | 0,061 | 0,065 | 0,071 |

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.  
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.  
Above parameters are based on ideal conditions. For smaller taper machining centers, please adjust parameters accordingly on diameters greater than 12mm.  
For better surface finish reduce feed per tooth.  
Side milling applications - for longest reach (L3) tools, reduce Ae by 30%.  
Slot milling applications - for longest reach (L3) tools, reduce Ae by 30%.

## WCE • Adjustment Factor Table for Feed Calculation

To calculate application-specific cutting data, please use Kv coefficient table to the right for adaptation of cutting speed and KFz for feed, respectively.

$$V_{c \text{ new}} = V_c \cdot K_v$$

$$F_z \text{ new} = IPT \cdot K_{Fz}$$

Calculation example:  
Application: D = 20mm; M2 material group;  
Ae = 2mm  
Cutting data recommendation: Vc = 80 m/min;  
Fz = 0,089 mm/th  
Adjustment coefficients: Ae = 2mm equals 10,0%;  
Kv = 1,3; KFz = 1,64

Final cutting data recommendation:  
Vc new = 80 \* 1,3 = 104 m/min  
Fz new = 0,089 \* 1,64 = 0,146 mm/m

### Metric

|              | Ae/D | 2%      | 4%       | 5%       | 8%   | 10%  | 12%  | 20%  | 30%  | 40%  | 50%  | 100% |
|--------------|------|---------|----------|----------|------|------|------|------|------|------|------|------|
| Speed Factor | Kv   | 1,9–3,3 | 1,45–2,7 | 1,45–2,3 | 1,45 | 1,3  | 1,3  | 1,2  | 1,1  | 1,0  | 0,9  | 0,8  |
| Feed Factor  | KFz  | 3,51    | 2,51     | 2,25     | 1,80 | 1,64 | 1,51 | 1,23 | 1,07 | 1,00 | 0,98 | 0,98 |

[illegible]

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## VERSATILE SOLID CARBIDE END MILLS

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