

# PRODUCT NEWS

**PN-E-009**  
(Web-only version)

**SERIES EXPANSION**

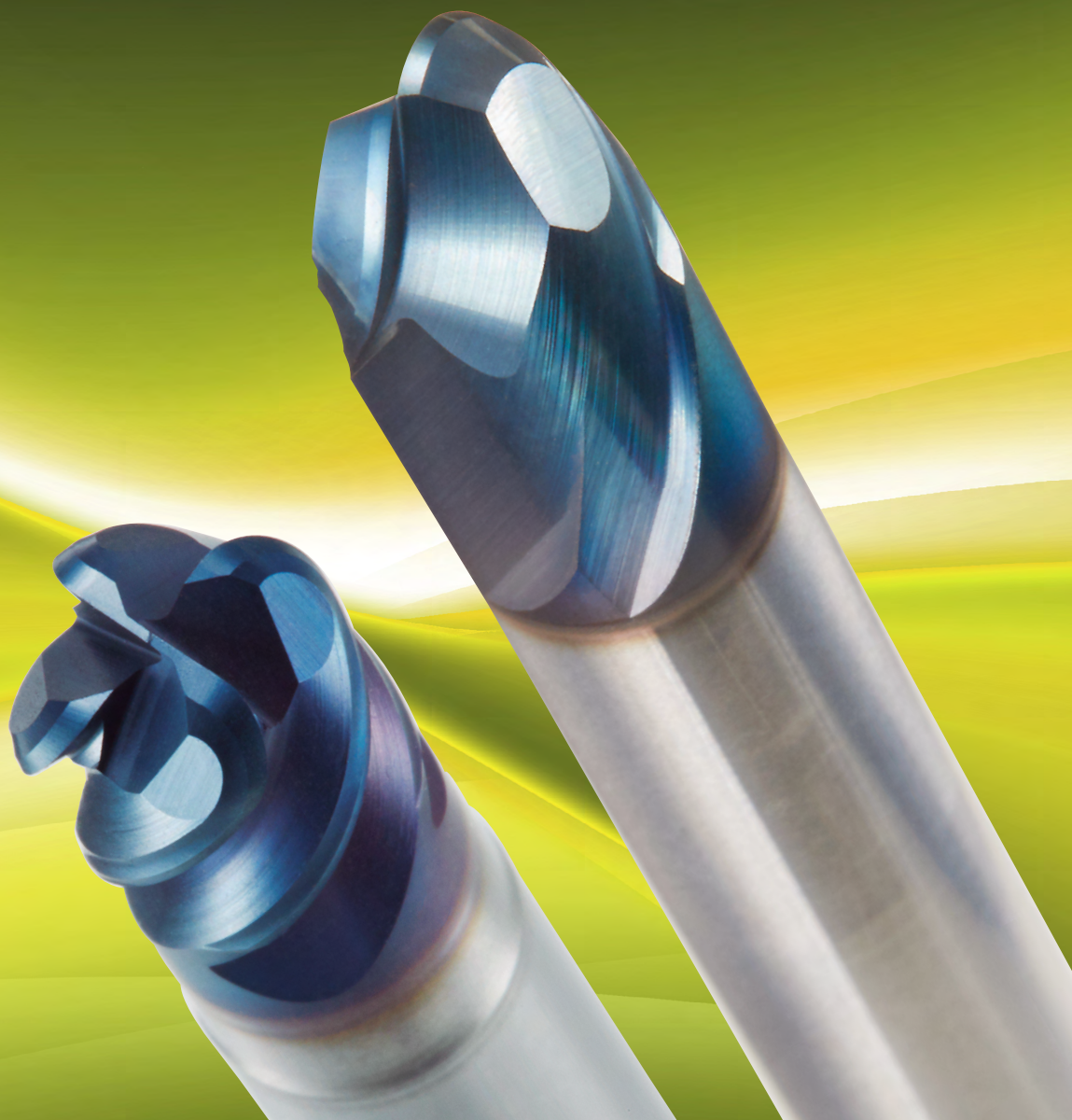


## **HARD-ONE** series

**HARD 1 RADIUS SFSR type :  $\varnothing 2 \sim 12$**

**HARD 1 BALL SFSB type :  $\varnothing 1 \sim 12$**

**DH1 Coated Solid Carbide End Mill Series  
for High-Hardened Die Steel up to 70 HRC**



**DIJET GmbH**

**[www.dijet.de](http://www.dijet.de)**

# HARD **1** RADIUS

## Feature 1

**Highly Rigid Design for High Efficiency Machining**

## Feature 2

**Suppress Vibration with Variable Helix Angle & Unequal Spacing Teeth Geometry**

## Feature 3

**Special design on center of cutting edge improves cutting performance**

## Feature 4

**Applicable for High Spindle Machine & Shrink Fit Holder**  
**Shank diameter tolerance: h5**

## Feature 5

**Excellent tool life for Hardened Materials with Newly developed grade "DH110"**



## New PVD coating <DH coating>

### ● Properties of DIJET PVD coating

|                            | DH coating  | DV coating  | DZ coating(TiAlN) |
|----------------------------|-------------|-------------|-------------------|
| Hardness(Hv)               | 3,500~3,700 | 3,300~3,500 | 2,800~2,900       |
| Oxidation temperature (°C) | 1,100~1,200 | 1,000~1,100 | 700~800           |
| Coefficient of friction    | 0.5         | 0.65        | 0.6               |

**SFSR**  
TYPE

**For General steel to Hardened steel**

● Helix angle 50°-52°



Fig.1

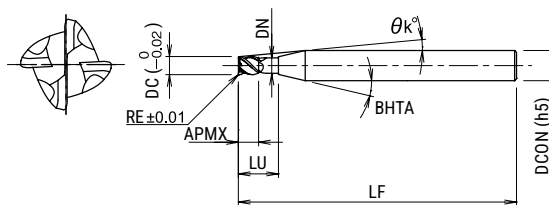
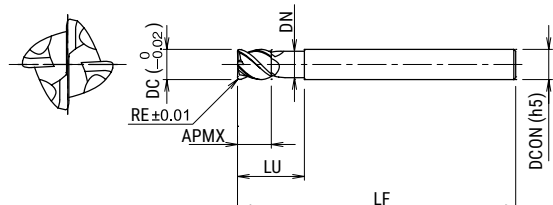
 $DC < DCON$ 


Fig.2

 $DC = DCON$ 


| Cat.No.         | Stock | Dimensions (mm) |    |      |    |    |      |      |                  |      | Fig. |
|-----------------|-------|-----------------|----|------|----|----|------|------|------------------|------|------|
|                 |       | RE              | DC | APMX | LU | LF | DN   | BHTA | $\theta k^\circ$ | DCON |      |
| SFSR4020S04-R05 | ●     | 0.5             | 2  | 2    | 4  | 40 | 1.9  | 20°  | 9.1°             | 4    | 1    |
| SFSR4020S06-R05 | ●     | 0.5             | 2  | 2    | 4  | 40 | 1.9  | 20°  | 12.6°            | 6    | 1    |
| SFSR4030S04-R08 | ●     | 0.8             | 3  | 3    | 6  | 40 | 2.9  | 20°  | 4.4°             | 4    | 1    |
| SFSR4030S06-R08 | ●     | 0.8             | 3  | 3    | 6  | 40 | 2.9  | 20°  | 9.2°             | 6    | 1    |
| SFSR4040S04-R10 | ●     | 1               | 4  | 4    | 8  | 40 | 3.8  | —    | —                | 4    | 2    |
| SFSR4040S06-R10 | ●     | 1               | 4  | 4    | 8  | 40 | 3.8  | 20°  | 5.9°             | 6    | 1    |
| SFSR4050S06-R12 | ●     | 1.2             | 5  | 5    | 10 | 50 | 4.8  | 20°  | 2.9°             | 6    | 1    |
| SFSR4060S06-R10 | ●     | 1               | 6  | 6    | 12 | 50 | 5.8  | —    | —                | 6    | 2    |
| SFSR4060S06-R15 | ●     | 1.5             | 6  | 6    | 12 | 50 | 5.8  | —    | —                | 6    | 2    |
| SFSR4080S08-R10 | ●     | 1               | 8  | 8    | 16 | 60 | 7.8  | —    | —                | 8    | 2    |
| SFSR4080S08-R20 | ●     | 2               | 8  | 8    | 16 | 60 | 7.8  | —    | —                | 8    | 2    |
| SFSR4100S10-R20 | ●     | 2               | 10 | 10   | 20 | 60 | 9.8  | —    | —                | 10   | 2    |
| SFSR4100S10-R30 | ●     | 3               | 10 | 10   | 20 | 60 | 9.8  | —    | —                | 10   | 2    |
| SFSR4120S12-R20 | ●     | 2               | 12 | 12   | 24 | 60 | 11.8 | —    | —                | 12   | 2    |
| SFSR4120S12-R30 | ●     | 3               | 12 | 12   | 24 | 60 | 11.8 | —    | —                | 12   | 2    |

● : Stocked Items



**SFSR**  
TYPE

**For General steel to Hardened steel**

- Helix angle 50°-52°
- Corner radius accuracy :  $\pm 0.005$



Fig.1

DC < DCON

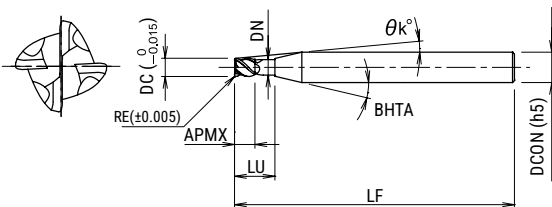
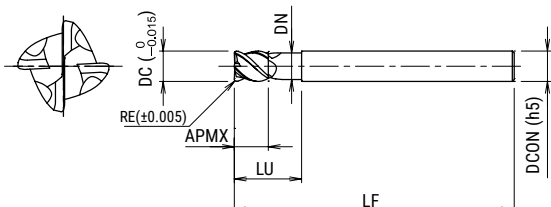


Fig.2

DC = DCON



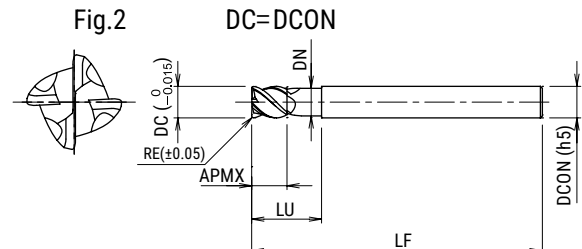
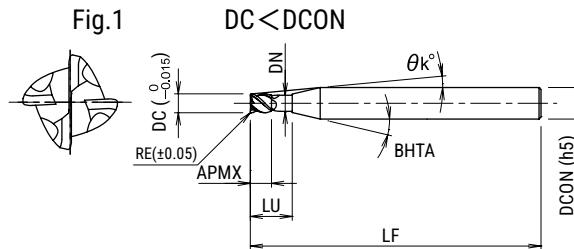
| Cat.No.            | Stock | Dimensions (mm) |    |      |    |     |      |      |        |      | Fig. |
|--------------------|-------|-----------------|----|------|----|-----|------|------|--------|------|------|
|                    |       | RE              | DC | APMX | LU | LF  | DN   | BHTA | θk     | DCON |      |
| SFSR4020S06-R05-06 | ●     | 0.5             | 2  | 2    | 6  | 60  | 1.9  | 20°  | 10.27° | 6    | 1    |
| SFSR4030S06-R08-09 | ●     | 0.8             | 3  | 3    | 9  | 60  | 2.9  | 20°  | 6.91°  | 6    | 1    |
| SFSR4040S06-R10-12 | ●     | 1               | 4  | 4    | 12 | 60  | 3.8  | 20°  | 4.15°  | 6    | 1    |
| SFSR4050S06-R12-15 | ●     | 1.2             | 5  | 5    | 15 | 60  | 4.7  | 20°  | 1.88°  | 6    | 1    |
| SFSR4060S06-R05-18 | ●     | 0.5             | 6  | 6    | 18 | 60  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R05-30 | ●     | 0.5             | 6  | 6    | 30 | 90  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R10-18 | ●     | 1               | 6  | 6    | 18 | 60  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R10-30 | ●     | 1               | 6  | 6    | 30 | 90  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R15-18 | ●     | 1.5             | 6  | 6    | 18 | 60  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R15-30 | ●     | 1.5             | 6  | 6    | 30 | 90  | 5.7  | —    | —      | 6    | 2    |
| SFSR4080S08-R05-24 | ●     | 0.5             | 8  | 8    | 24 | 75  | 7.6  | —    | —      | 8    | 2    |
| SFSR4080S08-R05-40 | ●     | 0.5             | 8  | 8    | 40 | 100 | 7.6  | —    | —      | 8    | 2    |
| SFSR4080S08-R10-24 | ●     | 1               | 8  | 8    | 24 | 75  | 7.6  | —    | —      | 8    | 2    |
| SFSR4080S08-R10-40 | ●     | 1               | 8  | 8    | 40 | 100 | 7.6  | —    | —      | 8    | 2    |
| SFSR4080S08-R20-24 | ●     | 2               | 8  | 8    | 24 | 75  | 7.6  | —    | —      | 8    | 2    |
| SFSR4080S08-R20-40 | ●     | 2               | 8  | 8    | 40 | 100 | 7.6  | —    | —      | 8    | 2    |
| SFSR4100S10-R05-30 | ●     | 0.5             | 10 | 10   | 30 | 80  | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R05-50 | ●     | 0.5             | 10 | 10   | 50 | 110 | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R10-30 | ●     | 1               | 10 | 10   | 30 | 80  | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R10-50 | ●     | 1               | 10 | 10   | 50 | 110 | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R20-30 | ●     | 2               | 10 | 10   | 30 | 80  | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R20-50 | ●     | 2               | 10 | 10   | 50 | 110 | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R30-30 | ●     | 3               | 10 | 10   | 30 | 80  | 9.5  | —    | —      | 10   | 2    |
| SFSR4100S10-R30-50 | ●     | 3               | 10 | 10   | 50 | 110 | 9.5  | —    | —      | 10   | 2    |
| SFSR4120S12-R05-36 | ●     | 0.5             | 12 | 12   | 36 | 100 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R05-60 | ●     | 0.5             | 12 | 12   | 60 | 120 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R10-36 | ●     | 1               | 12 | 12   | 36 | 100 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R10-60 | ●     | 1               | 12 | 12   | 60 | 120 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R20-36 | ●     | 2               | 12 | 12   | 36 | 100 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R20-60 | ●     | 2               | 12 | 12   | 60 | 120 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R30-36 | ●     | 3               | 12 | 12   | 36 | 100 | 11.5 | —    | —      | 12   | 2    |
| SFSR4120S12-R30-60 | ●     | 3               | 12 | 12   | 60 | 120 | 11.5 | —    | —      | 12   | 2    |

● : Stocked Items

**SFSR**  
TYPE

**For General steel to Hardened steel**

- Helix angle 50°-52°
- Corner radius R0.2



| Cat.No.            | Stock | Dimensions (mm) |    |      |    |     |      |      |        |      | Fig. |
|--------------------|-------|-----------------|----|------|----|-----|------|------|--------|------|------|
|                    |       | RE              | DC | APMX | LU | LF  | DN   | BHTA | θk     | DCON |      |
| SFSR4020S06-R02-06 | ●     | 0.2             | 2  | 2    | 6  | 60  | 1.9  | 20°  | 10.03° | 6    | 1    |
| SFSR4030S06-R02-09 | ●     | 0.2             | 3  | 3    | 9  | 60  | 2.9  | 20°  | 6.62°  | 6    | 1    |
| SFSR4040S06-R02-12 | ●     | 0.2             | 4  | 4    | 12 | 60  | 3.8  | 20°  | 3.93°  | 6    | 1    |
| SFSR4050S06-R02-15 | ●     | 0.2             | 5  | 5    | 15 | 60  | 4.7  | 20°  | 1.77°  | 6    | 1    |
| SFSR4060S06-R02-18 | ●     | 0.2             | 6  | 6    | 18 | 60  | 5.7  | —    | —      | 6    | 2    |
| SFSR4060S06-R02-30 | ●     | 0.2             | 6  | 6    | 30 | 90  | 5.7  | —    | —      | 6    | 2    |
| SFSR4080S08-R02-24 | ●     | 0.2             | 8  | 8    | 24 | 75  | 7.6  | —    | —      | 8    | 2    |
| SFSR4100S10-R02-30 | ●     | 0.2             | 10 | 10   | 30 | 80  | 9.5  | —    | —      | 10   | 2    |
| SFSR4120S12-R02-36 | ●     | 0.2             | 12 | 12   | 36 | 100 | 11.5 | —    | —      | 12   | 2    |

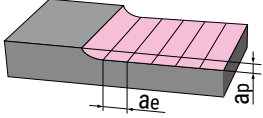
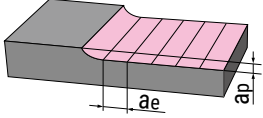


● : Stocked Items

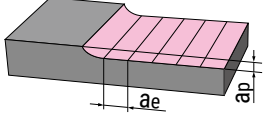
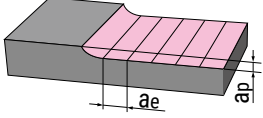
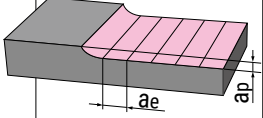
# Hard one Series – SFSR/SFSB type

## ■ Recommended Cutting Conditions — SFSR type

### ● Face Milling — Roughing

| Material     | Carbon steel<br>(S50C, S55C)<br>below 250HB                                                                                                                |                   | Alloy steel, Tool steel,<br>Mold steel<br>(SKD, SKH, NAK)<br>below 45HRC |                   | Stainless steel<br>(SUS304)  |                                                                                                                                   | Hardened steel<br>(SKD61, DAC, DHA)<br>42 – 52HRC |                   | Hardened steel<br>(SKD11, SKH51, SLD)<br>55 – 62HRC |                   | Hardened steel<br>(SKH, HAP)<br>63 – 70HRC |                   |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------|-------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------|-----------------------------------------------------|-------------------|--------------------------------------------|-------------------|
| DC<br>(mm)   | $n$<br>( $\text{min}^{-1}$ )                                                                                                                               | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                             | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ ) | $V_f$<br>(mm/min)                                                                                                                 | $n$<br>( $\text{min}^{-1}$ )                      | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                        | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )               | $V_f$<br>(mm/min) |
| 2            | 24,000                                                                                                                                                     | 7,000             | 24,000                                                                   | 7,000             | 25,000                       | 2,500                                                                                                                             | 16,000                                            | 2,300             | 9,000                                               | 1,700             | 3,000                                      | 600               |
| 3            | 17,000                                                                                                                                                     | 7,000             | 17,000                                                                   | 7,000             | 17,000                       | 3,000                                                                                                                             | 12,500                                            | 3,000             | 7,300                                               | 1,900             | 3,000                                      | 750               |
| 4            | 13,000                                                                                                                                                     | 8,000             | 13,000                                                                   | 8,000             | 13,000                       | 3,500                                                                                                                             | 11,000                                            | 3,500             | 6,500                                               | 2,100             | 3,000                                      | 1,000             |
| 5            | 10,000                                                                                                                                                     | 9,000             | 10,000                                                                   | 9,000             | 10,500                       | 4,000                                                                                                                             | 9,500                                             | 4,800             | 6,200                                               | 2,300             | 3,000                                      | 1,200             |
| 6            | 8,500                                                                                                                                                      | 10,000            | 8,500                                                                    | 10,000            | 8,600                        | 4,200                                                                                                                             | 8,000                                             | 5,500             | 6,000                                               | 2,500             | 3,200                                      | 1,400             |
| 8            | 6,500                                                                                                                                                      | 10,000            | 6,500                                                                    | 10,000            | 6,500                        | 4,200                                                                                                                             | 6,000                                             | 6,000             | 4,300                                               | 2,300             | 2,500                                      | 1,500             |
| 10           | 5,200                                                                                                                                                      | 10,000            | 5,200                                                                    | 10,000            | 4,500                        | 4,200                                                                                                                             | 4,800                                             | 6,000             | 3,300                                               | 2,500             | 2,000                                      | 1,600             |
| 12           | 4,300                                                                                                                                                      | 10,000            | 4,300                                                                    | 10,000            | 3,000                        | 4,200                                                                                                                             | 4,000                                             | 7,500             | 2,500                                               | 2,500             | 1,500                                      | 1,700             |
| Depth of Cut |  $a_p \leq 0.3\text{mm} (\phi Dc2 - 0.15\text{mm})$<br>$a_e \leq 0.33Dc$ |                   |                                                                          |                   |                              |  $a_p \leq 0.15\text{mm}$<br>$a_e \leq 0.33Dc$ |                                                   |                   |                                                     |                   |                                            |                   |

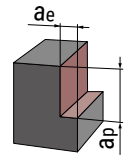
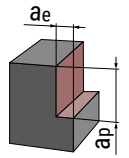
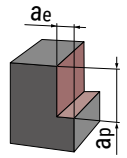
### ● Face Milling — Finishing

| Material     | Carbon steel<br>(S50C, S55C)<br>below 250HB                                                                                      |                   | Alloy steel, Tool steel,<br>Mold steel<br>(SKD, SKH, NAK)<br>below 45HRC |                   | Stainless steel<br>(SUS304)  |                   | Hardened steel<br>(SKD61, DAC, DHA)<br>42 – 52HRC                                                                                |                   | Hardened steel<br>(SKD11, SKH51, SLD)<br>55 – 62HRC |                                                                                                                                    | Hardened steel<br>(SKH, HAP)<br>63 – 70HRC |                   |
|--------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------|-------------------|------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------|
| DC<br>(mm)   | $n$<br>( $\text{min}^{-1}$ )                                                                                                     | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                             | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ ) | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                                                                                     | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                        | $V_f$<br>(mm/min)                                                                                                                  | $n$<br>( $\text{min}^{-1}$ )               | $V_f$<br>(mm/min) |
| 2            | 30,000                                                                                                                           | 2,000             | 30,000                                                                   | 2,000             | 30,000                       | 2,000             | 20,000                                                                                                                           | 1,300             | 13,000                                              | 900                                                                                                                                | 9,000                                      | 400               |
| 3            | 20,000                                                                                                                           | 2,000             | 20,000                                                                   | 2,000             | 20,000                       | 2,000             | 14,000                                                                                                                           | 1,100             | 9,000                                               | 700                                                                                                                                | 6,000                                      | 350               |
| 4            | 15,000                                                                                                                           | 2,000             | 15,000                                                                   | 2,000             | 15,000                       | 2,000             | 11,000                                                                                                                           | 950               | 7,000                                               | 550                                                                                                                                | 4,700                                      | 300               |
| 5            | 12,000                                                                                                                           | 2,000             | 12,000                                                                   | 2,000             | 12,000                       | 2,000             | 9,500                                                                                                                            | 900               | 5,700                                               | 550                                                                                                                                | 3,800                                      | 300               |
| 6            | 10,000                                                                                                                           | 2,000             | 10,000                                                                   | 2,000             | 10,000                       | 2,000             | 8,000                                                                                                                            | 800               | 4,700                                               | 450                                                                                                                                | 3,200                                      | 250               |
| 8            | 7,500                                                                                                                            | 2,000             | 7,500                                                                    | 2,000             | 7,500                        | 2,000             | 6,000                                                                                                                            | 700               | 3,500                                               | 400                                                                                                                                | 2,500                                      | 250               |
| 10           | 6,000                                                                                                                            | 1,900             | 6,000                                                                    | 1,900             | 5,000                        | 1,500             | 5,000                                                                                                                            | 650               | 2,800                                               | 350                                                                                                                                | 2,000                                      | 200               |
| 12           | 5,000                                                                                                                            | 1,800             | 5,000                                                                    | 1,800             | 3,000                        | 1,000             | 4,000                                                                                                                            | 650               | 2,400                                               | 350                                                                                                                                | 1,600                                      | 200               |
| Depth of Cut |  $a_p \leq 0.15\text{mm}$<br>$a_e \leq 0.1Dc$ |                   |                                                                          |                   |                              |                   |  $a_p \leq 0.1\text{mm}$<br>$a_e \leq 0.1Dc$ |                   |                                                     |  $a_p \leq 0.05\text{mm}$<br>$a_e \leq 0.1Dc$ |                                            |                   |

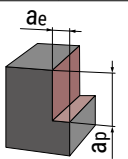
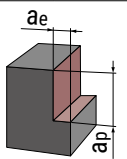
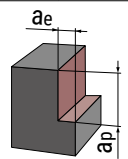
- Note: 1. These cutting conditions are for general guidance.  
 2. The figures should be adjusted according to machining shape, purpose and rigidity of machine and work clamping.  
 3. If rpm available is lower than that recommended, reduce the feed rate proportionately.  
 4. Recommend to down cut with air blow or mist coolant.  
 5. Wet cutting is recommended for stainless steel.

# ■ Recommended Cutting Conditions — SFSR type

## ● Side Milling — Roughing

| Material     | Carbon steel (S50C, S55C) below 250HB                                                                                                                |                | Alloy steel, Tool steel, Mold steel (SKD, SKH, NAK) below 45HRC |                | Stainless steel (SUS304)                                                                                                                             |                | Hardened steel (SKD61, DAC, DHA) 42 – 52HRC                                                                                                            |                | Hardened steel (SKD11, SKH51, SLD) 55 – 62HRC |                | Hardened steel (SKH, HAP) 63 – 70HRC |                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------|----------------|--------------------------------------|----------------|
| DC (mm)      | $n$ (min <sup>-1</sup> )                                                                                                                             | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                        | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                                                                                                             | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                                                                                                               | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                      | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )             | $V_f$ (mm/min) |
| 2            | 24,000                                                                                                                                               | 950            | 24,000                                                          | 950            | 3,200                                                                                                                                                | 2,500          | 13,000                                                                                                                                                 | 1,000          | 12,000                                        | 1,000          | 6,400                                | 600            |
| 3            | 24,000                                                                                                                                               | 1,300          | 24,000                                                          | 1,300          | 2,700                                                                                                                                                | 2,200          | 13,000                                                                                                                                                 | 1,300          | 11,000                                        | 1,200          | 6,000                                | 600            |
| 4            | 18,000                                                                                                                                               | 1,800          | 18,000                                                          | 1,800          | 2,300                                                                                                                                                | 2,000          | 11,000                                                                                                                                                 | 1,500          | 9,000                                         | 1,200          | 5,100                                | 550            |
| 5            | 15,000                                                                                                                                               | 2,000          | 15,000                                                          | 2,000          | 2,000                                                                                                                                                | 1,900          | 9,000                                                                                                                                                  | 1,600          | 7,200                                         | 1,200          | 4,200                                | 550            |
| 6            | 12,000                                                                                                                                               | 2,200          | 12,000                                                          | 2,200          | 1,800                                                                                                                                                | 1,800          | 7,500                                                                                                                                                  | 1,800          | 6,000                                         | 1,200          | 3,500                                | 650            |
| 8            | 10,000                                                                                                                                               | 2,200          | 10,000                                                          | 2,200          | 1,300                                                                                                                                                | 1,300          | 5,500                                                                                                                                                  | 2,200          | 4,500                                         | 1,200          | 2,500                                | 650            |
| 10           | 8,000                                                                                                                                                | 2,200          | 8,000                                                           | 2,200          | 1,000                                                                                                                                                | 1,000          | 4,500                                                                                                                                                  | 2,500          | 3,600                                         | 1,400          | 2,000                                | 600            |
| 12           | 6,500                                                                                                                                                | 1,900          | 6,500                                                           | 1,900          | 800                                                                                                                                                  | 800            | 3,800                                                                                                                                                  | 3,000          | 3,000                                         | 1,400          | 1,700                                | 600            |
| Depth of Cut |  <p><math>ap \leq 0.6Dc</math><br/><math>ae \leq 0.08Dc</math></p> |                |                                                                 |                |  <p><math>ap \leq 0.6Dc</math><br/><math>ae \leq 0.04Dc</math></p> |                |  <p><math>ap \leq 0.6Dc</math><br/><math>ae \leq 0.08Dc</math></p> |                |                                               |                |                                      |                |

## ● Side Milling — Finishing

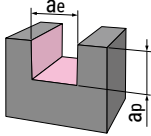
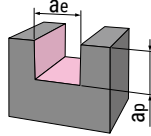
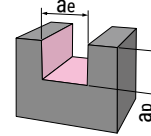
| Material     | Carbon steel (S50C, S55C) below 250HB                                                                                                                |                | Alloy steel, Tool steel, Mold steel (SKD, SKH, NAK) below 45HRC |                | Stainless steel (SUS304) |                | Hardened steel (SKD61, DAC, DHA) 42 – 52HRC                                                                                                            |                | Hardened steel (SKD11, SKH51, SLD) 55 – 62HRC                                                                                                          |                | Hardened steel (SKH, HAP) 63 – 70HRC |                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------|----------------|--------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------|----------------|
| DC (mm)      | $n$ (min <sup>-1</sup> )                                                                                                                             | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                        | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> ) | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                                                                                                               | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )                                                                                                                               | $V_f$ (mm/min) | $n$ (min <sup>-1</sup> )             | $V_f$ (mm/min) |
| 2            | 40,000                                                                                                                                               | 4,500          | 40,000                                                          | 4,500          | 40,000                   | 7,500          | 40,000                                                                                                                                                 | 2,500          | 30,000                                                                                                                                                 | 2,000          | 23,000                               | 550            |
| 3            | 29,000                                                                                                                                               | 4,000          | 29,000                                                          | 4,000          | 28,000                   | 5,500          | 26,500                                                                                                                                                 | 2,000          | 20,000                                                                                                                                                 | 1,500          | 15,000                               | 450            |
| 4            | 22,000                                                                                                                                               | 4,000          | 22,000                                                          | 4,000          | 21,000                   | 4,500          | 20,000                                                                                                                                                 | 1,800          | 15,000                                                                                                                                                 | 1,200          | 12,000                               | 400            |
| 5            | 18,000                                                                                                                                               | 4,000          | 18,000                                                          | 4,000          | 17,000                   | 4,000          | 16,000                                                                                                                                                 | 1,500          | 12,000                                                                                                                                                 | 1,100          | 9,500                                | 380            |
| 6            | 15,000                                                                                                                                               | 3,700          | 15,000                                                          | 3,700          | 14,000                   | 3,500          | 13,500                                                                                                                                                 | 1,300          | 10,000                                                                                                                                                 | 900            | 8,000                                | 350            |
| 8            | 11,000                                                                                                                                               | 2,800          | 11,000                                                          | 2,800          | 11,000                   | 3,000          | 10,000                                                                                                                                                 | 1,000          | 7,500                                                                                                                                                  | 700            | 6,000                                | 280            |
| 10           | 8,900                                                                                                                                                | 2,600          | 8,900                                                           | 2,600          | 9,000                    | 2,600          | 8,000                                                                                                                                                  | 800            | 6,000                                                                                                                                                  | 600            | 5,000                                | 280            |
| 12           | 7,400                                                                                                                                                | 2,300          | 7,400                                                           | 2,300          | 7,500                    | 2,200          | 6,500                                                                                                                                                  | 700            | 5,000                                                                                                                                                  | 500            | 4,000                                | 280            |
| Depth of Cut |  <p><math>ap \leq 0.3Dc</math><br/><math>ae \leq 0.1mm</math></p> |                |                                                                 |                |                          |                |  <p><math>ap \leq 0.2Dc</math><br/><math>ae \leq 0.1mm</math></p> |                |  <p><math>ap \leq 0.1Dc</math><br/><math>ae \leq 0.1mm</math></p> |                |                                      |                |

- Note: 1. These cutting conditions are for general guidance.  
 2. The figures should be adjusted according to machining shape, purpose and rigidity of machine and work clamping.  
 3. If rpm available is lower than that recommended, reduce the feed rate proportionately.  
 4. Recommend to down cut with air blow or mist coolant.  
 5. Wet cutting is recommended for stainless steel.

# Hard one Series – SFSR/SFSB type

## ■ Recommended Cutting Conditions — SFSR type

### ● Slot milling

| Material     | Carbon steel<br>(S50C, S55C)<br>below 250HB                                                                        |                   | Alloy steel, Tool steel,<br>Mold steel<br>(SKD, SKH, NAK)<br>below 45HRC |                   | Stainless steel<br>(SUS304)                                                                                         |                   | Hardened steel<br>(SKD61, DAC, DHA)<br>42 – 52HRC |                   | Hardened steel<br>(SKD11,SKH51,SLD)<br>55 – 62HRC                                                                    |                   | Hardened steel<br>(SKH, HAP)<br>63 – 70HRC |                   |
|--------------|--------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------|-------------------|
| DC<br>(mm)   | $n$<br>( $\text{min}^{-1}$ )                                                                                       | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                             | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                                                                        | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                      | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )                                                                                         | $V_f$<br>(mm/min) | $n$<br>( $\text{min}^{-1}$ )               | $V_f$<br>(mm/min) |
| 2            | 11,000                                                                                                             | 650               | 11,000                                                                   | 650               | 2,500                                                                                                               | 190               | 9,000                                             | 400               | 5,500                                                                                                                | 240               | 5,500                                      | 230               |
| 3            | 9,500                                                                                                              | 750               | 9,500                                                                    | 750               | 2,300                                                                                                               | 180               | 8,000                                             | 500               | 5,000                                                                                                                | 300               | 4,800                                      | 270               |
| 4            | 8,500                                                                                                              | 800               | 8,500                                                                    | 800               | 2,000                                                                                                               | 170               | 7,500                                             | 550               | 4,200                                                                                                                | 350               | 4,000                                      | 320               |
| 5            | 7,600                                                                                                              | 1,000             | 7,600                                                                    | 1,000             | 1,800                                                                                                               | 160               | 6,800                                             | 650               | 3,900                                                                                                                | 400               | 3,800                                      | 400               |
| 6            | 6,600                                                                                                              | 1,100             | 6,600                                                                    | 1,100             | 1,500                                                                                                               | 150               | 5,800                                             | 700               | 3,500                                                                                                                | 500               | 3,200                                      | 480               |
| 8            | 5,000                                                                                                              | 1,200             | 5,000                                                                    | 1,200             | 1,100                                                                                                               | 130               | 4,300                                             | 750               | 2,700                                                                                                                | 550               | 2,300                                      | 450               |
| 10           | 4,000                                                                                                              | 1,200             | 4,000                                                                    | 1,200             | 850                                                                                                                 | 130               | 3,400                                             | 900               | 2,200                                                                                                                | 620               | 1,800                                      | 470               |
| 12           | 3,300                                                                                                              | 1,300             | 3,300                                                                    | 1,300             | 700                                                                                                                 | 130               | 2,800                                             | 1,000             | 1,800                                                                                                                | 700               | 1,500                                      | 530               |
| Depth of Cut | <br>$ap \leq 0.3Dc$<br>$ae = Dc$ |                   |                                                                          |                   | <br>$ap \leq 0.25Dc$<br>$ae = Dc$ |                   |                                                   |                   | <br>$ap \leq 0.3Dc$<br>$ae = Dc$ |                   |                                            |                   |

- Note: 1. These cutting conditions are for general guidance.  
 2. The figures should be adjusted according to machining shape, purpose and rigidity of machine and work clamping.  
 3. If rpm available is lower than that recommended, reduce the feed rate proportionately.  
 4. Recommend to down cut with air blow or mist coolant.  
 5. Wet cutting is recommended for stainless steel.  
 6. Recommended ramping angle is up to 45° for cutting general steel.  
 In case of Stainless steel & Hardened steel, recommended ramping angle is up to 5° only.

# HARD 1 BALL

## Feature 1

Newly developed short length type solid carbide ball nose endmill that has high tool rigidity for stability and reliability.

## Feature 2

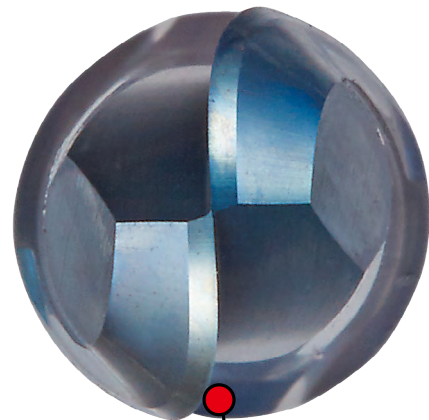
Secure Radius Accuracy :  $\pm 0.005\text{mm}$   
For better surface finish,  
improving chipping resistance during machining

## Feature 3

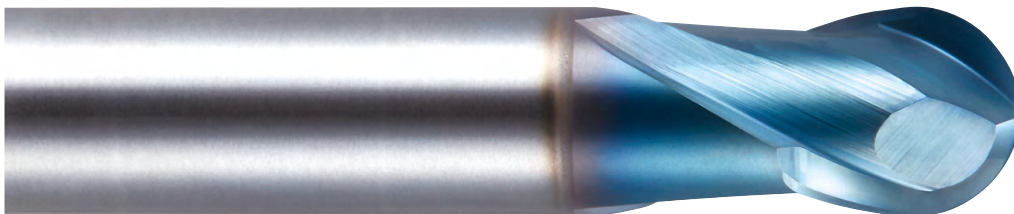
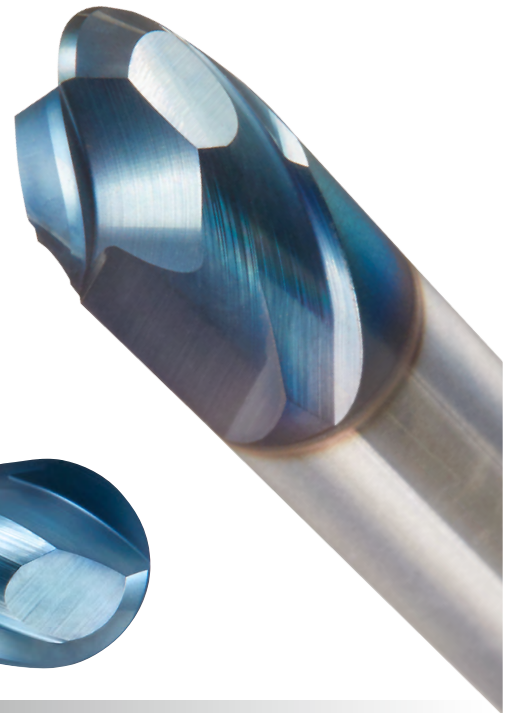
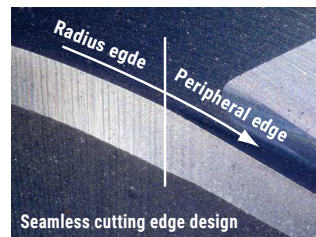
Shank diameter tolerance : h5  
**Suitable for shrink fit holders**

## Feature 4

Excellent tool life for Hardened Materials with  
Newly developed grade "DH110"



Radius Accuracy:  $\pm 0.005\text{mm}$



## New PVD coating <DH coating>

### ● Properties of DIJET PVD coating

|                            | DH coating  | DV coating  | DZ coating(TiAlN) |
|----------------------------|-------------|-------------|-------------------|
| Hardness(Hv)               | 3,500~3,700 | 3,300~3,500 | 2,800~2,900       |
| Oxidation temperature (°C) | 1,100~1,200 | 1,000~1,100 | 700~800           |
| Coefficient of friction    | 0.5         | 0.65        | 0.6               |



**SFSB**  
TYPE

For General steel to Hardened steel

● Helix angle 30°

Roughing

Semi-finishing

Finishing



Fig.1

DC < DCON

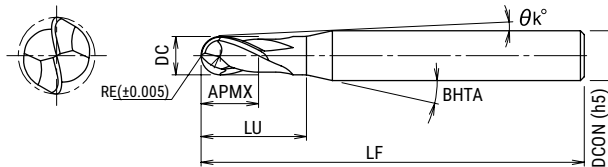
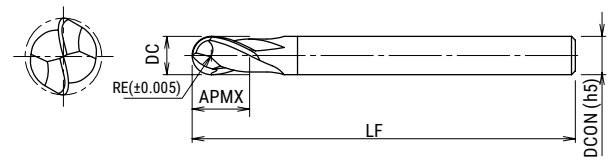


Fig.2

DC = DCON

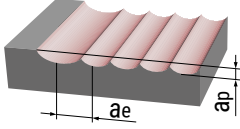
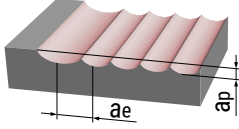
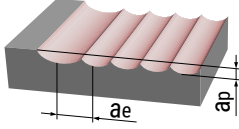


| Cat.No.     | Stock | Dimensions (mm) |    |      |     |    |      |        |      | Fig. |
|-------------|-------|-----------------|----|------|-----|----|------|--------|------|------|
|             |       | RE              | DC | APMX | LU  | LF | BHTA | θk     | DCON |      |
| SFSB2010    | ●     | 0.5             | 1  | 1    | 1.5 | 40 | 12°  | 10.49° | 4    | 1    |
| SFSB2010-S6 | ●     | 0.5             | 1  | 1    | 1.5 | 40 | 12°  | 11.04° | 6    | 1    |
| SFSB2020    | ●     | 1               | 2  | 2    | 2.5 | 40 | 10°  | 7.86°  | 4    | 1    |
| SFSB2020-S6 | ●     | 1               | 2  | 2    | 2.5 | 40 | 10°  | 8.8°   | 6    | 1    |
| SFSB2030    | ●     | 1.5             | 3  | 3    | 4   | 40 | 10°  | 5.29°  | 4    | 1    |
| SFSB2030-S6 | ●     | 1.5             | 3  | 3    | 4   | 40 | 10°  | 7.69°  | 6    | 1    |
| SFSB2040    | ●     | 2               | 4  | 4    | —   | 40 | —    | —      | 4    | 2    |
| SFSB2040-S6 | ●     | 2               | 4  | 4    | 5   | 40 | 8°   | 5.59°  | 6    | 1    |
| SFSB2050    | ●     | 2.5             | 5  | 5    | 6   | 50 | 5°   | 2.79°  | 6    | 1    |
| SFSB2060    | ●     | 3               | 6  | 6    | —   | 50 | —    | —      | 6    | 2    |
| SFSB2080    | ●     | 4               | 8  | 8    | —   | 60 | —    | —      | 8    | 2    |
| SFSB2100    | ●     | 5               | 10 | 10   | —   | 60 | —    | —      | 10   | 2    |
| SFSB2120    | ●     | 6               | 12 | 12   | —   | 60 | —    | —      | 12   | 2    |

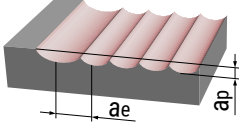
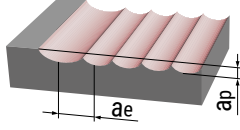
● : Stocked Items

■ Recommended Cutting Conditions — SFSB type

● Roughing — Semi finishing

| Material     | Carbon steel<br>(S50C, S55C)<br>below 250HB                                                                           |                              | Alloy steel, Tool steel,<br>Mold steel<br>(SKD, SKH, NAK)<br>below 45HRC |                              | Hardened steel<br>(SKD61, DAC, DHA)<br>42 – 52HRC                                                                                 |                              | Hardened steel<br>(SKD11, SKH51, SLD)<br>55 – 62HRC                                                                                   |                              | Hardened steel<br>(SKH, HAP)<br>63 – 70HRC |                              |
|--------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------|------------------------------|
| RE           | $n$<br>( $\text{min}^{-1}$ )                                                                                          | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                                             | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                                                                                                      | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                                                                                                          | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )               | $V_f$<br>( $\text{mm/min}$ ) |
| R 0.5        | 31,800                                                                                                                | 1,590                        | 31,800                                                                   | 1,590                        | 30,200                                                                                                                            | 1,210                        | 28,600                                                                                                                                | 1,140                        | 27,100                                     | 810                          |
| R 1          | 23,900                                                                                                                | 1,910                        | 23,900                                                                   | 1,910                        | 22,300                                                                                                                            | 1,560                        | 19,100                                                                                                                                | 1,150                        | 17,500                                     | 700                          |
| R 1.5        | 19,100                                                                                                                | 2,480                        | 19,100                                                                   | 2,290                        | 18,000                                                                                                                            | 1,800                        | 17,000                                                                                                                                | 1,360                        | 14,900                                     | 890                          |
| R 2          | 14,300                                                                                                                | 2,290                        | 14,300                                                                   | 2,150                        | 13,500                                                                                                                            | 1,620                        | 12,700                                                                                                                                | 1,270                        | 11,100                                     | 890                          |
| R 2.5        | 11,500                                                                                                                | 2,190                        | 11,500                                                                   | 2,070                        | 10,800                                                                                                                            | 1,620                        | 10,200                                                                                                                                | 1,220                        | 8,900                                      | 890                          |
| R 3          | 9,500                                                                                                                 | 2,090                        | 9,500                                                                    | 1,900                        | 9,000                                                                                                                             | 1,620                        | 8,500                                                                                                                                 | 1,280                        | 7,400                                      | 890                          |
| R 4          | 7,200                                                                                                                 | 1,940                        | 7,200                                                                    | 1,800                        | 6,800                                                                                                                             | 1,500                        | 6,400                                                                                                                                 | 1,280                        | 5,600                                      | 840                          |
| R 5          | 5,700                                                                                                                 | 1,820                        | 5,700                                                                    | 1,710                        | 5,400                                                                                                                             | 1,460                        | 5,100                                                                                                                                 | 1,280                        | 4,500                                      | 900                          |
| R 6          | 4,800                                                                                                                 | 1,540                        | 4,800                                                                    | 1,440                        | 4,500                                                                                                                             | 1,220                        | 4,200                                                                                                                                 | 1,050                        | 3,700                                      | 740                          |
| Depth of Cut |  $ap \leq 0.1Dc$<br>$ae \leq 0.3Dc$ |                              |                                                                          |                              |  $ap \leq 0.1Dc$ (MAX 0.5mm)<br>$ae \leq 0.3Dc$ |                              |  $ap \leq 0.05Dc$ (MAX 0.3mm)<br>$ae \leq 0.15Dc$ |                              |                                            |                              |

● Finishing

| Material     | Carbon steel<br>(S50C, S55C)<br>below 250HB                                                                              |                              | Alloy steel, Tool steel,<br>Mold steel<br>(SKD, SKH, NAK)<br>below 45HRC |                              | Hardened steel<br>(SKD61, DAC, DHA)<br>42 – 52HRC |                              | Hardened steel<br>(SKD11, SKH51, SLD)<br>55 – 62HRC |                              | Hardened steel<br>(SKH, HAP)<br>63 – 70HRC                                                                                 |                              |
|--------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------|------------------------------|---------------------------------------------------|------------------------------|-----------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------|
| RE           | $n$<br>( $\text{min}^{-1}$ )                                                                                             | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                                             | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                      | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                        | $V_f$<br>( $\text{mm/min}$ ) | $n$<br>( $\text{min}^{-1}$ )                                                                                               | $V_f$<br>( $\text{mm/min}$ ) |
| R 0.5        | 38,200                                                                                                                   | 3,440                        | 38,200                                                                   | 3,440                        | 35,000                                            | 2,450                        | 31,800                                              | 1,590                        | 30,200                                                                                                                     | 1,210                        |
| R 1          | 27,100                                                                                                                   | 3,250                        | 27,100                                                                   | 3,250                        | 25,500                                            | 2,550                        | 22,300                                              | 2,010                        | 19,100                                                                                                                     | 1,530                        |
| R 1.5        | 21,200                                                                                                                   | 3,390                        | 21,200                                                                   | 3,180                        | 20,200                                            | 2,630                        | 19,100                                              | 2,290                        | 15,900                                                                                                                     | 1,910                        |
| R 2          | 15,900                                                                                                                   | 3,340                        | 15,900                                                                   | 3,180                        | 15,100                                            | 2,270                        | 14,300                                              | 2,150                        | 11,900                                                                                                                     | 1,790                        |
| R 2.5        | 12,700                                                                                                                   | 2,670                        | 12,700                                                                   | 2,540                        | 12,100                                            | 2,420                        | 11,500                                              | 2,070                        | 9,500                                                                                                                      | 1,710                        |
| R 3          | 10,600                                                                                                                   | 2,860                        | 10,600                                                                   | 2,650                        | 10,100                                            | 2,530                        | 9,500                                               | 1,900                        | 8,000                                                                                                                      | 1,600                        |
| R 4          | 8,000                                                                                                                    | 2,560                        | 8,000                                                                    | 2,400                        | 7,600                                             | 2,280                        | 7,200                                               | 1,800                        | 6,000                                                                                                                      | 1,200                        |
| R 5          | 6,400                                                                                                                    | 2,370                        | 6,400                                                                    | 2,240                        | 6,000                                             | 1,920                        | 5,700                                               | 1,710                        | 4,800                                                                                                                      | 1,200                        |
| R 6          | 5,300                                                                                                                    | 1,960                        | 5,300                                                                    | 1,860                        | 5,000                                             | 1,600                        | 4,800                                               | 1,440                        | 4,000                                                                                                                      | 1,000                        |
| Depth of Cut |  $ap \leq 0.05Dc$<br>$ae \leq 0.02Dc$ |                              |                                                                          |                              |                                                   |                              |                                                     |                              |  $ap \leq 0.03Dc$<br>$ae \leq 0.02Dc$ |                              |

Note: 1. These cutting conditions are for general guidance. In case of ramping angle over 15° reduce cutting conditions by 70%.

2. The figures should be adjusted according to machining shape, purpose and rigidity of machine and work clamping.

3. If rpm available is lower than that recommended, reduce the feed rate proportionately.

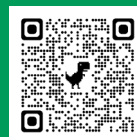
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