

## Cutting Speed ( $V_c$ ) and Material Factor ( $F_m$ )

| MATERIAL        |                             | Hardness<br>HB | Tensile Strength<br>N/mm <sup>2</sup> | Cutting Speed<br>( $V_c$ ) m/min | Material Factor<br>( $F_m$ ) |
|-----------------|-----------------------------|----------------|---------------------------------------|----------------------------------|------------------------------|
| Steel           | Low carbon, C < 0,25%       | < 120          | < 400                                 | 150 - 200                        | 1,2                          |
|                 | Medium carbon, C < 0,55%    | < 200          | < 700                                 | 120 - 170                        | 1,1                          |
|                 | High carbon, C < 0,85%      | < 250          | < 850                                 | 110 - 150                        | 1,0                          |
|                 | Low alloy                   | < 250          | < 850                                 | 100 - 140                        | 1,0                          |
|                 | High alloy                  | < 350          | < 1200                                | 70 - 110                         | 0,9                          |
|                 | Hardened, HRC < 45          |                |                                       | 60 - 100                         | 0,8                          |
|                 | Hardened, HRC < 55          |                |                                       | 30 - 60                          | 0,7                          |
|                 | Hardened, HRC < 65          |                |                                       | 20 - 40                          | 0,6                          |
| Cast iron       | Lamellar graphite           | < 150          | < 500                                 | 130 - 180                        | 1,2                          |
|                 | Lamellar graphite           | < 300          | < 1000                                | 100 - 150                        | 1,1                          |
|                 | Nodular graphite, malleable | < 200          | < 700                                 | 100 - 150                        | 1,0                          |
|                 | Nodular graphite, malleable | < 300          | < 1000                                | 80 - 120                         | 0,9                          |
| Stainless steel | Free machining              | < 250          | < 850                                 | 130 - 180                        | 1,0                          |
|                 | Austenitic                  | < 250          | < 850                                 | 90 - 140                         | 0,9                          |
|                 | Ferritic and austenitic     | < 300          | < 1000                                | 80 - 120                         | 0,8                          |
| Titanium        | Unalloyed                   | < 200          | < 700                                 | 60 - 80                          | 0,8                          |
|                 | Alloyed                     | < 270          | < 900                                 | 50 - 70                          | 0,7                          |
|                 | Alloyed                     | < 350          | < 1250                                | 30 - 50                          | 0,6                          |
| Nickel          | Unalloyed                   | < 150          | < 500                                 | 80 - 120                         | 0,8                          |
|                 | Alloyed                     | < 270          | < 900                                 | 60 - 80                          | 0,7                          |
|                 | Alloyed                     | < 350          | < 1250                                | 50 - 70                          | 0,6                          |
| Copper          | Unalloyed                   | < 100          | < 350                                 | 150 - 250                        | 1,0                          |
|                 | Brass, bronze               | < 200          | < 700                                 | 130 - 180                        | 1,0                          |
|                 | High strength bronze        | < 470          | < 1500                                | 60 - 80                          | 0,8                          |
| Aluminium       | Unalloyed                   | < 100          | < 350                                 | 500 - 900                        | 1,4                          |
|                 | Alloyed, Si < 0.5%          | < 150          | < 500                                 | 400 - 800                        | 1,3                          |
|                 | Alloyed, Si < 10%           | < 120          | < 400                                 | 300 - 500                        | 1,2                          |
|                 | Alloyed, Si > 10%           | < 120          | < 400                                 | 200 - 400                        | 1,1                          |
| Inconel         | 718                         | < 370          |                                       | 50 - 70                          | 0,6                          |
| Graphite        |                             |                |                                       | 300 - 500                        | 1,0                          |

## Code Key



type of end mill

cutter diameter

cutting length

carbide grade

shank dimension

cutting edges

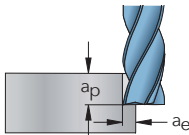
corner radius

B = two flute  
C = three flute  
D = four flute  
F = six flute

### Engagement Factor ( $F_e$ )

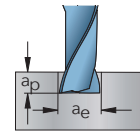
|                       | Side Milling         |                       |                      |                       | Slot Milling<br>$a_e = 1,0 \times D$ |
|-----------------------|----------------------|-----------------------|----------------------|-----------------------|--------------------------------------|
|                       | $a_e = 0,1 \times D$ | $a_e = 0,25 \times D$ | $a_e = 0,5 \times D$ | $a_e = 0,75 \times D$ |                                      |
| $a_p = 0,25 \times D$ | 3,5                  | 1,8                   | 1,4                  | 1,2                   | 1,0                                  |
| $a_p = 0,5 \times D$  | 3,0                  | 1,5                   | 1,2                  | 0,9                   | 0,7                                  |
| $a_p = 0,75 \times D$ | 2,5                  | 1,3                   | 1,0                  | 0,7                   | 0,6                                  |
| $a_p = 1,0 \times D$  | 2,0                  | 1,1                   | 0,8                  | 0,6                   | 0,5                                  |
| $a_p = 1,25 \times D$ | 1,7                  | 0,9                   | 0,6                  |                       |                                      |
| $a_p = 1,5 \times D$  | 1,4                  | 0,7                   |                      |                       |                                      |
| $a_p = 2,0 \times D$  | 1,2                  | 0,5                   |                      |                       |                                      |
| $a_p = 2,5 \times D$  | 1,0                  |                       |                      |                       |                                      |
| $a_p = 3,0 \times D$  | 0,8                  |                       |                      |                       |                                      |

#### Side Milling



$$F_z = F_m \times F_e \times F_d$$

#### Slot Milling



### Diameter Factor ( $F_d$ )

| D    | Diameter Factor ( $F_d$ ) |
|------|---------------------------|
| 0,5  | 0,004                     |
| 1,0  | 0,006                     |
| 2,0  | 0,009                     |
| 3,0  | 0,012                     |
| 4,0  | 0,016                     |
| 5,0  | 0,022                     |
| 6,0  | 0,032                     |
| 8,0  | 0,045                     |
| 10,0 | 0,056                     |
| 12,0 | 0,074                     |
| 14,0 | 0,086                     |
| 16,0 | 0,098                     |
| 18,0 | 0,110                     |
| 20,0 | 0,122                     |
| 25,0 | 0,135                     |
| 32,0 | 0,145                     |
| 40,0 | 0,155                     |

- D = cutter diameter (mm)
- $F_z$  = feed / flute (mm/flute)
- n = spindle speed (rpm)
- $V_c$  = cutting speed (m/min)
- $V_f$  = table feed (mm/min)
- z = cutting edges

$$n = \frac{V_c \times 1000}{\pi \times D}$$

#### Example

Side Milling with M1010D25 LC  
 Standard Length Four Flute End Mill  
 Carbon Steel, up to 700 N/mm<sup>2</sup>  
 D = 10 mm  
 $a_p = 1,0 \times D = 10$  mm  
 $a_e = 0,25 \times D = 2,5$  mm  
 $F_z = 1,1 \times 1,1 \times 0,056 = 0,068$  mm/flute  
 $n = (130 \times 1000) / (\pi \times 10) = 4138$  rpm  
 $V_f = 0,068 \times 4 \times 4138 = 1126$  mm/min

$$V_f = F_z \times z \times n$$

### Carbide Grades

**LC** Super Micrograin Carbide with AlCrN coating. Allround Grade with extremely high heat resistance. Use cutting data according to the tables.

**MG** Uncoated Super Micrograin Carbide. For Aluminium. Use cutting data according to the tables.

**FC** Micrograin Carbide with TiAlN coating. Allround Grade with high heat resistance. Use cutting data according to the tables.

**DC** Micrograin Carbide with Diamond coating. For Graphite. Use cutting data according to the tables.

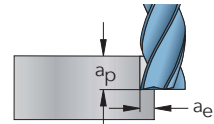


$$\text{Feed (mm/min)} = F_z \times z \times n$$

| F <sub>z</sub> (mm/z) |       | n (rpm) |     |     |     |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |
|-----------------------|-------|---------|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| z2                    | z3 z4 | 200     | 350 | 500 | 750 | 1000 | 1250 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 6000 | 8000 | 10000 | 15000 | 20000 | 25000 | 30000 | 40000 | 50000 |
| 0,003                 | 0,001 | 1       | 1   | 2   | 3   | 4    | 5    | 6    | 8    | 10   | 12   | 16   | 20   | 24   | 32   | 40    | 60    | 80    | 100   | 120   | 160   | 200   |
| 0,004                 | 0,002 | 1       | 2   | 3   | 5   | 6    | 8    | 9    | 12   | 15   | 18   | 24   | 30   | 36   | 48   | 60    | 90    | 120   | 150   | 180   | 240   | 300   |
| 0,005                 | 0,003 | 2       | 3   | 4   | 6   | 8    | 10   | 12   | 16   | 20   | 24   | 32   | 40   | 48   | 64   | 80    | 120   | 160   | 200   | 240   | 320   | 400   |
| 0,006                 | 0,004 | 2       | 4   | 5   | 8   | 10   | 13   | 15   | 20   | 25   | 30   | 40   | 50   | 60   | 80   | 100   | 150   | 200   | 250   | 300   | 400   | 500   |
| 0,007                 | 0,005 | 3       | 5   | 7   | 11  | 14   | 18   | 21   | 28   | 35   | 42   | 56   | 70   | 84   | 112  | 140   | 210   | 280   | 350   | 420   | 560   | 700   |
| 0,008                 | 0,006 | 4       | 6   | 9   | 14  | 18   | 23   | 27   | 36   | 45   | 54   | 72   | 90   | 108  | 144  | 180   | 270   | 360   | 450   | 540   | 720   | 900   |
| 0,010                 | 0,007 | 4       | 7   | 10  | 15  | 20   | 25   | 30   | 40   | 50   | 60   | 80   | 100  | 120  | 160  | 200   | 300   | 400   | 500   | 600   | 800   | 1000  |
| 0,012                 | 0,008 | 5       | 8   | 12  | 18  | 24   | 30   | 36   | 48   | 60   | 72   | 96   | 120  | 144  | 192  | 240   | 360   | 480   | 600   | 720   | 960   | 1200  |
| 0,014                 | 0,009 | 6       | 10  | 14  | 21  | 28   | 35   | 42   | 56   | 70   | 84   | 112  | 140  | 168  | 224  | 280   | 420   | 560   | 700   | 840   | 1120  | 1400  |
| 0,016                 | 0,011 | 6       | 11  | 16  | 24  | 32   | 40   | 48   | 64   | 80   | 96   | 128  | 160  | 192  | 256  | 320   | 480   | 640   | 800   | 960   | 1280  | 1600  |
| 0,018                 | 0,012 | 7       | 13  | 18  | 27  | 36   | 45   | 54   | 72   | 90   | 108  | 144  | 180  | 216  | 288  | 360   | 540   | 720   | 900   | 1080  | 1440  | 1800  |
| 0,020                 | 0,013 | 8       | 14  | 20  | 30  | 40   | 50   | 60   | 80   | 100  | 120  | 160  | 200  | 240  | 320  | 400   | 600   | 800   | 1000  | 1200  | 1600  | 2000  |
| 0,022                 | 0,015 | 9       | 15  | 22  | 33  | 44   | 55   | 66   | 88   | 110  | 132  | 176  | 220  | 264  | 352  | 440   | 660   | 880   | 1100  | 1320  | 1760  | 2200  |
| 0,024                 | 0,016 | 10      | 17  | 24  | 36  | 48   | 60   | 72   | 96   | 120  | 144  | 192  | 240  | 288  | 384  | 480   | 720   | 960   | 1200  | 1440  | 1920  | 2400  |
| 0,026                 | 0,017 | 10      | 18  | 26  | 39  | 52   | 65   | 78   | 104  | 130  | 156  | 208  | 260  | 312  | 416  | 520   | 780   | 1040  | 1300  | 1560  | 2080  | 2600  |
| 0,028                 | 0,019 | 11      | 20  | 28  | 42  | 56   | 70   | 84   | 112  | 140  | 168  | 224  | 280  | 336  | 448  | 560   | 840   | 1120  | 1400  | 1680  | 2240  | 2800  |
| 0,030                 | 0,020 | 12      | 21  | 30  | 45  | 60   | 75   | 90   | 120  | 150  | 180  | 240  | 300  | 360  | 480  | 600   | 900   | 1200  | 1500  | 1800  | 2400  | 3000  |
| 0,035                 | 0,023 | 14      | 25  | 35  | 53  | 70   | 88   | 105  | 140  | 175  | 210  | 280  | 350  | 420  | 560  | 700   | 1050  | 1400  | 1750  | 2100  | 2800  | 3500  |
| 0,040                 | 0,027 | 16      | 28  | 40  | 60  | 80   | 100  | 120  | 160  | 200  | 240  | 320  | 400  | 480  | 640  | 800   | 1200  | 1600  | 2000  | 2400  | 3200  | 4000  |
| 0,045                 | 0,030 | 18      | 32  | 45  | 68  | 90   | 113  | 135  | 180  | 225  | 270  | 360  | 450  | 540  | 720  | 900   | 1350  | 1800  | 2250  | 2700  | 3600  | 4500  |
| 0,050                 | 0,033 | 20      | 35  | 50  | 75  | 100  | 125  | 150  | 200  | 250  | 300  | 400  | 500  | 600  | 800  | 1000  | 1500  | 2000  | 2500  | 3000  | 4000  | 5000  |
| 0,055                 | 0,037 | 22      | 39  | 55  | 83  | 110  | 138  | 165  | 220  | 275  | 330  | 440  | 550  | 660  | 880  | 1100  | 1650  | 2200  | 2750  | 3300  | 4400  | 5500  |
| 0,060                 | 0,040 | 24      | 42  | 60  | 90  | 120  | 150  | 180  | 240  | 300  | 360  | 480  | 600  | 720  | 960  | 1200  | 1800  | 2400  | 3000  | 3600  | 4800  | 6000  |
| 0,065                 | 0,043 | 26      | 46  | 65  | 98  | 130  | 163  | 195  | 260  | 325  | 390  | 520  | 650  | 780  | 1040 | 1300  | 1950  | 2600  | 3250  | 3900  | 5200  | 6500  |
| 0,070                 | 0,047 | 28      | 49  | 70  | 105 | 140  | 175  | 210  | 280  | 350  | 420  | 560  | 700  | 840  | 1120 | 1400  | 2100  | 2800  | 3500  | 4200  | 5600  | 7000  |
| 0,075                 | 0,050 | 30      | 53  | 75  | 113 | 150  | 188  | 225  | 300  | 375  | 450  | 600  | 750  | 900  | 1200 | 1500  | 2250  | 3000  | 3750  | 4500  | 6000  | 7500  |
| 0,080                 | 0,053 | 32      | 56  | 80  | 120 | 160  | 200  | 240  | 320  | 400  | 480  | 640  | 800  | 960  | 1280 | 1600  | 2400  | 3200  | 4000  | 4800  | 6400  | 8000  |
| 0,090                 | 0,060 | 36      | 63  | 90  | 135 | 180  | 225  | 270  | 360  | 450  | 540  | 720  | 900  | 1080 | 1440 | 1800  | 2700  | 3600  | 4500  | 5400  | 7200  | 9000  |
| 0,100                 | 0,067 | 40      | 70  | 100 | 150 | 200  | 250  | 300  | 400  | 500  | 600  | 800  | 1000 | 1200 | 1600 | 2000  | 3000  | 4000  | 5000  | 6000  | 8000  | 10000 |
| 0,110                 | 0,073 | 44      | 77  | 110 | 165 | 220  | 275  | 330  | 440  | 550  | 660  | 880  | 1100 | 1320 | 1760 | 2200  | 3300  | 4400  | 5500  | 6600  | 8800  | 11000 |
| 0,120                 | 0,080 | 48      | 84  | 120 | 180 | 240  | 300  | 360  | 480  | 600  | 720  | 960  | 1200 | 1440 | 1920 | 2400  | 3600  | 4800  | 6000  | 7200  | 9600  | 12000 |
| 0,130                 | 0,087 | 52      | 91  | 130 | 195 | 260  | 325  | 390  | 520  | 650  | 780  | 1040 | 1300 | 1560 | 2080 | 2600  | 3900  | 5200  | 6500  | 7800  | 10400 | 13000 |
| 0,140                 | 0,093 | 56      | 98  | 140 | 210 | 280  | 350  | 420  | 560  | 700  | 840  | 1120 | 1400 | 1680 | 2240 | 2800  | 4200  | 5600  | 7000  | 8400  | 11200 | 14000 |
| 0,150                 | 0,100 | 60      | 105 | 150 | 225 | 300  | 375  | 450  | 600  | 750  | 900  | 1200 | 1500 | 1800 | 2400 | 3000  | 4500  | 6000  | 7500  | 9000  | 12000 | 15000 |
| 0,160                 | 0,107 | 64      | 112 | 160 | 240 | 320  | 400  | 480  | 640  | 800  | 960  | 1280 | 1600 | 1920 | 2560 | 3200  | 4800  | 6400  | 8000  | 9600  | 12800 | 16000 |
| 0,180                 | 0,120 | 72      | 126 | 180 | 270 | 360  | 450  | 540  | 720  | 900  | 1080 | 1440 | 1800 | 2160 | 2880 | 3600  | 5400  | 7200  | 9000  | 10800 | 14400 | 18000 |
| 0,200                 | 0,133 | 80      | 140 | 200 | 300 | 400  | 500  | 600  | 800  | 1000 | 1200 | 1600 | 2000 | 2400 | 3200 | 4000  | 6000  | 8000  | 10000 | 12000 | 16000 | 20000 |
| 0,220                 | 0,147 | 88      | 154 | 220 | 330 | 440  | 550  | 660  | 880  | 1100 | 1320 | 1760 | 2200 | 2640 | 3520 | 4400  | 6600  | 8800  | 11000 | 13200 | 17600 | 22000 |
| 0,240                 | 0,160 | 96      | 168 | 240 | 360 | 480  | 600  | 720  | 960  | 1200 | 1440 | 1920 | 2400 | 2880 | 3840 | 4800  | 7200  | 9600  | 12000 | 14400 | 19200 | 24000 |
| 0,260                 | 0,173 | 104     | 182 | 260 | 390 | 520  | 650  | 780  | 1040 | 1300 | 1560 | 2080 | 2600 | 3120 | 4160 | 5200  | 7800  | 10400 | 13000 | 15600 | 20800 | 26000 |
| 0,280                 | 0,187 | 112     | 196 | 280 | 420 | 560  | 700  | 840  | 1120 | 1400 | 1680 | 2240 | 2800 | 3360 | 4480 | 5600  | 8400  | 11200 | 14000 | 16800 | 22400 | 28000 |
| 0,300                 | 0,200 | 120     | 210 | 300 | 450 | 600  | 750  | 900  | 1200 | 1500 | 1800 | 2400 | 3000 | 3600 | 4800 | 6000  | 9000  | 12000 | 15000 | 18000 | 24000 | 30000 |
| 0,350                 | 0,233 | 140     | 245 | 350 | 525 | 700  | 875  | 1050 | 1400 | 1750 | 2100 | 2800 | 3500 | 4200 | 5600 | 7000  | 10500 | 14000 | 17500 | 21000 | 28000 | 35000 |
| 0,400                 | 0,267 | 160     | 280 | 400 | 600 | 800  | 1000 | 1200 | 1600 | 2000 | 2400 | 3200 | 4000 | 4800 | 6400 | 8000  | 12000 | 16000 | 20000 | 24000 | 32000 | 40000 |
| 0,450                 | 0,300 | 180     | 315 | 450 | 675 | 900  | 1125 | 1350 | 1800 | 2250 | 2700 | 3600 | 4500 | 5400 | 7200 | 9000  | 13500 | 18000 | 22500 | 27000 | 36000 | 45000 |
| 0,500                 | 0,333 | 200     | 350 | 500 | 750 | 1000 | 1250 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 6000 | 8000 | 10000 | 15000 | 20000 | 25000 | 30000 | 40000 | 50000 |
| 0,550                 | 0,367 | 220     | 385 | 550 | 825 | 1100 | 1375 | 1650 | 2200 | 2750 | 3300 | 4400 | 5500 | 6600 | 8800 | 11000 | 16500 | 22000 | 27500 | 33000 | 44000 | 55000 |

# SIDE MILLING

## Roughing



$$a_e = 0,25 \times D$$

$$a_p = 1,0 \times D$$

### Carbon Steel, up to 700 N/mm<sup>2</sup>

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4 | 0,75                 | 3,00                 | 130                     | 13 793   | 0,015                  | 801                      |
| 4,0     | 4 | 1,00                 | 4,00                 | 130                     | 10 345   | 0,019                  | 801                      |
| 5,0     | 4 | 1,25                 | 5,00                 | 130                     | 8 276    | 0,027                  | 881                      |
| 6,0     | 4 | 1,50                 | 6,00                 | 130                     | 6 897    | 0,039                  | 1 068                    |
| 8,0     | 4 | 2,00                 | 8,00                 | 130                     | 5 173    | 0,054                  | 1 127                    |
| 10,0    | 4 | 2,50                 | 10,00                | 130                     | 4 138    | 0,068                  | 1 122                    |
| 12,0    | 4 | 3,00                 | 12,00                | 130                     | 3 448    | 0,090                  | 1 235                    |
| 16,0    | 4 | 4,00                 | 16,00                | 130                     | 2 586    | 0,119                  | 1 227                    |
| 20,0    | 4 | 5,00                 | 20,00                | 130                     | 2 069    | 0,148                  | 1 222                    |
| 25,0    | 4 | 6,25                 | 25,00                | 130                     | 1 655    | 0,163                  | 1 082                    |

### High Alloy Steel / Hardened Steel HRC 30-45

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4 | 0,75                 | 3,00                 | 70                      | 7 427    | 0,011                  | 314                      |
| 4,0     | 4 | 1,00                 | 4,00                 | 70                      | 5 570    | 0,014                  | 314                      |
| 5,0     | 4 | 1,25                 | 5,00                 | 70                      | 4 456    | 0,019                  | 345                      |
| 6,0     | 4 | 1,50                 | 6,00                 | 70                      | 3 714    | 0,028                  | 418                      |
| 8,0     | 4 | 2,00                 | 8,00                 | 70                      | 2 785    | 0,040                  | 441                      |
| 10,0    | 4 | 2,50                 | 10,00                | 70                      | 2 228    | 0,049                  | 439                      |
| 12,0    | 4 | 3,00                 | 12,00                | 70                      | 1 857    | 0,065                  | 484                      |
| 16,0    | 4 | 4,00                 | 16,00                | 70                      | 1 393    | 0,086                  | 480                      |
| 20,0    | 4 | 5,00                 | 20,00                | 70                      | 1 114    | 0,107                  | 478                      |
| 25,0    | 4 | 6,25                 | 25,00                | 70                      | 891      | 0,119                  | 424                      |

### Cast Iron, Lamellar Graphite, up to 1000 N/mm<sup>2</sup>

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4 | 0,75                 | 3,00                 | 110                     | 11 671   | 0,015                  | 678                      |
| 4,0     | 4 | 1,00                 | 4,00                 | 110                     | 8 754    | 0,019                  | 678                      |
| 5,0     | 4 | 1,25                 | 5,00                 | 110                     | 7 003    | 0,027                  | 746                      |
| 6,0     | 4 | 1,50                 | 6,00                 | 110                     | 5 836    | 0,039                  | 904                      |
| 8,0     | 4 | 2,00                 | 8,00                 | 110                     | 4 377    | 0,054                  | 953                      |
| 10,0    | 4 | 2,50                 | 10,00                | 110                     | 3 501    | 0,068                  | 949                      |
| 12,0    | 4 | 3,00                 | 12,00                | 110                     | 2 918    | 0,090                  | 1 045                    |
| 16,0    | 4 | 4,00                 | 16,00                | 110                     | 2 188    | 0,119                  | 1 038                    |
| 20,0    | 4 | 5,00                 | 20,00                | 110                     | 1 751    | 0,148                  | 1 034                    |
| 25,0    | 4 | 6,25                 | 25,00                | 110                     | 1 401    | 0,163                  | 915                      |

### Copper, Unalloyed

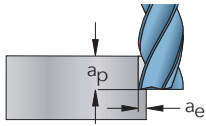
| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4 | 0,75                 | 3,00                 | 170                     | 18 038   | 0,013                  | 952                      |
| 4,0     | 4 | 1,00                 | 4,00                 | 170                     | 13 528   | 0,018                  | 952                      |
| 5,0     | 4 | 1,25                 | 5,00                 | 170                     | 10 823   | 0,024                  | 1 048                    |
| 6,0     | 4 | 1,50                 | 6,00                 | 170                     | 9 019    | 0,035                  | 1 270                    |
| 8,0     | 4 | 2,00                 | 8,00                 | 170                     | 6 764    | 0,050                  | 1 339                    |
| 10,0    | 4 | 2,50                 | 10,00                | 170                     | 5 411    | 0,062                  | 1 333                    |
| 12,0    | 4 | 3,00                 | 12,00                | 170                     | 4 509    | 0,081                  | 1 468                    |
| 16,0    | 4 | 4,00                 | 16,00                | 170                     | 3 382    | 0,108                  | 1 458                    |
| 20,0    | 4 | 5,00                 | 20,00                | 170                     | 2 706    | 0,134                  | 1 452                    |
| 25,0    | 4 | 6,25                 | 25,00                | 170                     | 2 165    | 0,149                  | 1 286                    |

### Stainless Steel, Austenitic

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 3 | 0,75                 | 3,00                 | 100                     | 10 610   | 0,012                  | 504                      |
| 4,0     | 3 | 1,00                 | 4,00                 | 100                     | 7 958    | 0,016                  | 504                      |
| 5,0     | 3 | 1,25                 | 5,00                 | 100                     | 6 366    | 0,022                  | 555                      |
| 6,0     | 3 | 1,50                 | 6,00                 | 100                     | 5 305    | 0,032                  | 672                      |
| 8,0     | 3 | 2,00                 | 8,00                 | 100                     | 3 979    | 0,045                  | 709                      |
| 10,0    | 3 | 2,50                 | 10,00                | 100                     | 3 183    | 0,055                  | 706                      |
| 12,0    | 3 | 3,00                 | 12,00                | 100                     | 2 653    | 0,073                  | 777                      |
| 16,0    | 3 | 4,00                 | 16,00                | 100                     | 1 989    | 0,097                  | 772                      |
| 20,0    | 3 | 5,00                 | 20,00                | 100                     | 1 592    | 0,121                  | 769                      |

### Aluminium, up to 10% Si

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 2 | 0,75                 | 3,00                 | 300                     | 31 831   | 0,016                  | 2 017                    |
| 4,0     | 2 | 1,00                 | 4,00                 | 300                     | 23 873   | 0,021                  | 2 017                    |
| 5,0     | 2 | 1,25                 | 5,00                 | 300                     | 19 099   | 0,029                  | 2 218                    |
| 6,0     | 2 | 1,50                 | 6,00                 | 300                     | 15 916   | 0,042                  | 2 689                    |
| 8,0     | 2 | 2,00                 | 8,00                 | 300                     | 11 937   | 0,059                  | 2 836                    |
| 10,0    | 2 | 2,50                 | 10,00                | 300                     | 9 549    | 0,074                  | 2 824                    |
| 12,0    | 2 | 3,00                 | 12,00                | 300                     | 7 958    | 0,098                  | 3 109                    |
| 16,0    | 2 | 4,00                 | 16,00                | 300                     | 5 968    | 0,129                  | 3 088                    |
| 20,0    | 2 | 5,00                 | 20,00                | 300                     | 4 775    | 0,161                  | 3 076                    |



# SIDE MILLING

## Finishing



$$a_e = 0,1 \times D$$

$$a_p = 1,5 \times D$$

### Carbon Steel, up to 700 N/mm<sup>2</sup>

| D<br>mm | z  | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|----|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4  | 0,30                 | 4,50                 | 150                     | 15 916   | 0,018                  | 1 176                    |
| 4,0     | 4  | 0,40                 | 6,00                 | 150                     | 11 937   | 0,025                  | 1 176                    |
| 5,0     | 4  | 0,50                 | 7,50                 | 150                     | 9 549    | 0,034                  | 1 294                    |
| 6,0     | 4  | 0,60                 | 9,00                 | 150                     | 7 958    | 0,049                  | 1 569                    |
| 8,0     | 4  | 0,80                 | 12,00                | 150                     | 5 968    | 0,069                  | 1 654                    |
| 10,0    | 4  | 1,00                 | 15,00                | 150                     | 4 775    | 0,086                  | 1 647                    |
|         | 6  | 1,00                 | 15,00                | 150                     | 4 775    | 0,086                  | 2 471                    |
| 12,0    | 4  | 1,20                 | 18,00                | 150                     | 3 979    | 0,114                  | 1 814                    |
|         | 6  | 1,20                 | 18,00                | 150                     | 3 979    | 0,114                  | 2 721                    |
| 16,0    | 4  | 1,60                 | 24,00                | 150                     | 2 984    | 0,151                  | 1 801                    |
|         | 6  | 1,60                 | 24,00                | 150                     | 2 984    | 0,151                  | 2 702                    |
| 20,0    | 4  | 2,00                 | 30,00                | 150                     | 2 387    | 0,188                  | 1 794                    |
|         | 6  | 2,00                 | 30,00                | 150                     | 2 387    | 0,188                  | 2 691                    |
| 25,0    | 4  | 2,50                 | 37,50                | 150                     | 1 910    | 0,208                  | 1 588                    |
|         | 6  | 2,50                 | 37,50                | 150                     | 1 910    | 0,208                  | 2 382                    |
| 32,0    | 8  | 3,20                 | 48,00                | 150                     | 1 492    | 0,223                  | 2 665                    |
| 40,0    | 10 | 4,00                 | 60,00                | 150                     | 1 194    | 0,239                  | 2 849                    |

### High Alloy Steel / Hardened Steel HRC 30-45

| D<br>mm | z  | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|----|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 4  | 0,30                 | 4,50                 | 90                      | 9 549    | 0,013                  | 513                      |
| 4,0     | 4  | 0,40                 | 6,00                 | 90                      | 7 162    | 0,018                  | 513                      |
| 5,0     | 4  | 0,50                 | 7,50                 | 90                      | 5 730    | 0,025                  | 565                      |
| 6,0     | 4  | 0,60                 | 9,00                 | 90                      | 4 775    | 0,036                  | 684                      |
| 8,0     | 4  | 0,80                 | 12,00                | 90                      | 3 581    | 0,050                  | 722                      |
| 10,0    | 4  | 1,00                 | 15,00                | 90                      | 2 865    | 0,063                  | 719                      |
|         | 6  | 1,00                 | 15,00                | 90                      | 2 865    | 0,063                  | 1 078                    |
| 12,0    | 4  | 1,20                 | 18,00                | 90                      | 2 387    | 0,083                  | 791                      |
|         | 6  | 1,20                 | 18,00                | 90                      | 2 387    | 0,083                  | 1 187                    |
| 16,0    | 4  | 1,60                 | 24,00                | 90                      | 1 790    | 0,110                  | 786                      |
|         | 6  | 1,60                 | 24,00                | 90                      | 1 790    | 0,110                  | 1 179                    |
| 20,0    | 4  | 2,00                 | 30,00                | 90                      | 1 432    | 0,137                  | 783                      |
|         | 6  | 2,00                 | 30,00                | 90                      | 1 432    | 0,137                  | 1 174                    |
| 25,0    | 4  | 2,50                 | 37,50                | 90                      | 1 146    | 0,151                  | 693                      |
|         | 6  | 2,50                 | 37,50                | 90                      | 1 146    | 0,151                  | 1 040                    |
| 32,0    | 8  | 3,20                 | 48,00                | 90                      | 895      | 0,162                  | 1 163                    |
| 40,0    | 10 | 4,00                 | 60,00                | 90                      | 716      | 0,174                  | 1 243                    |

### Cast Iron, Lamellar Graphite, up to 1000 N/mm<sup>2</sup>

| D<br>mm | z  | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|----|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 6,0     | 6  | 0,60                 | 9,00                 | 130                     | 6 897    | 0,049                  | 2 039                    |
| 8,0     | 6  | 0,80                 | 12,00                | 130                     | 5 173    | 0,069                  | 2 151                    |
| 10,0    | 6  | 1,00                 | 15,00                | 130                     | 4 138    | 0,086                  | 2 141                    |
| 12,0    | 6  | 1,20                 | 18,00                | 130                     | 3 448    | 0,114                  | 2 358                    |
| 16,0    | 6  | 1,60                 | 24,00                | 130                     | 2 586    | 0,151                  | 2 342                    |
| 20,0    | 6  | 2,00                 | 30,00                | 130                     | 2 069    | 0,188                  | 2 332                    |
| 25,0    | 8  | 2,50                 | 37,50                | 130                     | 1 655    | 0,208                  | 2 753                    |
| 32,0    | 8  | 3,20                 | 48,00                | 130                     | 1 293    | 0,223                  | 2 310                    |
| 40,0    | 10 | 4,00                 | 60,00                | 130                     | 1 035    | 0,239                  | 2 469                    |

### Copper, Unalloyed

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 4,0     | 4 | 0,40                 | 6,00                 | 200                     | 15 916   | 0,022                  | 1 426                    |
| 5,0     | 4 | 0,50                 | 7,50                 | 200                     | 12 732   | 0,031                  | 1 569                    |
| 6,0     | 4 | 0,60                 | 9,00                 | 200                     | 10 610   | 0,045                  | 1 901                    |
| 8,0     | 4 | 0,80                 | 12,00                | 200                     | 7 958    | 0,063                  | 2 005                    |
| 10,0    | 4 | 1,00                 | 15,00                | 200                     | 6 366    | 0,078                  | 1 996                    |
| 12,0    | 4 | 1,20                 | 18,00                | 200                     | 5 305    | 0,104                  | 2 198                    |
| 16,0    | 4 | 1,60                 | 24,00                | 200                     | 3 979    | 0,137                  | 2 184                    |
| 20,0    | 4 | 2,00                 | 30,00                | 200                     | 3 183    | 0,171                  | 2 175                    |
| 25,0    | 4 | 2,50                 | 37,50                | 200                     | 2 546    | 0,189                  | 1 925                    |

### Hardened Steel HRC 45-55

| D<br>mm | z  | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|----|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 6,0     | 6  | 0,60                 | 9,00                 | 45                      | 2 387    | 0,031                  | 449                      |
| 8,0     | 6  | 0,80                 | 12,00                | 45                      | 1 790    | 0,044                  | 474                      |
| 10,0    | 6  | 1,00                 | 15,00                | 45                      | 1 432    | 0,055                  | 472                      |
| 12,0    | 6  | 1,20                 | 18,00                | 45                      | 1 194    | 0,073                  | 519                      |
| 16,0    | 6  | 1,60                 | 24,00                | 45                      | 895      | 0,096                  | 516                      |
| 20,0    | 6  | 2,00                 | 30,00                | 45                      | 716      | 0,120                  | 514                      |
| 25,0    | 8  | 2,50                 | 37,50                | 45                      | 573      | 0,132                  | 606                      |
| 32,0    | 8  | 3,20                 | 48,00                | 45                      | 448      | 0,142                  | 509                      |
| 40,0    | 10 | 4,00                 | 60,00                | 45                      | 358      | 0,152                  | 544                      |

### Hardened Steel HRC 55-65

| D<br>mm | z  | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|----|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 6,0     | 6  | 0,60                 | 9,00                 | 30                      | 1 592    | 0,027                  | 257                      |
| 8,0     | 6  | 0,80                 | 12,00                | 30                      | 1 194    | 0,038                  | 271                      |
| 10,0    | 6  | 1,00                 | 15,00                | 30                      | 955      | 0,047                  | 270                      |
| 12,0    | 6  | 1,20                 | 18,00                | 30                      | 796      | 0,062                  | 297                      |
| 16,0    | 6  | 1,60                 | 24,00                | 30                      | 597      | 0,082                  | 295                      |
| 20,0    | 6  | 2,00                 | 30,00                | 30                      | 477      | 0,102                  | 294                      |
| 25,0    | 8  | 2,50                 | 37,50                | 30                      | 382      | 0,113                  | 347                      |
| 32,0    | 8  | 3,20                 | 48,00                | 30                      | 298      | 0,122                  | 291                      |
| 40,0    | 10 | 4,00                 | 60,00                | 30                      | 239      | 0,130                  | 311                      |

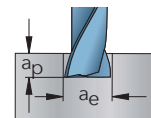
### Stainless Steel, Austenitic

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 3 | 0,30                 | 4,50                 | 120                     | 12 732   | 0,015                  | 578                      |
| 4,0     | 3 | 0,40                 | 6,00                 | 120                     | 9 549    | 0,020                  | 578                      |
| 5,0     | 3 | 0,50                 | 7,50                 | 120                     | 7 639    | 0,028                  | 635                      |
| 6,0     | 3 | 0,60                 | 9,00                 | 120                     | 6 366    | 0,040                  | 770                      |
| 8,0     | 3 | 0,80                 | 12,00                | 120                     | 4 775    | 0,057                  | 812                      |
| 10,0    | 3 | 1,00                 | 15,00                | 120                     | 3 820    | 0,071                  | 809                      |
| 12,0    | 3 | 1,20                 | 18,00                | 120                     | 3 183    | 0,093                  | 890                      |
| 16,0    | 3 | 1,60                 | 24,00                | 120                     | 2 387    | 0,123                  | 884                      |
| 20,0    | 3 | 2,00                 | 30,00                | 120                     | 1 910    | 0,154                  | 881                      |

### Aluminium, up to 10% Si

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 2 | 0,30                 | 4,50                 | 350                     | 37 136   | 0,020                  | 1 497                    |
| 4,0     | 2 | 0,40                 | 6,00                 | 350                     | 27 852   | 0,027                  | 1 497                    |
| 5,0     | 2 | 0,50                 | 7,50                 | 350                     | 22 282   | 0,037                  | 1 647                    |
| 6,0     | 2 | 0,60                 | 9,00                 | 350                     | 18 568   | 0,054                  | 1 996                    |
| 8,0     | 2 | 0,80                 | 12,00                | 350                     | 13 926   | 0,076                  | 2 106                    |
| 10,0    | 2 | 1,00                 | 15,00                | 350                     | 11 141   | 0,094                  | 2 096                    |
| 12,0    | 2 | 1,20                 | 18,00                | 350                     | 9 284    | 0,124                  | 2 308                    |
| 16,0    | 2 | 1,60                 | 24,00                | 350                     | 6 963    | 0,165                  | 2 293                    |
| 20,0    | 2 | 2,00                 | 30,00                | 350                     | 5 570    | 0,205                  | 2 283                    |

# SLOT MILLING



$$a_e = 1,0 \times D$$

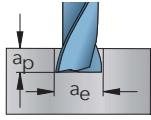
$$a_p = 0,5 \times D$$

## Carbon Steel, up to 700 N/mm<sup>2</sup>

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 0,5     | 2 | 0,50                 | 0,25                 | 130                     | 82 761   | 0,003                  | 510                      |
| 1,0     | 2 | 1,00                 | 0,50                 | 130                     | 41 380   | 0,005                  | 382                      |
|         | 3 | 1,00                 | 0,50                 | 130                     | 41 380   | 0,005                  | 574                      |
| 1,5     | 2 | 1,50                 | 0,75                 | 130                     | 27 587   | 0,006                  | 319                      |
|         | 3 | 1,50                 | 0,75                 | 130                     | 27 587   | 0,006                  | 478                      |
| 2,0     | 2 | 2,00                 | 1,00                 | 130                     | 20 690   | 0,007                  | 287                      |
|         | 3 | 2,00                 | 1,00                 | 130                     | 20 690   | 0,007                  | 430                      |
| 2,5     | 2 | 2,50                 | 1,25                 | 130                     | 16 552   | 0,008                  | 268                      |
|         | 3 | 2,50                 | 1,25                 | 130                     | 16 552   | 0,008                  | 401                      |
| 3,0     | 2 | 3,00                 | 1,50                 | 130                     | 13 793   | 0,009                  | 255                      |
|         | 3 | 3,00                 | 1,50                 | 130                     | 13 793   | 0,009                  | 382                      |
| 4,0     | 2 | 4,00                 | 2,00                 | 130                     | 10 345   | 0,012                  | 255                      |
|         | 3 | 4,00                 | 2,00                 | 130                     | 10 345   | 0,012                  | 382                      |
| 5,0     | 2 | 5,00                 | 2,50                 | 130                     | 8 276    | 0,017                  | 280                      |
|         | 3 | 5,00                 | 2,50                 | 130                     | 8 276    | 0,017                  | 421                      |
| 6,0     | 2 | 6,00                 | 3,00                 | 130                     | 6 897    | 0,025                  | 340                      |
|         | 3 | 6,00                 | 3,00                 | 130                     | 6 897    | 0,025                  | 510                      |
| 8,0     | 2 | 8,00                 | 4,00                 | 130                     | 5 173    | 0,035                  | 358                      |
|         | 3 | 8,00                 | 4,00                 | 130                     | 5 173    | 0,035                  | 538                      |
| 10,0    | 2 | 10,00                | 5,00                 | 130                     | 4 138    | 0,043                  | 357                      |
|         | 3 | 10,00                | 5,00                 | 130                     | 4 138    | 0,043                  | 535                      |
| 12,0    | 2 | 12,00                | 6,00                 | 130                     | 3 448    | 0,057                  | 393                      |
|         | 3 | 12,00                | 6,00                 | 130                     | 3 448    | 0,057                  | 589                      |
| 14,0    | 2 | 14,00                | 7,00                 | 130                     | 2 956    | 0,066                  | 391                      |
|         | 3 | 14,00                | 7,00                 | 130                     | 2 956    | 0,066                  | 587                      |
| 16,0    | 2 | 16,00                | 8,00                 | 130                     | 2 586    | 0,075                  | 390                      |
|         | 3 | 16,00                | 8,00                 | 130                     | 2 586    | 0,075                  | 585                      |
| 18,0    | 2 | 18,00                | 9,00                 | 130                     | 2 299    | 0,085                  | 389                      |
|         | 3 | 18,00                | 9,00                 | 130                     | 2 299    | 0,085                  | 584                      |
| 20,0    | 2 | 20,00                | 10,00                | 130                     | 2 069    | 0,094                  | 389                      |
|         | 3 | 20,00                | 10,00                | 130                     | 2 069    | 0,094                  | 583                      |
| 25,0    | 2 | 25,00                | 12,50                | 130                     | 1 655    | 0,104                  | 344                      |
|         | 3 | 25,00                | 12,50                | 130                     | 1 655    | 0,104                  | 516                      |

## High Alloy Steel / Hardened Steel HRC 30-45

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 0,5     | 2 | 0,50                 | 0,25                 | 70                      | 44 563   | 0,002                  | 200                      |
| 1,0     | 2 | 1,00                 | 0,50                 | 70                      | 22 282   | 0,003                  | 150                      |
|         | 3 | 1,00                 | 0,50                 | 70                      | 22 282   | 0,003                  | 225                      |
| 1,5     | 2 | 1,50                 | 0,75                 | 70                      | 14 854   | 0,004                  | 125                      |
|         | 3 | 1,50                 | 0,75                 | 70                      | 14 854   | 0,004                  | 187                      |
| 2,0     | 2 | 2,00                 | 1,00                 | 70                      | 11 141   | 0,005                  | 112                      |
|         | 3 | 2,00                 | 1,00                 | 70                      | 11 141   | 0,005                  | 168                      |
| 2,5     | 2 | 2,50                 | 1,25                 | 70                      | 8 913    | 0,006                  | 105                      |
|         | 3 | 2,50                 | 1,25                 | 70                      | 8 913    | 0,006                  | 157                      |
| 3,0     | 2 | 3,00                 | 1,50                 | 70                      | 7 427    | 0,007                  | 100                      |
|         | 3 | 3,00                 | 1,50                 | 70                      | 7 427    | 0,007                  | 150                      |
| 4,0     | 2 | 4,00                 | 2,00                 | 70                      | 5 570    | 0,009                  | 100                      |
|         | 3 | 4,00                 | 2,00                 | 70                      | 5 570    | 0,009                  | 150                      |
| 5,0     | 2 | 5,00                 | 2,50                 | 70                      | 4 456    | 0,012                  | 110                      |
|         | 3 | 5,00                 | 2,50                 | 70                      | 4 456    | 0,012                  | 165                      |
| 6,0     | 2 | 6,00                 | 3,00                 | 70                      | 3 714    | 0,018                  | 133                      |
|         | 3 | 6,00                 | 3,00                 | 70                      | 3 714    | 0,018                  | 200                      |
| 8,0     | 2 | 8,00                 | 4,00                 | 70                      | 2 785    | 0,025                  | 140                      |
|         | 3 | 8,00                 | 4,00                 | 70                      | 2 785    | 0,025                  | 211                      |
| 10,0    | 2 | 10,00                | 5,00                 | 70                      | 2 228    | 0,031                  | 140                      |
|         | 3 | 10,00                | 5,00                 | 70                      | 2 228    | 0,031                  | 210                      |
| 12,0    | 2 | 12,00                | 6,00                 | 70                      | 1 857    | 0,041                  | 154                      |
|         | 3 | 12,00                | 6,00                 | 70                      | 1 857    | 0,041                  | 231                      |
| 14,0    | 2 | 14,00                | 7,00                 | 70                      | 1 592    | 0,048                  | 153                      |
|         | 3 | 14,00                | 7,00                 | 70                      | 1 592    | 0,048                  | 230                      |
| 16,0    | 2 | 16,00                | 8,00                 | 70                      | 1 393    | 0,055                  | 153                      |
|         | 3 | 16,00                | 8,00                 | 70                      | 1 393    | 0,055                  | 229                      |
| 18,0    | 2 | 18,00                | 9,00                 | 70                      | 1 238    | 0,062                  | 153                      |
|         | 3 | 18,00                | 9,00                 | 70                      | 1 238    | 0,062                  | 229                      |
| 20,0    | 2 | 20,00                | 10,00                | 70                      | 1 114    | 0,068                  | 152                      |
|         | 3 | 20,00                | 10,00                | 70                      | 1 114    | 0,068                  | 228                      |
| 25,0    | 2 | 25,00                | 12,50                | 70                      | 891      | 0,076                  | 135                      |
|         | 3 | 25,00                | 12,50                | 70                      | 891      | 0,076                  | 202                      |



# SLOT MILLING

$$a_e = 1,0 \times D$$

$$a_p = 0,5 \times D$$

## Cast Iron, Lamellar Graphite, up to 1000 N/mm<sup>2</sup>

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 0,5     | 2 | 0,50                 | 0,25                 | 110                     | 70 028   | 0,003                  | 431                      |
| 1,0     | 2 | 1,00                 | 0,50                 | 110                     | 35 014   | 0,005                  | 324                      |
|         | 3 | 1,00                 | 0,50                 | 110                     | 35 014   | 0,005                  | 485                      |
| 1,5     | 2 | 1,50                 | 0,75                 | 110                     | 23 343   | 0,006                  | 270                      |
|         | 3 | 1,50                 | 0,75                 | 110                     | 23 343   | 0,006                  | 404                      |
| 2,0     | 2 | 2,00                 | 1,00                 | 110                     | 17 507   | 0,007                  | 243                      |
|         | 3 | 2,00                 | 1,00                 | 110                     | 17 507   | 0,007                  | 364                      |
| 2,5     | 2 | 2,50                 | 1,25                 | 110                     | 14 006   | 0,008                  | 226                      |
|         | 3 | 2,50                 | 1,25                 | 110                     | 14 006   | 0,008                  | 340                      |
| 3,0     | 2 | 3,00                 | 1,50                 | 110                     | 11 671   | 0,009                  | 216                      |
|         | 3 | 3,00                 | 1,50                 | 110                     | 11 671   | 0,009                  | 324                      |
| 4,0     | 2 | 4,00                 | 2,00                 | 110                     | 8 754    | 0,012                  | 216                      |
|         | 3 | 4,00                 | 2,00                 | 110                     | 8 754    | 0,012                  | 324                      |
| 5,0     | 2 | 5,00                 | 2,50                 | 110                     | 7 003    | 0,017                  | 237                      |
|         | 3 | 5,00                 | 2,50                 | 110                     | 7 003    | 0,017                  | 356                      |
| 6,0     | 2 | 6,00                 | 3,00                 | 110                     | 5 836    | 0,025                  | 288                      |
|         | 3 | 6,00                 | 3,00                 | 110                     | 5 836    | 0,025                  | 431                      |
| 8,0     | 2 | 8,00                 | 4,00                 | 110                     | 4 377    | 0,035                  | 303                      |
|         | 3 | 8,00                 | 4,00                 | 110                     | 4 377    | 0,035                  | 455                      |
| 10,0    | 2 | 10,00                | 5,00                 | 110                     | 3 501    | 0,043                  | 302                      |
|         | 3 | 10,00                | 5,00                 | 110                     | 3 501    | 0,043                  | 453                      |
| 12,0    | 2 | 12,00                | 6,00                 | 110                     | 2 918    | 0,057                  | 333                      |
|         | 3 | 12,00                | 6,00                 | 110                     | 2 918    | 0,057                  | 499                      |
| 14,0    | 2 | 14,00                | 7,00                 | 110                     | 2 501    | 0,066                  | 331                      |
|         | 3 | 14,00                | 7,00                 | 110                     | 2 501    | 0,066                  | 497                      |
| 16,0    | 2 | 16,00                | 8,00                 | 110                     | 2 188    | 0,075                  | 330                      |
|         | 3 | 16,00                | 8,00                 | 110                     | 2 188    | 0,075                  | 495                      |
| 18,0    | 2 | 18,00                | 9,00                 | 110                     | 1 945    | 0,085                  | 330                      |
|         | 3 | 18,00                | 9,00                 | 110                     | 1 945    | 0,085                  | 494                      |
| 20,0    | 2 | 20,00                | 10,00                | 110                     | 1 751    | 0,094                  | 329                      |
|         | 3 | 20,00                | 10,00                | 110                     | 1 751    | 0,094                  | 493                      |
| 25,0    | 2 | 25,00                | 12,50                | 110                     | 1 401    | 0,104                  | 291                      |
|         | 3 | 25,00                | 12,50                | 110                     | 1 401    | 0,104                  | 437                      |

## Copper, Unalloyed

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 0,5     | 2 | 0,50                 | 0,25                 | 170                     | 108 225  | 0,003                  | 606                      |
| 1,0     | 2 | 1,00                 | 0,50                 | 170                     | 54 113   | 0,004                  | 455                      |
|         | 3 | 1,00                 | 0,50                 | 170                     | 54 113   | 0,004                  | 682                      |
| 1,5     | 2 | 1,50                 | 0,75                 | 170                     | 36 075   | 0,005                  | 379                      |
|         | 3 | 1,50                 | 0,75                 | 170                     | 36 075   | 0,005                  | 568                      |
| 2,0     | 2 | 2,00                 | 1,00                 | 170                     | 27 056   | 0,006                  | 341                      |
|         | 3 | 2,00                 | 1,00                 | 170                     | 27 056   | 0,006                  | 511                      |
| 2,5     | 2 | 2,50                 | 1,25                 | 170                     | 21 645   | 0,007                  | 318                      |
|         | 3 | 2,50                 | 1,25                 | 170                     | 21 645   | 0,007                  | 477                      |
| 3,0     | 2 | 3,00                 | 1,50                 | 170                     | 18 038   | 0,008                  | 303                      |
|         | 3 | 3,00                 | 1,50                 | 170                     | 18 038   | 0,008                  | 455                      |
| 4,0     | 2 | 4,00                 | 2,00                 | 170                     | 13 528   | 0,011                  | 303                      |
|         | 3 | 4,00                 | 2,00                 | 170                     | 13 528   | 0,011                  | 455                      |
| 5,0     | 2 | 5,00                 | 2,50                 | 170                     | 10 823   | 0,015                  | 333                      |
|         | 3 | 5,00                 | 2,50                 | 170                     | 10 823   | 0,015                  | 500                      |
| 6,0     | 2 | 6,00                 | 3,00                 | 170                     | 9 019    | 0,022                  | 404                      |
|         | 3 | 6,00                 | 3,00                 | 170                     | 9 019    | 0,022                  | 606                      |
| 8,0     | 2 | 8,00                 | 4,00                 | 170                     | 6 764    | 0,032                  | 426                      |
|         | 3 | 8,00                 | 4,00                 | 170                     | 6 764    | 0,032                  | 639                      |
| 10,0    | 2 | 10,00                | 5,00                 | 170                     | 5 411    | 0,039                  | 424                      |
|         | 3 | 10,00                | 5,00                 | 170                     | 5 411    | 0,039                  | 636                      |
| 12,0    | 2 | 12,00                | 6,00                 | 170                     | 4 509    | 0,052                  | 467                      |
|         | 3 | 12,00                | 6,00                 | 170                     | 4 509    | 0,052                  | 701                      |
| 14,0    | 2 | 14,00                | 7,00                 | 170                     | 3 865    | 0,060                  | 465                      |
|         | 3 | 14,00                | 7,00                 | 170                     | 3 865    | 0,060                  | 698                      |
| 16,0    | 2 | 16,00                | 8,00                 | 170                     | 3 382    | 0,069                  | 464                      |
|         | 3 | 16,00                | 8,00                 | 170                     | 3 382    | 0,069                  | 696                      |
| 18,0    | 2 | 18,00                | 9,00                 | 170                     | 3 006    | 0,077                  | 463                      |
|         | 3 | 18,00                | 9,00                 | 170                     | 3 006    | 0,077                  | 694                      |
| 20,0    | 2 | 20,00                | 10,00                | 170                     | 2 706    | 0,085                  | 462                      |
|         | 3 | 20,00                | 10,00                | 170                     | 2 706    | 0,085                  | 693                      |
| 25,0    | 2 | 25,00                | 12,50                | 170                     | 2 165    | 0,095                  | 409                      |
|         | 3 | 25,00                | 12,50                | 170                     | 2 165    | 0,095                  | 614                      |

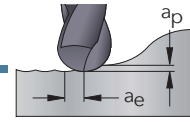
## Stainless Steel, Austenitic

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 3 | 3,00                 | 1,50                 | 100                     | 10 610   | 0,008                  | 241                      |
| 4,0     | 3 | 4,00                 | 2,00                 | 100                     | 7 958    | 0,010                  | 241                      |
| 5,0     | 3 | 5,00                 | 2,50                 | 100                     | 6 366    | 0,014                  | 265                      |
| 6,0     | 3 | 6,00                 | 3,00                 | 100                     | 5 305    | 0,020                  | 321                      |
| 8,0     | 3 | 8,00                 | 4,00                 | 100                     | 3 979    | 0,028                  | 338                      |
| 10,0    | 3 | 10,00                | 5,00                 | 100                     | 3 183    | 0,035                  | 337                      |
| 12,0    | 3 | 12,00                | 6,00                 | 100                     | 2 653    | 0,047                  | 371                      |
| 16,0    | 3 | 16,00                | 8,00                 | 100                     | 1 989    | 0,062                  | 368                      |
| 20,0    | 3 | 20,00                | 10,00                | 100                     | 1 592    | 0,077                  | 367                      |

## Aluminium, up to 10% Si

| D<br>mm | z | a <sub>e</sub><br>mm | a <sub>p</sub><br>mm | V <sub>c</sub><br>m/min | n<br>rpm | F <sub>z</sub><br>mm/z | V <sub>f</sub><br>mm/min |
|---------|---|----------------------|----------------------|-------------------------|----------|------------------------|--------------------------|
| 3,0     | 2 | 3,00                 | 1,50                 | 300                     | 31 831   | 0,010                  | 963                      |
| 4,0     | 2 | 4,00                 | 2,00                 | 300                     | 23 873   | 0,013                  | 963                      |
| 5,0     | 2 | 5,00                 | 2,50                 | 300                     | 19 099   | 0,018                  | 1 059                    |
| 6,0     | 2 | 6,00                 | 3,00                 | 300                     | 15 916   | 0,027                  | 1 283                    |
| 8,0     | 2 | 8,00                 | 4,00                 | 300                     | 11 937   | 0,038                  | 1 354                    |
| 10,0    | 2 | 10,00                | 5,00                 | 300                     | 9 549    | 0,047                  | 1 348                    |
| 12,0    | 2 | 12,00                | 6,00                 | 300                     | 7 958    | 0,062                  | 1 484                    |
| 16,0    | 2 | 16,00                | 8,00                 | 300                     | 5 968    | 0,082                  | 1 474                    |
| 20,0    | 2 | 20,00                | 10,00                | 300                     | 4 775    | 0,102                  | 1 468                    |





$$a_e = 0,3 \times D$$

$$a_p = 0,1 \times D$$

### High Alloy Steel / Hardened Steel HRC 30-45

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,09           | 0,03           | 47             | 50 000 | 0,005          | 500            |
| 0,4  | 2 | 0,12           | 0,04           | 63             | 50 000 | 0,007          | 700            |
| 0,5  | 2 | 0,15           | 0,05           | 79             | 50 000 | 0,009          | 900            |
| 0,6  | 2 | 0,18           | 0,06           | 94             | 50 000 | 0,010          | 1 000          |
| 0,7  | 2 | 0,21           | 0,07           | 110            | 50 000 | 0,012          | 1 200          |
| 0,8  | 2 | 0,24           | 0,08           | 126            | 50 000 | 0,014          | 1 400          |
| 1,0  | 2 | 0,30           | 0,10           | 157            | 50 000 | 0,018          | 1 800          |
| 1,2  | 2 | 0,36           | 0,12           | 188            | 50 000 | 0,021          | 2 100          |
| 1,5  | 2 | 0,45           | 0,15           | 236            | 50 000 | 0,027          | 2 700          |
| 2,0  | 2 | 0,60           | 0,20           | 300            | 47 747 | 0,035          | 3 342          |
| 2,5  | 2 | 0,75           | 0,25           | 300            | 38 197 | 0,047          | 3 591          |
| 3,0  | 2 | 0,90           | 0,30           | 300            | 31 831 | 0,064          | 4 074          |
| 4,0  | 2 | 1,20           | 0,40           | 300            | 23 873 | 0,082          | 3 915          |
| 5,0  | 2 | 1,50           | 0,50           | 300            | 19 099 | 0,102          | 3 896          |
| 6,0  | 2 | 1,80           | 0,60           | 300            | 15 916 | 0,121          | 3 852          |
| 8,0  | 2 | 2,40           | 0,80           | 300            | 11 937 | 0,138          | 3 295          |
| 10,0 | 2 | 3,00           | 1,00           | 300            | 9 549  | 0,152          | 2 903          |
| 12,0 | 2 | 3,60           | 1,20           | 300            | 7 958  | 0,163          | 2 594          |
| 16,0 | 2 | 4,80           | 1,60           | 300            | 5 968  | 0,181          | 2 161          |

### Hardened Steel HRC 45-55

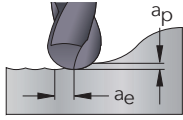
| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,09           | 0,03           | 47             | 50 000 | 0,004          | 440            |
| 0,4  | 2 | 0,12           | 0,04           | 63             | 50 000 | 0,006          | 616            |
| 0,5  | 2 | 0,15           | 0,05           | 79             | 50 000 | 0,008          | 792            |
| 0,6  | 2 | 0,18           | 0,06           | 94             | 50 000 | 0,009          | 880            |
| 0,7  | 2 | 0,21           | 0,07           | 110            | 50 000 | 0,011          | 1 056          |
| 0,8  | 2 | 0,24           | 0,08           | 126            | 50 000 | 0,012          | 1 232          |
| 1,0  | 2 | 0,30           | 0,10           | 157            | 50 000 | 0,016          | 1 584          |
| 1,2  | 2 | 0,36           | 0,12           | 188            | 50 000 | 0,018          | 1 848          |
| 1,5  | 2 | 0,45           | 0,15           | 236            | 50 000 | 0,024          | 2 376          |
| 2,0  | 2 | 0,60           | 0,20           | 250            | 39 789 | 0,031          | 2 451          |
| 2,5  | 2 | 0,75           | 0,25           | 250            | 31 831 | 0,041          | 2 633          |
| 3,0  | 2 | 0,90           | 0,30           | 250            | 26 526 | 0,056          | 2 988          |
| 4,0  | 2 | 1,20           | 0,40           | 250            | 19 894 | 0,072          | 2 871          |
| 5,0  | 2 | 1,50           | 0,50           | 250            | 15 916 | 0,090          | 2 857          |
| 6,0  | 2 | 1,80           | 0,60           | 250            | 13 263 | 0,106          | 2 824          |
| 8,0  | 2 | 2,40           | 0,80           | 250            | 9 947  | 0,121          | 2 416          |
| 10,0 | 2 | 3,00           | 1,00           | 250            | 7 958  | 0,134          | 2 129          |
| 12,0 | 2 | 3,60           | 1,20           | 250            | 6 631  | 0,143          | 1 902          |
| 16,0 | 2 | 4,80           | 1,60           | 250            | 4 974  | 0,159          | 1 584          |

### Hardened Steel HRC 55-65

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,09           | 0,03           | 47             | 50 000 | 0,004          | 410            |
| 0,4  | 2 | 0,12           | 0,04           | 63             | 50 000 | 0,006          | 574            |
| 0,5  | 2 | 0,15           | 0,05           | 79             | 50 000 | 0,007          | 738            |
| 0,6  | 2 | 0,18           | 0,06           | 94             | 50 000 | 0,008          | 820            |
| 0,7  | 2 | 0,21           | 0,07           | 110            | 50 000 | 0,010          | 984            |
| 0,8  | 2 | 0,24           | 0,08           | 126            | 50 000 | 0,011          | 1 148          |
| 1,0  | 2 | 0,30           | 0,10           | 157            | 50 000 | 0,015          | 1 476          |
| 1,2  | 2 | 0,36           | 0,12           | 188            | 50 000 | 0,017          | 1 722          |
| 1,5  | 2 | 0,45           | 0,15           | 200            | 42 441 | 0,022          | 1 879          |
| 2,0  | 2 | 0,60           | 0,20           | 200            | 31 831 | 0,029          | 1 827          |
| 2,5  | 2 | 0,75           | 0,25           | 200            | 25 465 | 0,039          | 1 963          |
| 3,0  | 2 | 0,90           | 0,30           | 200            | 21 221 | 0,052          | 2 227          |
| 4,0  | 2 | 1,20           | 0,40           | 200            | 15 916 | 0,067          | 2 140          |
| 5,0  | 2 | 1,50           | 0,50           | 200            | 12 732 | 0,084          | 2 130          |
| 6,0  | 2 | 1,80           | 0,60           | 200            | 10 610 | 0,099          | 2 106          |
| 8,0  | 2 | 2,40           | 0,80           | 200            | 7 958  | 0,113          | 1 801          |
| 10,0 | 2 | 3,00           | 1,00           | 200            | 6 366  | 0,125          | 1 587          |
| 12,0 | 2 | 3,60           | 1,20           | 200            | 5 305  | 0,134          | 1 418          |
| 16,0 | 2 | 4,80           | 1,60           | 200            | 3 979  | 0,148          | 1 181          |

### Graphite

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,09           | 0,03           | 47             | 50 000 | 0,006          | 625            |
| 0,4  | 2 | 0,12           | 0,04           | 63             | 50 000 | 0,009          | 875            |
| 0,5  | 2 | 0,15           | 0,05           | 79             | 50 000 | 0,011          | 1 125          |
| 0,6  | 2 | 0,18           | 0,06           | 94             | 50 000 | 0,013          | 1 250          |
| 0,7  | 2 | 0,21           | 0,07           | 110            | 50 000 | 0,015          | 1 500          |
| 0,8  | 2 | 0,24           | 0,08           | 126            | 50 000 | 0,018          | 1 750          |
| 1,0  | 2 | 0,30           | 0,10           | 157            | 50 000 | 0,023          | 2 250          |
| 1,2  | 2 | 0,36           | 0,12           | 188            | 50 000 | 0,026          | 2 625          |
| 1,5  | 2 | 0,45           | 0,15           | 236            | 50 000 | 0,034          | 3 375          |
| 2,0  | 2 | 0,60           | 0,20           | 314            | 50 000 | 0,044          | 4 375          |
| 2,5  | 2 | 0,75           | 0,25           | 393            | 50 000 | 0,059          | 5 875          |
| 3,0  | 2 | 0,90           | 0,30           | 400            | 42 441 | 0,080          | 6 791          |
| 4,0  | 2 | 1,20           | 0,40           | 400            | 31 831 | 0,103          | 6 525          |
| 5,0  | 2 | 1,50           | 0,50           | 400            | 25 465 | 0,128          | 6 494          |
| 6,0  | 2 | 1,80           | 0,60           | 400            | 21 221 | 0,151          | 6 419          |
| 8,0  | 2 | 2,40           | 0,80           | 400            | 15 916 | 0,173          | 5 491          |
| 10,0 | 2 | 3,00           | 1,00           | 400            | 12 732 | 0,190          | 4 838          |
| 12,0 | 2 | 3,60           | 1,20           | 400            | 10 610 | 0,204          | 4 324          |
| 16,0 | 2 | 4,80           | 1,60           | 400            | 7 958  | 0,226          | 3 601          |



# HIGH SPEED CUTTING

## Finishing



$$a_e = 0,05 \times D$$

$$a_p = 0,05 \times D$$

### High Alloy Steel / Hardened Steel HRC 30-45

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,02           | 0,02           | 47             | 50 000 | 0,006          | 600            |
| 0,4  | 2 | 0,02           | 0,02           | 63             | 50 000 | 0,008          | 840            |
| 0,5  | 2 | 0,03           | 0,03           | 79             | 50 000 | 0,011          | 1 080          |
| 0,6  | 2 | 0,03           | 0,03           | 94             | 50 000 | 0,012          | 1 200          |
| 0,7  | 2 | 0,04           | 0,04           | 110            | 50 000 | 0,014          | 1 440          |
| 0,8  | 2 | 0,04           | 0,04           | 126            | 50 000 | 0,017          | 1 680          |
| 1,0  | 2 | 0,05           | 0,05           | 157            | 50 000 | 0,022          | 2 160          |
| 1,2  | 2 | 0,06           | 0,06           | 188            | 50 000 | 0,025          | 2 520          |
| 1,5  | 2 | 0,08           | 0,08           | 236            | 50 000 | 0,032          | 3 240          |
| 2,0  | 2 | 0,10           | 0,10           | 314            | 50 000 | 0,042          | 4 200          |
| 2,5  | 2 | 0,13           | 0,13           | 350            | 44 563 | 0,056          | 5 027          |
| 3,0  | 2 | 0,15           | 0,15           | 350            | 37 136 | 0,077          | 5 704          |
| 4,0  | 2 | 0,20           | 0,20           | 350            | 27 852 | 0,098          | 5 481          |
| 5,0  | 2 | 0,25           | 0,25           | 350            | 22 282 | 0,122          | 5 455          |
| 6,0  | 2 | 0,30           | 0,30           | 350            | 18 568 | 0,145          | 5 392          |
| 8,0  | 2 | 0,40           | 0,40           | 350            | 13 926 | 0,166          | 4 612          |
| 10,0 | 2 | 0,50           | 0,50           | 350            | 11 141 | 0,182          | 4 064          |
| 12,0 | 2 | 0,60           | 0,60           | 350            | 9 284  | 0,196          | 3 632          |
| 16,0 | 2 | 0,80           | 0,80           | 350            | 6 963  | 0,217          | 3 025          |

### Hardened Steel HRC 45-55

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,02           | 0,02           | 47             | 50 000 | 0,005          | 528            |
| 0,4  | 2 | 0,02           | 0,02           | 63             | 50 000 | 0,007          | 739            |
| 0,5  | 2 | 0,03           | 0,03           | 79             | 50 000 | 0,010          | 950            |
| 0,6  | 2 | 0,03           | 0,03           | 94             | 50 000 | 0,011          | 1 056          |
| 0,7  | 2 | 0,04           | 0,04           | 110            | 50 000 | 0,013          | 1 267          |
| 0,8  | 2 | 0,04           | 0,04           | 126            | 50 000 | 0,015          | 1 478          |
| 1,0  | 2 | 0,05           | 0,05           | 157            | 50 000 | 0,019          | 1 901          |
| 1,2  | 2 | 0,06           | 0,06           | 188            | 50 000 | 0,022          | 2 218          |
| 1,5  | 2 | 0,08           | 0,08           | 236            | 50 000 | 0,029          | 2 851          |
| 2,0  | 2 | 0,10           | 0,10           | 300            | 47 747 | 0,037          | 3 529          |
| 2,5  | 2 | 0,13           | 0,13           | 300            | 38 197 | 0,050          | 3 792          |
| 3,0  | 2 | 0,15           | 0,15           | 300            | 31 831 | 0,068          | 4 303          |
| 4,0  | 2 | 0,20           | 0,20           | 300            | 23 873 | 0,087          | 4 134          |
| 5,0  | 2 | 0,25           | 0,25           | 300            | 19 099 | 0,108          | 4 114          |
| 6,0  | 2 | 0,30           | 0,30           | 300            | 15 916 | 0,128          | 4 067          |
| 8,0  | 2 | 0,40           | 0,40           | 300            | 11 937 | 0,146          | 3 479          |
| 10,0 | 2 | 0,50           | 0,50           | 300            | 9 549  | 0,161          | 3 066          |
| 12,0 | 2 | 0,60           | 0,60           | 300            | 7 958  | 0,172          | 2 740          |
| 16,0 | 2 | 0,80           | 0,80           | 300            | 5 968  | 0,191          | 2 282          |

### Hardened Steel HRC 55-65

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,02           | 0,02           | 47             | 50 000 | 0,005          | 492            |
| 0,4  | 2 | 0,02           | 0,02           | 63             | 50 000 | 0,007          | 689            |
| 0,5  | 2 | 0,03           | 0,03           | 79             | 50 000 | 0,009          | 886            |
| 0,6  | 2 | 0,03           | 0,03           | 94             | 50 000 | 0,010          | 984            |
| 0,7  | 2 | 0,04           | 0,04           | 110            | 50 000 | 0,012          | 1 181          |
| 0,8  | 2 | 0,04           | 0,04           | 126            | 50 000 | 0,014          | 1 378          |
| 1,0  | 2 | 0,05           | 0,05           | 157            | 50 000 | 0,018          | 1 771          |
| 1,2  | 2 | 0,06           | 0,06           | 188            | 50 000 | 0,021          | 2 066          |
| 1,5  | 2 | 0,08           | 0,08           | 236            | 50 000 | 0,027          | 2 657          |
| 2,0  | 2 | 0,10           | 0,10           | 250            | 39 789 | 0,034          | 2 741          |
| 2,5  | 2 | 0,13           | 0,13           | 250            | 31 831 | 0,046          | 2 944          |
| 3,0  | 2 | 0,15           | 0,15           | 250            | 26 526 | 0,063          | 3 341          |
| 4,0  | 2 | 0,20           | 0,20           | 250            | 19 894 | 0,081          | 3 210          |
| 5,0  | 2 | 0,25           | 0,25           | 250            | 15 916 | 0,100          | 3 195          |
| 6,0  | 2 | 0,30           | 0,30           | 250            | 13 263 | 0,119          | 3 158          |
| 8,0  | 2 | 0,40           | 0,40           | 250            | 9 947  | 0,136          | 2 701          |
| 10,0 | 2 | 0,50           | 0,50           | 250            | 7 958  | 0,150          | 2 380          |
| 12,0 | 2 | 0,60           | 0,60           | 250            | 6 631  | 0,160          | 2 127          |
| 16,0 | 2 | 0,80           | 0,80           | 250            | 4 974  | 0,178          | 1 772          |

### Graphite

| D    | z | a <sub>e</sub> | a <sub>p</sub> | V <sub>c</sub> | n      | F <sub>z</sub> | V <sub>f</sub> |
|------|---|----------------|----------------|----------------|--------|----------------|----------------|
| mm   |   | mm             | mm             | m/min          | rpm    | mm/z           | mm/min         |
| 0,3  | 2 | 0,02           | 0,02           | 47             | 50 000 | 0,008          | 750            |
| 0,4  | 2 | 0,02           | 0,02           | 63             | 50 000 | 0,011          | 1 050          |
| 0,5  | 2 | 0,03           | 0,03           | 79             | 50 000 | 0,014          | 1 350          |
| 0,6  | 2 | 0,03           | 0,03           | 94             | 50 000 | 0,015          | 1 500          |
| 0,7  | 2 | 0,04           | 0,04           | 110            | 50 000 | 0,018          | 1 800          |
| 0,8  | 2 | 0,04           | 0,04           | 126            | 50 000 | 0,021          | 2 100          |
| 1,0  | 2 | 0,05           | 0,05           | 157            | 50 000 | 0,027          | 2 700          |
| 1,2  | 2 | 0,06           | 0,06           | 188            | 50 000 | 0,032          | 3 150          |
| 1,5  | 2 | 0,08           | 0,08           | 236            | 50 000 | 0,041          | 4 050          |
| 2,0  | 2 | 0,10           | 0,10           | 314            | 50 000 | 0,053          | 5 250          |
| 2,5  | 2 | 0,13           | 0,13           | 393            | 50 000 | 0,071          | 7 050          |
| 3,0  | 2 | 0,15           | 0,15           | 450            | 47 747 | 0,096          | 9 167          |
| 4,0  | 2 | 0,20           | 0,20           | 450            | 35 810 | 0,123          | 8 809          |
| 5,0  | 2 | 0,25           | 0,25           | 450            | 28 648 | 0,153          | 8 766          |
| 6,0  | 2 | 0,30           | 0,30           | 450            | 23 873 | 0,182          | 8 666          |
| 8,0  | 2 | 0,40           | 0,40           | 450            | 17 905 | 0,207          | 7 413          |
| 10,0 | 2 | 0,50           | 0,50           | 450            | 14 324 | 0,228          | 6 532          |
| 12,0 | 2 | 0,60           | 0,60           | 450            | 11 937 | 0,245          | 5 837          |
| 16,0 | 2 | 0,80           | 0,80           | 450            | 8 952  | 0,272          | 4 861          |