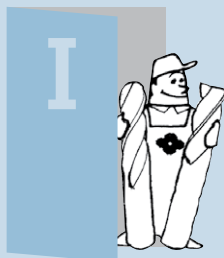


# Endmills

## I 1 to I 95

# I



|                                     |     |
|-------------------------------------|-----|
| Endmill Selection Guide             | I02 |
| Coatings for Endmills               | I05 |
| GSX MILL Series                     | I06 |
| SUMIDIA Coated Endmill Series       | I11 |
| SSEH Series                         | I12 |
| SAFE-LOCK Applicable Endmill Series | I13 |
| GS MILL HARD Series                 | I14 |
| AURORA Coat Endmill Series          | I15 |
| MOLD FINISH MASTER Series           | I16 |

|                                                                     |                                                               |                                   |     |
|---------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------|-----|
| Square                                                              | GSX MILL 2 Flutes                                             | GSX 2000S / 2000C                 | I20 |
|                                                                     | Spiral SSM/LSM 2 Flutes                                       | SSM 2000ZX / LSM 2000ZX           | I26 |
|                                                                     | GSX MILL 3 Flutes                                             | GSX 3000C                         | I28 |
|                                                                     | GSX MILL Slot 3 Flutes                                        | GSXSLT 3000C                      | I30 |
|                                                                     | UP MILL 3 Flutes                                              | SSUP 3000ZX                       | I31 |
|                                                                     | GSX MILL 4 Flutes                                             | GSX 4000S / 4000C                 | I32 |
|                                                                     | GSX MILL Anti-vibration 4 Flutes                              | GSXVL 4000-2.5D                   | I35 |
|                                                                     | GS MILL Roughing 4 Flutes                                     | GSRE 4000SF                       | I39 |
|                                                                     | GS MILL Hard 4/6/8 Flutes                                     | GSH 4000SF / 6000SF / 8000SF      | I40 |
|                                                                     | Hard HHM/LHHM/EHHM 4/6/8 Flutes                               | (L/E)HHM 4000ZX / 6000ZX / 8000ZX | I41 |
| Radius                                                              | UP MILL 4 Flutes                                              | SSUP 4000ZX                       | I44 |
|                                                                     | Spiral SSM/LSM 4 Flutes                                       | SSM 4000ZX / LSM 4000ZX           | I46 |
|                                                                     | GSX MILL Anti-vibration 4 Flutes                              | GSXVL 4000-R                      | I48 |
|                                                                     | GS MILL 4 Flutes                                              | GLM 4000SF-R                      | I50 |
|                                                                     | SSEH Anti-vibration for Exotic Alloys 4 Flutes                | SSEHVL 4000W-R                    | I51 |
| Ballnose                                                            | SSEH for Exotic Alloys 4 Flutes                               | SSEH 4000W-R                      | I52 |
|                                                                     | UP MILL 4 Flutes                                              | SSUP 4000ZX-R                     | I53 |
|                                                                     | GS MILL Hard 6/8 Flutes                                       | GSH 6000SF-R / 8000SF-R           | I55 |
| DLC Coat / Diamond Coat                                             | GSX MILL Ballnose 2 Flutes                                    | GSXB 20000                        | I56 |
|                                                                     | GS MILL Ballnose 2 Flutes                                     | GLB 2000SF                        | I57 |
|                                                                     | GS MILL Hard Ballnose 2 Flutes                                | GSBH 20000SF                      | I58 |
| Long Neck                                                           | AURORA Coat for Non-Ferrous Metal 2/4 Flutes                  | ASM 2000DL / 4000DL               | I59 |
|                                                                     | AURORA Coat Ballnose for Non-Ferrous Metal 2 Flutes           | SNB 2000DL                        | I61 |
|                                                                     | AURORA Coat Long Neck Ballnose for Copper Electrodes 2 Flutes | SNB 2                             | I62 |
|                                                                     | SUMIDIA Coated Endmills for CFRP 4 Flutes                     | SSDC 4000 / SSDC 4000-RL          | I63 |
| Solid Carbide (Uncoated)                                            | GS MILL Long Neck                                             | GGBN 2 / GSN 2 / GSN 4 Item List  | I64 |
|                                                                     | GS MILL Long Neck Ballnose 2 Flutes                           | GGBN 2                            | I66 |
|                                                                     | GS MILL Long Neck 2/4 Flutes                                  | GSN 2 / GSN 4                     | I68 |
| Carbide Binderless PCD / Hardened Steel CBN / Non-Ferrous Metal PCD | Spiral SSM/LSM/ELSM 2 Flutes                                  | SSM 2000 / LSM 2000 / ELSM 2000   | I76 |
|                                                                     | Non-Ferrous Metals 2 Flutes                                   | ASM 2000                          | I80 |
|                                                                     | SSM (Short) 4 Flutes                                          | SSM 4000 / LSM 4000 / ELSM 4000   | I81 |
|                                                                     | Roughing Brazed 4/6 Flutes                                    | RMES 4000(C) / 6000(C)            | I84 |
|                                                                     | SSEH Anti-vibration for Exotic Alloys 4 Flutes                | SSEHVL 4000-R                     | I86 |
|                                                                     | SSEH for Exotic Alloys 4 Flutes                               | SSEH 4000-R                       | I87 |
|                                                                     | Mold Finish Master 2 Flutes                                   | NPDB / BNBR / BNBP / BNBC         | I88 |
|                                                                     | SUMIBORON Helical Master 2 Flutes                             | BNES                              | I92 |
|                                                                     | SUMIBORON Ballnose 2 Flutes                                   | BNBS                              | I93 |
|                                                                     | SUMIDIA for Non-Ferrous Metal 2 Flutes                        | DFF / DAE                         | I94 |

I Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

PCD

### Stock Indications and Symbols

- mark: Standard stocked item
- mark: To be replaced by a new item featured on the same page.
- ▲ mark: To be replaced by new item (Please confirm stock availability)

- \* mark: Semi-standard stock (Please confirm stock availability)
- mark: Stock or planned stock (Please confirm stock availability)
- No mark: Made-to-order item
- mark: We cannot produce

# Square Endmill Selection Guide

●: Best (First Recommendation)  
○: Optimum ○: Suitable Blank: Not recommended ×: Unsuitable

| Application<br>Feature | No. of<br>Teeth | Diameter<br>øD <sub>c</sub><br>(Min to Max)<br>(mm) | Flute Length/<br>Type                         |             |        |                                                                          |             | Product Type<br>Series<br><br>(Ref. Page)                                | Grades         | Coating / Cutting Edge                           | Appearance     | Work Material                  |              |             |                    |                                            |              |              |             |                |                 |                               |           |          |              |          |      |  |
|------------------------|-----------------|-----------------------------------------------------|-----------------------------------------------|-------------|--------|--------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------|----------------|--------------------------------------------------|----------------|--------------------------------|--------------|-------------|--------------------|--------------------------------------------|--------------|--------------|-------------|----------------|-----------------|-------------------------------|-----------|----------|--------------|----------|------|--|
|                        |                 |                                                     | Long Neck / Relief Shank<br>Extra-Long Series | Long Series | Medium | Standard                                                                 | Short Flute |                                                                          |                |                                                  |                | P                              |              |             |                    | H                                          |              | M            | S           | K              | N               |                               |           |          |              |          |      |  |
|                        |                 |                                                     |                                               |             |        |                                                                          |             |                                                                          |                |                                                  |                | General Structure Rolled Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | 30 to 45 HRC<br>Tempered Steel / Die Steel | 45 to 55 HRC | 55 to 60 HRC | From 60 HRC | Hardened Steel | Stainless Steel | Ti Alloy/Heat Resistant Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |  |
| General Purpose        | 2               | ø1 to ø25                                           |                                               |             |        |                                                                          |             | <b>GSXMILL 2 Flutes</b><br>GSX20000C → I20                               | Coated Carbide |                                                  |                | ●                              | ●            | ●           | ●                  | ●                                          | ○            |              | ●           | ○              | ●               |                               |           |          |              |          |      |  |
|                        |                 | ø1 to ø20                                           |                                               |             |        |                                                                          |             | <b>GSXMILL 2 Flutes</b><br>GSX20000S → I21                               |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            |              | ○           | ○              | ○               |                               |           |          |              |          |      |  |
|                        |                 | ø1 to ø32                                           |                                               |             |        |                                                                          |             | <b>SSM Type 2 Flutes</b><br>SSM2000ZX → I26                              |                |                                                  |                | ○                              | ○            |             | ○                  | ○                                          |              |              | ○           | ○              |                 |                               |           |          |              |          |      |  |
|                        |                 | ø1~ø25                                              |                                               |             |        |                                                                          |             | <b>LSM Type Long 2 Flutes</b><br>LSM2000ZX → I27                         |                |                                                  |                | ○                              | ○            |             | ○                  | ○                                          |              |              | ○           | ○              |                 |                               |           |          |              |          |      |  |
|                        |                 | ø0.2 to ø30                                         |                                               |             |        |                                                                          |             | <b>Solid Carbide Spiral 2 Flutes</b><br>SSM2000 → I76                    |                | Carbide                                          |                |                                | ○            | ○           |                    |                                            |              |              |             |                |                 | ○                             | ○         |          |              |          |      |  |
|                        |                 | ø3 to ø25                                           |                                               |             |        |                                                                          |             | <b>Extra-Long Series Solid Carbide Spiral 2 Flutes</b><br>ELSM2000 → I79 |                |                                                  |                |                                | ○            | ○           |                    |                                            |              |              |             |                |                 | ○                             | ○         |          |              |          |      |  |
|                        | 3               | ø1 to ø20                                           |                                               |             |        |                                                                          |             | <b>GSXMILL 3 Flutes</b><br>GSX30000C → I28                               | Coated Carbide |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            |              | ○           | ○              | ○               |                               |           |          |              |          |      |  |
|                        |                 | 4                                                   | ø1 to ø25                                     |             |        |                                                                          |             |                                                                          |                | <b>GSXMILL 4 Flutes</b><br>GSX40000C → I32       | Coated Carbide |                                |              | ●           | ●                  | ●                                          | ●            | ●            | ○           |                | ●               | ○                             | ●         |          |              |          |      |  |
|                        |                 |                                                     | ø1 to ø20                                     |             |        |                                                                          |             |                                                                          |                | <b>GSXMILL 4 Flutes</b><br>GSX40000S → I33       |                |                                |              | ○           | ○                  | ○                                          | ○            | ○            | ○           |                | ○               | ○                             | ○         |          |              |          |      |  |
|                        |                 |                                                     | ø1.5 to ø32                                   |             |        |                                                                          |             |                                                                          |                | <b>SSM Type 4 Flutes</b><br>SSM4000ZX → I46      |                |                                |              | ○           | ○                  |                                            | ○            | ○            |             |                |                 | ○                             |           |          |              |          |      |  |
|                        |                 |                                                     | ø3 to ø25                                     |             |        |                                                                          |             |                                                                          |                | <b>LSM Type Long 4 Flutes</b><br>LSM4000ZX → I47 |                |                                |              | ○           | ○                  |                                            | ○            | ○            |             |                | ○               | ○                             |           |          |              |          |      |  |
|                        |                 | ø1.5 to ø25                                         |                                               |             |        |                                                                          |             | <b>Solid Carbide Spiral 4 Flutes</b><br>SSM4000 → I81                    |                | Carbide                                          |                |                                | ○            | ○           |                    |                                            |              |              |             |                |                 | ○                             | ○         |          |              |          |      |  |
| ø3 to ø25              |                 |                                                     |                                               |             |        | <b>Extra-Long Series Solid Carbide Spiral 4 Flutes</b><br>ELSM4000 → I83 |             |                                                                          | ○              |                                                  | ○              |                                |              |             |                    |                                            |              |              | ○           | ○              |                 |                               |           |          |              |          |      |  |
| High Efficiency        | 4               | ø2 to ø25                                           |                                               |             |        |                                                                          |             | <b>GSX MILL Anti-vibration 4 Flutes</b><br>GSXVL4000 → I35               | Coated Carbide |                                                  |                | ●                              | ●            | ●           | ●                  | ●                                          | ○            |              | ●           | ○              | ○               |                               |           |          |              |          |      |  |
|                        |                 | ø2 to ø20                                           |                                               |             |        |                                                                          |             | <b>UPMILL</b><br>SSUP4000ZX → I44                                        |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          |              |              | ○           | ○              | ○               |                               |           |          |              |          |      |  |
|                        |                 | ø3 to ø20                                           |                                               |             |        |                                                                          |             | <b>UPMILL Deep Shoulder</b><br>SSUPR4000ZX → I45                         |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            |              | ○           | ○              | ○               |                               |           |          |              |          |      |  |
| Hardened Steel         | 1               | ø6 to ø16                                           |                                               |             |        |                                                                          |             | <b>SUMIBORON Helical Master BNES Type</b><br>BNES → I92                  | CBN            |                                                  |                |                                |              |             | ○                  | ○                                          | ○            | ○            |             |                |                 | ×                             | ×         |          |              |          |      |  |
|                        | 2               | ø0.2 to ø6                                          |                                               |             |        |                                                                          |             | <b>GSMILL Long Neck</b><br>GSN2 → I65                                    | Coated Carbide |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            |              |             |                |                 |                               |           |          |              |          |      |  |
|                        | 4               | ø1 to ø10                                           |                                               |             |        |                                                                          |             | <b>GSMILL Long Neck</b><br>GSN4 → I65                                    | Coated Carbide |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            |              |             |                |                 |                               |           |          |              |          |      |  |
|                        | 4               | ø1 to ø20                                           |                                               |             |        |                                                                          |             | <b>GSMILL HARD</b><br>GSH4/6/8000SF → I40                                | Coated Carbide |                                                  |                | ●                              | ●            | ●           | ●                  | ●                                          | ●            |              |             |                |                 |                               |           |          |              |          |      |  |
|                        |                 | ø3 to ø32                                           |                                               |             |        |                                                                          |             | <b>HARD</b><br>HHM4/6/8000ZX → I41                                       |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            | ○            |             |                |                 |                               |           |          |              |          |      |  |
|                        |                 | ø3 to ø32                                           |                                               |             |        |                                                                          |             | <b>Long Hard</b><br>LHHM4/6/8000ZX → I42                                 |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            | ○            |             |                |                 |                               |           |          |              |          |      |  |
|                        |                 | ø3 to ø32                                           |                                               |             |        |                                                                          |             | <b>Extra-Long Hard</b><br>EHHM4/6/8000ZX → I43                           |                |                                                  |                | ○                              | ○            | ○           | ○                  | ○                                          | ○            | ○            |             |                |                 |                               |           |          |              |          |      |  |

# Square Endmill Selection Guide

●: Best (First Recommendation)

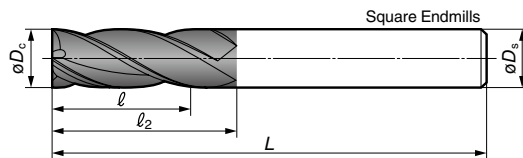
◎: Optimum ○: Suitable Blank: Not recommended ×: Unsuitable

| Application<br>Feature                   | No. of<br>Teeth | Diameter<br>øD <sub>c</sub><br>(Min to Max)<br><br>(mm) | Flute Length/<br>Type | Product Type<br><br>Series<br><br>(Ref. Page)                          | Grades         | Coating / Cutting Edge | Appearance                                                                           | Work Material                  |              |             |                                                  |                                                                               |                 |                               |           |          |              |          |      |   |
|------------------------------------------|-----------------|---------------------------------------------------------|-----------------------|------------------------------------------------------------------------|----------------|------------------------|--------------------------------------------------------------------------------------|--------------------------------|--------------|-------------|--------------------------------------------------|-------------------------------------------------------------------------------|-----------------|-------------------------------|-----------|----------|--------------|----------|------|---|
|                                          |                 |                                                         |                       |                                                                        |                |                        |                                                                                      | P                              |              |             |                                                  | H                                                                             | M               | S                             | K         | N        |              |          |      |   |
|                                          |                 |                                                         |                       |                                                                        |                |                        |                                                                                      | General Structure Rolled Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel<br>Tempered Steel / Die Steel | Hardened Steel<br>30 to 45 HRC<br>45 to 55 HRC<br>55 to 60 HRC<br>From 60 HRC | Stainless Steel | Ti Alloy/Heat Resistant Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |   |
| Roughing                                 | 4               | ø6 to ø20                                               |                       | <b>GSMILL Roughing</b><br>GSRE4000SF → I39                             | Coated Carbide | GS                     |    | ◎                              | ◎            | ◎           | ◎                                                | ◎                                                                             |                 | ◎                             | ○         | ◎        |              |          |      |   |
| Aluminium<br>and<br>Non-ferrous<br>Metal | 1               | ø4 to ø12                                               |                       | <b>SUMIDIA Endmills DAE Type</b><br>DAE → I95                          | PCD            |                        |    | ×                              | ×            | ×           | ×                                                | ×                                                                             | ×               | ×                             | ×         | ×        | ◎            | ◎        | ○    |   |
|                                          | 2               |                                                         |                       | <b>AURORA Coat 2 Flutes</b><br>ASM2000DL → I59                         | Coated Carbide | DLC                    |    |                                |              |             |                                                  |                                                                               |                 |                               |           |          |              |          |      |   |
|                                          | 2               | ø2 to ø16                                               |                       | <b>Solid Carbide Endmills for Non-ferrous cutting</b><br>ASM2000 → I80 | Carbide        |                        |    |                                |              |             |                                                  |                                                                               |                 |                               |           |          |              |          |      |   |
|                                          | 4               | ø4 to ø13                                               |                       | <b>SUMIDIA Endmills DFE Type</b><br>DFE → I94                          | PCD            |                        |    | ×                              | ×            | ×           | ×                                                | ×                                                                             | ×               | ×                             | ×         | ×        | ◎            | ◎        | ○    |   |
|                                          | 4               | ø2 to ø16                                               |                       | <b>AURORA Coat 4 Flutes</b><br>ASM4000DL → I60                         | Coated Carbide | DLC                    |    |                                |              |             |                                                  |                                                                               |                 |                               |           |          |              | ◎        | ◎    |   |
| CFRP                                     | 4               | ø6 to ø12                                               |                       | <b>SUMIDIA COAT SSDC Type</b><br>SSDC4000 → I63                        | Coated Carbide | SDC                    |   | ×                              | ×            | ×           | ×                                                | ×                                                                             | ×               | ×                             | ×         | ×        |              |          | ○    | ● |
|                                          |                 | ø6 to ø12                                               |                       | <b>SUMIDIA COAT SSDCRL Type</b><br>SSDC4000RL → I63                    | Coated Carbide | SDC                    |  | ×                              | ×            | ×           | ×                                                | ×                                                                             | ×               | ×                             | ×         | ×        |              |          | ○    | ● |
| Compound<br>Endmilling                   | 3               | ø1 to ø16                                               |                       | <b>GSXMILL Slot 3 Flutes</b><br>GSXSLT30000SF → I30                    | Coated Carbide | GSX                    |  | ○                              | ●            | ●           | ●                                                | ●                                                                             |                 | ●                             | ○         | ○        |              |          |      |   |
|                                          |                 | ø2 to ø16                                               |                       | <b>UPMILL Slot</b><br>SSUP3000ZX → I31                                 | Coated Carbide | ZX                     |  | ◎                              | ◎            | ◎           | ◎                                                | ◎                                                                             | ○               |                               | ◎         | ○        | ○            |          |      |   |

\* Other brazed carbide roughing endmills for rough cutting are also available (refer to page I85).

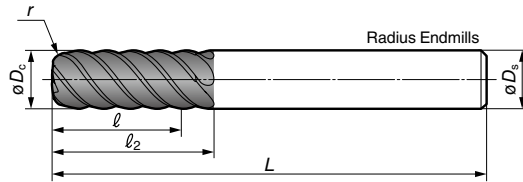
## Legend

|            |                     |
|------------|---------------------|
| $\phi D_c$ | Diameter            |
| $\ell$     | Cutting Edge Length |
| $\ell_2$   | Length Below Neck   |
| $L$        | Total Length        |
| $\phi D_s$ | Shank Diameter      |



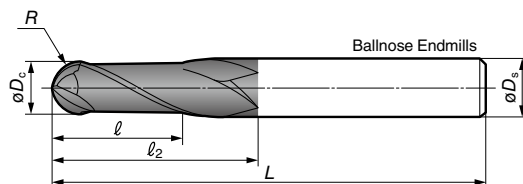
## Legend

|            |                     |
|------------|---------------------|
| $\phi D_c$ | Diameter            |
| $r$        | Corner Radius       |
| $\ell$     | Cutting Edge Length |
| $\ell_2$   | Length Below Neck   |
| $L$        | Total Length        |
| $\phi D_s$ | Shank Diameter      |



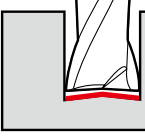
## Legend

|            |                     |
|------------|---------------------|
| $\phi D_c$ | Diameter            |
| $R$        | Endmill Radius      |
| $\ell$     | Cutting Edge Length |
| $\ell_2$   | Length Below Neck   |
| $L$        | Total Length        |
| $\phi D_s$ | Shank Diameter      |





Our square endmills have **concave ends**.



Therefore, they do not make flat bottoms in spot facing.

If a flat bottom is required, we recommend using the **Flat Multidrill MDF Type**. 

I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

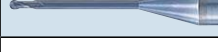
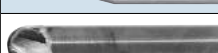
PCD

# Corner Radius Endmill Ballnose Endmill Selection Guide

●: Best (First Recommendation)  
◎: Optimum ○: Suitable Blank: Not recommended ×: Unsuitable

| Application<br>Feature                      | No. of<br>Teeth | (Radius)<br>Diameter<br>ØD <sub>c</sub><br>(Min to Max)               | Flute Length/<br>Type                                                                             |                   | Product Type<br>Series<br><br>(Ref. Page) | Grades         | Coating / Cutting Edge | Appearance                                                                        | Work Material |              |             |                    |                            |                |              |                 |                               |           |          |              |          |      |              |             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|                                             |                 | (Ballnose)<br>Ballnose<br>Radius<br>(Min to Max)<br>Tolerance<br>(mm) | Long Neck / Relief Shank<br>Extra-Long Series<br>Long Series<br>Medium<br>Standard<br>Short Flute | P                 |                                           |                |                        |                                                                                   | H             |              | M           | S                  | K                          | N              |              |                 |                               |           |          |              |          |      |              |             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                                             |                 |                                                                       |                                                                                                   | General Structure |                                           |                |                        |                                                                                   | Rolled Steel  | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel / Die Steel | Hardened Steel |              | Stainless Steel | Ti Alloy/Heat Resistant Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |              |             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                                             |                 |                                                                       |                                                                                                   |                   |                                           |                |                        |                                                                                   |               |              |             |                    |                            | 30 to 45 HRC   | 45 to 55 HRC |                 |                               |           |          |              |          |      | 55 to 60 HRC | From 60 HRC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Corner Radius Endmill Selection Guide       |                 |                                                                       |                                                                                                   |                   |                                           |                |                        |                                                                                   |               |              |             |                    |                            |                |              |                 |                               |           |          |              |          |      |              |             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| General<br>Endmilling With<br>Corner Radius | 4               | ø3 to ø12                                                             |                                                                                                   |                   | GSMILL Radius<br>GLM4000SF-R → I50        | Coated Carbide | GS                     |  | ◎             | ◎            | ◎           | ◎                  | ◎                          | ◎              |              | ◎               | ○                             | ○         |          |              |          |      |              |             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Ballnose Endmill Selection Guide

|                                   |   |                                  |           |  |  |  |                                                                                              |                |         |                                                                                     |         |   |   |   |   |                       |   |   |   |   |   |   |  |  |
|-----------------------------------|---|----------------------------------|-----------|--|--|--|----------------------------------------------------------------------------------------------|----------------|---------|-------------------------------------------------------------------------------------|---------|---|---|---|---|-----------------------|---|---|---|---|---|---|--|--|
| General Purpose                   | 2 | R0.2 to 12.5<br>± 0.01           |           |  |  |  | GSX MILL Ballnose<br>GSXB20000 → I56                                                         | Coated Carbide | GSX     |  | ●       | ● | ● | ● | ● | ○                     |   | ● | ○ | ○ |   |   |  |  |
|                                   |   | R0.5 to 6<br>± 0.01              |           |  |  |  | GSMILL Ballnose<br>GLB2000SF → I57                                                           | Coated Carbide | GS      |  | ◎       | ◎ | ◎ | ◎ | ◎ | ◎                     |   | ◎ | ○ | ● |   |   |  |  |
| Hardened Steel                    | 2 | R0.2 to 6<br>+0.003<br>to -0.007 |           |  |  |  | GSMILL HARD Ballnose<br>GSBH20000SF → I58                                                    | Coated Carbide | GS HARD |  | ◎       | ◎ | ◎ | ◎ | ◎ | ●                     | ● |   |   |   |   |   |  |  |
|                                   |   | R0.1 to 3<br>± 0.005             | Long Neck |  |  |  | GSMILL Long Neck Ballnose<br>GSBN2 → I64                                                     | Coated Carbide | GS      |  |         |   | ◎ | ◎ | ○ | ○                     |   |   |   |   |   |   |  |  |
| Aluminum and Non-Ferrous Metal    | 2 | R1 to 8<br>± 0.01                |           |  |  |  | AURORA COAT Ballnose<br>SNB2000DL → I61                                                      | Coated Carbide | DLC     |  |         |   |   |   |   |                       |   |   |   |   | ◎ | ◎ |  |  |
| Copper Electrodes                 | 2 | R0.05 to 2<br>± 0.005            | Long Neck |  |  |  | AURORA COAT Long Neck Ballnose<br>SNB2 → I62                                                 | Coated Carbide | DLC     |  |         |   |   |   |   |                       |   |   |   |   | ◎ | ● |  |  |
|                                   |   | R0.1 to 0.5<br>± 0.005           |           |  |  |  | Mold Finish Master<br>SUMIBORON Ball Endmills<br>BNBC → I91                                  | CBN            |         |  |         |   |   |   |   |                       |   |   |   |   |   | ● |  |  |
| High Precision Mold Profiling     | 2 | R0.2 to 1<br>± 0.005             |           |  |  |  | Mold Finish Master<br>SUMIBORON Ball Endmills<br>BNBP → I90                                  | CBN            |         |  |         |   |   | ○ |   | ○                     | ◎ | ◎ |   |   | × | × |  |  |
|                                   |   | R1 to 10<br>± 0.02               |           |  |  |  | SUMIBORON<br>Endmills BNBS Type<br>BNBS → I92                                                |                |         |  |         |   |   | ○ |   | ○                     | ◎ | ◎ |   |   | × | × |  |  |
| Carbide and Hard Brittle Material | 1 | R0.1 to 1                        |           |  |  |  | Mold Finish Master<br>SUMIDIA BINDERLESS Ball nose Endmills<br>NPDB <small>NEW</small> → I88 | Substrate PCD  |         |  | Carbide |   |   |   | ◎ | Hard Brittle Material |   |   |   | ○ |   |   |  |  |



# Coatings For Endmills

## Coatings For Endmills

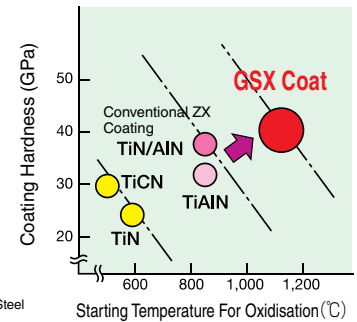
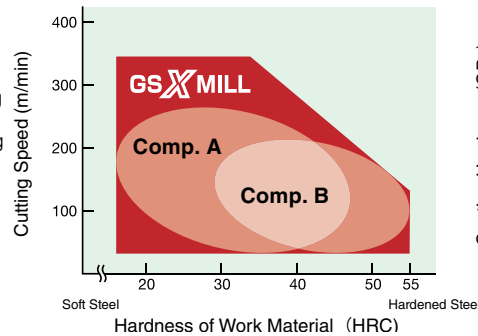
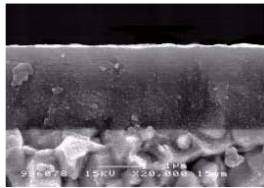
| Coating Name            | GSX Coat                                                | GS Hard Coat                                                       | ZX Coat                             | AURORA Coat                                                | SUMIDIA Coat                              |
|-------------------------|---------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------|-------------------------------------------|
| Coating Type            | TiAlCrN Type                                            | TiAlCrSiCN Type                                                    | TiAlN Type                          | DLC                                                        | Diamond                                   |
| Wear Resistance         | ◎                                                       | ◎                                                                  | ○                                   | ○                                                          | ◎                                         |
| Adhesion Resistance     | ◎                                                       | ◎                                                                  | ○                                   | ◎                                                          | △                                         |
| Thermal Resistance      | ◎                                                       | ◎                                                                  | ○                                   | △                                                          | ○                                         |
| Coating Thickness       | Up to 2μm                                               | Up to 2μm                                                          | Up to 2μm                           | Up to 0.5μm                                                | Up to 15μm                                |
| Characteristics         | Excellent in thermal resistance and adhesion resistance | Excellent in rigidity, thermal resistance, and adhesion resistance | General Purpose                     | Low friction coefficient and excellent adhesion resistance | Excellent in rigidity and wear resistance |
| Main Application        | For general steel/stainless steel milling               | For general steel/hardened steel milling                           | For general steel/cast iron milling | For aluminium alloy/copper alloy milling                   | For CFRP milling                          |
| Main Applicable Product | GSX/GSXVL                                               | GSH/SSEH/SSEHVL                                                    | UPMILL/LSM/HHM                      | ASM/SNB/SNB2                                               | SSDC                                      |

### GSX Coat



- Fine carbide substrate provides high traverse rupture strength and excellent thermal shock resistance improving reliability in wet cutting applications.
- GSX Coating provides improved reliability and longer tool life.

[Coating Structure]

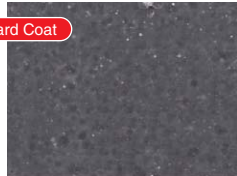


### GS Hard Coat

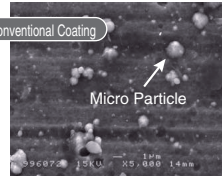


[Coating Surface Comparison]

GS Hard Coat



Conventional Coating



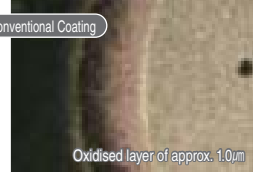
[Oxidisation Evaluation] (Scratches from calotest performed after one-hour exposure to the air of 1,100°C)

GS Hard Coat



Oxidised layer of approx. 0.3μm

Conventional Coating

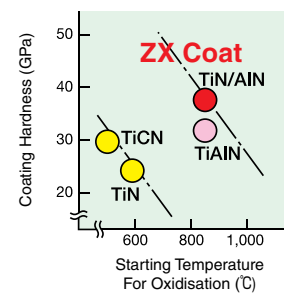
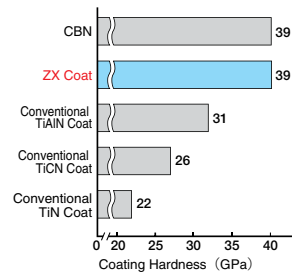


Oxidised layer of approx. 1.0μm

### ZX Coat



- Hardness almost equivalent to that of CBN
- Improvement in wear resistance, Oxidisation resistance, and peel-off resistance
- Approx. 6 times longer life compared with uncoated products



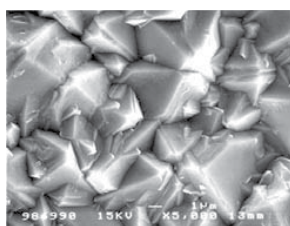
### DLC Coat



- Super smooth AURORA Coat reduces adhesion and provides good surface finish.
- Low milling resistance enables high feed machining and milling of low rigidity works.
- Perfect for machining non-ferrous metal/copper electrodes



AURORA Coat

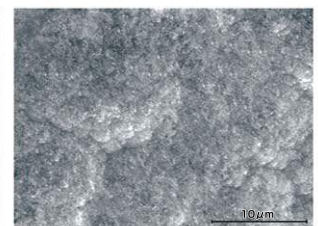
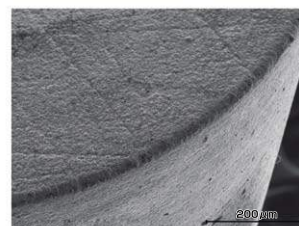


Competitor's Diamond Coating

### SUMIDIA Coat



- Our original polycrystalline diamond coating technology achieves over 10 times higher wear resistance than uncoated carbide.
- Realising fine diamond coating that provides both high strength and high wear resistance with smooth surface required for CFRP milling.



I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

PCD

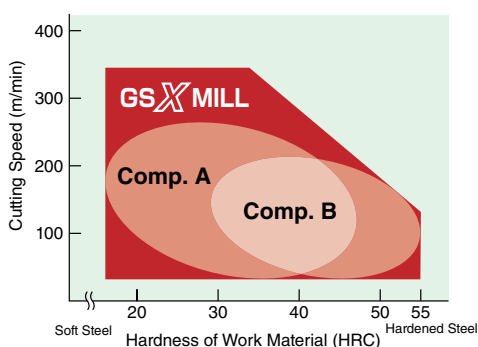
# NEW "Global Standard" Solid Endmill GSX MILL Series



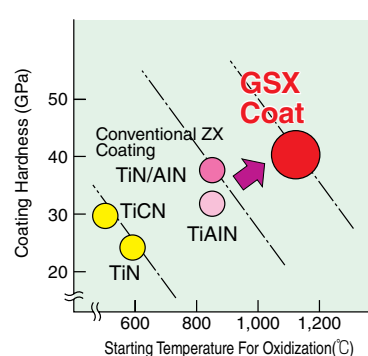
## ■ Characteristics and Applications

- Wide variation of three flute types and four flute lengths enable use in a wide variety of applications.
- Fine carbide substrate provides high traverse rupture strength and excellent thermal shock resistance improving reliability in wet cutting applications.
- **GSX Coat** provides improved reliability and longer tool life.
- Large rake angle and unique flute design improve sharpness and chip evacuation.
- Corner edge with gash land improves cutting edge strength.
- **Sharper edge** S type and **fracture resistant** C type added to the 2D size series.

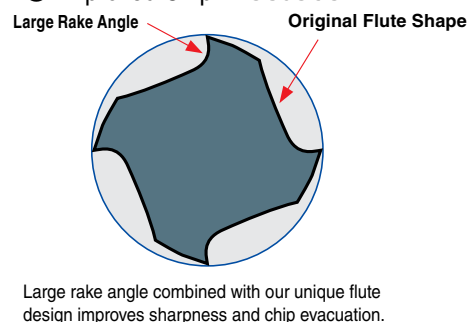
### ● Wear Resistance



- Thermal Resistance



- Improved Chip Evacuation

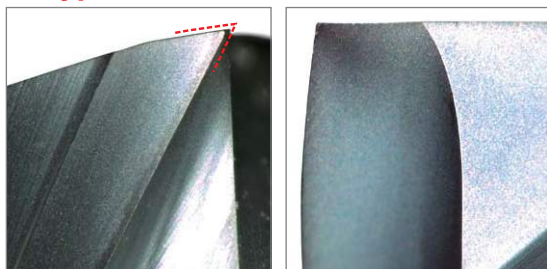


## ■ 2 cutting edge designs expand machining applications

Sharper edge S type and fracture resistant C type added to the 2D size series.

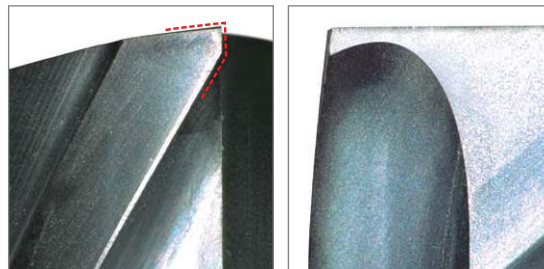
## S Type

## Sharp Corner: Sharper Edge Design

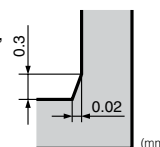


## C Type

## Gash Land: Fracture Resistant Design



**Note :** When using endmills with gash land, some material remains as shown on the right. If you need sharp corners, use the S Type.



■ Application Range    ◎ : Best    ○ : Good    Blank : Not recommended

| P                              |              |             |                    |           | H              |              |        | M               | S        | K                    | N         |          |              |          |      |
|--------------------------------|--------------|-------------|--------------------|-----------|----------------|--------------|--------|-----------------|----------|----------------------|-----------|----------|--------------|----------|------|
| General Structure Rolled Steel | Carbon Steel | Alloy Steel | Pre-hardened Steel | Die Steel | Hardened Steel |              |        | Stainless Steel | Ti Alloy | Heat Resistant Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|                                |              |             |                    |           | 45 to 55 HRC   | 55 to 60 HRC | 60 HRC |                 |          |                      |           |          |              |          |      |
|                                |              |             |                    |           |                |              |        |                 |          |                      |           |          |              |          |      |
| ○                              | ◎            | ◎           | ◎                  | ◎         | *1             |              |        | ◎               | ○        | ○                    | ○         |          |              |          |      |

\*1 : GSXSLT30000C is recommended for 50 HRC or less.

## ■ Recommended Milling Examples

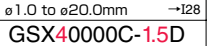
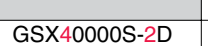
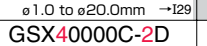
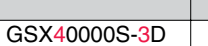
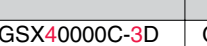
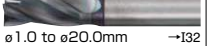
| Application   | Surface Milling                                                                      |           | Groove Milling                                                                        |           | Groove Finishing                                                                      |           |
|---------------|--------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------|-----------|
| Form          |  |           |  |           |  |           |
|               | Roughing                                                                             | Finishing | Roughing                                                                              | Finishing | Roughing                                                                              | Finishing |
| <b>S Type</b> |                                                                                      | ⊙         |                                                                                       | ○ *2      |                                                                                       | ⊙         |
| <b>C Type</b> | ⊙                                                                                    | ○         | ⊙                                                                                     | ⊙         | ⊙                                                                                     | ○         |

**S Type** is best for removing inside corner

\*2 : Use with small depth of cut.

# NEW "Global Standard" Solid Endmill GSX MILL Series

## Product Range

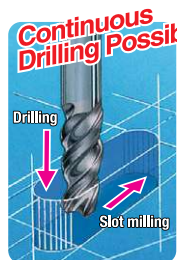
| Application         | No. of Teeth | Flute Length                                                                                                                   |                                                                                                                              |                                                                                                                              |                                                                                                                               |                                                                                                                                |                                                                                                                                |
|---------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|                     |              | 1.5D                                                                                                                           | 2D                                                                                                                           |                                                                                                                              | 3D                                                                                                                            |                                                                                                                                | 4D                                                                                                                             |
| General Purpose     |              | C Type                                                                                                                         | S Type                                                                                                                       | C Type                                                                                                                       | S Type                                                                                                                        | C Type                                                                                                                         | C Type                                                                                                                         |
|                     | 2            | GSX20000C-1.5D<br><br>ø 1.0 to ø 20.0mm → I20 | GSX20000S-2D<br><br>ø 0.5 to ø 20.0mm → I21 | GSX20000C-2D<br><br>ø 0.5 to ø 25.0mm → I22 | GSX20000S-3D<br><br>ø 0.5 to ø 20.0mm → I23 | GSX20000C-3D<br><br>ø 1.0 to ø 20.0mm → I24 | GSX20000C-4D<br><br>ø 1.0 to ø 20.0mm → I25 |
|                     | 3            | GSX30000C-1.5D<br><br>ø 1.0 to ø 20.0mm → I28 |                                                                                                                              | GSX30000C-2D<br><br>ø 1.0 to ø 20.0mm → I29 |                                                                                                                               |                                                                                                                                |                                                                                                                                |
|                     | 4            | GSX40000C-1.5D<br><br>ø 1.0 to ø 20.0mm → I32 | GSX40000S-2D<br><br>ø 1.0 to ø 20.0mm → I33 | GSX40000C-2D<br><br>ø 1.0 to ø 25.0mm → I34 | GSX40000S-3D<br><br>ø 1.0 to ø 20.0mm → I36 | GSX40000C-3D<br><br>ø 1.0 to ø 20.0mm → I37 | GSX40000C-4D<br><br>ø 1.0 to ø 20.0mm → I38 |
|                     | 3            | GSXSLT30000C-1.5D<br><br>ø 1.0~ø 16.0mm → I30 |                                                                                                                              |                                                                                                                              |                                                                                                                               |                                                                                                                                |                                                                                                                                |
| Compound Endmilling |              |                                                                                                                                |                                                                                                                              |                                                                                                                              |                                                                                                                               |                                                                                                                                |                                                                                                                                |

## High Precision

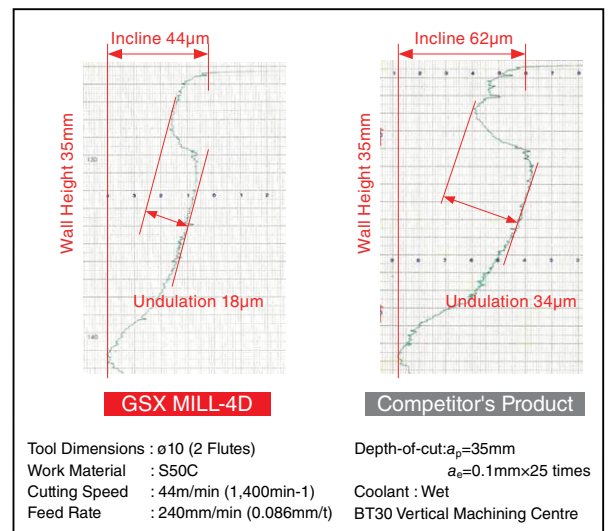
- Diametrical tolerance held to 2/3 of the previous type. Also features reduced variation and does not require tool diameter correction when replacing tools.

## Multi-Purpose

- Optimized flute design of slotted 3 flute (short) type reduces cutting resistance.
  - ① Allows drilling, slot milling and other continuous (compound) applications.
  - ② Perfect for use on thin walls and small machining centres.



## Long, High Rigidity Flutes



## Application Examples

### Carbon Steel Grooving with GSX20000C




**Gash land for stronger cutting edge.**

|                           |                                      |
|---------------------------|--------------------------------------|
| Tool Dimension            | ø6 (2 Flutes)                        |
| Work Material             | S50C                                 |
| Cutting Speed             | 87m/min (4615min <sup>-1</sup> )     |
| Feed Rate                 | 553mm/min (0.06mm/t)                 |
| Depth-of-cut              | $a_p=3\text{mm}$<br>$a_e=6\text{mm}$ |
| Coolant                   | Dry                                  |
| Vertical Machining Centre | BT50                                 |

**Breakage**

### Cast Iron Grooving with GSX20000C




**GSX Coat for improved wear resistance.**

|                           |                                                               |
|---------------------------|---------------------------------------------------------------|
| Tool Dimension            | ø10 (2 Flutes)                                                |
| Work Material             | Equivalent to FDC600                                          |
| Cutting Speed             | 66m/min (2100min <sup>-1</sup> )                              |
| Feed Rate                 | 302mm/min (0.072mm/t)                                         |
| Depth-of-cut              | $a_p=5\text{mm} \times 5 \text{ passes}$<br>$a_e=10\text{mm}$ |
| Coolant                   | Dry                                                           |
| Vertical Machining Centre | BT40                                                          |

**High Wear**

### Stainless Steel Machining with GSX20000C




**Improved reliability even under wet machining.**

|                           |                                         |
|---------------------------|-----------------------------------------|
| Tool Dimension            | ø10 (2 Flutes)                          |
| Work Material             | SUS304                                  |
| Cutting Speed             | 50m/min (1591min <sup>-1</sup> )        |
| Feed Rate                 | 127mm/min (0.04mm/t)                    |
| Depth-of-cut              | $a_p=10\text{mm}$<br>$a_e=0.5\text{mm}$ |
| Coolant                   | Wet                                     |
| Vertical Machining Centre | BT50                                    |

**Coating peel off**

### Surface Milling S50C with GSX20000S




**S type delivers optimum cutting performance.**

|                           |                                         |
|---------------------------|-----------------------------------------|
| Tool Dimension            | ø6 (2 Flutes)                           |
| Work Material             | S50C                                    |
| Cutting Speed             | 87m/min (4615min <sup>-1</sup> )        |
| Feed Rate                 | 553mm/min (0.06mm/t)                    |
| Depth-of-cut              | $a_p=10\text{mm}$<br>$a_e=0.3\text{mm}$ |
| Coolant                   | Dry                                     |
| Vertical Machining Centre | BT50                                    |

**Chipping**



# NEW "Global Standard" Solid Endmill GSX MILL Series



135/148

## Recommended Milling Examples

| Application | Side Milling |           | Groove Milling |           | Groove Finishing |           |
|-------------|--------------|-----------|----------------|-----------|------------------|-----------|
|             | Roughing     | Finishing | Roughing       | Finishing | Roughing         | Finishing |
| Square Type | ⊙            | ○         | ⊙              | ⊙         | ⊙                | ○         |
| Radius Type | ⊙            | ○         | ⊙              | ⊙         | ⊙                | ○         |

## Diameter

φ2 to 25mm



4

2.5D

GSX  
Coating

Corner

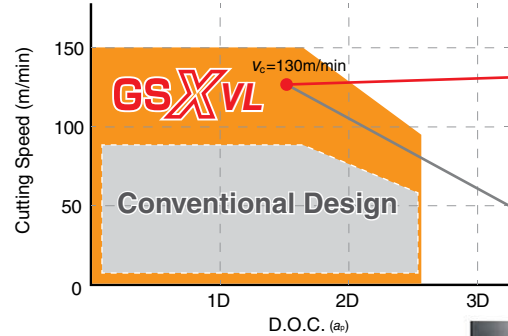
R

40°  
43°  
Helix Angle

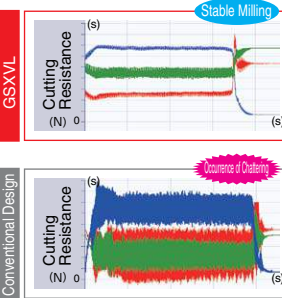
## Drastically improved resistance to chattering and breakage

Optimization of irregular pitch and lead design drastically improve vibration and breakage resistance. Achieving high-speed, high efficiency milling by lowering cutting resistance.

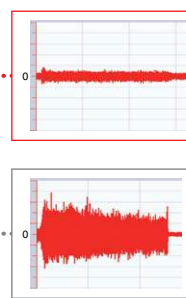
## Cutting Area



## Cutting Resistance



## Vibration Data



## Side Milling

Work Material: S50C Tool diameter: φ10

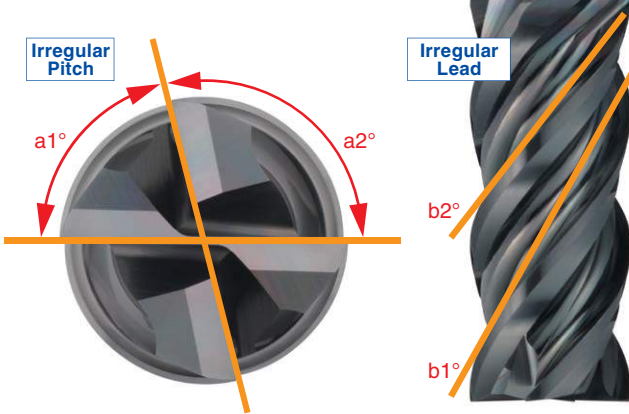
Cutting Conditions:  $n=4,100\text{min}^{-1}$

$V_c=1,450\text{m/min}$

$a_p=15\text{mm}$ ,  $a_e=2\text{mm}$ , Wet

Machine: BT50

## Irregular Pitch and Irregular Lead



## Drastically Improved Surface Quality

Improved milled surface quality through use of rounded land.  
(Rounded land is used on sizes φ5mm and up!)



## Application Examples (Work Material: SUS304)

| Tool                                                                        | Cutting Conditions                                                                                 | Surface Finish Quality                    | Enlarged Machined Surface | Surface Roughness                    |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------|--------------------------------------|
| GSXVL<br>Anti-vibration<br>Type<br>Irregular Pitch<br>Irregular Lead<br>φ12 | $n=1,200\text{min}^{-1}$<br>$V_c=300\text{m/min}$<br>$a_p=18\text{mm}$ , $a_e=1.2\text{mm}$<br>Wet | ⊙ Good                                    |                           | ⊙ Ideal for finishing<br>            |
| Competitor's Product<br>Regular Pitch<br>φ12                                | $n=1,300\text{min}^{-1}$<br>$V_c=630\text{m/min}$<br>$a_p=18\text{mm}$ , $a_e=1.2\text{mm}$<br>Wet | ⊙ Surface is rough but without chattering |                           | ⊙ Ideal for (high feed) roughing<br> |
| Competitor's Product<br>Regular Pitch<br>φ12                                | $n=1,200\text{min}^{-1}$<br>$V_c=300\text{m/min}$<br>$a_p=18\text{mm}$ , $a_e=1.2\text{mm}$<br>Wet | ✗ Occurrence of chattering                |                           | ✗ NG due to chattering<br>           |

I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
Coat

Long  
Neck

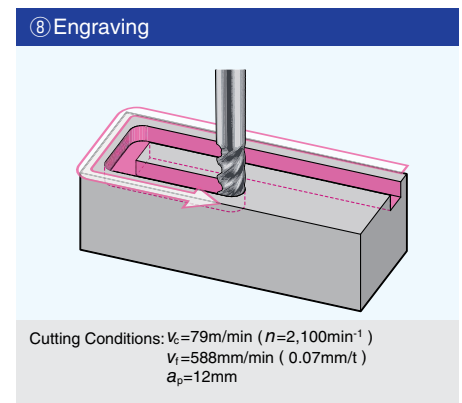
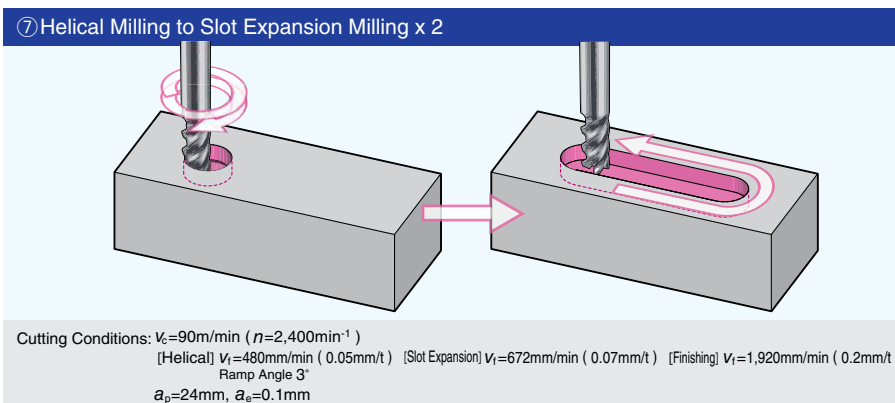
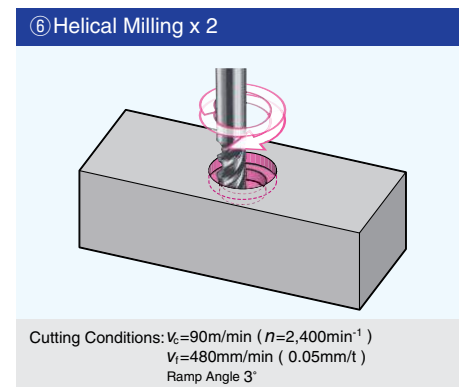
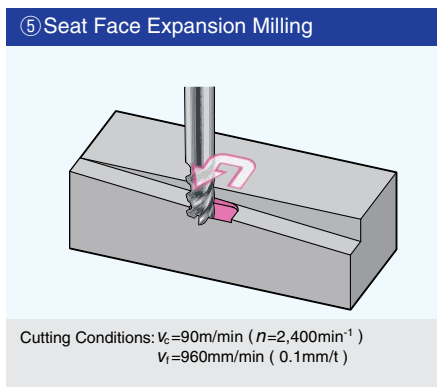
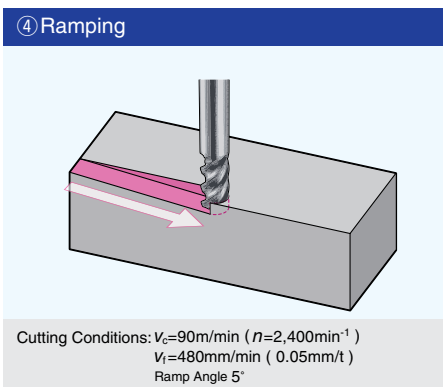
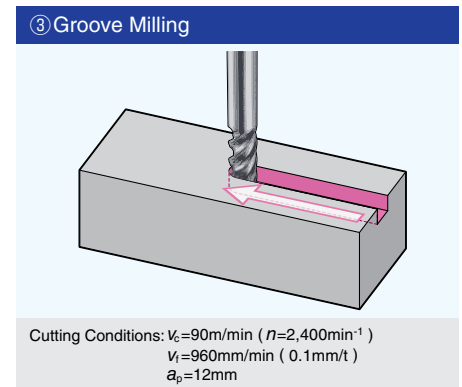
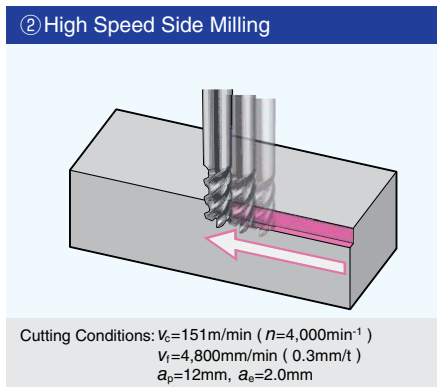
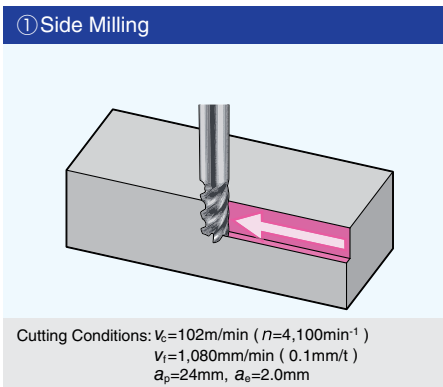
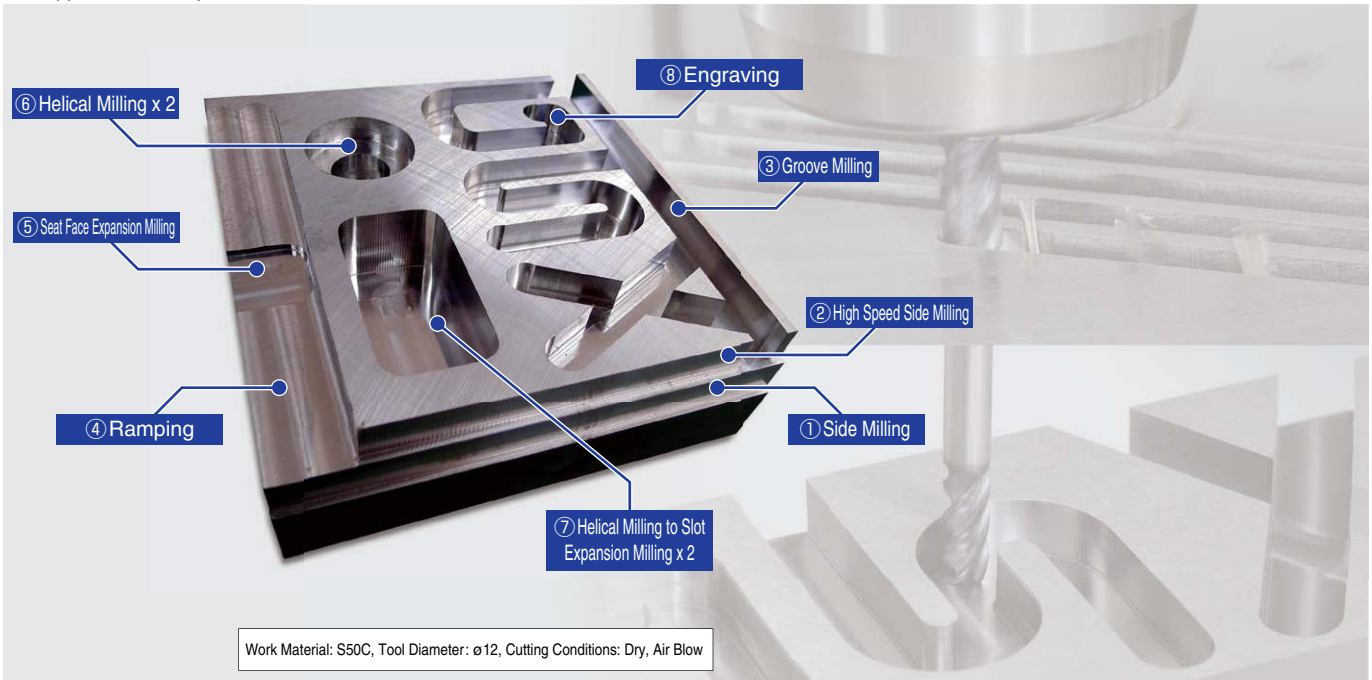
Uncoated

CBN  
PCD



# NEW "Global Standard" Solid Endmill GSX MILL Series

## Application Examples



I  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long

Neck

Uncoated

CBN

PCD

# NEW "Global Standard" Solid Endmill GSX MILL Series



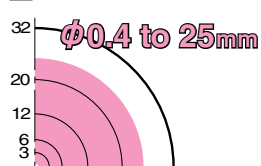
Ballnose Type

156

## Recommended Milling Examples

| Application   | Radius Milling |  | Copy Milling |  | Pocket Milling |  |
|---------------|----------------|--|--------------|--|----------------|--|
|               |                |  |              |  |                |  |
| Ballnose Type |                |  |              |  |                |  |

## Diameter



2

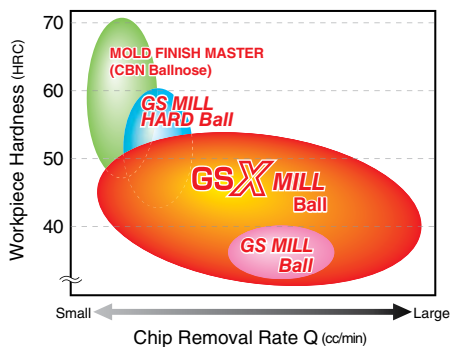
1.5D



## Improved Thermal Resistance and Wear Resistance

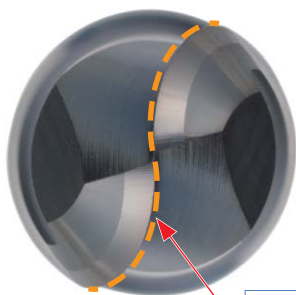
New coating combined with a fine-grained carbide substrate exhibit better thermal and wear resistance.

## Application Range



## Reduced Cutting Resistance

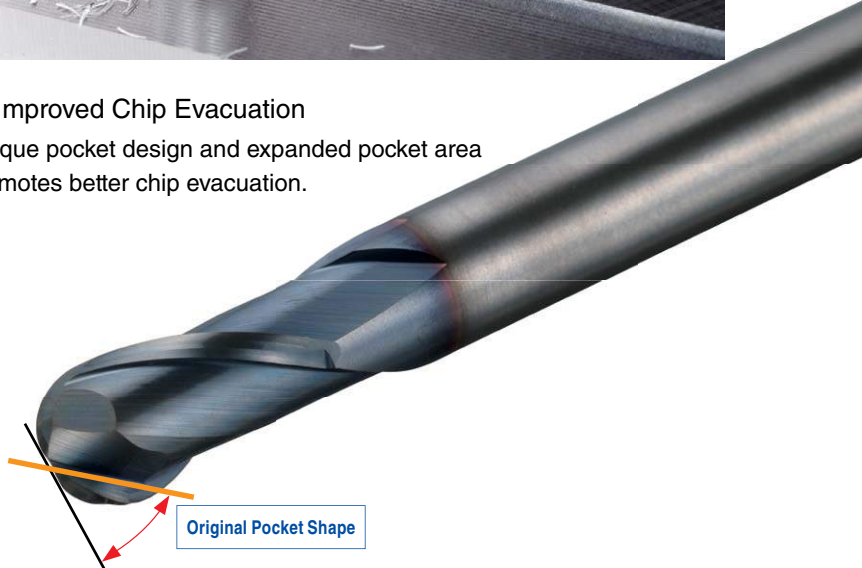
Large helix angle on cutting edge reduces cutting resistance.



Large Helix Angle

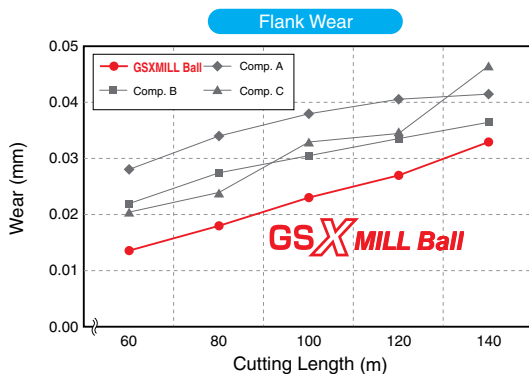
## Improved Chip Evacuation

Unique pocket design and expanded pocket area promotes better chip evacuation.



Original Pocket Shape

## Application Examples



## GSX Ball (Cutting Length 140 m)



Able to continue

## Conventional Tool (Cutting Length 80 m)



Unable to continue

Work Material: SKD61 (50HRC)  
Tool Dimensions: R3 (2 Flutes)  
Cutting Conditions:  $v_c=179\text{m/min}$  ( $n=9,500\text{min}^{-1}$ ),  $v_f=2,250\text{mm/min}$  ( $f_z=0.12\text{mm/t}$ )  
 $a_c=0.2$  to  $1.0\text{mm}$ ,  $p_1=0.3\text{mm}$ , Wet  
Equipment: Vertical Machining Centre BT40



163

## Series

| Type              | No. of Flutes | Shape                      | Diameter (mm) |
|-------------------|---------------|----------------------------|---------------|
| <b>SSDC4000</b>   | 4             | Right-hand Helix →I67      | ø6 to ø12     |
| <b>SSDC4000RL</b> | 4             | Right/Left-hand Helix →I67 | ø6 to ø12     |

## Characteristics and Applications

- Two different types of flute shapes are available.

### SSDC Type (Right-hand Helix Type)

Achieves both higher cutting performance and longer tool life through optimisation of rake angle and relief angle.



### SSDCRL Type (Right/Left-hand Helix Type)

Right/left-hand helix prevents delamination on top and bottom surfaces. Cutting resistance is dispersed even with unstable clamping, improving surface quality.

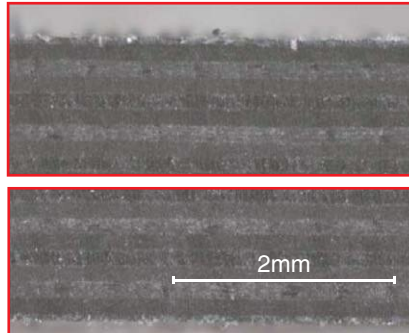
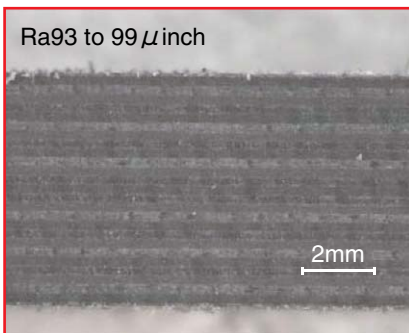


## Performance

### Surface Finish Comparison

#### SSDC Type

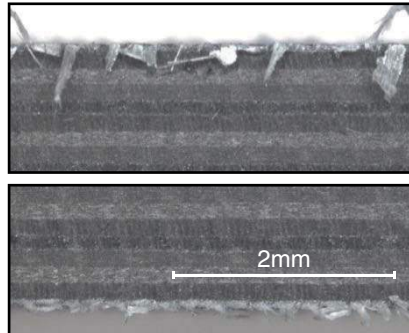
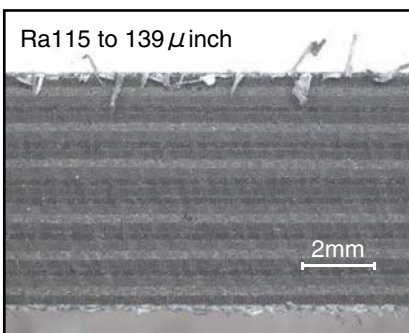
Ra93 to 99  $\mu$ inch



Work Material: CFRP  
Tool Diameter: ø 10 (4 Flutes)  
Cutting Conditions:  $v_c=314\text{m/min}$   
 $n=10,000\text{min}^{-1}$   
 $v_f=1,000\text{mm/min}$   
( $f_z=0.025\text{mm/t}$ )  
Dry

#### Competitor's Product

Ra115 to 139  $\mu$ inch



## Results

#### SSDC Type

High surface quality with no burrs

#### Competitor's Product

Burrs are formed. Low surface quality



# Radius Endmill for Exotic Alloys

## SSEH Series



I52/I87

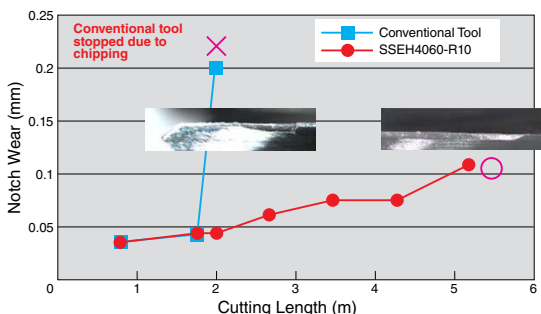
### SSEH Radius

#### Characteristics and Applications

- High helix (45° helix) improves sharpness.
- Combination of unique flute design and semi-mirrored surface improves chip evacuation and adhesion resistance.
- Ultra-smooth coating with improved hardness and heat resistance combined with tough carbide substrate improves tool life when working with heat resistant alloys.
- Unique, smooth radius shape mitigates cutting impact and improves fracture resistance.
- Both coated and uncoated types are available in stock to meet various conditions.

#### Application Examples

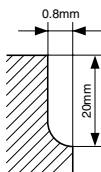
##### Inconel 718 (Side Milling)



Tool Diameter :  $\phi 6 \times R1$

Cutting Conditions:  $v_c=20\text{m/min}$ ,  $f_z=0.025\text{mm/t}$ ,  $a_p=5\text{mm}$ ,  $a_e=0.5\text{mm}$ , wet

##### Inconel 713 (Side Milling)

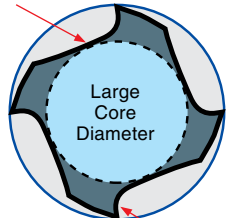
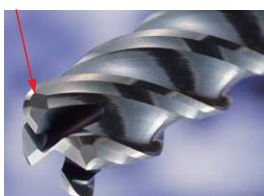


In Sumitomo Electric Hardmetal tests, the special coating with excellent adhesion resistance provided less cutting edge adhesion than the competitor's product and enabled fracture free machining. The competitor's product suffered from edge adhesion leading to breakage.

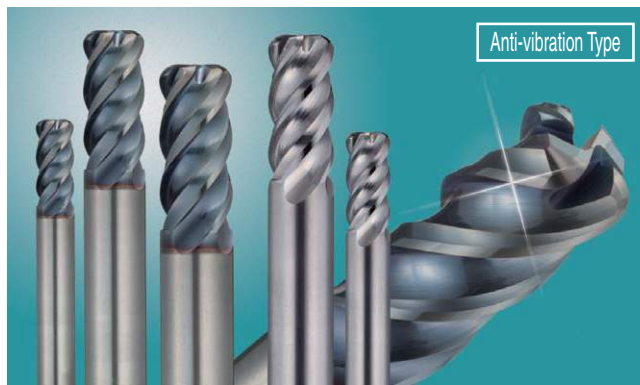
Tool Diameter :  $\phi 10 \times R1$  Output : 150pcs/tool  
Cutting Conditions:  $v_c=32\text{m/min}$ ,  $f_z=0.018\text{mm/t}$ ,  $a_p=20\text{mm}$ ,  $a_e=0.8\text{mm}$ , Dry

Unique, smooth radius design

Original Wide Arc Flute



Semi-mirrored Rake Face

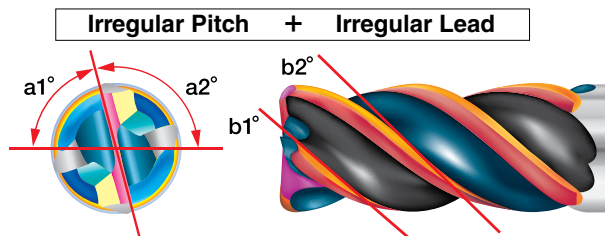


I51/I86

### SSEH Radius Anti-vibration Type

#### Characteristics and Applications

- New anti-vibration type added to the SSEH type endmill for exotic alloys.
- Builds on the same features of existing endmills by adding an irregular lead for exceptionally good anti-vibration performance.
- Compatible with wide range of milling for exotic alloys including SUS, Inconel, and Titanium.
- Reduces chattering for high-speed, high-feed cutting.
- Both coated and uncoated types are available in stock to meet various conditions.



#### Application Examples

##### Corner Finishing for Titanium Alloy

|                                                                                                                                                                              | SSEH Anti-vibration Radius Endmill<br>SSEHVL4120W-30 | No Anti-vibration Mechanism Endmill<br>$\phi 12 \times R3.0$ |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|
| Machined Surface                                                                                                                                                             | <br>No chattering                                    | <br>Chattering occurs                                        |
| Vibration Data                                                                                                                                                               | <br>Stable cutting                                   | <br>Increases chattering at entry point corner               |
| Tool Breakage                                                                                                                                                                | <br>No breakage                                      | <br>Chipping caused by chattering                            |
| Cutting Conditions: $v_c=42.4\text{m/min}$ ( $n=1,125\text{min}^{-1}$ )<br>$v_f=200\text{mm/min}$ ( $f_z=0.044\text{mm/t}$ )<br>$a_p=5.0\text{mm}$ , $a_e=12\text{mm}$ , Wet |                                                      |                                                              |

# Endmill Anti-drop Mechanism

## SAFE-LOCK™

License by HAIMER.



I35/I48/I51/I52

### Characteristics and Applications

- Incorporating **SAFE-LOCK™** prevents tools from coming off even during high load machining such as slotting and roughing, resulting in highly efficient machining.
- Work damage caused by tool that has come off can be avoided, which prevents failures.
- Endmill can be pushed out after regrinding so that clamping can always be performed at the same tool height.



### SAFE-LOCK™ Applicable Products

| Type              | No. of Flutes | Shape       | Diameter (mm)  |
|-------------------|---------------|-------------|----------------|
| GSXVL4000S-2.5D   | 4             | Square →I35 | ø12.0 to ø25.0 |
| GSXVL4000S-R-2.5D | 4             | Radius →I48 | ø12.0 to ø25.0 |

| Type          | No. of Flutes | Shape       | Diameter (mm)  |
|---------------|---------------|-------------|----------------|
| SSEHL4000WS-R | 4             | Radius →I51 | ø12.0 to ø25.0 |
| SSEH4000WS-R  | 4             | Radius →I52 | ø12.0 to ø25.0 |

### SAFE-LOCK™ Applicable Holders

#### ● Shrink-fit Chuck Holder



- High runout accuracy ensures long tool life.
- Easy setup with a dedicated shrink-fit unit
- High rigidity provides high resistance to chattering.

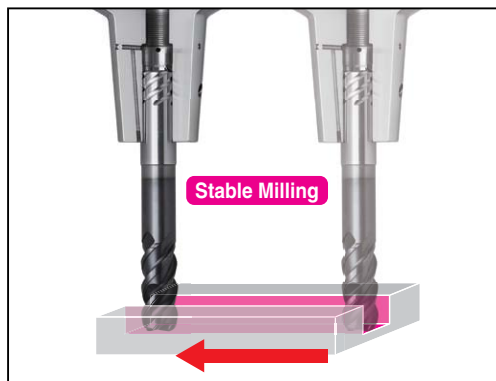
#### ● Collet Chuck Holder



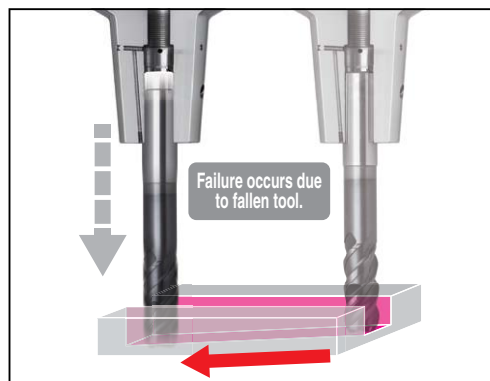
- Tool change-over is simple.
- Specially designed collet provides strong grip.
- High rigidity provides high resistance to chattering.

### Concept Illustration during slotting

#### ● SAFE-LOCK™ With Anti-drop Mechanism



#### ● Without Anti-drop Mechanism



I  
Endmills

Square  
2 Flutes  
3 Flutes  
4 Flutes  
6 Flutes  
8 Flutes  
Radius  
Ballnose  
DLC  
SUMIDIA  
Coat  
Long  
Neck  
Uncoated  
CBN  
PCD

# GS MILL HARD Series

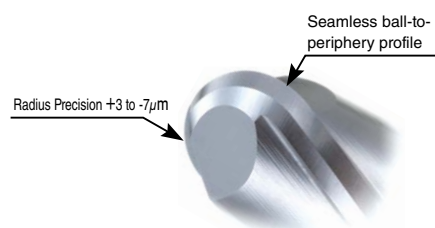


Side Milling of SKD61 (53HRC) with GS MILL Hard Radius

## ■ Characteristics

### GS MILL HARD (Square / Ballnose / Radius)

- With the newly developed high-Al content Al-Ti-Cr coating, GS Hard Coat, oxidation resistance is now 3 times higher than the conventional grade at 1,100°C. This improves thermal and wear resistance in ultra-high-speed machining.
- The coating surface roughness is similar to that of the conventional GS Coat, which reduces cutting friction while enhancing smooth cutting.
- Ultra-fine grained carbide substrate with low cobalt content has been newly developed to improve substrate strength. This increases tool durability and prevents the micro-plastic deformation of the cutting edge that occurs during ultra-high-speed machining.
- New unique cross-sectional design promotes better chip evacuation and tool rigidity.
- **Hard (Radius)** / New endmill series with improved fracture resistance.
- **Hard (Ballnose)** / Utilizes a new coating with excellent lubricity as well as thermal resistance. Achieves precision finishing of hardened steel, with a precise radial tolerance of +3 to -7μm and a seamless ball-to-periphery profile.



## ■ Series

### ● GS MILL HARD (Square/Ballnose)

| Type         | No. of Flutes | Shape                                                                               | Diameter (mm)                 |
|--------------|---------------|-------------------------------------------------------------------------------------|-------------------------------|
| GSH4000SF    | 4 Flutes      |  | ø1 to ø20                     |
| GSH6000SF    | 6 Flutes      |                                                                                     |                               |
| GSH8000SF    | 8 Flutes      |                                                                                     |                               |
| GSBH 20000SF | 2 Flutes      |  | R0.2 to R6.0<br>(ø0.4 to ø12) |

### ● GS MILL HARD (Radius)

| Type        | No. of Flutes | Shape                                                                                 | Diameter (mm) |
|-------------|---------------|---------------------------------------------------------------------------------------|---------------|
| GSH6000SF-R | 6 Flutes      |  | ø6 to ø20     |
| GSH8000SF-R | 8 Flutes      |                                                                                       |               |

I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long

Neck

Uncoated

CBN

PCD

## ■ GS MILL HARD (Square)

### ● Cutting Performance (6 Flutes, ø10 Side Face Milling)

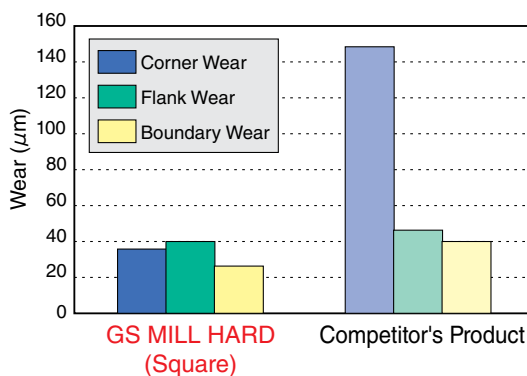
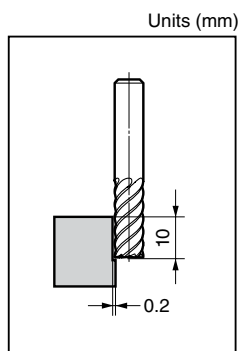
Work Material: SKD61 (53HRC)

Tool: GSH6100SF (ø10)

Cutting Length: 75m

Cutting Conditions:  $v_c=800\text{m/min}$  ( $n=25,460\text{min}^{-1}$ ) $f_z=0.07\text{ mm/t}$  ( $v_f=10,500\text{mm/min}$ ) $a_p=10\text{mm}$   $a_e=0.2\text{mm}$ 

Dry (Air Blown), Down Cut



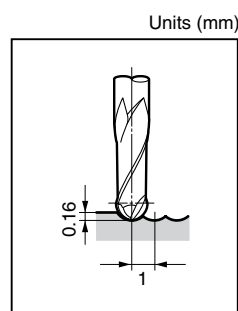
## ■ GS MILL HARD (Ballnose)

### ● Application Example(Automotive Component Precision Forging Die)

Work Material: SKH51 (62HRC)

Tool: GSBH20300SF (R3)

Cutting Length: Approx. 150m

Cutting Conditions:  $v_c=75\text{m/min}$  ( $n=4,000\text{min}^{-1}$ ) $f_z=0.075\text{ mm/t}$  ( $v_f=600\text{mm/min}$ ) $a_p=0.16\text{mm}$   $p_t=1\text{mm}$ 



# DLC (Diamond Like Carbon) Coating AURORA Coat Endmill Series



I59/I61



For Copper Electrodes

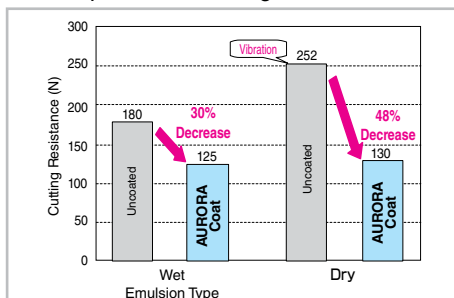
I66

## Characteristics and Applications

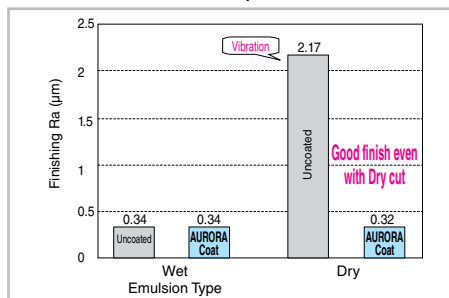
- Super smooth AURORA Coat results in low adhesion as well as good surface finish!
- With lower cutting forces and high rigidity, this series is suitable for low rigidity machine!
- Available in 2 and 4 flutes square type as well as ballnose type endmills
- Added R0.05 to R2.00mm long neck ball endmills for machining copper electrodes!!

## Performance

### Comparison of Cutting Resistance



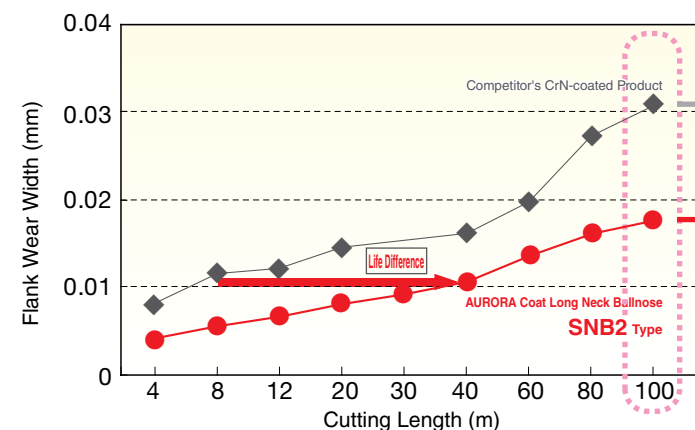
### Surface Finish Comparison



Work Material: A5052  
Tool: ASM4100DL  
ø10 (4 Flutes)  
Cutting Conditions:  
 $v_c=200\text{m/min}$   
 $n=6,300\text{min}^{-1}$   
 $f_z=0.05\text{mm/t}$   
 $v_f=1,300\text{mm/min}$   
 $a_p=10\text{mm}$   
 $a_e=1\text{mm}$   
Down Cut

## AURORA Coat Long Neck Ballnose SNB2 Type

- Achieves longer tool life compared with chromium nitride (CrN)-coated carbide tools.
- Ballnose radii of 0.05 to 2.00mm are covered in this product line.
- Reduced friction coefficient
- Extremely smooth coating structure
- Tool Wear Comparison



| Tool                            | Cutting Length 100 m | Cutting Conditions                                                                                                                                                                                                                               |
|---------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Competitor's CrN-coated Product |                      | Work Material : Tough-pitch Copper<br>Tool : R0.3mm Ballnose Endmill<br>Cutting Conditions :<br>$v_c = 57\text{m/min}$<br>$n = 30,000\text{min}^{-1}$<br>$v_f = 700\text{mm/min}$<br>$a_p = 0.035\text{mm}$<br>$a_e = 0.03\text{mm}$<br>Oil Mist |
| SNB2 Type                       |                      |                                                                                                                                                                                                                                                  |

Excellent in adhesion resistance in copper alloy milling and achieves long tool life!

I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

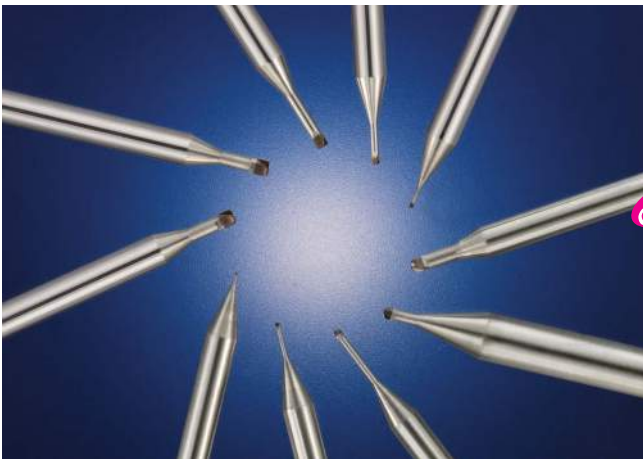
Uncoated

CBN

PCD

# SUMIBORON MOLD FINISH MASTER

Expansion



SUMIDIA BINDERLESS Ball nose Endmills

New

**NPDB Type**

Finishing of Carbide and Hard Brittle Material

SUMIBORON Radius Endmills

**BNBR Type**

High-Speed/High-Precision Hardened Steel Machining

SUMIBORON Ball Endmills

**BNBP Type**

High-Speed/High-Precision Hardened Steel Machining

SUMIBORON Ball Endmills

**BNBC Type**

High-Precision Copper Electrode (Copper Alloy) Machining

SUMIDIA Binderless Ball-nose Endmills

**NPDB Type**

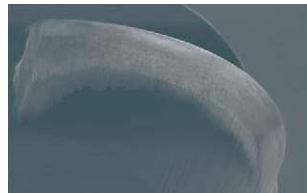
New

I188

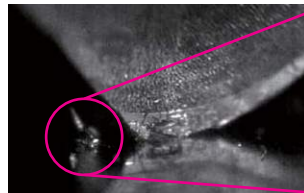


The NPDB type enables direct mirror finishing of carbide, which is impossible for existing single-crystal or polycrystalline diamonds, by employing nanopolycrystalline diamond, which is harder than singlecrystal diamond, for the cutting edge.

- Ideal for Finishing of Hard, Brittle Materials Including Carbide  
Provides excellent machined surface quality thanks to the sharp cutting edge and optimized edge treatment.
- Enables High-Precision Machining and Achieves Long Tool Life  
Maintains excellent dimensional accuracy for a long time thanks to the high contour accuracy of the cutting edge and the excellent wear resistance of diamonds.



Close-up of Cutting Edge



Direct Cutting of Carbide



Insert (Close-up)

Carbide and Hard Brittle Material

I  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long

Neck

Uncoated

CBN

PCD

SUMIBORON Radius Endmills

**BNBR Type**

I189



For Hardened Steel

SUMIBORON Ball Endmills

**BNBP Type**

I190



For Copper Electrodes

SUMIBORON Ball Endmills

**BNBC Type**

I191



For Copper Electrodes

- Achieving longer tool life in high speed, high precision machining of pre-hardened steel (up to 60HRC)
- Excellent surface finish drastically reduces the grinding process.
- Optimized cutting edge design and CBN grade for copy and face milling, caters to a wide range of applications.

- Ballnose radii of 0.1 to 0.5mm are covered in this series.
- Utilizing high CBN content grade for excellent edge sharpness and wear resistance.
- Achieves high quality milling with high precision cutting edge.

# SUMIDIA Binderless



## General Features

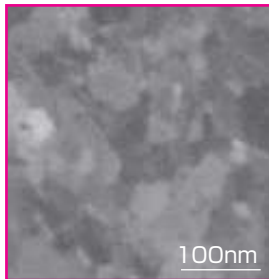
SUMIDIA Binderless is a polycrystalline diamond that directly binds nanometer-level diamond particles with high strength without using binders. SUMIDIA Binderless is harder than single-crystal diamond and has no cleavability. Therefore, it enables machining of hard brittle materials such as carbides and enables new machining methods.

## Characteristic

- SUMIDIA Binderless is a pure diamond, but, unlike single-crystal diamonds, has no anisotropy. Therefore, it displays excellent wear resistance with less uneven wear.
- Thanks to its polycrystalline structure, SUMIDIA Binderless has no cleavability peculiar to single-crystal diamonds and displays excellent fracture resistance.

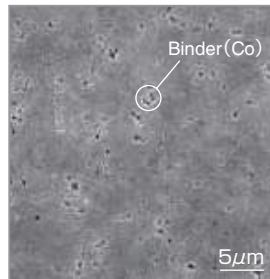
## Comparison of Structures

SUMIDIA Binderless  
SEM Structure



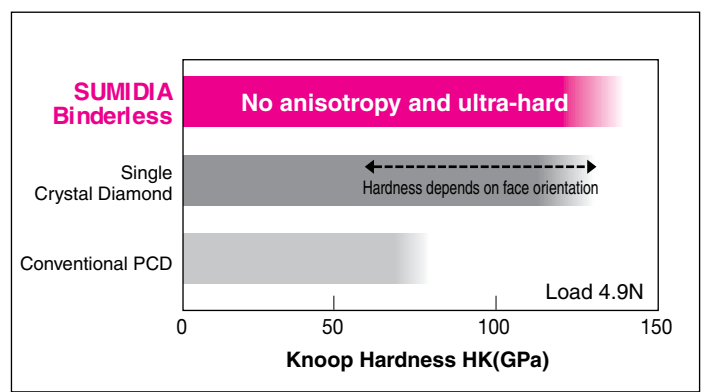
Diamond Grains  
(30 to 50nm)

Conventional PCD  
SEM Structure



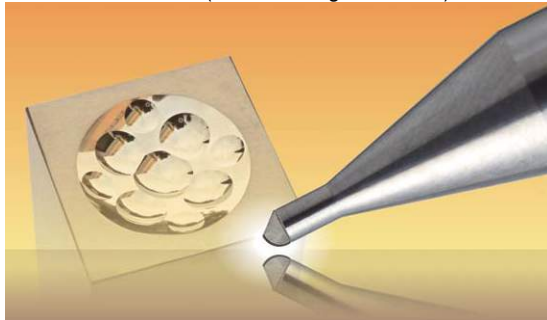
Diamond Grains  
(1 to 10μm)

## Hardness



## Application Examples of SUMIDIA Binderless

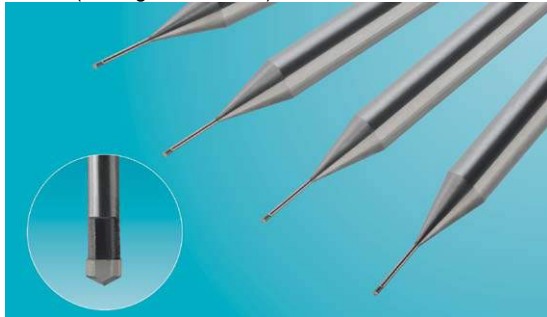
### ●Ballnose Endmill (Direct Cutting of Carbide)



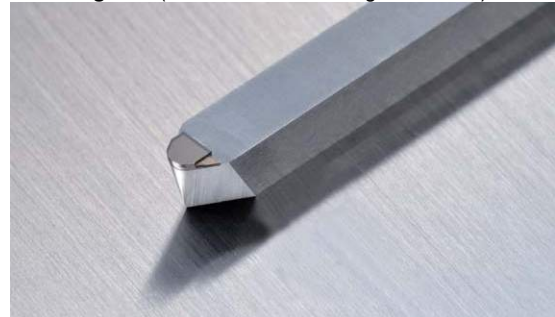
### ●Indexable Insert (Turning of Carbide)



### ●Drill (Drilling of Ceramics)



### ●Cutting Tool (Ultra-Precision Cutting of Carbide)



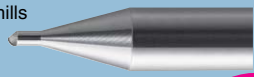


# SUMIBORON MOLD FINISH MASTER



SUMIDIA Binderless Ball-nose Endmills

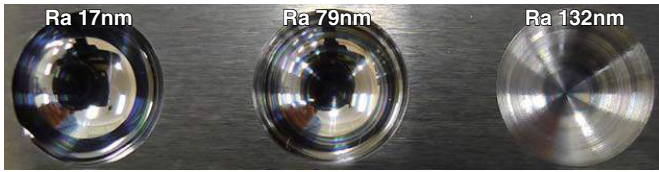
## NPDB Type



- Ideal for Finishing of Hard, Brittle Materials Including Carbide

**New**

Machined Surface Comparison (Finished Carbide Surface)



SUMIDIA BINDERLESS  
NPDB Type

Diamond-Coated  
Endmill

Electroplated Grinding  
Wheel

Work Material : AF1(HRA92.5) Work Shape :  $\phi 5.66\text{mm}$ , SR3

- Application to Optical Use (Fly-Eye Lens Mold)



Work Material : Carbide AF1 (Ultra-fine Grain Carbide)  
Tool : Finishing NPDB1050-020(R0.5)  
Roughing Diamond-Coated Endmill (R0.5)  
Cutting Conditions :  $n=60,000\text{min}^{-1}$ ,  $v_f=300\text{mm/min}$   
 $p_f=0.005\text{mm}$ , Oil Mist  
Surface Roughness :  $Ra\ 0.015\mu\text{m}$   
Cutting Time : Finishing 2 hours 40 minutes  
Roughing 55 minutes

- Application to Medical Use ( $\mu$ -TAS Mold)

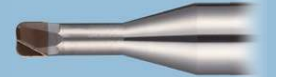


Work Material : Carbide AF1 (Ultra-fine Grain Carbide)  
Tool : NPDB1030-010(R0.5)  
Cutting Conditions :  $n=38,000\text{min}^{-1}$ ,  $v_f=95\text{mm/min}$   
 $p_f=0.001\text{mm}$ , Wet(Oil based)  
Machining Allowance : 0.003mm  
Surface Roughness :  $Ra\ 0.016 - 0.020\mu\text{m}$   
Cutting Length : 8.3m  
Cutting Time : Finishing 1 hour 28 minutes



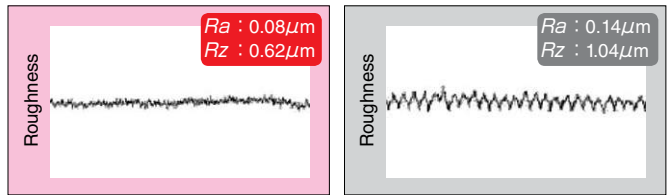
SUMIBORON MOLD FINISH MASTER

## BNBR Type



- Improved machining surface quality through use of wiper edge (available on  $\phi 1.0\text{mm}$  endmills and larger).

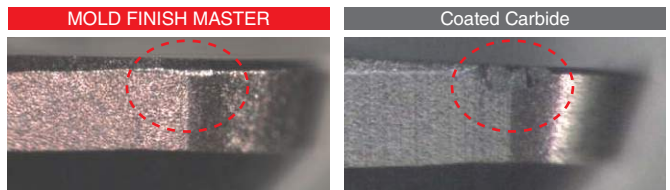
Machined Surface Comparison (MOLD FINISH MASTER)



With Wiper Edge

Without Wiper Edge

- Combination of CBN SUMIBORON BNX20 with excellent wear resistance and optimal cutting edge design realises longer tool life.

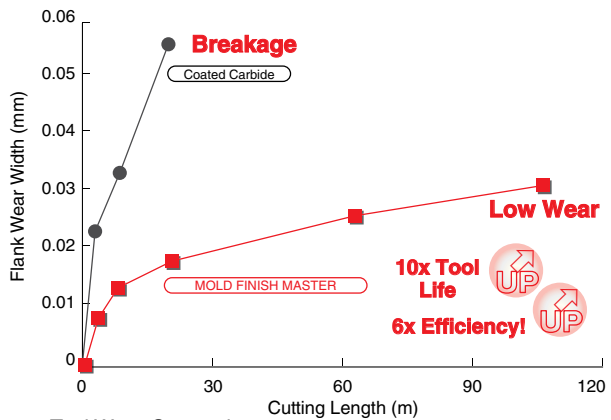


No Chipping

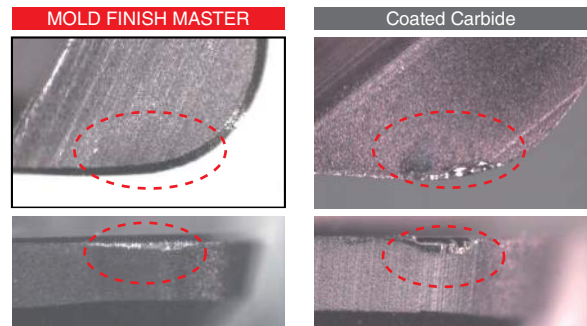
Breakage on Central Insert

Work Material : STAVAX(52HRC)  
Tool : BNBR 2D200R050-0604( $\phi 2 \times r0.5$ )  
Cutting Conditions :  $n=20,000\text{min}^{-1}$ ,  $v_f=400\text{mm/min}$   
 $a_p=0.03\text{mm}$ ,  $p_f=0.7\text{mm}$  Oil Mist

- Excellent wear resistance delivers almost 10 times longer tool life than carbide endmills.



Tool Wear Comparison



Low Wear

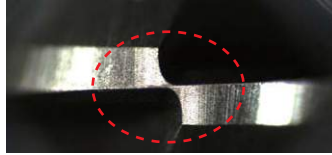
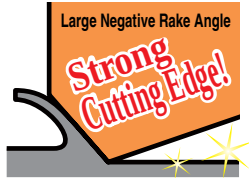
Breakage

Work Material : STAVAX(52HRC)  
Tool : BNBR 2D200R050-0604( $\phi 2 \times r0.5$ )  
MOLD FINISH MASTER  
Cutting Conditions :  $n=20,000\text{min}^{-1}$ ,  $v_f=800\text{mm/min}$   
 $a_p=0.03\text{mm}$ ,  $p_f=0.7\text{mm}$  Oil Mist  
Coated Carbide  
Cutting Conditions :  $n=4,800\text{min}^{-1}$ ,  $v_f=120\text{mm/min}$   
 $a_p=0.03\text{mm}$ ,  $p_f=0.7\text{mm}$  Oil Mist

# MOLD FINISH MASTER

## SUMIBORON MOLD FINISH MASTER BNBP Type

- Achieves high precision machining with precise ball profile of  $\pm 0.005 \mu\text{m}$ .
- Combination of SUMIBORON BN350 with excellent fracture resistance and cutting edge designed with negative rake angle provides stable interrupted cutting.



Center cutting edge, stable machined surface quality

- Strong cutting edge enables use in roughing applications

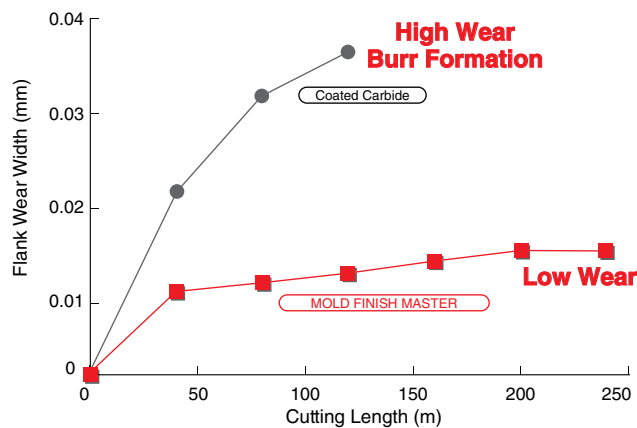


No Chipping

Chipping at centre portion

Work Material : STAVAX(52HRC)  
Tool : BNPB 2R100-0554 (R1.0)  
Cutting Conditions :  $n=25,000\text{min}^{-1}$ ,  $v_f=1,500\text{mm/min}$   
 $a_p=0.10\text{mm}$ ,  $p_f=0.20\text{mm}$  Oil Mist

- Excellent Wear Resistance and Machined Surface Quality

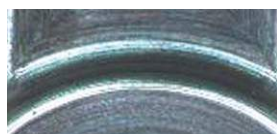


Tool Wear and Machined Surface Comparisons

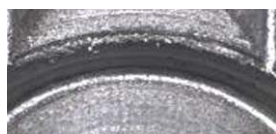


Low Wear

High Wear



Good Machined Surface



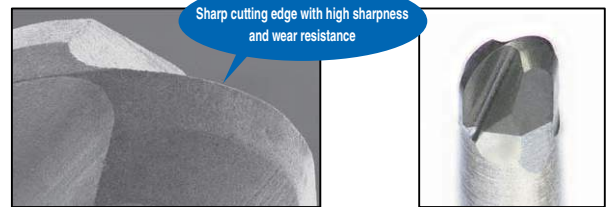
Burr Formation

Work Material : STAVAX(52HRC)  
Tool : BNPB 2R030-0154 (R0.3)  
Cutting Conditions :  $n=25,000\text{min}^{-1}$ ,  $v_f=1,500\text{mm/min}$   
 $a_p=0.05\text{mm}$ ,  $p_f=0.10\text{mm}$  Oil Mist

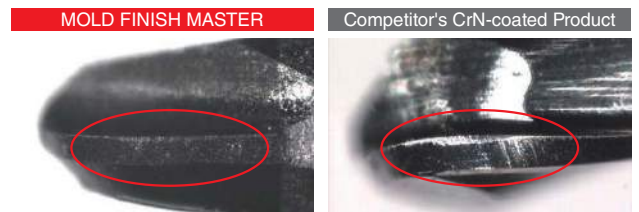
## SUMIBORON MOLD FINISH MASTER BNBC Type

For Copper Electrodes

- Ballnose radii of 0.1 to 0.5mm are covered in this series.
- Achieves high quality milling with high precision cutting edge.



- Achieving further improved tool life

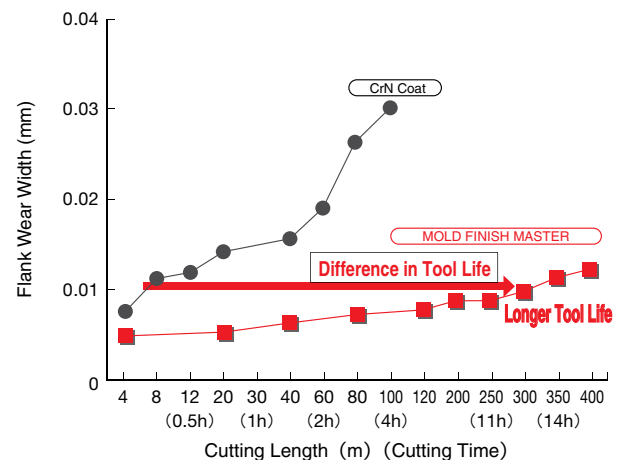


Low Wear (Cutting Length 400mm)

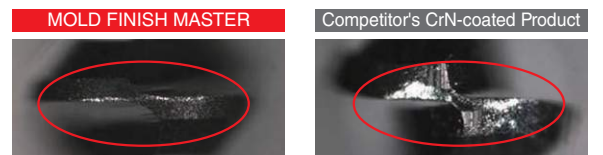
High Wear (Cutting Length 100mm)

Work Material : Tough-pitch Copper (Side Milling)  
Tool : BNBC 2R030-0304 (R0.3)  
Cutting Conditions :  $n=30,000\text{min}^{-1}$ ,  $v_f=700\text{mm/min}$   
 $a_p=0.035\text{mm}$ ,  $a_e=0.03\text{mm}$  Oil Mist

- Utilizing high CBN content grade for excellent edge sharpness and wear resistance.

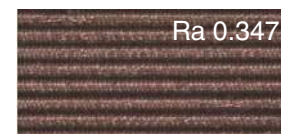


Tool Wear Comparison



Minimal wear, Able to Continue

High Wear



Good cutter mark surface on BNBC Type

Work Material : Tough-pitch Copper  
Tool : BNBC 2R030-0304 (R0.3)  
Cutting Conditions :  $v_c=57\text{m/min}$ ,  $n=30,000\text{min}^{-1}$   
 $f_z=0.007\text{mm/t}$ ,  $v_f=400\text{mm/min}$   
 $a_p=0.005\text{mm}$ ,  $a_e=0.05\text{mm}$  Oil Mist

I

Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long Neck

Uncoated

CBN

PCD

## GSX20000C-1.5D Type

2  
Flutes2  
FlutesGSX  
Coating

Corner

Side Milling

Groove Milling

Groove Finishing

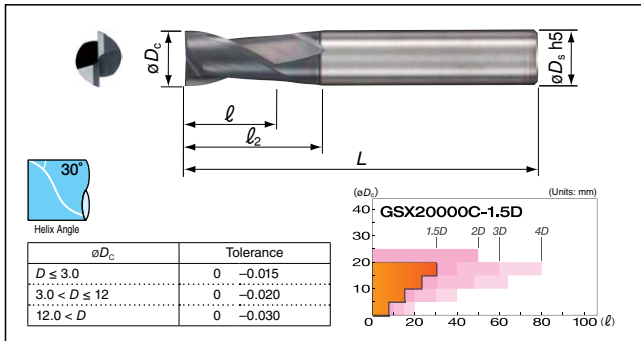
Face Milling

Spot Facing

Helical Milling

Ramping

| Coated | Carbon | Alloy | Aluminum | Tempered | Hardened | Stainless | Ti Alloy | Cast Iron | Al Alloy | Copper | Graphite | CFRP |
|--------|--------|-------|----------|----------|----------|-----------|----------|-----------|----------|--------|----------|------|
| ○      | ○      | ○     | ○        | ○        | ○        | ○         | ○        | ○         | ○        | ○      | ○        | ○    |



## Endmill Identification (GSXMILL Series Only)

GSX 2 1000 C - 1.5D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge (S: Sharp Edge, C: Gash Land)    ⑤ Cutting Edge Length

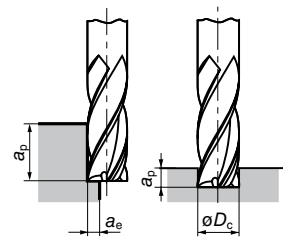
## Body

| Cat. No.        | Stock | Dimensions (mm) |        |          |     |            |
|-----------------|-------|-----------------|--------|----------|-----|------------|
|                 |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 20100C-1.5D | ●     | 1.0             | 1.5    | 2.5      | 40  | 4          |
| 20150C-1.5D     | ●     | 1.5             | 2.3    | 3.3      | 40  | 4          |
| 20200C-1.5D     | ●     | 2.0             | 3.0    | 4.0      | 40  | 4          |
| 20250C-1.5D     | ●     | 2.5             | 3.8    | 4.8      | 40  | 4          |
| 20300C-1.5D     | ●     | 3.0             | 4.5    | 6.0      | 45  | 6          |
| GSX 20350C-1.5D | ●     | 3.5             | 5.3    | 6.8      | 45  | 6          |
| 20400C-1.5D     | ●     | 4.0             | 6.0    | 7.5      | 45  | 6          |
| 20450C-1.5D     | ●     | 4.5             | 6.8    | 8.3      | 50  | 6          |
| 20500C-1.5D     | ●     | 5.0             | 7.5    | 9.5      | 50  | 6          |
| 20550C-1.5D     | ●     | 5.5             | 8.3    | 10.3     | 50  | 6          |
| GSX 20600C-1.5D | ●     | 6.0             | 9.0    | —        | 50  | 6          |
| 20700C-1.5D     | ●     | 7.0             | 11.0   | 13.0     | 60  | 8          |
| 20800C-1.5D     | ●     | 8.0             | 12.0   | —        | 60  | 8          |
| 20900C-1.5D     | ●     | 9.0             | 14.0   | 16.0     | 70  | 10         |
| 21000C-1.5D     | ●     | 10.0            | 15.0   | —        | 70  | 10         |
| GSX 21200C-1.5D | ●     | 12.0            | 18.0   | —        | 75  | 12         |
| 21400C-1.5D     | ●     | 14.0            | 21.0   | 24.5     | 90  | 16         |
| 21500C-1.5D     | ●     | 15.0            | 23.0   | 26.5     | 90  | 16         |
| 21600C-1.5D     | ●     | 16.0            | 24.0   | —        | 90  | 16         |
| 22000C-1.5D     | ●     | 20.0            | 30.0   | —        | 100 | 20         |

Grade: ACF20

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 19,600                             | 250                | 19,600                             | 250                | 19,600                             | 250                | 18,300                             | 180                | 12,700                                                | 100                | 9,000                              | 60                 | 11,000                             | 70                 | 9,000                               | 50                 |
| 2.0           | 11,200                             | 340                | 11,200                             | 340                | 11,200                             | 340                | 10,500                             | 240                | 7,300                                                 | 130                | 5,300                              | 80                 | 6,400                              | 90                 | 5,300                               | 70                 |
| 4.0           | 6,400                              | 460                | 6,400                              | 460                | 6,400                              | 460                | 6,000                              | 320                | 4,200                                                 | 180                | 3,000                              | 110                | 3,600                              | 120                | 3,000                               | 90                 |
| 6.0           | 4,600                              | 560                | 4,600                              | 560                | 4,600                              | 560                | 4,300                              | 400                | 3,000                                                 | 210                | 2,200                              | 130                | 2,700                              | 140                | 2,200                               | 100                |
| 8.0           | 3,400                              | 560                | 3,400                              | 560                | 3,400                              | 560                | 3,200                              | 400                | 2,200                                                 | 210                | 1,600                              | 130                | 2,000                              | 140                | 1,600                               | 100                |
| 10.0          | 2,800                              | 560                | 2,800                              | 560                | 2,800                              | 560                | 2,600                              | 400                | 1,800                                                 | 210                | 1,300                              | 130                | 1,600                              | 140                | 1,300                               | 100                |
| 12.0          | 2,300                              | 560                | 2,300                              | 560                | 2,300                              | 560                | 2,200                              | 400                | 1,500                                                 | 210                | 1,100                              | 130                | 1,300                              | 140                | 1,100                               | 100                |
| 16.0          | 1,700                              | 450                | 1,700                              | 450                | 1,700                              | 450                | 1,600                              | 320                | 1,100                                                 | 180                | 800                                | 100                | 1,000                              | 110                | 800                                 | 85                 |
| 20.0          | 1,350                              | 380                | 1,350                              | 380                | 1,350                              | 380                | 1,300                              | 280                | 900                                                   | 160                | 650                                | 90                 | 800                                | 100                | 650                                 | 75                 |
| Standard      | 1.5D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.05D <sub>c</sub>                 |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Standard      | 1.0D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.02D <sub>c</sub>                 |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |

## Groove Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 19,600                             | 200                | 19,600                             | 250                | 19,600                             | 250                | 18,300                             | 180                | 12,700                                                | 100                | 9,000                              | 60                 | 11,000                             | 50                 | 4,500                               | 20                 |
| 2.0           | 11,200                             | 270                | 11,200                             | 340                | 11,200                             | 340                | 10,500                             | 240                | 7,300                                                 | 130                | 5,300                              | 80                 | 6,400                              | 65                 | 2,650                               | 25                 |
| 4.0           | 6,400                              | 370                | 6,400                              | 460                | 6,400                              | 460                | 6,000                              | 320                | 4,200                                                 | 180                | 3,000                              | 110                | 3,600                              | 80                 | 1,500                               | 35                 |
| 6.0           | 4,600                              | 450                | 4,600                              | 560                | 4,600                              | 560                | 4,300                              | 400                | 3,000                                                 | 210                | 2,200                              | 130                | 2,700                              | 100                | 1,100                               | 40                 |
| 8.0           | 3,400                              | 450                | 3,400                              | 560                | 3,400                              | 560                | 3,200                              | 400                | 2,200                                                 | 210                | 1,600                              | 130                | 2,000                              | 100                | 800                                 | 40                 |
| 10.0          | 2,800                              | 450                | 2,800                              | 560                | 2,800                              | 560                | 2,600                              | 400                | 1,800                                                 | 210                | 1,300                              | 130                | 1,600                              | 100                | 650                                 | 40                 |
| 12.0          | 2,300                              | 450                | 2,300                              | 560                | 2,300                              | 560                | 2,200                              | 400                | 1,500                                                 | 210                | 1,100                              | 130                | 1,300                              | 100                | 500                                 | 40                 |
| 16.0          | 1,700                              | 360                | 1,700                              | 450                | 1,700                              | 450                | 1,600                              | 320                | 1,100                                                 | 180                | 800                                | 100                | 1,000                              | 80                 | 400                                 | 35                 |
| 20.0          | 1,350                              | 300                | 1,350                              | 380                | 1,350                              | 380                | 1,300                              | 280                | 900                                                   | 160                | 650                                | 90                 | 800                                | 70                 | 320                                 | 30                 |
| Standard      | 0.2D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.5D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Standard      | 0.2D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.05D <sub>c</sub>                 |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Standard      | 0.2D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.2D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |



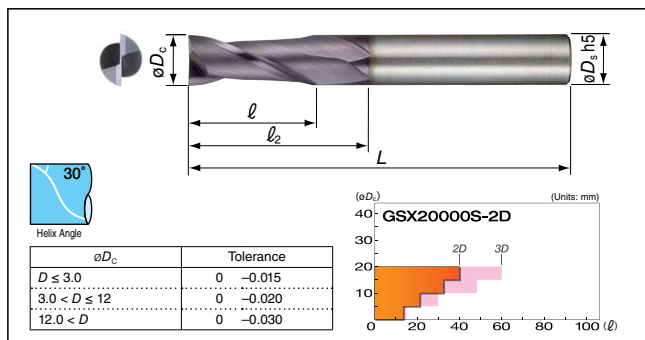


GSX MILL 2 Flute Endmills Sharp Edge

## GSX20000S-2D Type



|                |              |             |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## ■ Endmill Identification (GSXMILL Series Only)

## GSX 2 0150 S - 2D - S3

|             |              |          |                                 |                     |                |
|-------------|--------------|----------|---------------------------------|---------------------|----------------|
| ①           | ②            | ③        | ④                               | ⑤                   | ⑥              |
| Series Code | No. of Teeth | Diameter | Cutting Edge                    | Cutting Edge Length | Shank Diameter |
|             |              |          | (S: Sharp Edge<br>C: Gash Land) |                     |                |

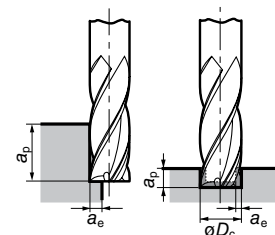
## ■ Body

| Cat. No.         | Stock | Dimensions (mm) |        |          |     |            |
|------------------|-------|-----------------|--------|----------|-----|------------|
|                  |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 20050S-2D    | ●     | 0.5             | 1.3    | 1.7      | 40  | 4          |
| 20100S-2D        | ●     | 1.0             | 2.5    | 3.5      | 40  | 4          |
| 20150S-2D        | ●     | 1.5             | 3.8    | 4.8      | 40  | 4          |
| 20150S-2D-S3     | ●     | 1.5             | 3.8    | 4.8      | 38  | 3          |
| 20200S-2D        | ●     | 2.0             | 5.0    | 6.0      | 40  | 4          |
| GSX 20200S-2D-S3 | ●     | 2.0             | 5.0    | 6.0      | 38  | 3          |
| 20250S-2D        | ●     | 2.5             | 6.3    | 7.3      | 40  | 4          |
| 20300S-2D        | ●     | 3.0             | 7.5    | 9.0      | 45  | 6          |
| 20300S-2D-S3     | ●     | 3.0             | 7.5    | —        | 38  | 3          |
| 20350S-2D        | ●     | 3.5             | 8.8    | 10.3     | 45  | 6          |
| GSX 20400S-2D    | ●     | 4.0             | 11.0   | 14.0     | 45  | 6          |
| 20400S-2D-S4     | ●     | 4.0             | 11.0   | —        | 45  | 4          |
| 20450S-2D        | ●     | 4.5             | 11.3   | 12.8     | 50  | 6          |
| 20500S-2D        | ●     | 5.0             | 13.0   | 19.6     | 50  | 6          |
| 20550S-2D        | ●     | 5.5             | 13.0   | 19.6     | 50  | 6          |
| GSX 20600S-2D    | ●     | 6.0             | 13.0   | —        | 50  | 6          |
| 20700S-2D        | ●     | 7.0             | 16.0   | 21.1     | 60  | 8          |
| 20800S-2D        | ●     | 8.0             | 19.0   | —        | 60  | 8          |
| 20900S-2D        | ●     | 9.0             | 19.0   | 24.1     | 70  | 10         |
| 21000S-2D        | ●     | 10.0            | 22.0   | —        | 70  | 10         |
| GSX 21200S-2D    | ●     | 12.0            | 26.0   | —        | 75  | 12         |
| 21600S-2D        | ●     | 16.0            | 32.0   | —        | 90  | 16         |
| 22000S-2D        | ●     | 20.0            | 40.0   | —        | 100 | 20         |

Grade: ACF20

## ■ Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blow when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
5. This series is not recommended for groove milling.
6. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## ● Side Milling

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
|                             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 16,600                             | 180                | 16,600                             | 180                | 16,600                             | 180                | 15,500                             | 130                | 10,500                                                | 70                 | 7,500                              | 45                 | 9,400                              | 50                 | 7,500                               | 35                 |
| 2.0                         | 9,500                              | 250                | 9,500                              | 250                | 9,500                              | 250                | 9,000                              | 200                | 6,200                                                 | 100                | 4,500                              | 60                 | 5,400                              | 70                 | 4,500                               | 50                 |
| 4.0                         | 5,400                              | 330                | 5,400                              | 330                | 5,400                              | 330                | 5,000                              | 250                | 3,400                                                 | 120                | 2,500                              | 75                 | 3,000                              | 90                 | 2,500                               | 65                 |
| 6.0                         | 4,000                              | 400                | 4,000                              | 400                | 4,000                              | 400                | 3,700                              | 300                | 2,550                                                 | 150                | 1,900                              | 100                | 2,300                              | 110                | 1,900                               | 80                 |
| 8.0                         | 3,000                              | 400                | 3,000                              | 400                | 3,000                              | 400                | 2,800                              | 300                | 1,900                                                 | 150                | 1,400                              | 100                | 1,700                              | 110                | 1,400                               | 80                 |
| 10.0                        | 2,400                              | 400                | 2,400                              | 400                | 2,400                              | 400                | 2,200                              | 300                | 1,500                                                 | 150                | 1,100                              | 100                | 1,300                              | 110                | 1,100                               | 80                 |
| 12.0                        | 2,000                              | 400                | 2,000                              | 400                | 2,000                              | 400                | 1,850                              | 300                | 1,300                                                 | 150                | 950                                | 100                | 1,100                              | 110                | 950                                 | 80                 |
| 16.0                        | 1,500                              | 330                | 1,500                              | 330                | 1,500                              | 330                | 1,400                              | 250                | 950                                                   | 120                | 700                                | 75                 | 850                                | 85                 | 700                                 | 60                 |
| 20.0                        | 1,200                              | 280                | 1,200                              | 280                | 1,200                              | 280                | 1,100                              | 220                | 750                                                   | 110                | 550                                | 65                 | 650                                | 75                 | 550                                 | 55                 |
| Standard Depth-of-cut $a_p$ | 2.0 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.01 $D_c$                         |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$          | 0.02 $D_c$                         |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.01 $D_c$                         |                    |                                    |                    |                                     |                    |

## ● Groove Finishing

| Work Material            |                | Structural Steel<br>SS                |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SUS316     |                       | Heat Resisive Steel<br>Titanium Alloy |                       |
|--------------------------|----------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
|                          |                | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)      | 1.0            | 16,600                                | 180                   | 16,600                                | 180                   | 16,600                                | 180                   | 15,500                                | 130                   | 10,500                                                      | 70                    | 7,500                                 | 45                    | 9,400                                 | 50                    | 7,500                                 | 35                    |
|                          | 2.0            | 9,500                                 | 250                   | 9,500                                 | 250                   | 9,500                                 | 250                   | 9,000                                 | 200                   | 6,200                                                       | 100                   | 4,500                                 | 60                    | 5,400                                 | 70                    | 4,500                                 | 50                    |
|                          | 4.0            | 5,400                                 | 330                   | 5,400                                 | 330                   | 5,400                                 | 330                   | 5,000                                 | 250                   | 3,400                                                       | 120                   | 2,500                                 | 75                    | 3,000                                 | 90                    | 2,500                                 | 65                    |
|                          | 6.0            | 4,000                                 | 400                   | 4,000                                 | 400                   | 4,000                                 | 400                   | 3,700                                 | 300                   | 2,550                                                       | 150                   | 1,900                                 | 100                   | 2,300                                 | 110                   | 1,900                                 | 80                    |
|                          | 8.0            | 3,000                                 | 400                   | 3,000                                 | 400                   | 3,000                                 | 400                   | 2,800                                 | 300                   | 1,900                                                       | 150                   | 1,400                                 | 100                   | 1,700                                 | 110                   | 1,400                                 | 80                    |
|                          | 10.0           | 2,400                                 | 400                   | 2,400                                 | 400                   | 2,400                                 | 400                   | 2,200                                 | 300                   | 1,500                                                       | 150                   | 1,100                                 | 100                   | 1,300                                 | 110                   | 1,100                                 | 80                    |
| 12.0                     | 2,000          | 400                                   | 2,000                 | 400                                   | 2,000                 | 400                                   | 1,850                 | 300                                   | 1,300                 | 150                                                         | 950                   | 100                                   | 1,100                 | 110                                   | 950                   | 80                                    |                       |
| 16.0                     | 1,500          | 330                                   | 1,500                 | 330                                   | 1,500                 | 330                                   | 1,400                 | 250                                   | 950                   | 120                                                         | 700                   | 75                                    | 850                   | 85                                    | 700                   | 60                                    |                       |
| 20.0                     | 1,200          | 280                                   | 1,200                 | 280                                   | 1,200                 | 280                                   | 1,100                 | 220                                   | 750                   | 110                                                         | 550                   | 65                                    | 650                   | 75                                    | 550                   | 55                                    |                       |
| Standard<br>Depth-of-cut | a <sub>p</sub> | 1.5D <sub>c</sub>                     |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                       |                       |
|                          | a <sub>e</sub> | 0.02D <sub>c</sub> Max.               |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                       |                       |

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

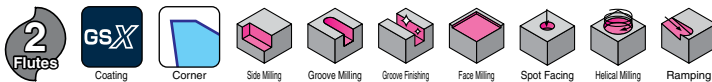
SUMIDIA Coat

Long Neck

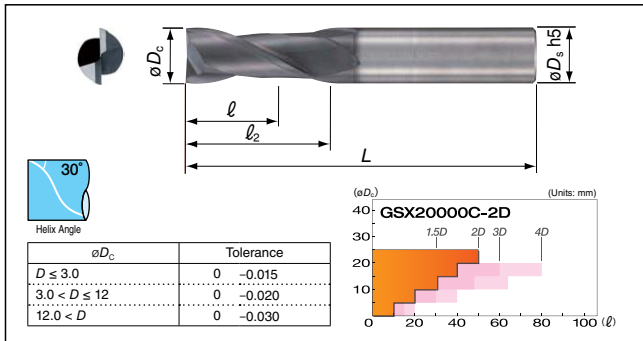
Uncoated

CBN PCD

## GSX20000C-3D Type

2  
Flutes

|        |        |       |          |          |          |           |          |           |          |        |          |      |
|--------|--------|-------|----------|----------|----------|-----------|----------|-----------|----------|--------|----------|------|
| Coated | Carbon | Alloy | Aluminum | Tempered | Hardened | Stainless | Ti Alloy | Cast Iron | Al Alloy | Copper | Graphite | CFRP |
| ○      | ○      | ○     | ○        | ○        | ○        | ○         | ○        | ○         | ○        | ○      | ○        | ○    |



## Endmill Identification (GSXMILL Series Only)

## GSX 2 0050 C - 2D

| ①           | ②            | ③        | ④                                               | ⑤                   |
|-------------|--------------|----------|-------------------------------------------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge<br>(S: Sharp Edge<br>C: Gash Land) | Cutting Edge Length |

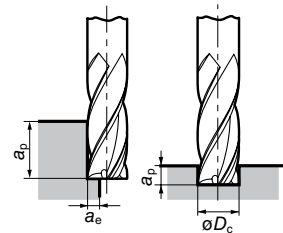
## Body

| Cat. No.      | Stock | Dimensions (mm) |      |       |     |            |
|---------------|-------|-----------------|------|-------|-----|------------|
|               |       | $\phi D_c$      | $l$  | $l_2$ | $L$ | $\phi D_s$ |
| GSX 20050C-2D | ●     | 0.5             | 1.0  | 1.4   | 40  | 4          |
| 20100C-2D     | ●     | 1.0             | 2.0  | 3.0   | 40  | 4          |
| 20150C-2D     | ●     | 1.5             | 3.0  | 4.0   | 40  | 4          |
| 20200C-2D     | ●     | 2.0             | 4.0  | 5.0   | 40  | 4          |
| 20250C-2D     | ●     | 2.5             | 5.0  | 6.0   | 40  | 4          |
| GSX 20300C-2D | ●     | 3.0             | 6.0  | 7.5   | 45  | 6          |
| 20350C-2D     | ●     | 3.5             | 7.0  | 8.5   | 45  | 6          |
| 20400C-2D     | ●     | 4.0             | 8.0  | 9.5   | 45  | 6          |
| 20450C-2D     | ●     | 4.5             | 9.0  | 10.5  | 50  | 6          |
| 20500C-2D     | ●     | 5.0             | 10.0 | 12.0  | 50  | 6          |
| GSX 20550C-2D | ●     | 5.5             | 11.0 | 13.0  | 50  | 6          |
| 20600C-2D     | ●     | 6.0             | 12.0 | —     | 50  | 6          |
| 20700C-2D     | ●     | 7.0             | 14.0 | 16.0  | 60  | 8          |
| 20800C-2D     | ●     | 8.0             | 16.0 | —     | 60  | 8          |
| 20900C-2D     | ●     | 9.0             | 18.0 | 20.0  | 70  | 10         |
| GSX 21000C-2D | ●     | 10.0            | 20.0 | —     | 70  | 10         |
| 21200C-2D     | ●     | 12.0            | 24.0 | —     | 75  | 12         |
| 21400C-2D     | ●     | 14.0            | 28.0 | 31.5  | 90  | 16         |
| 21500C-2D     | ●     | 15.0            | 30.0 | 33.5  | 90  | 16         |
| 21600C-2D     | ●     | 16.0            | 32.0 | —     | 90  | 16         |
| GSX 22000C-2D | ●     | 20.0            | 40.0 | —     | 100 | 20         |
| 22500C-2D     | ●     | 25.0            | 50.0 | —     | 120 | 25         |

Grade: ACF20

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

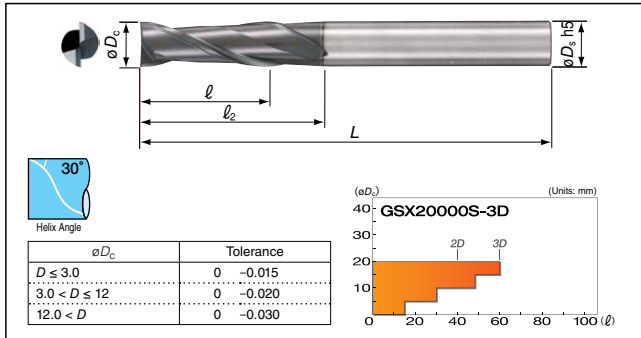
| Work Material       | Structural Steel<br>SS                |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SUS316     |                       | Heat Resistive Steel<br>Titanium Alloy |                       |  |
|---------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|--|
| Cond.               | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |  |
| D <sub>c</sub> (mm) |                                       |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |  |
| 1.0                 | 19,600                                | 250                   | 19,600                                | 250                   | 19,600                                | 250                   | 18,300                                | 180                   | 12,700                                                      | 100                   | 9,000                                 | 60                    | 11,000                                | 70                    | 9,000                                  | 50                    |  |
| 2.0                 | 11,200                                | 340                   | 11,200                                | 340                   | 11,200                                | 340                   | 10,500                                | 240                   | 7,300                                                       | 130                   | 5,300                                 | 80                    | 6,400                                 | 90                    | 5,300                                  | 70                    |  |
| 4.0                 | 6,400                                 | 460                   | 6,400                                 | 460                   | 6,400                                 | 460                   | 6,000                                 | 320                   | 4,200                                                       | 180                   | 3,000                                 | 110                   | 3,600                                 | 120                   | 3,000                                  | 90                    |  |
| 6.0                 | 4,600                                 | 560                   | 4,600                                 | 560                   | 4,600                                 | 560                   | 4,300                                 | 400                   | 3,000                                                       | 210                   | 2,200                                 | 130                   | 2,700                                 | 140                   | 2,200                                  | 100                   |  |
| 8.0                 | 3,400                                 | 560                   | 3,400                                 | 560                   | 3,400                                 | 560                   | 3,200                                 | 400                   | 2,200                                                       | 210                   | 1,600                                 | 130                   | 2,000                                 | 140                   | 1,600                                  | 100                   |  |
| 10.0                | 2,800                                 | 560                   | 2,800                                 | 560                   | 2,800                                 | 560                   | 2,600                                 | 400                   | 1,800                                                       | 210                   | 1,300                                 | 130                   | 1,600                                 | 140                   | 1,300                                  | 100                   |  |
| 12.0                | 2,300                                 | 560                   | 2,300                                 | 560                   | 2,300                                 | 560                   | 2,200                                 | 400                   | 1,500                                                       | 210                   | 1,100                                 | 130                   | 1,300                                 | 140                   | 1,100                                  | 100                   |  |
| 16.0                | 1,700                                 | 450                   | 1,700                                 | 450                   | 1,700                                 | 450                   | 1,600                                 | 320                   | 1,100                                                       | 180                   | 800                                   | 100                   | 1,000                                 | 110                   | 800                                    | 85                    |  |
| 20.0                | 1,350                                 | 380                   | 1,350                                 | 380                   | 1,350                                 | 380                   | 1,300                                 | 280                   | 900                                                         | 160                   | 650                                   | 90                    | 800                                   | 100                   | 650                                    | 75                    |  |
| 25.0                | 1,000                                 | 300                   | 1,000                                 | 300                   | 1,000                                 | 300                   | 1,000                                 | 220                   | 700                                                         | 120                   | 500                                   | 70                    | 640                                   | 80                    | 500                                    | 60                    |  |
| Standard            | a <sub>p</sub>                        | 1.5D <sub>c</sub>     |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       | 1.0D <sub>c</sub>     |                                       |                       |                                        |                       |  |
| Depth-of-cut        | a <sub>e</sub>                        | 0.05D <sub>c</sub>    |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       | 0.02D <sub>c</sub>    |                                       |                       |                                        |                       |  |

## Groove Milling

| Work Material         | Structural Steel<br>SS                |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SU316      |                       | Heat Resisive Steel<br>Titanium Alloy |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cond.                 | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)   | 1.0                                   | 19,600 200            | 19,600 250                            | 19,600 250            | 18,300 180                            | 12,700 100            | 9,000 60                              | 11,000 50             | 4,500 20                                                    |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 2.0                                   | 11,200 270            | 11,200 340                            | 11,200 340            | 10,500 240                            | 7,300 130             | 5,300 80                              | 6,400 65              | 2,650 25                                                    |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 4.0                                   | 6,400 370             | 6,400 460                             | 6,400 460             | 6,000 320                             | 4,200 180             | 3,000 110                             | 3,600 80              | 1,500 35                                                    |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 6.0                                   | 4,600 450             | 4,600 560                             | 4,600 560             | 4,300 400                             | 3,000 210             | 2,200 130                             | 2,700 100             | 1,100 40                                                    |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 8.0                                   | 3,400 450             | 3,400 560                             | 3,400 560             | 3,200 400                             | 2,200 210             | 1,600 130                             | 2,000 100             | 800 40                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
| 8 Flutes              | 10.0                                  | 2,800 450             | 2,800 560                             | 2,800 560             | 2,600 400                             | 1,800 210             | 1,300 130                             | 1,600 100             | 650 40                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 12.0                                  | 2,300 450             | 2,300 560                             | 2,300 560             | 2,200 400                             | 1,500 210             | 1,100 130                             | 1,300 100             | 500 40                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 16.0                                  | 1,700 360             | 1,700 450                             | 1,700 450             | 1,600 320                             | 1,100 180             | 800 100                               | 1,000 80              | 400 35                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 20.0                                  | 1,350 300             | 1,350 380                             | 1,350 380             | 1,300 280                             | 900 160               | 650 90                                | 800 70                | 320 30                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
|                       | 25.0                                  | 1,000 240             | 1,000 300                             | 1,000 300             | 1,000 220                             | 700 120               | 500 70                                | 640 55                | 250 25                                                      |                       |                                       |                       |                                       |                       |                                       |                       |
| Standard Depth-of-cut | a <sub>o</sub>                        | 0.2D <sub>c</sub>     |                                       | 0.5D <sub>c</sub>     |                                       | 0.2D <sub>c</sub>     |                                       | 0.05D <sub>c</sub>    |                                                             | 0.2D <sub>c</sub>     |                                       | 0.2D <sub>c</sub>     |                                       |                       |                                       |                       |



| Coated Carbide | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.      | Stock | Dimensions (mm) |        |          |     |            |
|---------------|-------|-----------------|--------|----------|-----|------------|
|               |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 20050S-3D | ●     | 0.5             | 1.5    | 1.9      | 40  | 4          |
| 20100S-3D     | ●     | 1.0             | 3.0    | 4.0      | 40  | 4          |
| 20150S-3D     | ●     | 1.5             | 4.5    | 5.5      | 40  | 4          |
| 20200S-3D     | ●     | 2.0             | 6.0    | 7.0      | 40  | 4          |
| 20250S-3D     | ●     | 2.5             | 7.5    | 8.5      | 40  | 4          |
| GSX 20300S-3D | ●     | 3.0             | 9.0    | 10.5     | 50  | 6          |
| 20400S-3D     | ●     | 4.0             | 12.0   | 13.5     | 50  | 6          |
| 20500S-3D     | ●     | 5.0             | 15.0   | 17.0     | 50  | 6          |
| 20600S-3D     | ●     | 6.0             | 18.0   | —        | 50  | 6          |
| 20800S-3D     | ●     | 8.0             | 24.0   | —        | 70  | 8          |
| GSX 21000S-3D | ●     | 10.0            | 30.0   | —        | 90  | 10         |
| 21200S-3D     | ●     | 12.0            | 36.0   | —        | 90  | 12         |
| 21600S-3D     | ●     | 16.0            | 48.0   | —        | 110 | 16         |
| 22000S-3D     | ●     | 20.0            | 60.0   | —        | 120 | 20         |

Grade: ACF20

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- This series is not recommended for grooving.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.

## Side Milling

| Work Material      | Structural Steel SS                                         |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|--------------------|-------------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.              | Spindle Speed (min <sup>-1</sup> )                          | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                                             |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                | 14,000                                                      | 140                | 14,000                             | 140                | 14,000                             | 140                | 13,200                             | 100                | 8,900                                                 | 50                 | 6,300                              | 30                 | 8,000                              | 35                 | 6,300                               | 25                 |
| 2.0                | 8,100                                                       | 180                | 8,100                              | 180                | 8,100                              | 180                | 7,600                              | 150                | 5,300                                                 | 90                 | 3,700                              | 45                 | 4,400                              | 50                 | 3,800                               | 40                 |
| 4.0                | 4,400                                                       | 240                | 4,400                              | 240                | 4,400                              | 240                | 4,000                              | 150                | 2,900                                                 | 110                | 1,900                              | 55                 | 2,200                              | 65                 | 1,900                               | 50                 |
| 6.0                | 2,900                                                       | 260                | 2,900                              | 260                | 2,900                              | 260                | 2,700                              | 180                | 2,100                                                 | 130                | 1,200                              | 65                 | 1,400                              | 75                 | 1,200                               | 60                 |
| 8.0                | 2,200                                                       | 230                | 2,200                              | 230                | 2,200                              | 230                | 2,000                              | 180                | 1,600                                                 | 130                | 900                                | 65                 | 1,100                              | 75                 | 900                                 | 60                 |
| 10.0               | 1,800                                                       | 220                | 1,800                              | 220                | 1,800                              | 220                | 1,600                              | 170                | 1,300                                                 | 130                | 750                                | 65                 | 850                                | 75                 | 750                                 | 60                 |
| 12.0               | 1,500                                                       | 200                | 1,500                              | 200                | 1,500                              | 200                | 1,300                              | 170                | 1,000                                                 | 130                | 630                                | 65                 | 700                                | 75                 | 600                                 | 60                 |
| 16.0               | 1,100                                                       | 170                | 1,100                              | 170                | 1,100                              | 170                | 1,000                              | 150                | 800                                                   | 110                | 450                                | 55                 | 550                                | 65                 | 450                                 | 50                 |
| 20.0               | 850                                                         | 160                | 850                                | 160                | 850                                | 160                | 800                                | 130                | 600                                                   | 100                | 350                                | 50                 | 400                                | 55                 | 350                                 | 45                 |
| Standard $a_p$     | 2.5 $D_c$                                                   |                    |                                    |                    |                                    |                    |                                    |                    | 2.0 $D_c$                                             |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$ | Below $\phi 3$ : 0.02 $D_c$ $\phi 3$ and above : 0.05 $D_c$ |                    |                                    |                    |                                    |                    |                                    |                    | 0.01 $D_c$                                            |                    |                                    |                    |                                    |                    |                                     |                    |

## Groove Milling

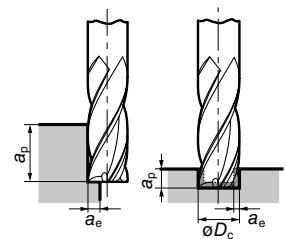
| Work Material      | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.              | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                | 14,000                             | 140                | 14,000                             | 140                | 14,000                             | 140                | 13,200                             | 100                | 8,900                                                 | 50                 | 6,300                              | 30                 | 8,000                              | 35                 | 6,300                               | 25                 |
| 2.0                | 8,100                              | 180                | 8,100                              | 180                | 8,100                              | 180                | 7,600                              | 150                | 5,300                                                 | 90                 | 3,700                              | 45                 | 4,400                              | 50                 | 3,800                               | 40                 |
| 4.0                | 4,400                              | 240                | 4,400                              | 240                | 4,400                              | 240                | 4,000                              | 150                | 2,900                                                 | 110                | 1,900                              | 55                 | 2,200                              | 65                 | 1,900                               | 50                 |
| 6.0                | 2,900                              | 260                | 2,900                              | 260                | 2,900                              | 260                | 2,700                              | 180                | 2,100                                                 | 130                | 1,200                              | 65                 | 1,400                              | 75                 | 1,200                               | 60                 |
| 8.0                | 2,200                              | 230                | 2,200                              | 230                | 2,200                              | 230                | 2,000                              | 180                | 1,600                                                 | 130                | 900                                | 65                 | 1,100                              | 75                 | 900                                 | 60                 |
| 10.0               | 1,800                              | 220                | 1,800                              | 220                | 1,800                              | 220                | 1,600                              | 170                | 1,300                                                 | 130                | 750                                | 65                 | 850                                | 75                 | 750                                 | 60                 |
| 12.0               | 1,500                              | 200                | 1,500                              | 200                | 1,500                              | 200                | 1,300                              | 170                | 1,000                                                 | 130                | 630                                | 65                 | 700                                | 75                 | 600                                 | 60                 |
| 16.0               | 1,100                              | 170                | 1,100                              | 170                | 1,100                              | 170                | 1,000                              | 150                | 800                                                   | 110                | 450                                | 55                 | 550                                | 65                 | 450                                 | 50                 |
| 20.0               | 850                                | 160                | 850                                | 160                | 850                                | 160                | 800                                | 130                | 600                                                   | 100                | 350                                | 50                 | 400                                | 55                 | 350                                 | 45                 |
| Standard $a_p$     | 1.5 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$ | 0.02 $D_c$ Max.                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |

## Endmill Identification (GSXMILL Series Only)

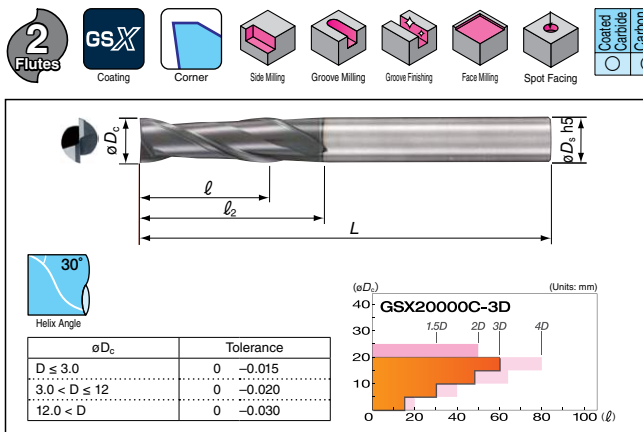
# GSX 2 0050 S - 3D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

(S: Sharp Edge    C: Gash Land)







|                |              |             |          |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Aluminum | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○        | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |

## ■ Body

| Cat. No.      | Stock | Dimensions (mm) |        |          |     |            |
|---------------|-------|-----------------|--------|----------|-----|------------|
|               |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 20100C-3D | ●     | 1.0             | 3.0    | 4.0      | 40  | 4          |
| 20150C-3D     | ●     | 1.5             | 4.5    | 5.5      | 40  | 4          |
| 20200C-3D     | ●     | 2.0             | 6.0    | 7.0      | 40  | 4          |
| 20250C-3D     | ●     | 2.5             | 7.5    | 8.5      | 40  | 4          |
| 20300C-3D     | ●     | 3.0             | 9.0    | 10.5     | 50  | 6          |
| GSX 20400C-3D | ●     | 4.0             | 12.0   | 13.5     | 50  | 6          |
| 20500C-3D     | ●     | 5.0             | 15.0   | 17.0     | 50  | 6          |
| 20600C-3D     | ●     | 6.0             | 18.0   | —        | 50  | 6          |
| 20800C-3D     | ●     | 8.0             | 24.0   | —        | 70  | 8          |
| 21000C-3D     | ●     | 10.0            | 30.0   | —        | 90  | 10         |
| GSX 21200C-3D | ●     | 12.0            | 36.0   | —        | 90  | 12         |
| 21600C-3D     | ●     | 16.0            | 48.0   | —        | 110 | 16         |
| 22000C-3D     | ●     | 20.0            | 60.0   | —        | 120 | 20         |

Grade: ACF20

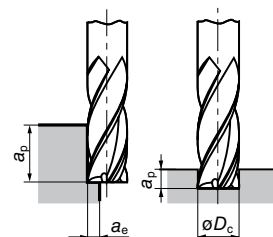
## ■ Endmill Identification (GSXMILL Series Only)

## GSX 2 0100 C - 3D

| ①           | ②            | ③        | ④                               | ⑤                   |
|-------------|--------------|----------|---------------------------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge                    | Cutting Edge Length |
|             |              |          | (S: Sharp Edge<br>C: Gash Land) |                     |

## ■ Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rare cases, chatter may occur in early milling stages, dissipating after 2m of cutting.
- If chatter is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## ● Side Milling

| Work Material | Structural Steel SS                                      |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|----------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> )                       | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0           | 16,600                                                   | 190                | 16,600                             | 190                | 16,600                             | 190                | 15,500                             | 140                | 10,500                                                | 70                 | 7,500                              | 45                 | 9,400                              | 50                 | 7,500                               | 35                 |
| 2.0           | 9,500                                                    | 250                | 9,500                              | 250                | 9,500                              | 250                | 9,000                              | 200                | 6,200                                                 | 120                | 4,500                              | 60                 | 5,200                              | 70                 | 4,500                               | 50                 |
| 4.0           | 5,200                                                    | 330                | 5,200                              | 330                | 5,200                              | 330                | 4,800                              | 200                | 3,400                                                 | 150                | 2,500                              | 75                 | 2,600                              | 90                 | 2,250                               | 65                 |
| 6.0           | 3,500                                                    | 360                | 3,500                              | 360                | 3,500                              | 360                | 3,200                              | 250                | 2,550                                                 | 170                | 1,500                              | 90                 | 1,700                              | 100                | 1,500                               | 80                 |
| 8.0           | 2,600                                                    | 320                | 2,600                              | 320                | 2,600                              | 320                | 2,400                              | 240                | 1,900                                                 | 170                | 1,100                              | 90                 | 1,300                              | 100                | 1,100                               | 80                 |
| 10.0          | 2,100                                                    | 300                | 2,100                              | 300                | 2,100                              | 300                | 1,900                              | 230                | 1,500                                                 | 170                | 900                                | 90                 | 1,000                              | 100                | 900                                 | 80                 |
| 12.0          | 1,750                                                    | 280                | 1,750                              | 280                | 1,750                              | 280                | 1,600                              | 230                | 1,250                                                 | 170                | 750                                | 90                 | 850                                | 100                | 750                                 | 80                 |
| 16.0          | 1,300                                                    | 240                | 1,300                              | 240                | 1,300                              | 240                | 1,200                              | 200                | 950                                                   | 150                | 550                                | 75                 | 650                                | 85                 | 550                                 | 65                 |
| 20.0          | 1,050                                                    | 220                | 1,050                              | 220                | 1,050                              | 220                | 950                                | 180                | 750                                                   | 140                | 450                                | 70                 | 500                                | 75                 | 450                                 | 60                 |
| Standard      | $2.5D_c$                                                 |                    |                                    |                    |                                    |                    |                                    |                    | $2.0D_c$                                              |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | Below $\phi 3$ : $0.05D_c$ $\phi 3$ and above : $0.1D_c$ |                    |                                    |                    |                                    |                    |                                    |                    | $0.02D_c$                                             |                    |                                    |                    |                                    |                    |                                     |                    |

## ● Groove Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0           | 16,600                             | 70                 | 16,600                             | 80                 | 16,600                             | 80                 | 15,500                             | 50                 | 10,500                                                | 50                 | 7,500                              | 35                 | 9,400                              | 30                 | 7,500                               | 10                 |
| 2.0           | 9,500                              | 80                 | 9,500                              | 100                | 9,500                              | 100                | 9,000                              | 90                 | 6,200                                                 | 60                 | 4,500                              | 45                 | 5,200                              | 40                 | 4,500                               | 15                 |
| 4.0           | 5,200                              | 120                | 5,200                              | 150                | 5,200                              | 150                | 4,800                              | 120                | 3,400                                                 | 80                 | 2,500                              | 50                 | 2,600                              | 50                 | 2,250                               | 20                 |
| 6.0           | 3,500                              | 140                | 3,500                              | 170                | 3,500                              | 170                | 3,200                              | 130                | 2,550                                                 | 100                | 1,500                              | 50                 | 1,700                              | 60                 | 1,500                               | 25                 |
| 8.0           | 2,600                              | 140                | 2,600                              | 160                | 2,600                              | 160                | 2,400                              | 130                | 1,900                                                 | 100                | 1,100                              | 50                 | 1,300                              | 60                 | 1,100                               | 25                 |
| 10.0          | 2,100                              | 130                | 2,100                              | 150                | 2,100                              | 150                | 1,900                              | 120                | 1,500                                                 | 90                 | 900                                | 50                 | 1,000                              | 60                 | 900                                 | 25                 |
| 12.0          | 1,750                              | 130                | 1,750                              | 150                | 1,750                              | 150                | 1,600                              | 120                | 1,250                                                 | 90                 | 750                                | 50                 | 850                                | 60                 | 750                                 | 25                 |
| 16.0          | 1,300                              | 110                | 1,300                              | 130                | 1,300                              | 130                | 1,200                              | 110                | 950                                                   | 80                 | 550                                | 45                 | 650                                | 50                 | 550                                 | 20                 |
| 20.0          | 1,050                              | 100                | 1,050                              | 120                | 1,050                              | 120                | 950                                | 100                | 750                                                   | 70                 | 450                                | 40                 | 500                                | 40                 | 450                                 | 15                 |
| Standard      | $0.1D_c$                           |                    | $0.2D_c$                           |                    | $0.05D_c$                          |                    | $0.1D_c$                           |                    | $0.05D_c$                                             |                    | $0.1D_c$                           |                    | $0.1D_c$                           |                    | $0.1D_c$                            |                    |

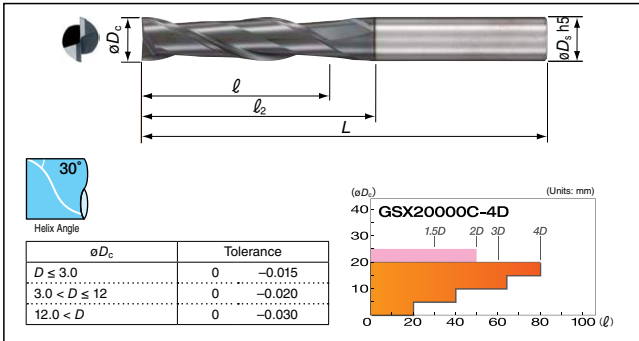


GSX MILL Endmills (2 Flutes)

# GSX20000C-4D Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.             | Stock | Dimensions (mm) |      |       |     |            |
|----------------------|-------|-----------------|------|-------|-----|------------|
|                      |       | $\phi D_c$      | $l$  | $l_2$ | $L$ | $\phi D_s$ |
| <b>GSX 20100C-4D</b> | ●     | 1.0             | 4.0  | 5.0   | 40  | 4          |
| <b>20150C-4D</b>     | ●     | 1.5             | 6.0  | 7.0   | 40  | 4          |
| <b>20200C-4D</b>     | ●     | 2.0             | 8.0  | 9.0   | 40  | 4          |
| <b>20250C-4D</b>     | ●     | 2.5             | 10.0 | 11.0  | 50  | 4          |
| <b>20300C-4D</b>     | ●     | 3.0             | 12.0 | 13.5  | 50  | 6          |
| <b>GSX 20400C-4D</b> | ●     | 4.0             | 16.0 | 17.5  | 50  | 6          |
| <b>20500C-4D</b>     | ●     | 5.0             | 20.0 | 22.0  | 60  | 6          |
| <b>20600C-4D</b>     | ●     | 6.0             | 24.0 | —     | 60  | 6          |
| <b>20800C-4D</b>     | ●     | 8.0             | 32.0 | —     | 80  | 8          |
| <b>21000C-4D</b>     | ●     | 10.0            | 40.0 | —     | 90  | 10         |
| <b>GSX 21200C-4D</b> | ●     | 12.0            | 48.0 | —     | 100 | 12         |
| <b>21600C-4D</b>     | ●     | 16.0            | 64.0 | —     | 120 | 16         |
| <b>22000C-4D</b>     | ●     | 20.0            | 80.0 | —     | 140 | 20         |

Grade: ACF20

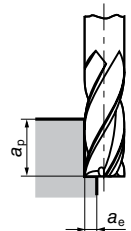
## Endmill Identification (GSXMILL Series Only)

### GSX 2 0100 C - 4D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length  
(S: Sharp Edge    C: Gash Land)

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rear cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- This series is not recommended for grooving.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 9,000                              | 130                | 9,000                              | 130                | 9,000                              | 130                | 7,000                              | 95                 | 6,500                                                 | 50                 | 4,500                              | 30                 | 5,400                              | 40                 | 4,500                               | 25                 |
| 2.0           | 4,500                              | 180                | 4,500                              | 180                | 4,500                              | 180                | 3,500                              | 120                | 3,200                                                 | 70                 | 2,300                              | 40                 | 2,700                              | 50                 | 2,300                               | 35                 |
| 4.0           | 2,250                              | 240                | 2,250                              | 240                | 2,250                              | 240                | 1,750                              | 160                | 1,600                                                 | 95                 | 1,200                              | 60                 | 1,350                              | 65                 | 1,200                               | 40                 |
| 6.0           | 1,500                              | 300                | 1,500                              | 300                | 1,500                              | 300                | 1,150                              | 170                | 1,050                                                 | 110                | 800                                | 70                 | 900                                | 70                 | 800                                 | 50                 |
| 8.0           | 1,100                              | 260                | 1,100                              | 260                | 1,100                              | 260                | 850                                | 170                | 800                                                   | 110                | 600                                | 70                 | 660                                | 70                 | 600                                 | 50                 |
| 10.0          | 900                                | 250                | 900                                | 250                | 900                                | 250                | 700                                | 160                | 650                                                   | 110                | 460                                | 70                 | 540                                | 70                 | 460                                 | 50                 |
| 12.0          | 750                                | 240                | 750                                | 240                | 750                                | 240                | 580                                | 160                | 520                                                   | 110                | 400                                | 70                 | 450                                | 70                 | 400                                 | 50                 |
| 16.0          | 550                                | 200                | 550                                | 200                | 550                                | 200                | 440                                | 140                | 400                                                   | 95                 | 300                                | 55                 | 330                                | 60                 | 300                                 | 45                 |
| 20.0          | 450                                | 180                | 450                                | 180                | 450                                | 180                | 350                                | 120                | 320                                                   | 85                 | 240                                | 45                 | 270                                | 50                 | 240                                 | 40                 |
| Standard      | 3.5 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.08 $D_c$                         |                    |                                    |                    |                                    |                    |                                    |                    | 0.04 $D_c$                                            |                    |                                    |                    |                                    |                    |                                     |                    |

I Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

PCD

## SSM 2000ZX Type

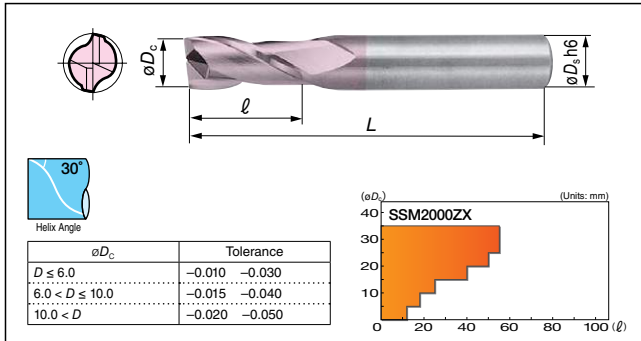
2  
Flutes2  
FlutesZX  
Coating

Corner

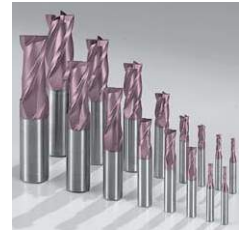
Side Milling

Groove Finishing

| Coated Carbide | Carbon Steel | Alloy Steel  | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy     | Copper Alloy | Graphite     | CFRP         |
|----------------|--------------|--------------|--------------------|----------------|----------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| ○              | ◎            | ◎            | ◎                  | ◎              | ◎              | ◎               | ◎            | ◎            | ◎            | ◎            | ◎            | ◎            |
| 45 to 55 HRC   | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC       | 45 to 55 HRC   | 45 to 55 HRC   | 45 to 55 HRC    | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC |



- Excellent edge sharpness and good chip evacuation
- General purpose type with a wide application range from finishing to general machining

Body (Diameter  $\phi 1.0$  to 11.5mm)

| Cat. No.   | Stock | Dimensions (mm) |     |     |            |
|------------|-------|-----------------|-----|-----|------------|
|            |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| SSM 2010ZX | ▲     | 1.0             | 3   | 40  | 4          |
| 2015ZX     | ▲     | 1.5             | 5   | 40  | 4          |
| 2020ZX     | ▲     | 2.0             | 6   | 40  | 4          |
| 2021ZX     | *     | 2.1             | 6   | 40  | 4          |
| 2022ZX     | *     | 2.2             | 6   | 40  | 4          |
| SSM 2023ZX | *     | 2.3             | 6   | 40  | 4          |
| 2024ZX     | *     | 2.4             | 6   | 40  | 4          |
| 2025ZX     | ▲     | 2.5             | 8   | 40  | 4          |
| 2026ZX     | *     | 2.6             | 8   | 40  | 4          |
| 2027ZX     | *     | 2.7             | 8   | 40  | 4          |
| SSM 2028ZX | *     | 2.8             | 8   | 40  | 4          |
| 2029ZX     | *     | 2.9             | 8   | 40  | 4          |
| 2030ZX     | ▲     | 3.0             | 8   | 45  | 6          |
| 2035ZX     | ▲     | 3.5             | 8   | 45  | 6          |
| 2040ZX     | ▲     | 4.0             | 10  | 45  | 6          |
| SSM 2045ZX | ▲     | 4.5             | 10  | 45  | 6          |
| 2050ZX     | ▲     | 5.0             | 12  | 50  | 6          |
| 2055ZX     | ▲     | 5.5             | 12  | 50  | 6          |
| 2060ZX     | ▲     | 6.0             | 12  | 50  | 6          |
| 2065ZX     | ▲     | 6.5             | 12  | 50  | 8          |
| SSM 2070ZX | ▲     | 7.0             | 15  | 55  | 8          |
| 2075ZX     | ▲     | 7.5             | 15  | 55  | 8          |
| 2080ZX     | ▲     | 8.0             | 15  | 55  | 8          |
| 2085ZX     | ▲     | 8.5             | 15  | 55  | 10         |
| 2090ZX     | ▲     | 9.0             | 15  | 55  | 10         |
| SSM 2095ZX | ▲     | 9.5             | 15  | 55  | 10         |
| 2100ZX     | ▲     | 10.0            | 18  | 65  | 10         |
| 2105ZX     | *     | 10.5            | 18  | 70  | 12         |
| 2110ZX     | ▲     | 11.0            | 18  | 70  | 12         |
| 2115ZX     | *     | 11.5            | 18  | 70  | 12         |

Grade: ACZ50

Body (Diameter  $\phi 12.0$  to 32.0mm)

| Cat. No.   | Stock | Dimensions (mm) |     |     |            |
|------------|-------|-----------------|-----|-----|------------|
|            |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| SSM 2120ZX | ▲     | 12.0            | 18  | 70  | 12         |
| 2125ZX     | *     | 12.5            | 20  | 80  | 16         |
| 2130ZX     | ▲     | 13.0            | 20  | 80  | 16         |
| 2140ZX     | ▲     | 14.0            | 20  | 80  | 16         |
| 2150ZX     | ▲     | 15.0            | 25  | 80  | 16         |
| SSM 2160ZX | ▲     | 16.0            | 35  | 90  | 16         |
| 2170ZX     | *     | 17.0            | 35  | 90  | 20         |
| 2180ZX     | ▲     | 18.0            | 40  | 105 | 20         |
| 2190ZX     | *     | 19.0            | 40  | 105 | 20         |
| 2200ZX     | ▲     | 20.0            | 40  | 105 | 20         |
| SSM 2210ZX | *     | 21.0            | 40  | 105 | 25         |
| 2220ZX     | *     | 22.0            | 40  | 105 | 25         |
| 2230ZX     | *     | 23.0            | 45  | 115 | 25         |
| 2240ZX     | *     | 24.0            | 45  | 115 | 25         |
| 2250ZX     | ▲     | 25.0            | 50  | 120 | 25         |
| SSM 2300ZX | ▲     | 30.0            | 55  | 130 | 32         |
| 2320ZX     | ▲     | 32.0            | 55  | 130 | 32         |

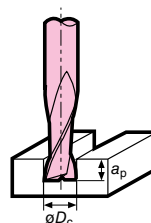
Grade: ACZ50

## Recommended Cutting Conditions

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## Groove Milling

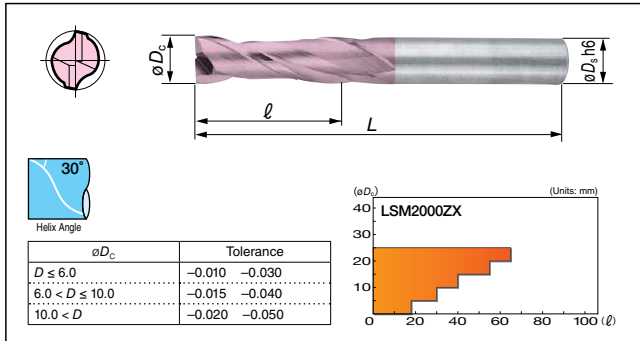
| Work Material                                   | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    | Stainless Steel Titanium Alloy     |                    |
|-------------------------------------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                                                 | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| 1.0                                             | 19,400                                  | 140                | 13,750                                  | 100                | 23,200                             | 170                | 12,100                             | 70                 |
| 2.0                                             | 10,650                                  | 150                | 7,700                                   | 100                | 12,800                             | 180                | 6,950                              | 80                 |
| 3.0                                             | 7,600                                   | 200                | 5,850                                   | 110                | 9,100                              | 240                | 4,850                              | 85                 |
| 4.0                                             | 5,950                                   | 240                | 4,600                                   | 140                | 7,100                              | 300                | 3,850                              | 100                |
| 6.0                                             | 4,400                                   | 300                | 3,200                                   | 140                | 5,300                              | 390                | 2,750                              | 110                |
| 8.0                                             | 3,300                                   | 300                | 2,400                                   | 140                | 4,000                              | 380                | 2,100                              | 110                |
| 10.0                                            | 2,650                                   | 280                | 1,850                                   | 140                | 3,200                              | 360                | 1,650                              | 105                |
| 12.0                                            | 2,200                                   | 260                | 1,550                                   | 140                | 2,650                              | 320                | 1,400                              | 105                |
| 16.0                                            | 1,650                                   | 210                | 1,200                                   | 130                | 2,000                              | 260                | 1,050                              | 90                 |
| 20.0                                            | 1,300                                   | 170                | 950                                     | 110                | 1,600                              | 220                | 850                                | 80                 |
| 25.0                                            | 1,050                                   | 150                | 750                                     | 100                | 1,250                              | 180                | 650                                | 65                 |
| 32.0                                            | 830                                     | 130                | 600                                     | 100                | 1,000                              | 150                | 520                                | 55                 |
| Standard                                        | 0.3D <sub>c</sub>                       |                    | 0.3D <sub>c</sub>                       |                    | 0.3D <sub>c</sub>                  |                    | 0.3D <sub>c</sub>                  |                    |
| Below $\phi 3$ : a <sub>p</sub>                 | 0.3D <sub>c</sub>                       |                    | 0.3D <sub>c</sub>                       |                    | 0.3D <sub>c</sub>                  |                    | 0.3D <sub>c</sub>                  |                    |
| Depth-of-cut $\phi 3$ and above: a <sub>p</sub> | 0.5D <sub>c</sub>                       |                    | 0.5D <sub>c</sub>                       |                    | 0.5D <sub>c</sub>                  |                    | 0.5D <sub>c</sub>                  |                    |







|                |              |             |                    |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ◎            | ◎           | ◎                  | ◎              | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



- SSM-ZX series, long type
- For deep endmilling

## Body (Diameter $\phi 1.0$ to $14.0\text{mm}$ )

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LSM 2010ZX | *     | 1.0             | 5      | 45  | 4          |
| 2015ZX     | *     | 1.5             | 7      | 45  | 4          |
| 2020ZX     | *     | 2.0             | 9      | 45  | 4          |
| 2025ZX     | *     | 2.5             | 12     | 45  | 4          |
| 2030ZX     | ▲     | 3.0             | 12     | 50  | 6          |
| LSM 2035ZX | *     | 3.5             | 12     | 50  | 6          |
| 2040ZX     | ▲     | 4.0             | 15     | 50  | 6          |
| 2045ZX     | *     | 4.5             | 15     | 50  | 6          |
| 2050ZX     | ▲     | 5.0             | 18     | 55  | 6          |
| 2055ZX     | *     | 5.5             | 18     | 55  | 6          |
| LSM 2060ZX | ▲     | 6.0             | 18     | 55  | 6          |
| 2065ZX     | *     | 6.5             | 18     | 55  | 8          |
| 2070ZX     | ▲     | 7.0             | 25     | 65  | 8          |
| 2075ZX     | *     | 7.5             | 25     | 65  | 8          |
| 2080ZX     | ▲     | 8.0             | 25     | 65  | 8          |
| LSM 2085ZX | *     | 8.5             | 25     | 65  | 10         |
| 2090ZX     | ▲     | 9.0             | 25     | 65  | 10         |
| 2095ZX     | *     | 9.5             | 25     | 65  | 10         |
| 2100ZX     | ▲     | 10.0            | 30     | 75  | 10         |
| 2105ZX     | *     | 10.5            | 30     | 80  | 12         |
| LSM 2110ZX | ▲     | 11.0            | 30     | 80  | 12         |
| 2115ZX     | *     | 11.5            | 30     | 80  | 12         |
| 2120ZX     | ▲     | 12.0            | 30     | 80  | 12         |
| 2130ZX     | ▲     | 13.0            | 35     | 95  | 16         |
| 2140ZX     | ▲     | 14.0            | 40     | 95  | 16         |

Grade: ACZ50

## Body (Diameter $\phi 15.0$ to $25.0\text{mm}$ )

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LSM 2150ZX | ▲     | 15.0            | 40     | 95  | 16         |
| 2160ZX     | ▲     | 16.0            | 50     | 105 | 16         |
| 2170ZX     | *     | 17.0            | 50     | 105 | 20         |
| 2180ZX     | ▲     | 18.0            | 50     | 115 | 20         |
| 2190ZX     | *     | 19.0            | 55     | 120 | 20         |
| LSM 2200ZX | ▲     | 20.0            | 55     | 120 | 20         |
| 2240ZX     | *     | 24.0            | 65     | 140 | 25         |
| 2250ZX     | ▲     | 25.0            | 65     | 140 | 25         |

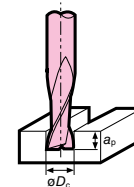
Grade: ACZ50

## Recommended Cutting Conditions

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## Groove Milling

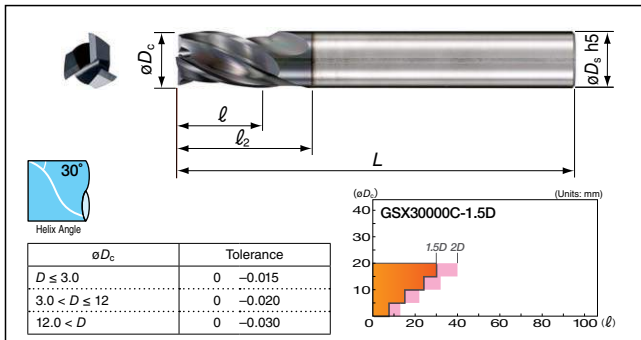
| Work Material                          | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    | Stainless Steel Titanium Alloy     |                    |
|----------------------------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cutting Conditions                     |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| $D_c$ (mm)                             | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| 1.0                                    | 19,500                                  | 130                | 14,000                                  | 100                | 23,000                             | 160                | 12,100                             | 70                 |
| 2.0                                    | 10,500                                  | 140                | 7,700                                   | 100                | 13,000                             | 180                | 7,000                              | 80                 |
| 3.0                                    | 7,600                                   | 190                | 5,800                                   | 110                | 9,100                              | 220                | 4,800                              | 80                 |
| 4.0                                    | 6,000                                   | 230                | 4,600                                   | 140                | 7,100                              | 280                | 3,900                              | 100                |
| 6.0                                    | 4,400                                   | 300                | 3,200                                   | 140                | 5,300                              | 350                | 2,700                              | 110                |
| 8.0                                    | 3,300                                   | 290                | 2,400                                   | 140                | 4,000                              | 340                | 2,000                              | 110                |
| 10.0                                   | 2,600                                   | 275                | 1,900                                   | 140                | 3,200                              | 330                | 1,600                              | 105                |
| 12.0                                   | 2,200                                   | 275                | 1,600                                   | 140                | 2,600                              | 330                | 1,350                              | 105                |
| 16.0                                   | 1,650                                   | 220                | 1,200                                   | 130                | 2,000                              | 260                | 1,000                              | 90                 |
| 20.0                                   | 1,300                                   | 190                | 1,000                                   | 120                | 1,600                              | 220                | 800                                | 80                 |
| 25.0                                   | 1,050                                   | 160                | 770                                     | 105                | 1,250                              | 200                | 650                                | 70                 |
| Standard                               | $0.3D_c$                                |                    | $0.3D_c$                                |                    | $0.3D_c$                           |                    | $0.3D_c$                           |                    |
| Depth-of-cut $\phi 3$ and above: $a_p$ | $0.5D_c$                                |                    | $0.5D_c$                                |                    | $0.5D_c$                           |                    | $0.5D_c$                           |                    |



## GSX 30000C-1.5D Type



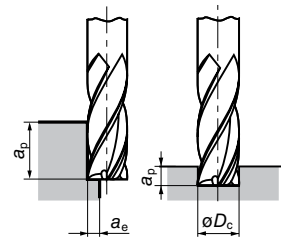
|  |                |              |             |                                                   |                 |                                                   |           |          |              |          |      |
|--|----------------|--------------|-------------|---------------------------------------------------|-----------------|---------------------------------------------------|-----------|----------|--------------|----------|------|
|  | Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel                                    | Stainless Steel | Ti Alloy                                          | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|  | ○              | ◎            | ◎           | ◎<br>45 to 55 HRC<br>55 to 60 HRC<br>60 to 65 HRC | ◎               | ◎<br>45 to 55 HRC<br>55 to 60 HRC<br>60 to 65 HRC | ○         | ○        | ○            | ○        | ○    |



# GSX 3 0100 C - 1.5D

| Cat. No.               | Stock | Dimensions (mm)   |        |          |     |                   |
|------------------------|-------|-------------------|--------|----------|-----|-------------------|
|                        |       | $\varnothing D_c$ | $\ell$ | $\ell_2$ | $L$ | $\varnothing D_s$ |
| <b>GSX 30100C-1.5D</b> | ●     | 1.0               | 1.5    | 2.5      | 40  | 4                 |
| <b>30150C-1.5D</b>     | ●     | 1.5               | 2.3    | 3.3      | 40  | 4                 |
| <b>30200C-1.5D</b>     | ●     | 2.0               | 3.0    | 4.0      | 40  | 4                 |
| <b>30250C-1.5D</b>     | ●     | 2.5               | 3.8    | 4.8      | 40  | 4                 |
| <b>30300C-1.5D</b>     | ●     | 3.0               | 4.5    | 6.0      | 45  | 6                 |
| <b>GSX 30400C-1.5D</b> | ●     | 4.0               | 6.0    | 7.5      | 45  | 6                 |
| <b>30500C-1.5D</b>     | ●     | 5.0               | 7.5    | 9.5      | 50  | 6                 |
| <b>30600C-1.5D</b>     | ●     | 6.0               | 9.0    | —        | 50  | 6                 |
| <b>30700C-1.5D</b>     | ●     | 7.0               | 11.0   | 13.0     | 60  | 8                 |
| <b>30800C-1.5D</b>     | ●     | 8.0               | 12.0   | —        | 60  | 8                 |
| <b>GSX 30900C-1.5D</b> | ●     | 9.0               | 14.0   | 16.0     | 70  | 10                |
| <b>31000C-1.5D</b>     | ●     | 10.0              | 15.0   | —        | 70  | 10                |
| <b>31200C-1.5D</b>     | ●     | 12.0              | 18.0   | —        | 75  | 12                |
| <b>31600C-1.5D</b>     |       | 16.0              | 24.0   | —        | 90  | 16                |
| <b>32000C-1.5D</b>     |       | 20.0              | 30.0   | —        | 100 | 20                |

| ①           | ②            | ③        | ④                                               | ⑤                   |
|-------------|--------------|----------|-------------------------------------------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge<br>(S: Sharp Edge<br>C: Gash Land) | Cutting Edge Length |



| Work Material            | Structural Steel<br>SS                |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SU316      |                       | Heat Resistant Steel<br>Titanium Alloy |                       |
|--------------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|
| Cond.                    |                                       |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |
| $D_c$ (mm)               | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |
| 1.0                      | 19,600                                | 300                   | 19,600                                | 300                   | 19,600                                | 300                   | 18,300                                | 210                   | 12,700                                                      | 130                   | 9,000                                 | 80                    | 11,000                                | 90                    | 9,000                                  | 65                    |
| 2.0                      | 11,200                                | 410                   | 11,200                                | 410                   | 11,200                                | 410                   | 10,500                                | 280                   | 7,300                                                       | 170                   | 5,300                                 | 100                   | 6,400                                 | 120                   | 5,300                                  | 90                    |
| 4.0                      | 6,400                                 | 550                   | 6,400                                 | 550                   | 6,400                                 | 550                   | 6,000                                 | 370                   | 4,200                                                       | 230                   | 3,000                                 | 140                   | 3,600                                 | 150                   | 3,000                                  | 120                   |
| 6.0                      | 4,600                                 | 670                   | 4,600                                 | 670                   | 4,600                                 | 670                   | 4,300                                 | 460                   | 3,000                                                       | 270                   | 2,200                                 | 170                   | 2,700                                 | 180                   | 2,200                                  | 130                   |
| 8.0                      | 3,400                                 | 670                   | 3,400                                 | 670                   | 3,400                                 | 670                   | 3,200                                 | 460                   | 2,200                                                       | 270                   | 1,600                                 | 170                   | 2,000                                 | 180                   | 1,600                                  | 130                   |
| 10.0                     | 2,800                                 | 670                   | 2,800                                 | 670                   | 2,800                                 | 670                   | 2,600                                 | 460                   | 1,800                                                       | 270                   | 1,300                                 | 170                   | 1,600                                 | 180                   | 1,300                                  | 130                   |
| 12.0                     | 2,300                                 | 670                   | 2,300                                 | 670                   | 2,300                                 | 670                   | 2,200                                 | 460                   | 1,500                                                       | 270                   | 1,100                                 | 170                   | 1,300                                 | 180                   | 1,100                                  | 130                   |
| 16.0                     | 1,700                                 | 550                   | 1,700                                 | 550                   | 1,700                                 | 550                   | 1,600                                 | 370                   | 1,100                                                       | 230                   | 800                                   | 140                   | 1,000                                 | 150                   | 800                                    | 100                   |
| 20.0                     | 1,350                                 | 490                   | 1,350                                 | 490                   | 1,350                                 | 490                   | 1,300                                 | 330                   | 900                                                         | 210                   | 650                                   | 120                   | 800                                   | 130                   | 650                                    | 90                    |
| Standard<br>Depth-of-cut | $a_p$                                 | $1.5D_c$<br>$0.05D_c$ |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       | $1.0D_c$<br>$0.02D_c$ |                                       |                       |                                        |                       |

| Work Material         | Structural Steel<br>SS                |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SUS316     |                       | Heat Resistant Steel<br>Titanium Alloy |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|
| Cond.                 | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)   |                                       |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |
| 1.0                   | 19,600                                | 240                   | 19,600                                | 300                   | 19,600                                | 300                   | 18,300                                | 210                   | 12,700                                                      | 130                   | 9,000                                 | 80                    | 11,000                                | 65                    | 4,500                                  | 25                    |
| 2.0                   | 11,200                                | 320                   | 11,200                                | 410                   | 11,200                                | 410                   | 10,500                                | 280                   | 7,300                                                       | 170                   | 5,300                                 | 100                   | 6,400                                 | 85                    | 2,650                                  | 35                    |
| 4.0                   | 6,400                                 | 540                   | 6,400                                 | 550                   | 6,400                                 | 550                   | 6,000                                 | 370                   | 4,200                                                       | 230                   | 3,000                                 | 140                   | 3,600                                 | 100                   | 1,500                                  | 50                    |
| 6.0                   | 4,600                                 | 450                   | 4,600                                 | 670                   | 4,600                                 | 670                   | 4,300                                 | 460                   | 3,000                                                       | 270                   | 2,200                                 | 170                   | 2,650                                 | 130                   | 1,150                                  | 55                    |
| 8.0                   | 3,400                                 | 540                   | 3,400                                 | 670                   | 3,400                                 | 670                   | 3,200                                 | 460                   | 2,200                                                       | 270                   | 1,600                                 | 170                   | 2,000                                 | 130                   | 800                                    | 55                    |
| 10.0                  | 2,800                                 | 540                   | 2,800                                 | 670                   | 2,800                                 | 670                   | 2,600                                 | 460                   | 1,800                                                       | 270                   | 1,300                                 | 170                   | 1,600                                 | 130                   | 650                                    | 55                    |
| 12.0                  | 2,300                                 | 540                   | 2,300                                 | 670                   | 2,300                                 | 670                   | 2,200                                 | 460                   | 1,500                                                       | 270                   | 1,100                                 | 170                   | 1,300                                 | 130                   | 500                                    | 55                    |
| 16.0                  | 1,700                                 | 440                   | 1,700                                 | 550                   | 1,700                                 | 550                   | 1,600                                 | 370                   | 1,100                                                       | 230                   | 800                                   | 140                   | 1,000                                 | 110                   | 400                                    | 45                    |
| 20.0                  | 1,350                                 | 390                   | 1,350                                 | 490                   | 1,350                                 | 490                   | 1,300                                 | 330                   | 900                                                         | 210                   | 650                                   | 120                   | 800                                   | 90                    | 320                                    | 40                    |
| Standard Depth of Cut | a <sub>n</sub>                        | 0.2D <sub>c</sub>     |                                       |                       |                                       | 0.5D <sub>c</sub>     |                                       |                       |                                                             | 0.2D <sub>c</sub>     |                                       | 0.05D <sub>c</sub>    |                                       |                       | 0.2D <sub>c</sub>                      |                       |

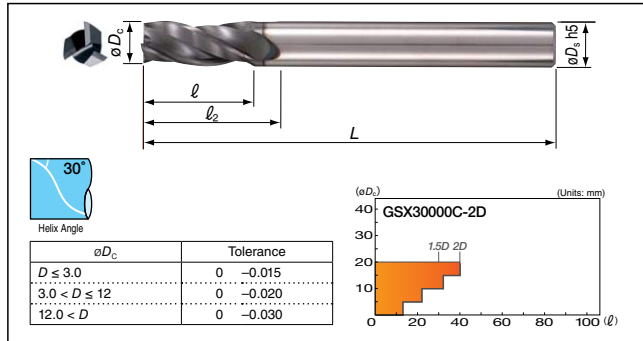


GSX MILL Endmills (3 Flutes)

## GSX 30000C-2D Type



| Coated Carbide | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.      | Stock | Dimensions (mm) |        |          |     |            |
|---------------|-------|-----------------|--------|----------|-----|------------|
|               |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 30100C-2D | ●     | 1.0             | 2.5    | 3.5      | 40  | 4          |
| 30150C-2D     | ●     | 1.5             | 3.8    | 4.8      | 40  | 4          |
| 30200C-2D     | ●     | 2.0             | 5.0    | 6.0      | 40  | 4          |
| 30250C-2D     | ●     | 2.5             | 6.3    | 7.3      | 40  | 4          |
| 30300C-2D     | ●     | 3.0             | 7.5    | 9.0      | 45  | 6          |
| GSX 30400C-2D | ●     | 4.0             | 11.0   | 12.5     | 45  | 6          |
| 30500C-2D     | ●     | 5.0             | 13.0   | 15.0     | 50  | 6          |
| 30600C-2D     | ●     | 6.0             | 13.0   | —        | 50  | 6          |
| 30700C-2D     | ●     | 7.0             | 16.0   | 18.0     | 60  | 8          |
| 30800C-2D     | ●     | 8.0             | 19.0   | —        | 60  | 8          |
| GSX 30900C-2D | ●     | 9.0             | 19.0   | 21.0     | 70  | 10         |
| 31000C-2D     | ●     | 10.0            | 22.0   | —        | 70  | 10         |
| 31200C-2D     | ●     | 12.0            | 26.0   | —        | 75  | 12         |
| 31600C-2D     | ●     | 16.0            | 32.0   | —        | 90  | 16         |
| 32000C-2D     | ●     | 20.0            | 40.0   | —        | 100 | 20         |

Grade: ACF20

## Endmill Identification (GSXMILL Series Only)

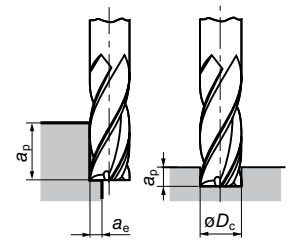
## GSX 3 0100 C - 2D

① Series Code    ② No. of Teeth    ③ Diameter    ④ Cutting Edge    ⑤ Cutting Edge Length

(S: Sharp Edge  
C: Gash Land)

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material      | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.              | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                | 19,600                             | 300                | 19,600                             | 300                | 19,600                             | 300                | 18,300                             | 210                | 12,700                                                | 130                | 9,000                              | 80                 | 11,000                             | 90                 | 9,000                               | 65                 |
| 2.0                | 11,200                             | 410                | 11,200                             | 410                | 11,200                             | 410                | 10,500                             | 280                | 7,300                                                 | 170                | 5,300                              | 100                | 6,400                              | 120                | 5,300                               | 90                 |
| 4.0                | 6,400                              | 550                | 6,400                              | 550                | 6,400                              | 550                | 6,000                              | 370                | 4,200                                                 | 230                | 3,000                              | 140                | 3,600                              | 150                | 3,000                               | 120                |
| 6.0                | 4,600                              | 670                | 4,600                              | 670                | 4,600                              | 670                | 4,300                              | 460                | 3,000                                                 | 270                | 2,200                              | 170                | 2,700                              | 180                | 2,200                               | 130                |
| 8.0                | 3,400                              | 670                | 3,400                              | 670                | 3,400                              | 670                | 3,200                              | 460                | 2,200                                                 | 270                | 1,600                              | 170                | 2,000                              | 180                | 1,600                               | 130                |
| 10.0               | 2,800                              | 670                | 2,800                              | 670                | 2,800                              | 670                | 2,600                              | 460                | 1,800                                                 | 270                | 1,300                              | 170                | 1,600                              | 180                | 1,300                               | 130                |
| 12.0               | 2,300                              | 670                | 2,300                              | 670                | 2,300                              | 670                | 2,200                              | 460                | 1,500                                                 | 270                | 1,100                              | 170                | 1,300                              | 180                | 1,100                               | 130                |
| 16.0               | 1,700                              | 550                | 1,700                              | 550                | 1,700                              | 550                | 1,600                              | 370                | 1,100                                                 | 230                | 800                                | 140                | 1,000                              | 150                | 800                                 | 100                |
| 20.0               | 1,350                              | 490                | 1,350                              | 490                | 1,350                              | 490                | 1,300                              | 330                | 900                                                   | 210                | 650                                | 120                | 800                                | 130                | 650                                 | 90                 |
| Standard $a_p$     | $1.5D_c$                           |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | $1.0D_c$                           |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$ | $0.05D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | $0.02D_c$                          |                    |                                    |                    |                                     |                    |

## Groove Milling

| Work Material  | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|----------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.          | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)     |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0            | 19,600                             | 240                | 19,600                             | 300                | 19,600                             | 300                | 18,300                             | 210                | 12,700                                                | 130                | 9,000                              | 80                 | 11,000                             | 65                 | 4,500                               | 25                 |
| 2.0            | 11,200                             | 320                | 11,200                             | 410                | 11,200                             | 410                | 10,500                             | 280                | 7,300                                                 | 170                | 5,300                              | 100                | 6,400                              | 85                 | 2,650                               | 35                 |
| 4.0            | 6,400                              | 450                | 6,400                              | 550                | 6,400                              | 550                | 6,000                              | 370                | 4,200                                                 | 230                | 3,000                              | 140                | 3,600                              | 100                | 1,500                               | 50                 |
| 6.0            | 4,600                              | 540                | 4,600                              | 670                | 4,600                              | 670                | 4,300                              | 460                | 3,000                                                 | 270                | 2,200                              | 170                | 2,650                              | 130                | 1,150                               | 55                 |
| 8.0            | 3,400                              | 540                | 3,400                              | 670                | 3,400                              | 670                | 3,200                              | 460                | 2,200                                                 | 270                | 1,600                              | 170                | 2,000                              | 130                | 800                                 | 55                 |
| 10.0           | 2,800                              | 540                | 2,800                              | 670                | 2,800                              | 670                | 2,600                              | 460                | 1,800                                                 | 270                | 1,300                              | 170                | 1,600                              | 130                | 650                                 | 55                 |
| 12.0           | 2,300                              | 540                | 2,300                              | 670                | 2,300                              | 670                | 2,200                              | 460                | 1,500                                                 | 270                | 1,100                              | 170                | 1,300                              | 130                | 500                                 | 55                 |
| 16.0           | 1,700                              | 440                | 1,700                              | 550                | 1,700                              | 550                | 1,600                              | 370                | 1,100                                                 | 230                | 800                                | 140                | 1,000                              | 110                | 400                                 | 45                 |
| 20.0           | 1,350                              | 390                | 1,350                              | 490                | 1,350                              | 490                | 1,300                              | 330                | 900                                                   | 210                | 650                                | 120                | 800                                | 90                 | 320                                 | 40                 |
| Standard $a_p$ | $0.2D_c$                           |                    | $0.5D_c$                           |                    | $0.2D_c$                           |                    | $0.05D_c$                          |                    | $0.02D_c$                                             |                    | $0.05D_c$                          |                    | $0.2D_c$                           |                    | $0.2D_c$                            |                    |

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

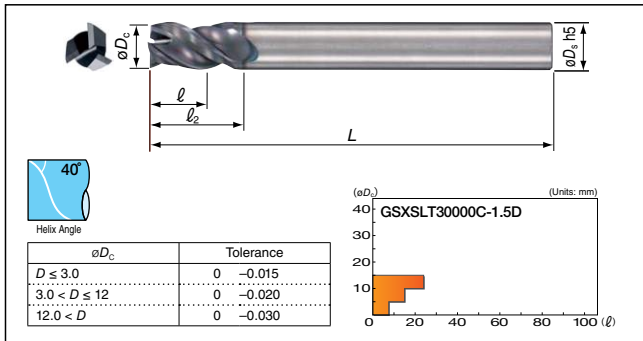
PCD



## GSXSLT30000C-1.5D Type



| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○                  | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



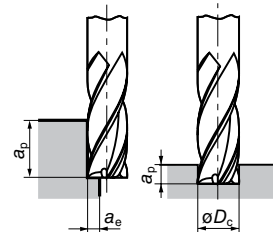
## ■ Body

| Cat. No.                  | Stock | Dimensions (mm) |      |       |     |            |
|---------------------------|-------|-----------------|------|-------|-----|------------|
|                           |       | $\phi D_c$      | $l$  | $l_2$ | $L$ | $\phi D_s$ |
| <b>GSXSLT 30100C-1.5D</b> | ●     | 1.0             | 1.5  | 2.5   | 40  | 4          |
| <b>30150C-1.5D</b>        | ●     | 1.5             | 2.3  | 3.3   | 40  | 4          |
| <b>30200C-1.5D</b>        | ●     | 2.0             | 3.0  | 4.0   | 40  | 4          |
| <b>30250C-1.5D</b>        | ●     | 2.5             | 3.8  | 4.8   | 40  | 4          |
| <b>30300C-1.5D</b>        | ●     | 3.0             | 4.5  | 6.0   | 45  | 6          |
| <b>GSXSLT 30400C-1.5D</b> | ●     | 4.0             | 6.0  | 7.5   | 45  | 6          |
| <b>30500C-1.5D</b>        | ●     | 5.0             | 7.5  | 9.5   | 50  | 6          |
| <b>30600C-1.5D</b>        | ●     | 6.0             | 9.0  | —     | 50  | 6          |
| <b>30700C-1.5D</b>        | ●     | 7.0             | 11.0 | 13.0  | 60  | 8          |
| <b>30800C-1.5D</b>        | ●     | 8.0             | 12.0 | —     | 60  | 8          |
| <b>GSXSLT 30900C-1.5D</b> | ●     | 9.0             | 14.0 | 16.0  | 70  | 10         |
| <b>31000C-1.5D</b>        | ●     | 10.0            | 15.0 | —     | 70  | 10         |
| <b>31200C-1.5D</b>        | ●     | 12.0            | 18.0 | —     | 75  | 12         |
| <b>31600C-1.5D</b>        | ●     | 16.0            | 24.0 | —     | 90  | 16         |

Grade: ACF20

## ■ Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- Use step machining of  $0.1D_c$  when drilling stainless steel, heat resistant alloy, and titanium alloy.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## ● Side Milling

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 19,600                             | 300                | 19,600                             | 300                | 19,600                             | 300                | 18,300                             | 210                | 12,700                                                | 130                | 9,000                              | 80                 | 11,000                             | 90                 | 9,000                               | 65                 |
| 2.0                         | 11,200                             | 410                | 11,200                             | 410                | 11,200                             | 410                | 10,500                             | 280                | 7,300                                                 | 170                | 5,300                              | 100                | 6,400                              | 120                | 5,300                               | 90                 |
| 4.0                         | 6,400                              | 550                | 6,400                              | 550                | 6,400                              | 550                | 6,000                              | 370                | 4,200                                                 | 230                | 3,000                              | 140                | 3,600                              | 150                | 3,000                               | 120                |
| 6.0                         | 4,600                              | 670                | 4,600                              | 670                | 4,600                              | 670                | 4,300                              | 460                | 3,000                                                 | 270                | 2,200                              | 170                | 2,700                              | 180                | 2,200                               | 130                |
| 8.0                         | 3,400                              | 670                | 3,400                              | 670                | 3,400                              | 670                | 3,200                              | 460                | 2,200                                                 | 270                | 1,600                              | 170                | 2,000                              | 180                | 1,600                               | 130                |
| 10.0                        | 2,800                              | 670                | 2,800                              | 670                | 2,800                              | 670                | 2,600                              | 460                | 1,800                                                 | 270                | 1,300                              | 170                | 1,600                              | 180                | 1,300                               | 130                |
| 12.0                        | 2,300                              | 670                | 2,300                              | 670                | 2,300                              | 670                | 2,200                              | 460                | 1,500                                                 | 270                | 1,100                              | 170                | 1,300                              | 180                | 1,100                               | 130                |
| 16.0                        | 1,700                              | 550                | 1,700                              | 550                | 1,700                              | 550                | 1,600                              | 370                | 1,100                                                 | 230                | 800                                | 140                | 1,000                              | 150                | 800                                 | 100                |
| Standard Depth-of-cut $a_p$ | 1.5D <sub>c</sub>                  |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 1.0D <sub>c</sub>                  |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$          | 0.05D <sub>c</sub>                 |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.02D <sub>c</sub>                 |                    |                                    |                    |                                     |                    |

## ● Groove Milling

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 19,600                             | 240                | 19,600                             | 300                | 19,600                             | 300                | 18,300                             | 210                | 12,700                                                | 130                | 9,000                              | 80                 | 11,000                             | 65                 | 4,500                               | 25                 |
| 2.0                         | 11,200                             | 320                | 11,200                             | 410                | 11,200                             | 410                | 10,500                             | 280                | 7,300                                                 | 170                | 5,300                              | 100                | 6,400                              | 85                 | 2,650                               | 35                 |
| 4.0                         | 6,400                              | 450                | 6,400                              | 550                | 6,400                              | 550                | 6,000                              | 370                | 4,200                                                 | 230                | 3,000                              | 140                | 3,600                              | 100                | 1,500                               | 50                 |
| 6.0                         | 4,600                              | 540                | 4,600                              | 670                | 4,600                              | 670                | 4,300                              | 460                | 3,000                                                 | 270                | 2,200                              | 170                | 2,650                              | 130                | 1,150                               | 55                 |
| 8.0                         | 3,400                              | 540                | 3,400                              | 670                | 3,400                              | 670                | 3,200                              | 460                | 2,200                                                 | 270                | 1,600                              | 170                | 2,000                              | 130                | 800                                 | 55                 |
| 10.0                        | 2,800                              | 540                | 2,800                              | 670                | 2,800                              | 670                | 2,600                              | 460                | 1,800                                                 | 270                | 1,300                              | 170                | 1,600                              | 130                | 650                                 | 55                 |
| 12.0                        | 2,300                              | 540                | 2,300                              | 670                | 2,300                              | 670                | 2,200                              | 460                | 1,500                                                 | 270                | 1,100                              | 170                | 1,300                              | 130                | 500                                 | 55                 |
| 16.0                        | 1,700                              | 440                | 1,700                              | 550                | 1,700                              | 550                | 1,600                              | 370                | 1,100                                                 | 230                | 800                                | 140                | 1,000                              | 110                | 400                                 | 45                 |
| Standard Depth-of-cut $a_p$ | 0.2D <sub>c</sub>                  |                    | 0.5D <sub>c</sub>                  |                    | 0.2D <sub>c</sub>                  |                    | 0.05D <sub>c</sub>                 |                    | 0.2D <sub>c</sub>                                     |                    | 0.05D <sub>c</sub>                 |                    | 0.2D <sub>c</sub>                  |                    |                                     |                    |

## ● Slot Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0           | 19,600                             | 70                 | 19,600                             | 90                 | 19,600                             | 90                 | 18,300                             | 60                 | 12,700                                                | 40                 | 9,000                              | 25                 | 11,000                             | 20                 | 4,500                               | 10                 |
| 2.0           | 11,200                             | 90                 | 11,200                             | 120                | 11,200                             | 120                | 10,500                             | 80                 | 7,300                                                 | 50                 | 5,300                              | 30                 | 6,400                              | 25                 | 2,650                               | 15                 |
| 4.0           | 6,400                              | 130                | 6,400                              | 160                | 6,400                              | 160                | 6,000                              | 110                | 4,200                                                 | 70                 | 3,000                              | 40                 | 3,600                              | 30                 | 1,500                               | 20                 |
| 6.0           | 4,600                              | 160                | 4,600                              | 200                | 4,600                              | 200                | 4,300                              | 130                | 3,000                                                 | 80                 | 2,200                              | 50                 | 2,650                              | 40                 | 1,150                               | 20                 |
| 8.0           | 3,400                              | 160                | 3,400                              | 200                | 3,400                              | 200                | 3,200                              | 130                | 2,200                                                 | 80                 | 1,600                              | 50                 | 2,000                              | 40                 | 800                                 | 20                 |
| 10.0          | 2,800                              | 160                | 2,800                              | 200                | 2,800                              | 200                | 2,600                              | 130                | 1,800                                                 | 80                 | 1,300                              | 50                 | 1,600                              | 40                 | 650                                 | 20                 |
| 12.0          | 2,300                              | 160                | 2,300                              | 200                | 2,300                              | 200                | 2,200                              | 130                | 1,500                                                 | 80                 | 1,100                              | 50                 | 1,300                              | 40                 | 500                                 | 20                 |
| 16.0          | 1,700                              | 130                | 1,700                              | 160                | 1,700                              | 160                | 1,600                              | 110                | 1,100                                                 | 70                 | 800                                | 40                 | 1,000                              | 35                 | 400                                 | 15                 |

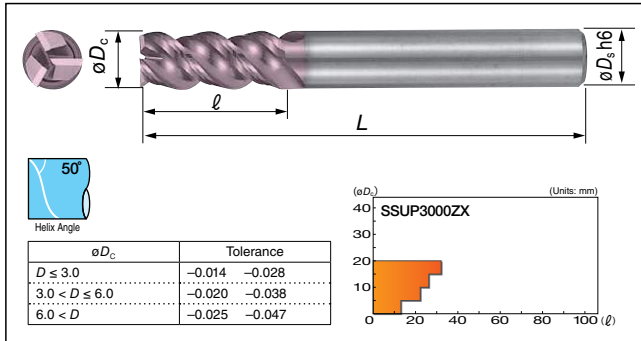


ZX Coated UP Mill Slot

## SSUP 3000ZX Type



| Coated Carbide | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ◎              | ◎            | ◎           | ◎              | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |

■ Body (Diameter:  $\phi 2.0$  to  $8.0$  mm)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSUP 3020ZX | ●     | 2.0             | 6      | 50  | 4          |
| 3025ZX      | ●     | 2.5             | 8      | 50  | 4          |
| 3030ZX      | ●     | 3.0             | 8      | 50  | 6          |
| 3035ZX      | ●     | 3.5             | 10     | 50  | 6          |
| 3040ZX      | ●     | 4.0             | 11     | 50  | 6          |
| SSUP 3045ZX | ●     | 4.5             | 11     | 50  | 6          |
| 3050ZX      | ●     | 5.0             | 13     | 60  | 6          |
| 3055ZX      | ●     | 5.5             | 13     | 60  | 6          |
| 3060ZX      | ●     | 6.0             | 13     | 60  | 6          |
| 3065ZX      | ●     | 6.5             | 16     | 70  | 8          |
| SSUP 3070ZX | ●     | 7.0             | 16     | 70  | 8          |
| 3075ZX      | ●     | 7.5             | 16     | 70  | 8          |
| 3080ZX      | ●     | 8.0             | 19     | 80  | 8          |

Grade:ACZ50M

■ Body (Diameter:  $\phi 8.5$  to  $16.0$  mm)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSUP 3085ZX | ●     | 8.5             | 19     | 90  | 10         |
| 3090ZX      | ●     | 9.0             | 19     | 90  | 10         |
| 3095ZX      | ●     | 9.5             | 19     | 90  | 10         |
| 3100ZX      | ●     | 10.0            | 22     | 90  | 10         |
| 3110ZX      | ●     | 11.0            | 22     | 90  | 12         |
| SSUP 3120ZX | ●     | 12.0            | 26     | 90  | 12         |
| 3130ZX      | ●     | 13.0            | 26     | 100 | 12         |
| 3140ZX      | ●     | 14.0            | 26     | 110 | 16         |
| 3150ZX      | ●     | 15.0            | 26     | 110 | 16         |
| 3160ZX      | ●     | 16.0            | 32     | 115 | 16         |

Grade:ACZ50M

## ■ Recommended Cutting Conditions

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## ● Side Milling and Groove Milling

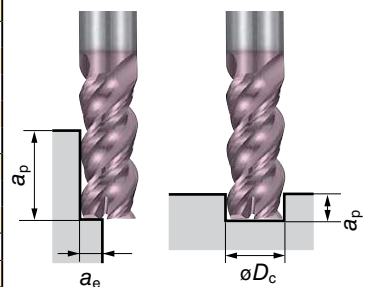
| Work Material  | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel (*)                |                    | Heat Resistant Steel Titanium Alloy (20 to 45HRC) |                    |
|----------------|----------------------------------------|--------------------|------------------------------------|--------------------|----------------------------------------------|--------------------|------------------------------------|--------------------|---------------------------------------------------|--------------------|
| Cond.          | Spindle Speed (min <sup>-1</sup> )     | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                | Feed Rate (mm/min) |
| $D_c$ (mm)     |                                        |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| 2.0            | 9,000                                  | 540                | 6,000                              | 320                | 4,000                                        | 240                | 5,500                              | 240                | 2,600                                             | 90                 |
| 4.0            | 6,600                                  | 600                | 4,500                              | 340                | 3,000                                        | 280                | 4,000                              | 240                | 2,000                                             | 90                 |
| 6.0            | 4,800                                  | 720                | 3,000                              | 360                | 2,500                                        | 280                | 3,000                              | 360                | 1,200                                             | 90                 |
| 8.0            | 3,600                                  | 750                | 2,200                              | 460                | 2,000                                        | 300                | 2,000                              | 390                | 1,000                                             | 100                |
| 10.0           | 2,800                                  | 750                | 1,800                              | 460                | 1,500                                        | 300                | 1,700                              | 410                | 800                                               | 120                |
| 12.0           | 2,400                                  | 710                | 1,500                              | 410                | 1,200                                        | 280                | 1,500                              | 380                | 700                                               | 100                |
| 14.0           | 2,200                                  | 660                | 1,300                              | 370                | 1,000                                        | 270                | 1,200                              | 320                | 600                                               | 95                 |
| 16.0           | 1,800                                  | 490                | 1,100                              | 320                | 800                                          | 230                | 1,000                              | 270                | 500                                               | 90                 |
| Side Milling   | $a_p$                                  |                    | $1.5D_c$                           |                    | $0.1D_c$                                     |                    | $0.05D_c$                          |                    | $0.05D_c$                                         |                    |
| Groove Milling | $a_p$                                  |                    | $1.0D_c$                           |                    | $0.2D_c$                                     |                    | $0.3D_c$                           |                    | $0.2D_c$                                          |                    |

- For groove milling of Stainless steel, use 60% of recommended spindle speed and 40% of recommended feed rate. (\*)
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## ● Slot Milling

| Work Material | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel                    |                    | Heat Resistant Steel Titanium Alloy (20 to 45HRC) |                    |
|---------------|----------------------------------------|--------------------|------------------------------------|--------------------|----------------------------------------------|--------------------|------------------------------------|--------------------|---------------------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )     | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                        |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| 2.0           | 9,000                                  | 150                | 6,000                              | 100                | 4,000                                        | 60                 | 6,400                              | 25                 | 2,600                                             | 20                 |
| 4.0           | 6,600                                  | 250                | 4,500                              | 170                | 3,000                                        | 80                 | 3,600                              | 30                 | 2,000                                             | 40                 |
| 6.0           | 4,800                                  | 300                | 3,000                              | 200                | 2,500                                        | 110                | 2,650                              | 40                 | 1,200                                             | 40                 |
| 8.0           | 3,600                                  | 300                | 2,200                              | 200                | 2,000                                        | 120                | 2,000                              | 40                 | 1,000                                             | 50                 |
| 10.0          | 2,800                                  | 300                | 1,800                              | 200                | 1,500                                        | 120                | 1,600                              | 40                 | 800                                               | 50                 |
| 12.0          | 2,400                                  | 300                | 1,500                              | 200                | 1,200                                        | 120                | 1,300                              | 40                 | 700                                               | 50                 |
| 14.0          | 2,200                                  | 250                | 1,300                              | 150                | 1,000                                        | 80                 | 1,150                              | 35                 | 600                                               | 40                 |
| 16.0          | 1,800                                  | 200                | 1,100                              | 120                | 800                                          | 60                 | 1,000                              | 35                 | 500                                               | 30                 |

- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.
- Supply water-soluble coolant when machining stainless steel, heat resistant alloy, and titanium alloy. Use dry machining (air blow) for all other work materials.



I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

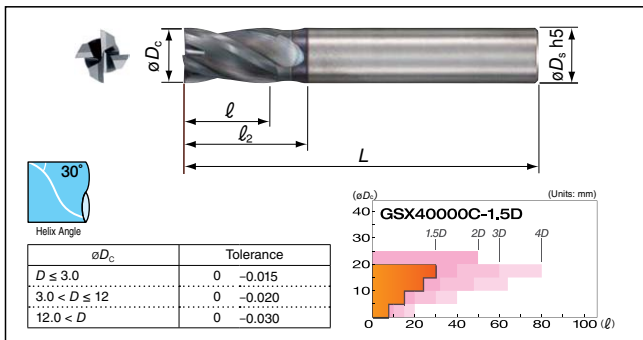
CBN

PCD

## GSX40000C-1.5D Type

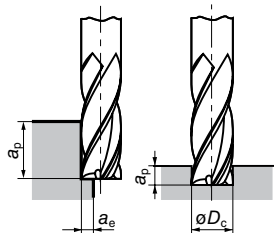


| Coated | Carbon | Alloy | Prehardened | Tempered | Hardened | Stainless | Ti Alloy | Cast Iron | Al Alloy | Copper | Graphite | CFRP |
|--------|--------|-------|-------------|----------|----------|-----------|----------|-----------|----------|--------|----------|------|
| ○      | ○      | ○     | ○           | ○        | ○        | ○         | ○        | ○         | ○        | ○      | ○        | ○    |



## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Body

| Cat. No.        | Stock | Dimensions (mm) |        |          |     |            |
|-----------------|-------|-----------------|--------|----------|-----|------------|
|                 |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 40100C-1.5D | ●     | 1.0             | 1.5    | 2.5      | 40  | 4          |
| 40150C-1.5D     | ●     | 1.5             | 2.3    | 3.3      | 40  | 4          |
| 40200C-1.5D     | ●     | 2.0             | 3.0    | 4.0      | 40  | 4          |
| 40250C-1.5D     | ●     | 2.5             | 3.8    | 4.8      | 40  | 4          |
| 40300C-1.5D     | ●     | 3.0             | 4.5    | 6.0      | 45  | 6          |
| GSX 40350C-1.5D | ●     | 3.5             | 5.3    | 6.8      | 45  | 6          |
| 40400C-1.5D     | ●     | 4.0             | 6.0    | 7.5      | 45  | 6          |
| 40450C-1.5D     | ●     | 4.5             | 6.8    | 8.3      | 50  | 6          |
| 40500C-1.5D     | ●     | 5.0             | 7.5    | 9.5      | 50  | 6          |
| 40550C-1.5D     | ●     | 5.5             | 8.3    | 10.3     | 50  | 6          |
| GSX 40600C-1.5D | ●     | 6.0             | 9.0    | —        | 50  | 6          |
| 40700C-1.5D     | ●     | 7.0             | 11.0   | 13.0     | 60  | 8          |
| 40800C-1.5D     | ●     | 8.0             | 12.0   | —        | 60  | 8          |
| 40900C-1.5D     | ●     | 9.0             | 14.0   | 16.0     | 70  | 10         |
| 41000C-1.5D     | ●     | 10.0            | 15.0   | —        | 70  | 10         |
| GSX 41200C-1.5D | ●     | 12.0            | 18.0   | —        | 75  | 12         |
| 41400C-1.5D     | ●     | 14.0            | 21.0   | 24.5     | 90  | 16         |
| 41500C-1.5D     | ●     | 15.0            | 23.0   | 26.5     | 90  | 16         |
| 41600C-1.5D     | ●     | 16.0            | 24.0   | —        | 90  | 16         |
| 42000C-1.5D     | ●     | 20.0            | 30.0   | —        | 100 | 20         |

Grade: ACF20

## Side Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 24,000                             | 470                | 24,000                             | 470                | 24,000                             | 470                | 21,000                             | 290                | 14,500                                                | 180                | 10,500                             | 120                | 12,600                             | 120                | 10,500                              | 85                 |
| 2.0           | 12,800                             | 570                | 12,800                             | 570                | 12,800                             | 570                | 12,000                             | 380                | 8,300                                                 | 230                | 6,000                              | 150                | 7,200                              | 160                | 6,000                               | 110                |
| 4.0           | 6,800                              | 730                | 6,800                              | 730                | 6,800                              | 730                | 6,400                              | 490                | 4,400                                                 | 300                | 3,200                              | 200                | 3,800                              | 210                | 3,200                               | 130                |
| 6.0           | 4,600                              | 780                | 4,600                              | 780                | 4,600                              | 780                | 4,300                              | 520                | 3,000                                                 | 320                | 2,200                              | 210                | 2,650                              | 220                | 2,200                               | 150                |
| 8.0           | 3,400                              | 780                | 3,400                              | 780                | 3,400                              | 780                | 3,200                              | 520                | 2,200                                                 | 320                | 1,600                              | 210                | 2,000                              | 220                | 1,600                               | 150                |
| 10.0          | 2,800                              | 780                | 2,800                              | 780                | 2,800                              | 780                | 2,600                              | 520                | 1,800                                                 | 320                | 1,300                              | 210                | 1,500                              | 220                | 1,300                               | 150                |
| 12.0          | 2,300                              | 780                | 2,300                              | 780                | 2,300                              | 780                | 2,200                              | 520                | 1,500                                                 | 320                | 1,100                              | 210                | 1,300                              | 220                | 1,100                               | 150                |
| 16.0          | 1,700                              | 650                | 1,700                              | 650                | 1,700                              | 650                | 1,600                              | 420                | 1,100                                                 | 280                | 800                                | 170                | 1,000                              | 180                | 800                                 | 120                |
| 20.0          | 1,350                              | 600                | 1,350                              | 600                | 1,350                              | 600                | 1,300                              | 380                | 900                                                   | 260                | 650                                | 150                | 800                                | 160                | 650                                 | 100                |
| Standard      | $a_p$                              |                    | $1.5D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                                              |                    | $1.0D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                            |                    |
| Depth-of-cut  | $a_e$                              |                    | $0.05D_c$                          |                    | $0.05D_c$                          |                    | $0.05D_c$                          |                    | $0.05D_c$                                             |                    | $0.05D_c$                          |                    | $0.02D_c$                          |                    | $0.02D_c$                           |                    |

## Side Milling (High Speed Machining Centre)

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 60,000                             | 1,200              | 60,000                             | 1,200              | 60,000                             | 1,200              | 60,000                             | 850                | 60,000                                                | 720                | 48,000                             | 500                | 32,000                             | 300                | —                                   | —                  |
| 2.0           | 47,800                             | 2,200              | 47,800                             | 2,200              | 47,800                             | 2,200              | 47,800                             | 1,600              | 39,800                                                | 1,200              | 31,800                             | 900                | 15,900                             | 400                | —                                   | —                  |
| 4.0           | 23,900                             | 2,600              | 23,900                             | 2,600              | 23,900                             | 2,600              | 23,900                             | 1,900              | 19,900                                                | 1,400              | 15,900                             | 1,100              | 8,000                              | 490                | —                                   | —                  |
| 6.0           | 16,000                             | 2,700              | 16,000                             | 2,700              | 16,000                             | 2,700              | 16,000                             | 2,000              | 13,300                                                | 1,500              | 10,600                             | 1,200              | 5,300                              | 520                | —                                   | —                  |
| 8.0           | 12,000                             | 2,700              | 12,000                             | 2,700              | 12,000                             | 2,700              | 12,000                             | 2,000              | 10,000                                                | 1,500              | 8,000                              | 1,200              | 4,000                              | 520                | —                                   | —                  |
| 10.0          | 9,600                              | 2,700              | 9,600                              | 2,700              | 9,600                              | 2,700              | 9,600                              | 2,000              | 8,000                                                 | 1,500              | 6,400                              | 1,200              | 3,200                              | 520                | —                                   | —                  |
| 12.0          | 8,000                              | 2,700              | 8,000                              | 2,700              | 8,000                              | 2,700              | 8,000                              | 2,000              | 6,700                                                 | 1,500              | 5,300                              | 1,200              | 2,700                              | 520                | —                                   | —                  |
| 16.0          | 6,000                              | 2,200              | 6,000                              | 2,200              | 6,000                              | 2,200              | 6,000                              | 1,600              | 5,000                                                 | 1,200              | 4,000                              | 900                | 2,000                              | 450                | —                                   | —                  |
| 20.0          | 4,800                              | 2,000              | 4,800                              | 2,000              | 4,800                              | 2,000              | 4,800                              | 1,400              | 4,000                                                 | 1,100              | 3,200                              | 750                | 1,600                              | 380                | —                                   | —                  |
| Standard      | $a_p$                              |                    | $1.5D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                                              |                    | $1.0D_c$                           |                    | $1.0D_c$                           |                    | $1.0D_c$                            |                    |
| Depth-of-cut  | $a_e$                              |                    | $0.05D_c$                          |                    | $0.05D_c$                          |                    | $0.05D_c$                          |                    | $0.05D_c$                                             |                    | $0.05D_c$                          |                    | $0.02D_c$                          |                    | $0.02D_c$                           |                    |

## Groove Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 24,000                             | 380                | 24,000                             | 470                | 24,000                             | 470                | 21,000                             | 290                | 14,500                                                | 180                | 10,500                             | 120                | 12,600                             | 85                 | 5,200                               | 30                 |
| 2.0           | 12,800                             | 460                | 12,800                             | 570                | 12,800                             | 570                | 12,000                             | 380                | 8,300                                                 | 230                | 6,000                              | 150                | 7,200                              | 110                | 3,000                               | 40                 |
| 4.0           | 6,800                              | 580                | 6,800                              | 730                | 6,800                              | 730                | 5,400                              | 490                | 4,400                                                 | 300                | 3,200                              | 200                | 3,800                              | 130                | 1,600                               | 55                 |
| 6.0           | 4,600                              | 620                | 4,600                              | 780                | 4,600                              | 780                | 4,300                              | 520                | 3,000                                                 | 320                | 2,200                              | 210                | 2,650                              | 160                | 1,100                               | 65                 |
| 8.0           | 3,400                              | 620                | 3,400                              | 780                | 3,400                              | 780                | 3,200                              | 520                | 2,200                                                 | 320                | 1,600                              | 210                | 2,000                              | 160                | 800                                 | 65                 |
| 10.0          | 2,800                              | 620                | 2,800                              | 780                | 2,800                              | 780                | 2,600                              | 520                | 1,800                                                 | 320                | 1,300                              | 210                | 1,600                              | 160                | 650                                 | 65                 |
| 12.0          | 2,300                              | 620                | 2,300                              | 780                | 2,300                              | 780                | 2,200                              | 520                | 1,500                                                 | 320                | 1,100                              | 210                | 1,300                              | 160                | 550                                 | 65                 |
| 16.0          | 1,700                              | 520                | 1,700                              | 560                | 1,700                              | 560                | 1,600                              | 420                | 1,100                                                 | 280                | 800                                | 170                | 1,000                              | 130                | 400                                 | 55                 |
| 20.0          | 1,350                              | 480                | 1,350                              | 600                | 1,350                              | 600                | 1,300                              | 380                | 900                                                   | 260                | 650                                | 150                | 800                                | 110                | 320                                 | 50                 |
| Standard      | $a_p$                              |                    | $0.2D_c$                           |                    | $0.5D_c$                           |                    | $0.2D_c$                           |                    | $0.2D_c$                                              |                    | $0.05D_c$                          |                    | $0.2D_c$                           |                    | $0.2D_c$                            |                    |

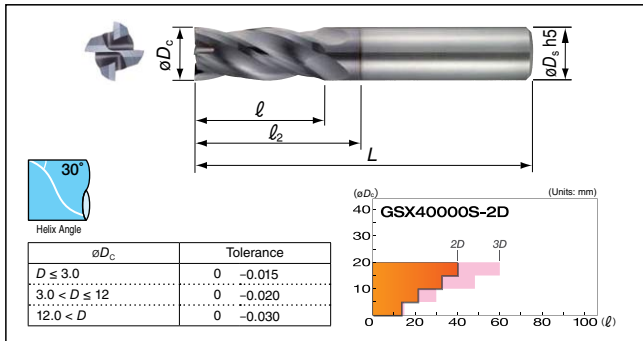


GSX MILL 4 Flute Endmills Sharp Edge

# GSX40000S-2D Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Aluminum | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○               | ○        | ○            | ○        | ○    |



## Endmill Identification (GSXMILL Series Only)

### GSX 4 0100 S - 2D - S3

| ①           | ②            | ③        | ④                               | ⑤                   | ⑥              |
|-------------|--------------|----------|---------------------------------|---------------------|----------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge                    | Cutting Edge Length | Shank Diameter |
|             |              |          | (S: Sharp Edge<br>C: Gash Land) |                     |                |

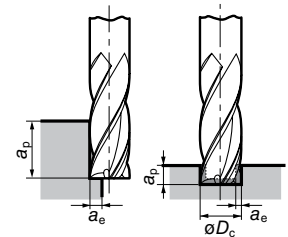
## Body

| Cat. No.         | Stock | Dimensions (mm) |        |          |     |            |
|------------------|-------|-----------------|--------|----------|-----|------------|
|                  |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 40100S-2D    | ●     | 1.0             | 2.5    | 3.5      | 40  | 4          |
| 40100S-2D-S3     | ●     | 1.0             | 2.5    | 3.5      | 38  | 3          |
| 40150S-2D        | ●     | 1.5             | 3.8    | 4.8      | 40  | 4          |
| 40200S-2D        | ●     | 2.0             | 5.0    | 6.0      | 40  | 4          |
| 40200S-2D-S3     | ●     | 2.0             | 5.0    | 6.0      | 38  | 3          |
| GSX 40250S-2D    | ●     | 2.5             | 6.3    | 7.3      | 40  | 4          |
| 40300S-2D        | ●     | 3.0             | 7.5    | 9.0      | 45  | 6          |
| 40300S-2D-S3     | ●     | 3.0             | 7.5    | —        | 38  | 3          |
| 40350S-2D        | ●     | 3.5             | 8.8    | 10.0     | 45  | 6          |
| 40400S-2D        | ●     | 4.0             | 11.0   | 14.0     | 45  | 6          |
| GSX 40400S-2D-S4 | ●     | 4.0             | 11.0   | —        | 45  | 4          |
| 40450S-2D        | ●     | 4.5             | 11.3   | 12.8     | 50  | 6          |
| 40500S-2D        | ●     | 5.0             | 13.0   | 19.6     | 50  | 6          |
| 40550S-2D        | ●     | 5.5             | 13.0   | 19.6     | 50  | 6          |
| 40600S-2D        | ●     | 6.0             | 13.0   | —        | 50  | 6          |
| GSX 40700S-2D    | ●     | 7.0             | 16.0   | 21.1     | 60  | 8          |
| 40800S-2D        | ●     | 8.0             | 19.0   | —        | 60  | 8          |
| 40900S-2D        | ●     | 9.0             | 19.0   | 24.1     | 70  | 10         |
| 41000S-2D        | ●     | 10.0            | 22.0   | —        | 70  | 10         |
| 41200S-2D        | ●     | 12.0            | 26.0   | —        | 75  | 12         |
| GSX 41600S-2D    | ●     | 16.0            | 32.0   | —        | 90  | 16         |
| 42000S-2D        | ●     | 20.0            | 40.0   | —        | 100 | 20         |

Grade: ACF20

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- This series is not recommended for groove milling.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 22,000                             | 360                | 22,000                             | 360                | 22,000                             | 360                | 19,000                             | 220                | 13,000                                                | 140                | 9,500                              | 90                 | 11,300                             | 90                 | 9,500                               | 65                 |
| 2.0                         | 11,500                             | 440                | 11,500                             | 440                | 11,500                             | 440                | 11,000                             | 290                | 7,500                                                 | 180                | 5,400                              | 110                | 6,500                              | 120                | 5,400                               | 85                 |
| 4.0                         | 6,000                              | 560                | 6,000                              | 560                | 6,000                              | 560                | 5,800                              | 370                | 4,000                                                 | 230                | 2,900                              | 150                | 3,400                              | 160                | 2,900                               | 100                |
| 6.0                         | 4,200                              | 600                | 4,200                              | 600                | 4,200                              | 600                | 4,000                              | 400                | 2,700                                                 | 240                | 2,000                              | 160                | 2,400                              | 170                | 2,000                               | 120                |
| 8.0                         | 3,000                              | 600                | 3,000                              | 600                | 3,000                              | 600                | 2,800                              | 400                | 2,000                                                 | 240                | 1,450                              | 160                | 1,800                              | 170                | 1,450                               | 120                |
| 10.0                        | 2,500                              | 600                | 2,500                              | 600                | 2,500                              | 600                | 2,350                              | 400                | 1,600                                                 | 240                | 1,200                              | 160                | 1,450                              | 170                | 1,200                               | 120                |
| 12.0                        | 2,100                              | 600                | 2,100                              | 600                | 2,100                              | 600                | 2,000                              | 400                | 1,350                                                 | 240                | 1,000                              | 160                | 1,200                              | 170                | 1,000                               | 120                |
| 16.0                        | 1,500                              | 500                | 1,500                              | 500                | 1,500                              | 500                | 1,450                              | 320                | 1,000                                                 | 210                | 750                                | 130                | 900                                | 140                | 750                                 | 90                 |
| 20.0                        | 1,200                              | 460                | 1,200                              | 460                | 1,200                              | 460                | 1,150                              | 290                | 800                                                   | 200                | 600                                | 110                | 700                                | 120                | 600                                 | 75                 |
| Standard Depth-of-cut $a_p$ | 2.0 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.01 $D_c$                         |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$          | 0.03 $D_c$                         |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.01 $D_c$                         |                    |                                    |                    |                                     |                    |

## Groove Milling

| Work Material            |                                  | Structural Steel<br>SS                        |                       | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SUS316     |                       | Heat Resistent Steel<br>Titanium Alloy |                       |
|--------------------------|----------------------------------|-----------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|
| Cond.                    |                                  | Spindle Speed<br>(min <sup>-1</sup> )         | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)      |                                  |                                               |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |
| 1.0                      |                                  | 22,000                                        | 360                   | 22,000                                | 360                   | 22,000                                | 360                   | 19,000                                | 220                   | 13,000                                                      | 140                   | 9,500                                 | 90                    | 11,300                                | 90                    | 9,500                                  | 65                    |
| 2.0                      |                                  | 11,500                                        | 440                   | 11,500                                | 440                   | 11,500                                | 440                   | 11,000                                | 290                   | 7,500                                                       | 180                   | 5,400                                 | 110                   | 6,500                                 | 120                   | 5,400                                  | 85                    |
| 4.0                      |                                  | 6,000                                         | 560                   | 6,000                                 | 560                   | 6,000                                 | 560                   | 5,800                                 | 370                   | 4,000                                                       | 230                   | 2,900                                 | 150                   | 3,400                                 | 160                   | 2,900                                  | 100                   |
| 6.0                      |                                  | 4,200                                         | 600                   | 4,200                                 | 600                   | 4,200                                 | 600                   | 4,000                                 | 400                   | 2,700                                                       | 240                   | 2,000                                 | 160                   | 2,400                                 | 170                   | 2,000                                  | 120                   |
| 8.0                      |                                  | 3,000                                         | 600                   | 3,000                                 | 600                   | 3,000                                 | 600                   | 2,800                                 | 400                   | 2,000                                                       | 240                   | 1,450                                 | 160                   | 1,800                                 | 170                   | 1,450                                  | 120                   |
| 10.0                     |                                  | 2,500                                         | 600                   | 2,500                                 | 600                   | 2,500                                 | 600                   | 2,350                                 | 400                   | 1,600                                                       | 240                   | 1,200                                 | 160                   | 1,450                                 | 170                   | 1,200                                  | 120                   |
| 12.0                     |                                  | 2,100                                         | 600                   | 2,100                                 | 600                   | 2,100                                 | 600                   | 2,000                                 | 400                   | 1,350                                                       | 240                   | 1,000                                 | 160                   | 1,200                                 | 170                   | 1,000                                  | 120                   |
| 16.0                     |                                  | 1,500                                         | 500                   | 1,500                                 | 500                   | 1,500                                 | 500                   | 1,450                                 | 320                   | 1,000                                                       | 210                   | 750                                   | 130                   | 900                                   | 140                   | 750                                    | 90                    |
| 20.0                     |                                  | 1,200                                         | 460                   | 1,200                                 | 460                   | 1,200                                 | 460                   | 1,150                                 | 290                   | 800                                                         | 200                   | 600                                   | 110                   | 700                                   | 120                   | 600                                    | 75                    |
| Standard<br>Depth-of-cut | a <sub>p</sub><br>a <sub>e</sub> | 1.5D <sub>c</sub><br>Below 0.02D <sub>c</sub> |                       |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |

I Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

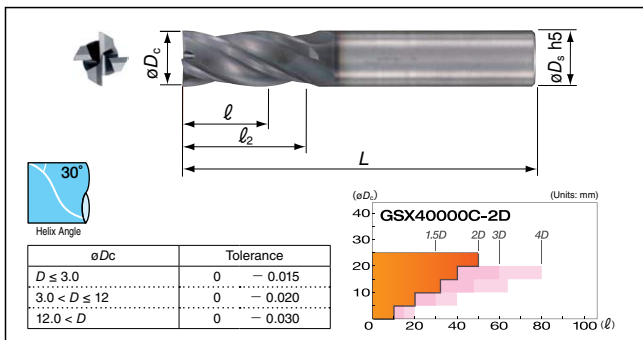
CBN PCD



## GSX4000C-2D Type

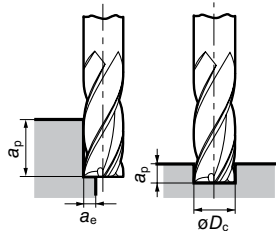


| Coated Carbide | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 24,000                             | 470                | 24,000                             | 470                | 24,000                             | 470                | 21,000                             | 290                | 14,500                                                | 180                | 10,500                             | 120                | 12,600                             | 120                | 10,500                              | 85                 |
| 2.0                         | 12,800                             | 570                | 12,800                             | 570                | 12,800                             | 570                | 12,000                             | 380                | 8,300                                                 | 230                | 6,000                              | 150                | 7,200                              | 160                | 6,000                               | 110                |
| 4.0                         | 6,800                              | 730                | 6,800                              | 730                | 6,800                              | 730                | 6,400                              | 490                | 4,400                                                 | 300                | 3,200                              | 200                | 3,800                              | 210                | 3,200                               | 130                |
| 6.0                         | 4,600                              | 780                | 4,600                              | 780                | 4,600                              | 780                | 4,300                              | 520                | 3,000                                                 | 320                | 2,200                              | 210                | 2,650                              | 220                | 2,200                               | 150                |
| 8.0                         | 3,400                              | 780                | 3,400                              | 780                | 3,400                              | 780                | 3,200                              | 520                | 2,200                                                 | 320                | 1,600                              | 210                | 2,000                              | 220                | 1,600                               | 150                |
| 10.0                        | 2,800                              | 780                | 2,800                              | 780                | 2,800                              | 780                | 2,600                              | 520                | 1,800                                                 | 320                | 1,300                              | 210                | 1,500                              | 220                | 1,300                               | 150                |
| 12.0                        | 2,300                              | 780                | 2,300                              | 780                | 2,300                              | 780                | 2,200                              | 520                | 1,500                                                 | 320                | 1,100                              | 210                | 1,300                              | 220                | 1,100                               | 150                |
| 16.0                        | 1,700                              | 650                | 1,700                              | 650                | 1,700                              | 650                | 1,600                              | 420                | 1,100                                                 | 280                | 800                                | 170                | 1,000                              | 180                | 800                                 | 120                |
| 20.0                        | 1,350                              | 600                | 1,350                              | 600                | 1,350                              | 600                | 1,300                              | 380                | 900                                                   | 260                | 650                                | 150                | 800                                | 160                | 650                                 | 100                |
| 25.0                        | 1,000                              | 480                | 1,000                              | 480                | 1,000                              | 480                | 1,000                              | 300                | 700                                                   | 200                | 500                                | 120                | 640                                | 120                | 500                                 | 80                 |
| Standard Depth-of-cut $a_p$ | 1.5 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 1.0 $D_c$                          |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$          | 0.05 $D_c$                         |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.02 $D_c$                         |                    |                                    |                    |                                     |                    |

Grade: ACF20

## Side Milling (High Speed Machining Centre)

| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 60,000                             | 1,200              | 60,000                             | 1,200              | 60,000                             | 1,200              | 60,000                             | 850                | 60,000                                                | 720                | 48,000                             | 500                | 32,000                             | 300                | —                                   | —                  |
| 2.0                         | 47,800                             | 2,200              | 47,800                             | 2,200              | 47,800                             | 2,200              | 47,800                             | 1,600              | 39,800                                                | 1,200              | 31,800                             | 900                | 15,900                             | 400                | —                                   | —                  |
| 4.0                         | 23,900                             | 2,600              | 23,900                             | 2,600              | 23,900                             | 2,600              | 23,900                             | 1,900              | 19,900                                                | 1,400              | 15,900                             | 1,100              | 8,000                              | 490                | —                                   | —                  |
| 6.0                         | 16,000                             | 2,700              | 16,000                             | 2,700              | 16,000                             | 2,700              | 16,000                             | 2,000              | 13,300                                                | 1,500              | 10,600                             | 1,200              | 5,300                              | 520                | —                                   | —                  |
| 8.0                         | 12,000                             | 2,700              | 12,000                             | 2,700              | 12,000                             | 2,700              | 12,000                             | 2,000              | 10,000                                                | 1,500              | 8,000                              | 1,200              | 4,000                              | 520                | —                                   | —                  |
| 10.0                        | 9,600                              | 2,700              | 9,600                              | 2,700              | 9,600                              | 2,700              | 9,600                              | 2,000              | 8,000                                                 | 1,500              | 6,400                              | 1,200              | 3,200                              | 520                | —                                   | —                  |
| 12.0                        | 8,000                              | 2,700              | 8,000                              | 2,700              | 8,000                              | 2,700              | 8,000                              | 2,000              | 6,700                                                 | 1,500              | 5,300                              | 1,200              | 2,700                              | 520                | —                                   | —                  |
| 16.0                        | 6,000                              | 2,200              | 6,000                              | 2,200              | 6,000                              | 2,200              | 6,000                              | 1,600              | 5,000                                                 | 1,200              | 4,000                              | 900                | 2,000                              | 450                | —                                   | —                  |
| 20.0                        | 4,800                              | 2,000              | 4,800                              | 2,000              | 4,800                              | 2,000              | 4,800                              | 1,400              | 4,000                                                 | 1,100              | 3,200                              | 750                | 1,600                              | 380                | —                                   | —                  |
| 25.0                        | 3,800                              | 1,500              | 3,800                              | 1,500              | 3,800                              | 1,500              | 3,800                              | 1,100              | 3,200                                                 | 900                | 2,500                              | 600                | 1,300                              | 300                | —                                   | —                  |
| Standard Depth-of-cut $a_p$ | 1.5 $D_c$                          |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 1.0 $D_c$                          |                    |                                    |                    |                                     |                    |
| Depth-of-cut $a_e$          | 0.05 $D_c$                         |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    | 0.02 $D_c$                         |                    |                                    |                    |                                     |                    |

## Groove Milling

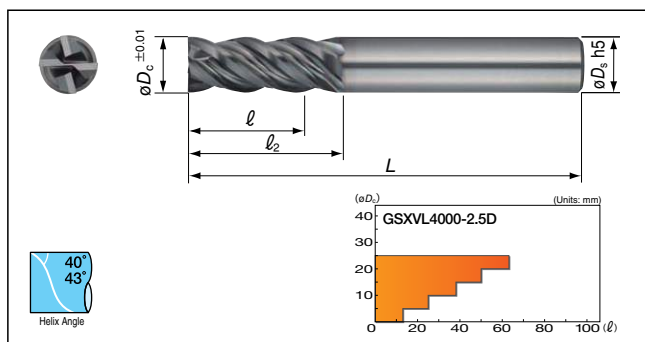
| Work Material               | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)                  |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                                       |                    |                                    |                    |                                    |                    |                                     |                    |
| 1.0                         | 24,000                             | 380                | 24,000                             | 470                | 24,000                             | 470                | 21,000                             | 290                | 14,500                                                | 180                | 10,500                             | 120                | 12,600                             | 85                 | 5,200                               | 30                 |
| 2.0                         | 12,800                             | 460                | 12,800                             | 570                | 12,800                             | 570                | 12,000                             | 380                | 8,300                                                 | 230                | 6,000                              | 150                | 7,200                              | 110                | 3,000                               | 40                 |
| 4.0                         | 6,800                              | 580                | 6,800                              | 730                | 6,800                              | 730                | 6,400                              | 490                | 4,400                                                 | 300                | 3,200                              | 200                | 3,800                              | 130                | 1,600                               | 55                 |
| 6.0                         | 4,600                              | 620                | 4,600                              | 780                | 4,600                              | 780                | 4,300                              | 520                | 3,000                                                 | 320                | 2,200                              | 210                | 2,650                              | 160                | 1,100                               | 65                 |
| 8.0                         | 3,400                              | 620                | 3,400                              | 780                | 3,400                              | 780                | 3,200                              | 520                | 2,200                                                 | 320                | 1,600                              | 210                | 2,000                              | 160                | 800                                 | 65                 |
| 10.0                        | 2,800                              | 620                | 2,800                              | 780                | 2,800                              | 780                | 2,600                              | 520                | 1,800                                                 | 320                | 1,300                              | 210                | 1,600                              | 160                | 650                                 | 65                 |
| 12.0                        | 2,300                              | 620                | 2,300                              | 780                | 2,300                              | 780                | 2,200                              | 520                | 1,500                                                 | 320                | 1,100                              | 210                | 1,300                              | 160                | 550                                 | 65                 |
| 16.0                        | 1,700                              | 520                | 1,700                              | 560                | 1,700                              | 560                | 1,600                              | 420                | 1,100                                                 | 280                | 800                                | 170                | 1,000                              | 130                | 400                                 | 55                 |
| 20.0                        | 1,350                              | 480                | 1,350                              | 600                | 1,350                              | 600                | 1,300                              | 380                | 900                                                   | 260                | 650                                | 150                | 800                                | 110                | 320                                 | 50                 |
| 25.0                        | 1,000                              | 380                | 1,000                              | 450                | 1,000                              | 450                | 1,000                              | 300                | 700                                                   | 200                | 500                                | 120                | 640                                | 80                 | 250                                 | 40                 |
| Standard Depth-of-cut $a_p$ | 0.2 $D_c$                          |                    | 0.5 $D_c$                          |                    | 0.2 $D_c$                          |                    | 0.05 $D_c$                         |                    | 0.2 $D_c$                                             |                    | 0.05 $D_c$                         |                    | 0.2 $D_c$                          |                    | 0.2 $D_c$                           |                    |



# GSX MILL 4 Flute Endmills Anti-vibration Type GSXVL 4000-2.5D Type

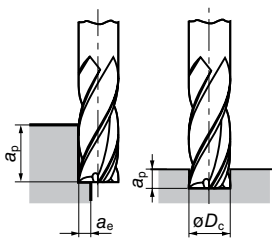


|                |              |             |                    |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ◎              | ◎            | ◎           | ◎                  | ◎              | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Body

| Cat. No.        | Stock | Dimensions (mm) |        |          |     |            |
|-----------------|-------|-----------------|--------|----------|-----|------------|
|                 |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSXVL 4020-2.5D | ●     | 2.0             | 5      | 6.5      | 50  | 4          |
| 4030-2.5D       | ●     | 3.0             | 8      | 9.5      | 50  | 6          |
| 4040-2.5D       | ●     | 4.0             | 10     | 11.5     | 50  | 6          |
| 4050-2.5D       | ●     | 5.0             | 13     | 14.5     | 60  | 6          |
| 4060-2.5D       | ●     | 6.0             | 15     | —        | 60  | 6          |
| GSXVL 4070-2.5D | ●     | 7.0             | 18     | 20.0     | 70  | 8          |
| 4080-2.5D       | ●     | 8.0             | 20     | —        | 80  | 8          |
| 4090-2.5D       | ●     | 9.0             | 23     | 25.0     | 90  | 10         |
| 4100-2.5D       | ●     | 10.0            | 25     | —        | 90  | 10         |
| 4110-2.5D       | ●     | 11.0            | 28     | 30.5     | 90  | 12         |
| GSXVL 4120-2.5D | ●     | 12.0            | 30     | —        | 90  | 12         |
| 4140-2.5D       | ●     | 14.0            | 35     | 37.5     | 110 | 16         |
| 4150-2.5D       | ●     | 15.0            | 38     | 41.0     | 110 | 16         |
| 4160-2.5D       | ●     | 16.0            | 40     | —        | 115 | 16         |
| 4180-2.5D       | ●     | 18.0            | 45     | 48.0     | 120 | 20         |
| GSXVL 4200-2.5D | ●     | 20.0            | 50     | —        | 125 | 20         |
| 4250-2.5D       | ●     | 25.0            | 63     | —        | 140 | 25         |

## Body (SAFE-LOCK™ Applicable Products) Grade: ACF20

| Cat. No.         | Stock | Dimensions (mm) |        |          |     |            |
|------------------|-------|-----------------|--------|----------|-----|------------|
|                  |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSXVL 4120S-2.5D | ●     | 12.0            | 30     | —        | 90  | 12         |
| 4140S-2.5D       | ●     | 14.0            | 35     | 37.5     | 110 | 16         |
| 4150S-2.5D       | ●     | 15.0            | 38     | 41.0     | 110 | 16         |
| 4160S-2.5D       | ●     | 16.0            | 40     | —        | 115 | 16         |
| 4180S-2.5D       | ●     | 18.0            | 45     | 48.0     | 120 | 20         |
| GSXVL 4200S-2.5D | ●     | 20.0            | 50     | —        | 125 | 20         |
| 4250S-2.5D       | ●     | 25.0            | 63     | —        | 140 | 25         |

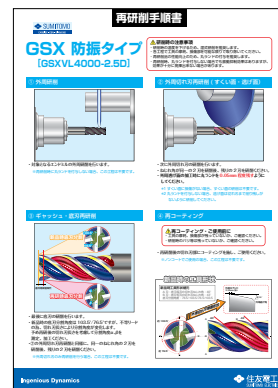
Grade: ACF20

## Side Milling

| Work Material         | Carbon Steel, Cast Iron            |                    | Cast Iron                          |                    | Tempered Steel - Hardened Steel    |                    | Stainless Steel                    |                    | Titanium Alloy                     |                    |
|-----------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                       | SS, SC, FC (150 to 250HB)          |                    | (25 to 35HRC)                      |                    | NAK, HPM (40 to 50HRC)             |                    | SUS304, SUS316                     |                    |                                    |                    |
| Cond.                 | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)            |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |
| 2.0                   | 13,000                             | 1,000              | 10,000                             | 800                | 8,000                              | 700                | 10,000                             | 580                | 5,000                              | 200                |
| 4.0                   | 9,600                              | 1,200              | 8,000                              | 1,000              | 6,000                              | 800                | 5,500                              | 650                | 3,000                              | 230                |
| 6.0                   | 6,800                              | 1,500              | 5,600                              | 1,200              | 4,200                              | 900                | 3,800                              | 680                | 2,100                              | 240                |
| 8.0                   | 5,200                              | 1,600              | 4,400                              | 1,300              | 3,200                              | 950                | 2,800                              | 650                | 1,600                              | 250                |
| 10.0                  | 4,200                              | 1,500              | 3,500                              | 1,200              | 2,600                              | 800                | 2,300                              | 600                | 1,300                              | 210                |
| 12.0                  | 3,500                              | 1,400              | 3,000                              | 1,200              | 2,200                              | 700                | 1,900                              | 550                | 1,100                              | 180                |
| 14.0                  | 3,000                              | 1,200              | 2,600                              | 1,100              | 1,800                              | 600                | 1,600                              | 500                | 900                                | 150                |
| 16.0                  | 2,700                              | 1,100              | 2,200                              | 1,000              | 1,600                              | 600                | 1,400                              | 480                | 760                                | 130                |
| 18.0                  | 2,400                              | 1,000              | 2,000                              | 900                | 1,400                              | 570                | 1,300                              | 450                | 680                                | 120                |
| 20.0                  | 2,200                              | 900                | 1,700                              | 800                | 1,200                              | 550                | 1,100                              | 400                | 600                                | 100                |
| 25.0                  | 1,700                              | 680                | 1,400                              | 630                | 1,000                              | 450                | 890                                | 310                | 480                                | 82                 |
| Standard Depth-of-cut | $a_p$                              |                    | $a_e$                              |                    | $1.5D_c$                           |                    | $0.1D_c$                           |                    | $0.05D_c$                          |                    |
|                       | $0.2D_c$                           |                    | $0.05D_c$                          |                    | $0.1D_c$                           |                    | $0.05D_c$                          |                    |                                    |                    |

## Groove Milling

| Work Material         | Carbon Steel, Cast Iron            |                    | Cast Iron                          |                    | Tempered Steel - Hardened Steel    |                    | Stainless Steel                    |                    | Titanium Alloy                     |                    |
|-----------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                       | SS, SC, FC (150 to 250HB)          |                    | (25 to 35HRC)                      |                    | NAK, HPM (40 to 50HRC)             |                    | SUS304, SUS316                     |                    |                                    |                    |
| Cond.                 | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)            |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |
| 2.0                   | 13,000                             | 750                | 10,000                             | 550                | 8,400                              | 500                | 6,500                              | 300                | 4,000                              | 140                |
| 4.0                   | 8,200                              | 800                | 6,000                              | 600                | 5,200                              | 500                | 4,000                              | 330                | 2,000                              | 130                |
| 6.0                   | 6,100                              | 1,100              | 4,000                              | 600                | 3,500                              | 580                | 2,700                              | 350                | 1,350                              | 150                |
| 8.0                   | 4,600                              | 1,000              | 3,000                              | 580                | 2,600                              | 570                | 2,000                              | 330                | 1,000                              | 140                |
| 10.0                  | 3,600                              | 1,000              | 2,400                              | 550                | 2,100                              | 510                | 1,600                              | 200                | 800                                | 130                |
| 12.0                  | 3,100                              | 920                | 2,000                              | 500                | 1,700                              | 450                | 1,300                              | 280                | 660                                | 110                |
| 14.0                  | 2,600                              | 750                | 1,700                              | 450                | 1,500                              | 400                | 1,100                              | 250                | 570                                | 100                |
| 16.0                  | 2,300                              | 670                | 1,500                              | 420                | 1,300                              | 350                | 1,000                              | 230                | 500                                | 90                 |
| 18.0                  | 2,000                              | 620                | 1,300                              | 380                | 1,100                              | 330                | 900                                | 200                | 430                                | 80                 |
| 20.0                  | 1,900                              | 600                | 1,200                              | 360                | 1,000                              | 320                | 800                                | 180                | 380                                | 70                 |
| 25.0                  | 1,500                              | 470                | 1,000                              | 300                | 790                                | 250                | 640                                | 140                | 300                                | 55                 |
| Standard Depth-of-cut | $a_p$                              |                    | $1.0D_c$                           |                    | $0.2D_c$                           |                    | $0.5D_c$                           |                    | $0.2D_c$                           |                    |



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[[www.sumitool.com/products/cutting/endmills/gsx.html](http://www.sumitool.com/products/cutting/endmills/gsx.html)]

●トップページ>製品情報>切削工具>エンドミル>GSX MILL シリーズ

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

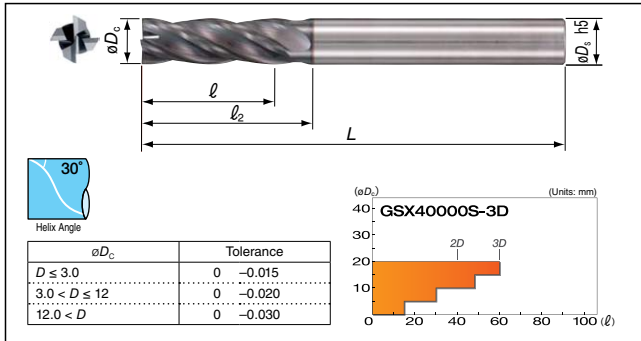
CBN

PCD

## GSX40000S-3D Type



|                |              |             |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.      | Stock | Dimensions (mm) |        |          |     |            |
|---------------|-------|-----------------|--------|----------|-----|------------|
|               |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| GSX 40100S-3D | ●     | 1.0             | 3.0    | 4.0      | 40  | 4          |
| 40200S-3D     | ●     | 2.0             | 6.0    | 7.0      | 40  | 4          |
| 40300S-3D     | ●     | 3.0             | 9.0    | 10.5     | 50  | 6          |
| 40400S-3D     | ●     | 4.0             | 12.0   | 13.5     | 50  | 6          |
| 40500S-3D     | ●     | 5.0             | 15.0   | 17.0     | 50  | 6          |
| GSX 40600S-3D | ●     | 6.0             | 18.0   | —        | 50  | 6          |
| 40700S-3D     | ●     | 7.0             | 21.0   | 23.0     | 70  | 8          |
| 40800S-3D     | ●     | 8.0             | 24.0   | —        | 70  | 8          |
| 41000S-3D     | ●     | 10.0            | 30.0   | —        | 90  | 10         |
| 41200S-3D     | ●     | 12.0            | 36.0   | —        | 90  | 12         |
| GSX 41600S-3D | ●     | 16.0            | 48.0   | —        | 110 | 16         |
| 42000S-3D     | ●     | 20.0            | 60.0   | —        | 120 | 20         |

Grade: ACF20

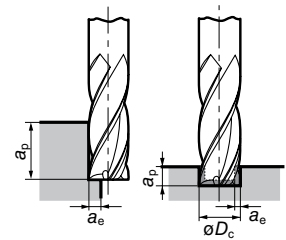
## Endmill Identification

## GSX 4 0100 S - 3D

| ①           | ②            | ③        | ④                                 | ⑤                   |
|-------------|--------------|----------|-----------------------------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge                      | Cutting Edge Length |
|             |              |          | (S : Sharp Edge<br>C : Gash Land) |                     |

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rare cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material | Structural Steel SS                                                                                  |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------------------------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> )                                                                   | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 18,500                                                                                               | 250                | 18,500                             | 250                | 18,500                             | 250                | 17,000                             | 150                | 11,500                                                | 100                | 8,000                              | 65                 | 9,400                              | 65                 | 8,000                               | 45                 |
| 2.0           | 9,400                                                                                                | 250                | 9,400                              | 250                | 9,400                              | 250                | 8,500                              | 200                | 6,700                                                 | 130                | 4,000                              | 65                 | 4,600                              | 90                 | 4,000                               | 60                 |
| 4.0           | 4,500                                                                                                | 350                | 4,500                              | 350                | 4,500                              | 350                | 4,300                              | 250                | 3,500                                                 | 210                | 2,000                              | 110                | 2,300                              | 110                | 2,000                               | 70                 |
| 6.0           | 3,100                                                                                                | 400                | 3,100                              | 400                | 3,100                              | 400                | 2,800                              | 300                | 2,400                                                 | 220                | 1,300                              | 120                | 1,500                              | 120                | 1,300                               | 90                 |
| 8.0           | 2,300                                                                                                | 380                | 2,300                              | 380                | 2,300                              | 380                | 2,100                              | 300                | 1,800                                                 | 220                | 950                                | 120                | 1,100                              | 120                | 900                                 | 90                 |
| 10.0          | 1,800                                                                                                | 350                | 1,800                              | 350                | 1,800                              | 350                | 1,700                              | 300                | 1,400                                                 | 220                | 700                                | 120                | 900                                | 120                | 800                                 | 90                 |
| 12.0          | 1,500                                                                                                | 350                | 1,500                              | 350                | 1,500                              | 350                | 1,400                              | 300                | 1,200                                                 | 220                | 650                                | 110                | 750                                | 120                | 650                                 | 90                 |
| 16.0          | 1,100                                                                                                | 300                | 1,100                              | 300                | 1,100                              | 300                | 1,000                              | 240                | 900                                                   | 190                | 480                                | 90                 | 550                                | 100                | 490                                 | 70                 |
| 20.0          | 900                                                                                                  | 280                | 900                                | 280                | 900                                | 280                | 850                                | 210                | 700                                                   | 170                | 400                                | 80                 | 440                                | 90                 | 400                                 | 60                 |
| Standard      | $2.5D_c$                                                                                             |                    |                                    |                    |                                    |                    |                                    |                    | $2.0D_c$                                              |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | Below $\phi 3$ : $0.02D_c$ From $\phi 3$ to below $\phi 8$ : $0.05D_c$ $\phi 8$ and above: $0.07D_c$ |                    |                                    |                    |                                    |                    |                                    |                    | $0.01D_c$                                             |                    |                                    |                    |                                    |                    |                                     |                    |

## Groove Milling

| Work Material | Structural Steel SS                |                    | Carbon Steel SC (150 to 250HB)     |                    | Cast Iron FC                       |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) |                    | Hardened Steel (45 to 55HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Conc.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| 1.0           | 18,500                             | 250                | 18,500                             | 250                | 18,500                             | 250                | 17,000                             | 150                | 11,500                                                | 100                | 8,000                              | 65                 | 9,400                              | 65                 | 8,000                               | 45                 |
| 2.0           | 9,400                              | 250                | 9,400                              | 250                | 9,400                              | 250                | 8,500                              | 200                | 6,700                                                 | 130                | 4,000                              | 65                 | 4,600                              | 90                 | 4,000                               | 60                 |
| 4.0           | 4,500                              | 350                | 4,500                              | 350                | 4,500                              | 350                | 4,300                              | 250                | 3,500                                                 | 210                | 2,000                              | 110                | 2,300                              | 110                | 2,000                               | 70                 |
| 6.0           | 3,100                              | 400                | 3,100                              | 400                | 3,100                              | 400                | 2,800                              | 300                | 2,400                                                 | 220                | 1,300                              | 120                | 1,500                              | 120                | 1,300                               | 90                 |
| 8.0           | 2,300                              | 380                | 2,300                              | 380                | 2,300                              | 380                | 2,100                              | 300                | 1,800                                                 | 220                | 950                                | 120                | 1,100                              | 120                | 900                                 | 90                 |
| 10.0          | 1,800                              | 350                | 1,800                              | 350                | 1,800                              | 350                | 1,700                              | 300                | 1,400                                                 | 220                | 700                                | 120                | 900                                | 120                | 800                                 | 90                 |
| 12.0          | 1,500                              | 350                | 1,500                              | 350                | 1,500                              | 350                | 1,400                              | 300                | 1,200                                                 | 220                | 650                                | 110                | 750                                | 120                | 650                                 | 90                 |
| 16.0          | 1,100                              | 300                | 1,100                              | 300                | 1,100                              | 300                | 1,000                              | 240                | 900                                                   | 190                | 480                                | 90                 | 550                                | 100                | 490                                 | 70                 |
| 20.0          | 900                                | 280                | 900                                | 280                | 900                                | 280                | 850                                | 210                | 700                                                   | 170                | 400                                | 80                 | 440                                | 90                 | 400                                 | 60                 |
| Standard      | $1.5D_c$                           |                    |                                    |                    |                                    |                    |                                    |                    | $0.02D_c$ Max.                                        |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | $0.02D_c$ Max.                     |                    |                                    |                    |                                    |                    |                                    |                    | $0.02D_c$ Max.                                        |                    |                                    |                    |                                    |                    |                                     |                    |

▲ mark : To be replaced by new item (Please confirm stock availability)

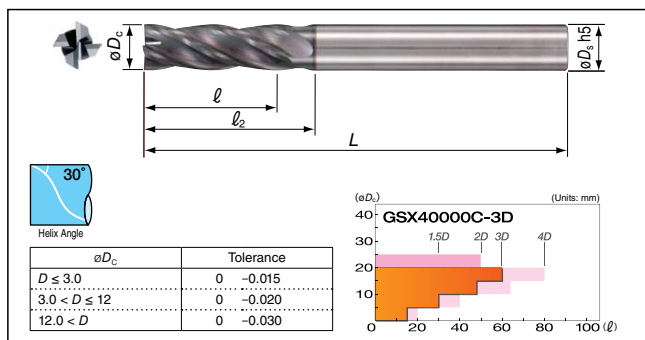


GSX MILL Endmills (4 Flutes)

## GSX40000C-3D Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○               | ○        | ○            | ○        | ○    |



## Body

| Cat. No.      | Stock | Dimensions (mm) |      |       |     |            |
|---------------|-------|-----------------|------|-------|-----|------------|
|               |       | $\phi D_c$      | $l$  | $l_2$ | $L$ | $\phi D_s$ |
| GSX 40100C-3D | ●     | 1.0             | 3.0  | 4.0   | 40  | 4          |
| 40150C-3D     | ●     | 1.5             | 4.5  | 5.5   | 40  | 4          |
| 40200C-3D     | ●     | 2.0             | 6.0  | 7.0   | 40  | 4          |
| 40250C-3D     | ●     | 2.5             | 7.5  | 8.5   | 40  | 4          |
| 40300C-3D     | ●     | 3.0             | 9.0  | 10.5  | 50  | 6          |
| GSX 40400C-3D | ●     | 4.0             | 12.0 | 13.5  | 50  | 6          |
| 40500C-3D     | ●     | 5.0             | 15.0 | 17.0  | 50  | 6          |
| 40600C-3D     | ●     | 6.0             | 18.0 | —     | 50  | 6          |
| 40800C-3D     | ●     | 8.0             | 24.0 | —     | 70  | 8          |
| 41000C-3D     | ●     | 10.0            | 30.0 | —     | 90  | 10         |
| GSX 41200C-3D | ●     | 12.0            | 36.0 | —     | 90  | 12         |
| 41600C-3D     | ●     | 16.0            | 48.0 | —     | 110 | 16         |
| 42000C-3D     | ●     | 20.0            | 60.0 | —     | 120 | 20         |

Grade: ACF20

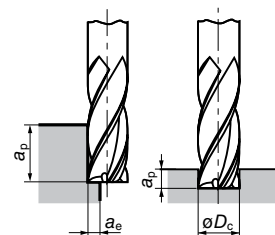
## Endmill Identification (GSXMILL Series Only)

GSX 4 0100 C - 3D

① Series Code ② No. of Teeth ③ Diameter ④ Cutting Edge (S : Sharp Edge, C : Gash Land) ⑤ Cutting Edge Length

## Recommended Cutting Conditions

- For stable machining performance use rigid, high-precision machines and holders.
- Use air blow when dry machining.
- Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
- In rare cases, chattering may occur in early milling stages, dissipating after 2m of cutting.
- If chattering is a problem, reduce the spindle speed and feed rate indicated in the table below by the same ratio, or reduce the depth of cut.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



## Side Milling

| Work Material               | Structural Steel SS                                                                                    | Carbon Steel SC (150 to 250HB) | Cast Iron FC                       | Alloy Steel SCM (25 to 35HRC) | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) | Hardened Steel (45 to 55HRC) | Stainless Steel SUS304, SUS316     | Heat Resistant Steel Titanium Alloy |
|-----------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------|-------------------------------|-------------------------------------------------------|------------------------------|------------------------------------|-------------------------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> )                                                                     | Feed Rate (mm/min)             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)            | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min)           | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)                  |
| $D_c$ (mm)                  |                                                                                                        |                                |                                    |                               |                                                       |                              |                                    |                                     |
| 1.0                         | 21,000                                                                                                 | 360                            | 21,000                             | 360                           | 19,000                                                | 220                          | 13,000                             | 140                                 |
| 2.0                         | 10,500                                                                                                 | 360                            | 10,500                             | 360                           | 9,600                                                 | 290                          | 7,500                              | 180                                 |
| 4.0                         | 5,200                                                                                                  | 500                            | 5,200                              | 500                           | 4,800                                                 | 370                          | 4,000                              | 280                                 |
| 6.0                         | 3,500                                                                                                  | 560                            | 3,500                              | 560                           | 3,200                                                 | 400                          | 2,700                              | 300                                 |
| 8.0                         | 2,600                                                                                                  | 520                            | 2,600                              | 520                           | 2,400                                                 | 400                          | 2,000                              | 300                                 |
| 10.0                        | 2,100                                                                                                  | 500                            | 2,100                              | 500                           | 1,900                                                 | 400                          | 1,600                              | 300                                 |
| 12.0                        | 1,750                                                                                                  | 500                            | 1,750                              | 500                           | 1,600                                                 | 400                          | 1,350                              | 300                                 |
| 16.0                        | 1,300                                                                                                  | 420                            | 1,300                              | 420                           | 1,200                                                 | 330                          | 1,000                              | 260                                 |
| 20.0                        | 1,050                                                                                                  | 380                            | 1,050                              | 380                           | 950                                                   | 290                          | 800                                | 230                                 |
| Standard Depth-of-cut $a_p$ | 2.5 $D_c$                                                                                              |                                |                                    |                               |                                                       | 2.0 $D_c$                    |                                    |                                     |
| $a_e$                       | Below $\phi 3$ : 0.05 $D_c$ From $\phi 3$ to below $\phi 8$ : 0.1 $D_c$ $\phi 8$ and above: 0.15 $D_c$ |                                |                                    |                               |                                                       | 0.02 $D_c$                   |                                    |                                     |

## Groove Milling

| Work Material               | Structural Steel SS                | Carbon Steel SC (150 to 250HB) | Cast Iron FC                       | Alloy Steel SCM (25 to 35HRC) | Tempered Steel, Hardened Steel NAK, HPM (35 to 45HRC) | Hardened Steel (45 to 55HRC) | Stainless Steel SUS304, SUS316     | Heat Resistant Steel Titanium Alloy |
|-----------------------------|------------------------------------|--------------------------------|------------------------------------|-------------------------------|-------------------------------------------------------|------------------------------|------------------------------------|-------------------------------------|
| Cond.                       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)            | Spindle Speed (min <sup>-1</sup> )                    | Feed Rate (mm/min)           | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)                  |
| $D_c$ (mm)                  |                                    |                                |                                    |                               |                                                       |                              |                                    |                                     |
| 1.0                         | 16,600                             | 140                            | 16,600                             | 140                           | 15,500                                                | 100                          | 10,500                             | 100                                 |
| 2.0                         | 9,500                              | 160                            | 9,500                              | 160                           | 9,000                                                 | 180                          | 6,200                              | 120                                 |
| 4.0                         | 5,200                              | 160                            | 5,200                              | 180                           | 4,800                                                 | 160                          | 3,400                              | 110                                 |
| 6.0                         | 3,500                              | 160                            | 3,500                              | 200                           | 3,200                                                 | 160                          | 2,550                              | 120                                 |
| 8.0                         | 2,600                              | 160                            | 2,600                              | 200                           | 2,400                                                 | 160                          | 1,900                              | 120                                 |
| 10.0                        | 2,100                              | 160                            | 2,100                              | 200                           | 1,900                                                 | 160                          | 1,500                              | 120                                 |
| 12.0                        | 1,750                              | 160                            | 1,750                              | 200                           | 1,600                                                 | 160                          | 1,250                              | 120                                 |
| 16.0                        | 1,300                              | 160                            | 1,300                              | 200                           | 1,200                                                 | 160                          | 950                                | 120                                 |
| 20.0                        | 1,050                              | 160                            | 1,050                              | 200                           | 950                                                   | 160                          | 750                                | 120                                 |
| Standard Depth-of-cut $a_p$ | 0.1 $D_c$                          |                                | 0.2 $D_c$                          |                               | 0.05 $D_c$                                            |                              | 0.1 $D_c$                          |                                     |

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

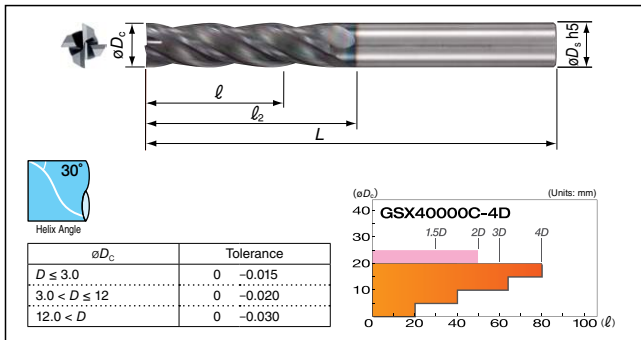
PCD



## GSX4000C-4D Type



|                |              |             |                    |                |                |              |              |   |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|--------------|--------------|---|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel |              |              |   | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ◎            | ◎           | ◎                  | ◎              | 45 to 55 HRC   | 55 to 60 HRC | 60 to 65 HRC | ◎ | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



# GSX 4 0100 C - 4D

| ①           | ②            | ③        | ④                               | ⑤                   |
|-------------|--------------|----------|---------------------------------|---------------------|
| Series Code | No. of Teeth | Diameter | Cutting Edge                    | Cutting Edge Length |
|             |              |          | (S: Sharp Edge<br>C: Gash Land) |                     |

| Cat. No.             | Stock | Dimensions (mm)   |        |          |     |                   |
|----------------------|-------|-------------------|--------|----------|-----|-------------------|
|                      |       | $\varnothing D_c$ | $\ell$ | $\ell_2$ | $L$ | $\varnothing D_s$ |
| <b>GSX 40100C-4D</b> | ●     | 1.0               | 4.0    | 5.0      | 40  | 4                 |
| <b>40150C-4D</b>     | ●     | 1.5               | 6.0    | 7.0      | 40  | 4                 |
| <b>40200C-4D</b>     | ●     | 2.0               | 8.0    | 9.0      | 40  | 4                 |
| <b>40250C-4D</b>     | ●     | 2.5               | 10.0   | 11.0     | 50  | 4                 |
| <b>40300C-4D</b>     | ●     | 3.0               | 12.0   | 13.5     | 50  | 6                 |
| <b>GSX 40400C-4D</b> | ●     | 4.0               | 16.0   | 17.5     | 50  | 6                 |
| <b>40500C-4D</b>     | ●     | 5.0               | 20.0   | 22.0     | 60  | 6                 |
| <b>40600C-4D</b>     | ●     | 6.0               | 24.0   | —        | 60  | 6                 |
| <b>40800C-4D</b>     | ●     | 8.0               | 32.0   | —        | 80  | 8                 |
| <b>41000C-4D</b>     | ●     | 10.0              | 40.0   | —        | 90  | 10                |
| <b>GSX 41200C-4D</b> | ●     | 12.0              | 48.0   | —        | 100 | 12                |
| <b>41600C-4D</b>     | ●     | 16.0              | 64.0   | —        | 120 | 16                |
| <b>42000C-4D</b>     |       | 20.0              | 80.0   | —        | 140 | 20                |

| Work Material            | Structural Steel<br>SS                |                                                                                                        | Carbon Steel<br>SC<br>(150 to 250HB)  |                       | Cast Iron<br>FC                       |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel<br>SUS304, SUS316     |                       | Heat Resistant Steel<br>Titanium Alloy |                       |  |
|--------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|--|
| Cond.                    | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min)                                                                                  | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |  |
| 1.0                      | 9,000                                 | 140                                                                                                    | 9,000                                 | 140                   | 9,000                                 | 140                   | 7,000                                 | 80                    | 6,500                                                       | 60                    | 4,500                                 | 40                    | 5,400                                 | 40                    | 4,500                                  | 40                    |  |
| 2.0                      | 4,500                                 | 140                                                                                                    | 4,500                                 | 140                   | 4,500                                 | 140                   | 3,500                                 | 100                   | 3,200                                                       | 80                    | 2,300                                 | 55                    | 2,700                                 | 55                    | 2,300                                  | 40                    |  |
| 4.0                      | 2,250                                 | 200                                                                                                    | 2,250                                 | 200                   | 2,250                                 | 200                   | 1,750                                 | 120                   | 1,600                                                       | 100                   | 1,200                                 | 60                    | 1,350                                 | 50                    | 1,200                                  | 35                    |  |
| 6.0                      | 1,500                                 | 250                                                                                                    | 1,500                                 | 250                   | 1,500                                 | 250                   | 1,150                                 | 160                   | 1,050                                                       | 140                   | 800                                   | 65                    | 900                                   | 45                    | 800                                    | 35                    |  |
| 8.0                      | 1,100                                 | 220                                                                                                    | 1,100                                 | 220                   | 1,100                                 | 220                   | 850                                   | 160                   | 800                                                         | 130                   | 600                                   | 65                    | 660                                   | 45                    | 600                                    | 35                    |  |
| 10.0                     | 900                                   | 210                                                                                                    | 900                                   | 210                   | 900                                   | 210                   | 700                                   | 140                   | 650                                                         | 120                   | 460                                   | 65                    | 540                                   | 45                    | 460                                    | 35                    |  |
| 12.0                     | 750                                   | 200                                                                                                    | 750                                   | 200                   | 750                                   | 200                   | 580                                   | 140                   | 520                                                         | 110                   | 400                                   | 65                    | 450                                   | 45                    | 400                                    | 35                    |  |
| 16.0                     | 550                                   | 170                                                                                                    | 550                                   | 170                   | 550                                   | 170                   | 440                                   | 120                   | 400                                                         | 95                    | 300                                   | 55                    | 330                                   | 45                    | 300                                    | 35                    |  |
| 20.0                     | 450                                   | 150                                                                                                    | 450                                   | 150                   | 450                                   | 150                   | 350                                   | 100                   | 320                                                         | 80                    | 240                                   | 50                    | 270                                   | 45                    | 240                                    | 35                    |  |
| Standard<br>Depth-of-cut | $a_p$                                 | 3.5 $D_c$                                                                                              |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       | 3.0 $D_c$             |                                       |                       |                                        |                       |  |
|                          | $a_e$                                 | Below $\phi 3$ : 0.04 $D_c$ From $\phi 3$ to below $\phi 8$ : 0.08 $D_c$ $\phi 8$ and above: 0.1 $D_c$ |                                       |                       |                                       |                       |                                       |                       |                                                             |                       |                                       | 0.02 $D_c$            |                                       |                       |                                        |                       |  |

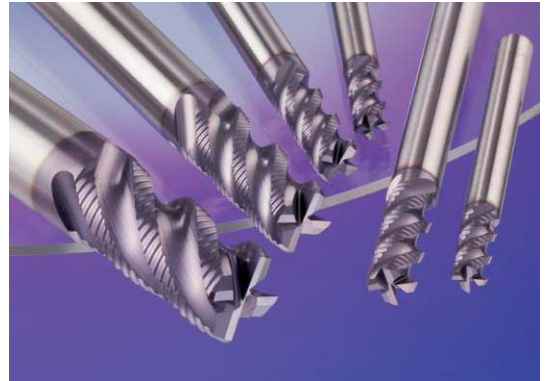
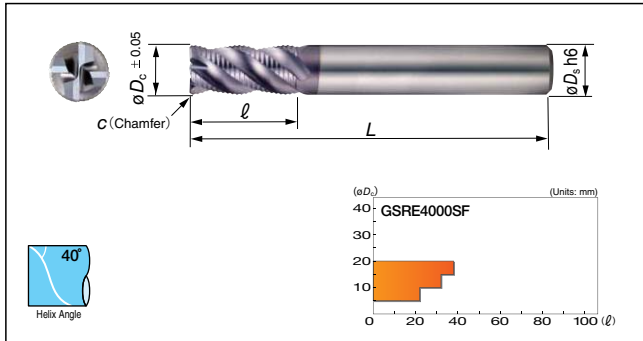


GS MILL Roughing

# GSRE 4000 SF Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ◎              | ◎            | ◎           | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



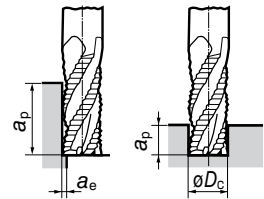
## Body

| Cat. No.    | Stock | Dimensions (mm) |        |     |     |            |
|-------------|-------|-----------------|--------|-----|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $c$ | $\phi D_s$ |
| GSRE 4060SF | ●     | 6.0             | 13     | 50  | 0.3 | 6          |
| 4070SF      | ●     | 7.0             | 16     | 60  | 0.3 | 8          |
| 4080SF      | ●     | 8.0             | 19     | 60  | 0.4 | 8          |
| 4090SF      | ●     | 9.0             | 19     | 70  | 0.4 | 10         |
| 4100SF      | ●     | 10.0            | 22     | 70  | 0.5 | 10         |
| GSRE 4110SF | ●     | 11.0            | 22     | 75  | 0.5 | 12         |
| 4120SF      | ●     | 12.0            | 26     | 75  | 0.6 | 12         |
| 4140SF      | ●     | 14.0            | 26     | 90  | 0.6 | 16         |
| 4160SF      | ●     | 16.0            | 32     | 90  | 0.8 | 16         |
| 4180SF      | ●     | 18.0            | 32     | 100 | 0.8 | 20         |
| GSRE 4200SF | ●     | 20.0            | 38     | 100 | 1.0 | 20         |

Grade: ACZ20W

## Recommended Cutting Conditions

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.



## Side Milling

| Work Material | Structural Steel, Carbon Steel (150 to 250HB) |                    | Cast Iron FC, FCD                  |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Hardened Steel (45 to 50HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|-----------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )            | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                               |                    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                     |                    |
| 6.0           | 4,800                                         | 1,200              | 5,800                              | 1,500              | 3,200                              | 380                | 2,600                              | 400                | 5,300                              | 250                | 1,600                               | 90                 |
| 7.0           | 4,100                                         | 1,200              | 5,000                              | 1,500              | 2,700                              | 380                | 2,200                              | 400                | 4,500                              | 250                | 1,350                               | 90                 |
| 8.0           | 3,600                                         | 1,200              | 4,500                              | 1,500              | 2,400                              | 380                | 2,000                              | 400                | 4,000                              | 250                | 1,250                               | 90                 |
| 9.0           | 3,200                                         | 1,200              | 4,000                              | 1,500              | 2,100                              | 380                | 1,800                              | 400                | 3,500                              | 250                | 1,050                               | 90                 |
| 10.0          | 2,800                                         | 1,200              | 3,500                              | 1,500              | 1,900                              | 380                | 1,600                              | 400                | 3,200                              | 250                | 1,000                               | 100                |
| 11.0          | 2,600                                         | 1,200              | 3,000                              | 1,400              | 1,700                              | 380                | 1,500                              | 400                | 2,900                              | 250                | 900                                 | 100                |
| 12.0          | 2,400                                         | 1,200              | 2,900                              | 1,400              | 1,600                              | 400                | 1,300                              | 400                | 2,600                              | 250                | 800                                 | 100                |
| 14.0          | 2,200                                         | 1,100              | 2,600                              | 1,300              | 1,300                              | 380                | 1,100                              | 350                | 2,200                              | 200                | 700                                 | 100                |
| 16.0          | 1,800                                         | 900                | 2,200                              | 1,100              | 1,200                              | 380                | 1,000                              | 350                | 2,000                              | 180                | 600                                 | 100                |
| 18.0          | 1,400                                         | 700                | 1,800                              | 900                | 1,000                              | 380                | 900                                | 300                | 1,800                              | 150                | 550                                 | 100                |
| 20.0          | 1,400                                         | 700                | 1,700                              | 850                | 850                                | 380                | 800                                | 300                | 1,600                              | 150                | 500                                 | 100                |
| Standard      | 1.5 $D_c$                                     |                    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                     |                    |
| Depth-of-cut  | 0.5 $D_c$                                     |                    |                                    |                    |                                    |                    | 0.3 $D_c$                          |                    |                                    |                    |                                     |                    |

## Groove Milling

| Work Material | Structural Steel, Carbon Steel (150 to 250HB) |                    | Cast Iron FC, FCD                  |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Hardened Steel (45 to 50HRC)       |                    | Stainless Steel SUS304, SUS316     |                    | Heat Resistant Steel Titanium Alloy |                    |
|---------------|-----------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|-------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )            | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                               |                    |                                    |                    |                                    |                    |                                    |                    |                                    |                    |                                     |                    |
| 6.0           | 3,600                                         | 900                | 4,300                              | 1,100              | 2,400                              | 300                | 1,700                              | 260                | 4,200                              | 250                | 1,100                               | 60                 |
| 7.0           | 3,000                                         | 900                | 3,700                              | 1,100              | 2,000                              | 280                | 1,500                              | 260                | 3,600                              | 250                | 900                                 | 60                 |
| 8.0           | 2,700                                         | 900                | 3,400                              | 1,100              | 1,800                              | 280                | 1,350                              | 260                | 3,200                              | 250                | 800                                 | 60                 |
| 9.0           | 2,400                                         | 900                | 3,000                              | 1,100              | 1,600                              | 280                | 1,200                              | 260                | 2,800                              | 250                | 700                                 | 60                 |
| 10.0          | 2,100                                         | 900                | 2,600                              | 1,100              | 1,400                              | 280                | 1,100                              | 270                | 2,500                              | 250                | 650                                 | 65                 |
| 11.0          | 2,000                                         | 900                | 2,300                              | 1,100              | 1,300                              | 280                | 1,000                              | 270                | 2,300                              | 250                | 600                                 | 70                 |
| 12.0          | 1,800                                         | 900                | 2,200                              | 1,100              | 1,200                              | 300                | 900                                | 270                | 2,100                              | 250                | 550                                 | 70                 |
| 14.0          | 1,600                                         | 800                | 2,000                              | 1,000              | 1,000                              | 290                | 750                                | 240                | 1,800                              | 180                | 450                                 | 65                 |
| 16.0          | 1,350                                         | 650                | 1,650                              | 850                | 900                                | 280                | 700                                | 240                | 1,600                              | 160                | 400                                 | 65                 |
| 18.0          | 1,200                                         | 550                | 1,500                              | 750                | 800                                | 280                | 600                                | 230                | 1,400                              | 140                | 350                                 | 60                 |
| 20.0          | 1,050                                         | 500                | 1,350                              | 700                | 700                                | 280                | 550                                | 210                | 1,250                              | 125                | 300                                 | 60                 |
| Standard      | 1.0 $D_c$                                     |                    |                                    |                    |                                    |                    | 0.5 $D_c$                          |                    |                                    |                    |                                     |                    |

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

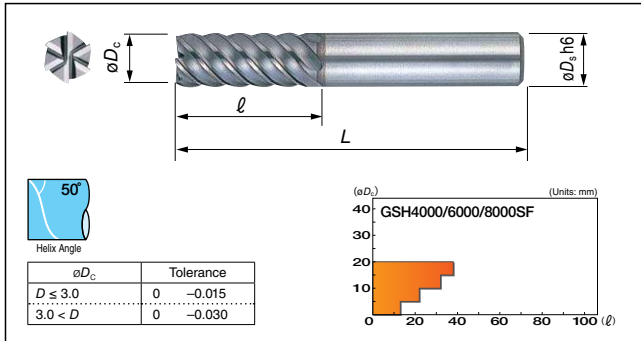
CBN

PCD

## GSH 4000/6000/8000SF Type



| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ◎              | ◎            | ◎           | ◎                  | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



## ■ Body (4 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |     |     |            |
|------------|-------|-----------------|-----|-----|------------|
|            |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| GSH 4010SF | ●     | 1.0             | 3   | 50  | 6          |
| 4015SF     | ●     | 1.5             | 4   | 50  | 6          |
| 4020SF     | ●     | 2.0             | 6   | 50  | 6          |

Grade: ACF07C

## ■ Body (8 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |     |     |            |
|------------|-------|-----------------|-----|-----|------------|
|            |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| GSH 8160SF | ●     | 16.0            | 32  | 90  | 16         |
| 8200SF     | ●     | 20.0            | 38  | 100 | 20         |

Grade: ACF07C

## ■ Body (6 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |     |     |            |
|------------|-------|-----------------|-----|-----|------------|
|            |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| GSH 6030SF | ●     | 3.0             | 8   | 50  | 6          |
| 6040SF     | ●     | 4.0             | 11  | 50  | 6          |
| 6050SF     | ●     | 5.0             | 13  | 50  | 6          |
| 6060SF     | ●     | 6.0             | 13  | 50  | 6          |
| 6080SF     | ●     | 8.0             | 19  | 60  | 8          |
| GSH 6100SF | ●     | 10.0            | 22  | 70  | 10         |
| 6120SF     | ●     | 12.0            | 26  | 75  | 12         |

Grade: ACF07C

## ■ General Purpose Machines

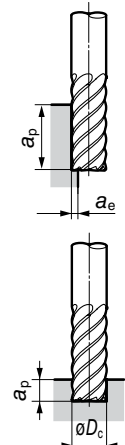
- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## ● Side Milling and Groove Milling

| Work Material | Cond.          | Low Carbon Steel<br>Carbon Steel, Alloy Steel<br>(Up to 35HRC) |                       | Middle Hardened Steel<br>Pre-hardened Steel, Die Steel<br>(35 to 45HRC) |                       | Hardened Steel<br>SKD61<br>(45 to 55HRC) |                       | Hardened Steel<br>SKD11<br>(55 to 60HRC) |                       | Hardened Steel<br>SKH51<br>(60 to 65HRC) |                             | Hardened Steel<br>SKH55<br>(65HRC and above) |                             |
|---------------|----------------|----------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------------|----------------------------------------------|-----------------------------|
|               |                | Spindle Speed<br>(min <sup>-1</sup> )                          | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min)       | Spindle Speed<br>(min <sup>-1</sup> )        | Feed Rate<br>(mm/min)       |
| Square        | $D_c$ (mm)     |                                                                |                       |                                                                         |                       |                                          |                       |                                          |                       |                                          |                             |                                              |                             |
|               | 1.0            | 20,000                                                         | 540                   | 20,000                                                                  | 390                   | 15,600                                   | 260                   | 12,300                                   | 160                   | 11,100                                   | 140                         | 7,800                                        | 95                          |
|               | 2.0            | 19,000                                                         | 1,100                 | 17,200                                                                  | 770                   | 13,400                                   | 530                   | 10,500                                   | 320                   | 9,500                                    | 270                         | 6,700                                        | 190                         |
|               | 3.0            | 15,000                                                         | 2,150                 | 13,400                                                                  | 1,540                 | 10,400                                   | 1,050                 | 8,200                                    | 650                   | 7,400                                    | 540                         | 5,200                                        | 380                         |
|               | 4.0            | 11,200                                                         | 2,400                 | 10,000                                                                  | 1,740                 | 7,800                                    | 1,180                 | 6,100                                    | 730                   | 5,600                                    | 600                         | 3,900                                        | 420                         |
|               | 5.0            | 9,000                                                          | 2,700                 | 8,000                                                                   | 1,930                 | 6,200                                    | 1,300                 | 4,900                                    | 810                   | 4,400                                    | 670                         | 3,100                                        | 470                         |
|               | 6.0            | 7,500                                                          | 2,700                 | 6,700                                                                   | 1,930                 | 5,200                                    | 1,300                 | 4,100                                    | 810                   | 3,700                                    | 670                         | 2,600                                        | 470                         |
|               | 8.0            | 5,600                                                          | 2,700                 | 5,000                                                                   | 1,930                 | 3,900                                    | 1,300                 | 3,050                                    | 810                   | 2,800                                    | 670                         | 1,950                                        | 470                         |
|               | 10.0           | 4,500                                                          | 2,700                 | 4,000                                                                   | 1,930                 | 3,100                                    | 1,300                 | 2,450                                    | 810                   | 2,200                                    | 670                         | 1,550                                        | 470                         |
|               | 12.0           | 3,750                                                          | 2,700                 | 3,350                                                                   | 1,930                 | 2,600                                    | 1,300                 | 2,050                                    | 810                   | 1,850                                    | 670                         | 1,300                                        | 470                         |
| Radius        | Side Milling   | $a_p$                                                          | 1 to 1.5 $D_c$        | $a_e$                                                                   | 1 to 1.5 $D_c$        | $a_p$                                    | 1 to 1.5 $D_c$        | $a_e$                                    | 1 to 1.5 $D_c$        | $a_p$                                    | 1 to 1.5 $D_c$              | $a_e$                                        | 1 to 1.5 $D_c$              |
|               | Groove Milling | $a_p$                                                          | 0.1 $D_c$             | $a_e$                                                                   | 0.1 $D_c$             | $a_p$                                    | 0.05 $D_c$            | $a_e$                                    | 0.05 $D_c$            | $a_p$                                    | 0.02 $D_c$                  | $a_e$                                        | 0.02 $D_c$                  |
|               | Ballnose       | $a_p$                                                          | 0.1 $D_c$             | $a_e$                                                                   | 0.1 $D_c$             | $a_p$                                    | 0.05 $D_c$            | $a_e$                                    | 0.05 $D_c$            | $a_p$                                    | Up to 0.05 $D_c$ Max. 0.5mm | $a_e$                                        | Up to 0.05 $D_c$ Max. 0.5mm |
|               |                | $a_p$                                                          |                       | $a_e$                                                                   |                       | $a_p$                                    |                       | $a_e$                                    |                       | $a_p$                                    |                             | $a_e$                                        |                             |

## ● Side Milling (High Speed Machining Centre)

| Work Material | Cond.        | Low Carbon Steel<br>Carbon Steel, Alloy Steel<br>(Up to 35HRC) |                       | Middle Hardened Steel<br>Pre-hardened Steel, Die Steel<br>(35 to 45HRC) |                       | Hardened Steel<br>SKD61<br>(45 to 55HRC) |                       | Hardened Steel<br>SKD11<br>(55 to 60HRC) |                       | Hardened Steel<br>SKH51<br>(60 to 65HRC) |                       |
|---------------|--------------|----------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------|
|               |              | Spindle Speed<br>(min <sup>-1</sup> )                          | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) |
| DLC           | $D_c$ (mm)   |                                                                |                       |                                                                         |                       |                                          |                       |                                          |                       |                                          |                       |
|               | 1.0          | 48,000                                                         | 1,250                 | 48,000                                                                  | 1,250                 | 48,000                                   | 1,250                 | 48,000                                   | 930                   | 38,000                                   | 700                   |
|               | 2.0          | 48,000                                                         | 2,850                 | 48,000                                                                  | 2,850                 | 48,000                                   | 2,850                 | 36,000                                   | 1,600                 | 24,000                                   | 1,000                 |
|               | 3.0          | 32,000                                                         | 4,900                 | 32,000                                                                  | 4,900                 | 32,000                                   | 4,900                 | 24,000                                   | 2,740                 | 16,000                                   | 1,700                 |
|               | 4.0          | 24,000                                                         | 5,200                 | 24,000                                                                  | 5,200                 | 24,000                                   | 5,200                 | 18,000                                   | 2,900                 | 12,000                                   | 1,800                 |
|               | 5.0          | 19,200                                                         | 5,800                 | 19,200                                                                  | 5,800                 | 19,200                                   | 5,800                 | 14,300                                   | 3,200                 | 9,600                                    | 2,000                 |
|               | 6.0          | 16,000                                                         | 5,800                 | 16,000                                                                  | 5,800                 | 16,000                                   | 5,800                 | 12,000                                   | 3,200                 | 8,000                                    | 2,000                 |
|               | 8.0          | 12,000                                                         | 5,800                 | 12,000                                                                  | 5,800                 | 12,000                                   | 5,800                 | 9,000                                    | 3,200                 | 6,000                                    | 2,000                 |
|               | 10.0         | 9,600                                                          | 5,800                 | 9,600                                                                   | 5,800                 | 9,600                                    | 5,800                 | 7,200                                    | 3,200                 | 4,800                                    | 2,000                 |
|               | 12.0         | 8,000                                                          | 5,800                 | 8,000                                                                   | 5,800                 | 8,000                                    | 5,800                 | 6,000                                    | 3,200                 | 4,000                                    | 2,000                 |
| SUMIDIA Coat  | 16.0         | 6,000                                                          | 5,400                 | 6,000                                                                   | 5,400                 | 6,000                                    | 5,400                 | 4,500                                    | 3,000                 | 3,000                                    | 1,900                 |
|               | 20.0         | 4,800                                                          | 4,600                 | 4,800                                                                   | 4,600                 | 4,800                                    | 4,600                 | 3,600                                    | 2,580                 | 2,400                                    | 1,600                 |
|               | Standard     | $a_p$                                                          | 1 to 1.5 $D_c$        | $a_e$                                                                   | 1 to 1.5 $D_c$        | $a_p$                                    | 1 to 1.5 $D_c$        | $a_e$                                    | 1 to 1.5 $D_c$        | $a_p$                                    | 1 to 1.5 $D_c$        |
|               | Depth-of-cut | $a_p$                                                          | 0.1 $D_c$             | $a_e$                                                                   | 0.05 $D_c$            | $a_p$                                    | 0.05 $D_c$            | $a_e$                                    | 0.02 $D_c$            | $a_p$                                    | 0.01 $D_c$            |



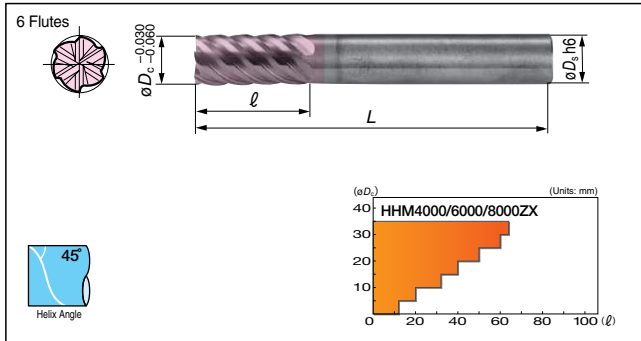


ZX Coated Hard Endmills

# HHM 4000/6000/8000ZX Type



| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○                  | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



- For general to hardened steel machining
- High rigidity design (Core diameter:  $0.85 \times \phi D_c$ )
- Fine Pitch Type

## Body (4 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| HHM 4030ZX | ●     | 3.0             | 8      | 50  | 6          |
| 4040ZX     | ●     | 4.0             | 10     | 50  | 6          |
| 4050ZX     | ●     | 5.0             | 12     | 50  | 6          |

Grade: ACZ10M

## Body (6 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| HHM 6060ZX | ●     | 6.0             | 12     | 50  | 6          |
| 6080ZX     | ●     | 8.0             | 16     | 60  | 8          |
| 6100ZX     | ●     | 10.0            | 20     | 71  | 10         |
| 6120ZX     | ●     | 12.0            | 24     | 75  | 12         |

Grade: ACZ10M

## Body (8 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| HHM 8160ZX | ●     | 16.0            | 32     | 90  | 16         |
| 8200ZX     | ●     | 20.0            | 40     | 106 | 20         |
| 8250ZX     | ●     | 25.0            | 50     | 120 | 25         |
| 8300ZX     | ●     | 30.0            | 60     | 130 | 32         |
| 8320ZX     | ●     | 32.0            | 64     | 130 | 32         |

Grade: ACZ10M

## General Purpose Machines

1. If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## Side Milling (HHM 4000ZX 4 Flutes)

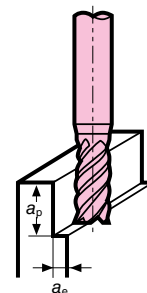
| Work Material | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|               | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 3.0           | 16,500                                  | 2,000              | 14,700                                  | 1,750              | 8,200                              | 600                | 16,500                             | 2,000              |
| 4.0           | 12,300                                  | 2,000              | 11,000                                  | 1,750              | 6,100                              | 600                | 12,300                             | 2,000              |
| 5.0           | 9,800                                   | 2,000              | 8,800                                   | 1,750              | 4,900                              | 600                | 9,800                              | 2,000              |
| Standard      | $1.5D_c$                                |                    | $1.5D_c$                                |                    | $1.0D_c$                           |                    | $1.5D_c$                           |                    |
| Depth-of-cut  | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |

## Side Milling (HHM 6000ZX 6 Flutes)

| Work Material | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|               | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 6.0           | 8,200                                   | 2,900              | 7,300                                   | 2,600              | 4,100                              | 900                | 8,200                              | 2,900              |
| 8.0           | 6,100                                   | 2,900              | 5,500                                   | 2,600              | 3,100                              | 900                | 6,100                              | 2,900              |
| 10.0          | 4,900                                   | 2,900              | 4,400                                   | 2,600              | 2,500                              | 900                | 4,900                              | 2,900              |
| 12.0          | 4,100                                   | 2,900              | 3,650                                   | 2,600              | 2,100                              | 900                | 4,100                              | 2,900              |
| Standard      | $1.5D_c$                                |                    | $1.5D_c$                                |                    | $1.0D_c$                           |                    | $1.5D_c$                           |                    |
| Depth-of-cut  | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |

## Side Milling (HHM 8000ZX 8 Flutes)

| Work Material | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|               | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 16.0          | 3,100                                   | 3,500              | 2,750                                   | 3,200              | 1,550                              | 1,100              | 3,100                              | 3,500              |
| 20.0          | 2,500                                   | 3,150              | 2,200                                   | 2,800              | 1,250                              | 950                | 2,500                              | 3,150              |
| 25.0          | 2,000                                   | 2,800              | 1,750                                   | 2,300              | 1,000                              | 850                | 2,000                              | 2,800              |
| 32.0          | 1,550                                   | 2,400              | 1,350                                   | 1,950              | 780                                | 700                | 1,550                              | 2,400              |
| Standard      | $1.5D_c$                                |                    | $1.5D_c$                                |                    | $1.0D_c$                           |                    | $1.5D_c$                           |                    |
| Depth-of-cut  | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |



I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

5 Flutes

6 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

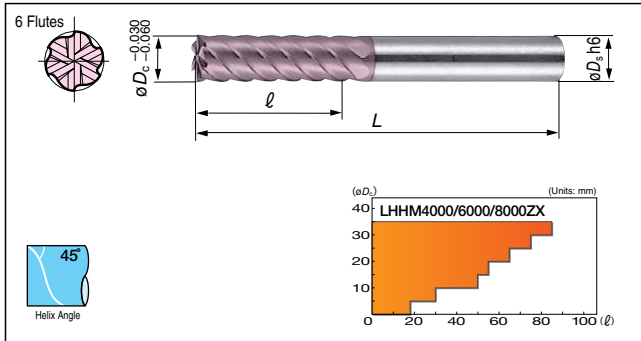
PCD



## LHHM 4000/6000/8000ZX Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○               | ○         | ○        | ○            | ○        | ○    |



- HHH-ZX series long type
- High rigidity endmill for precision of deep steps

## ■ Body (4 Flutes)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LHHM 4030ZX | ●     | 3.0             | 12     | 55  | 6          |
| 4040ZX      | ●     | 4.0             | 15     | 60  | 6          |
| 4050ZX      | ●     | 5.0             | 18     | 60  | 6          |

## ■ Body (6 Flutes)

Grade: ACZ10M

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LHHM 6060ZX | ●     | 6.0             | 18     | 60  | 6          |
| 6080ZX      | ●     | 8.0             | 25     | 75  | 8          |
| 6100ZX      | ●     | 10.0            | 30     | 80  | 10         |
| 6120ZX      | ●     | 12.0            | 30     | 100 | 12         |

Grade: ACZ10M

## ■ Body (8 Flutes)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LHHM 8160ZX | ●     | 16.0            | 50     | 105 | 16         |
| 8200ZX      | ●     | 20.0            | 55     | 120 | 20         |
| 8250ZX      | ●     | 25.0            | 65     | 140 | 25         |
| 8300ZX      | ●     | 30.0            | 75     | 160 | 32         |
| 8320ZX      | ●     | 32.0            | 85     | 170 | 32         |

Grade: ACZ10M

## ■ Application

| Hardness HRC      | 20                         | 30 | 40 | 50 | 60 |
|-------------------|----------------------------|----|----|----|----|
| Application Range | Finishing to Light Cutting |    |    |    |    |

## ■ General Purpose Machines

1. If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available
2. If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## ● Side Milling (LHHM 4000ZX 4 Flutes)

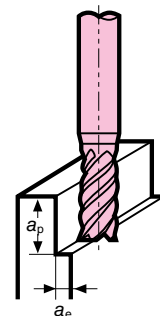
| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 3.0                | 16,500                                  | 1,500              | 14,700                                  | 1,300              | 8,200                              | 450                | 16,500                             | 1,500              |
| 4.0                | 12,300                                  | 1,500              | 11,000                                  | 1,300              | 6,100                              | 450                | 12,300                             | 1,500              |
| 5.0                | 9,800                                   | 1,500              | 8,800                                   | 1,300              | 4,900                              | 450                | 9,800                              | 1,500              |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $1.5D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |

## ● Side Milling (LHHM 6000ZX 6 Flutes)

| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 6.0                | 8,200                                   | 2,200              | 7,300                                   | 2,000              | 4,150                              | 700                | 8,200                              | 2,200              |
| 8.0                | 6,100                                   | 2,200              | 5,500                                   | 2,000              | 3,100                              | 700                | 6,100                              | 2,200              |
| 10.0               | 4,900                                   | 2,200              | 4,400                                   | 2,000              | 2,500                              | 700                | 4,900                              | 2,200              |
| 12.0               | 4,100                                   | 2,200              | 3,700                                   | 2,000              | 2,100                              | 700                | 4,100                              | 2,200              |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $1.5D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |

## ● Side Milling (LHHM 8000ZX 8 Flutes)

| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 16.0               | 3,100                                   | 2,700              | 2,750                                   | 2,400              | 1,550                              | 800                | 3,100                              | 2,700              |
| 20.0               | 2,500                                   | 2,400              | 2,200                                   | 2,100              | 1,250                              | 700                | 2,500                              | 2,400              |
| 25.0               | 2,000                                   | 2,100              | 1,750                                   | 1,700              | 1,000                              | 600                | 2,000                              | 2,000              |
| 32.0               | 1,550                                   | 1,800              | 1,350                                   | 1,500              | 780                                | 550                | 1,550                              | 1,800              |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $1.5D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.02D_c$                          |                    | $0.1D_c$                           |                    |

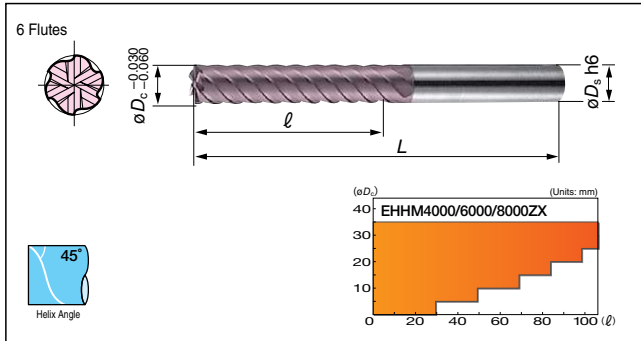




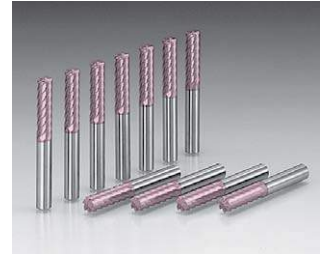
# ZX Coated Extra Long Hard Endmills EHHM 4000/6000/8000ZX Type



| Coated | Carbon | Alloy | Steel | Aluminum | Brass | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|--------|--------|-------|-------|----------|-------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○      | ○      | ○     | ○     | ○        | ○     | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



- HHM-ZX series extra long type
- High rigidity endmill for precision of deep steps



## Body (4 Flutes)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| EHHM 4030ZX | ●     | 3.0             | 20     | 60  | 6          |
| 4040ZX      | ●     | 4.0             | 25     | 65  | 6          |
| 4050ZX      | ●     | 5.0             | 30     | 70  | 6          |

Grade: ACZ10M

## Body (6 Flutes)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| EHHM 6060ZX | ●     | 6.0             | 30     | 70  | 6          |
| 6080ZX      | ●     | 8.0             | 40     | 90  | 8          |
| 6100ZX      | ●     | 10.0            | 50     | 100 | 10         |
| 6120ZX      | ●     | 12.0            | 50     | 120 | 12         |

Grade: ACZ10M

## Body (8 Flutes)

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| EHHM 8160ZX | ●     | 16.0            | 70     | 140 | 16         |
| 8200ZX      | ●     | 20.0            | 85     | 165 | 20         |
| 8250ZX      | ●     | 25.0            | 100    | 185 | 25         |
| 8300ZX      | ●     | 30.0            | 110    | 205 | 32         |
| 8320ZX      | ●     | 32.0            | 110    | 205 | 32         |

Grade: ACZ10M

## Application

| Hardness HRC      | 20                         | 30 | 40 | 50 | 60 |
|-------------------|----------------------------|----|----|----|----|
| Application Range | Finishing to Light Cutting |    |    |    |    |

## General Purpose Machines

1. If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available
2. If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## Side Milling (EHHM 4000ZX 4 Flutes)

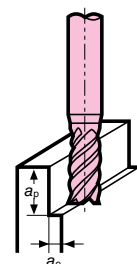
| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 3.0                | 5,800                                   | 700                | 4,600                                   | 400                | 1,800                              | 90                 | 5,800                              | 700                |
| 4.0                | 4,400                                   | 650                | 3,500                                   | 400                | 1,350                              | 100                | 4,400                              | 650                |
| 5.0                | 3,500                                   | 600                | 2,800                                   | 400                | 1,100                              | 110                | 3,500                              | 600                |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $2.0D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.05D_c$                               |                    | $0.02D_c$                               |                    | $0.01D_c$                          |                    | $0.05D_c$                          |                    |

## Side Milling (EHHM 6000ZX 6 Flutes)

| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 6.0                | 2,900                                   | 810                | 2,300                                   | 590                | 900                                | 160                | 2,900                              | 810                |
| 8.0                | 2,400                                   | 860                | 2,000                                   | 620                | 800                                | 170                | 2,400                              | 860                |
| 10.0               | 2,100                                   | 920                | 1,800                                   | 650                | 700                                | 170                | 2,100                              | 920                |
| 12.0               | 1,750                                   | 880                | 1,500                                   | 580                | 600                                | 170                | 1,750                              | 880                |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $2.0D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.05D_c$                               |                    | $0.02D_c$                               |                    | $0.01D_c$                          |                    | $0.05D_c$                          |                    |

## Side Milling (EHHM 8000ZX 8 Flutes)

| Work Material      | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Hardened Steel (Below 65HRC)       |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| 16.0               | 1,350                                   | 1,000              | 1,100                                   | 600                | 450                                | 190                | 1,350                              | 1,000              |
| 20.0               | 1,100                                   | 850                | 900                                     | 520                | 350                                | 160                | 1,100                              | 850                |
| 25.0               | 850                                     | 700                | 700                                     | 420                | 300                                | 150                | 850                                | 700                |
| 32.0               | 680                                     | 580                | 550                                     | 350                | 220                                | 120                | 680                                | 580                |
| Standard $a_p$     | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $2.0D_c$                           |                    | $2.0D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.05D_c$                               |                    | $0.02D_c$                               |                    | $0.01D_c$                          |                    | $0.05D_c$                          |                    |



I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

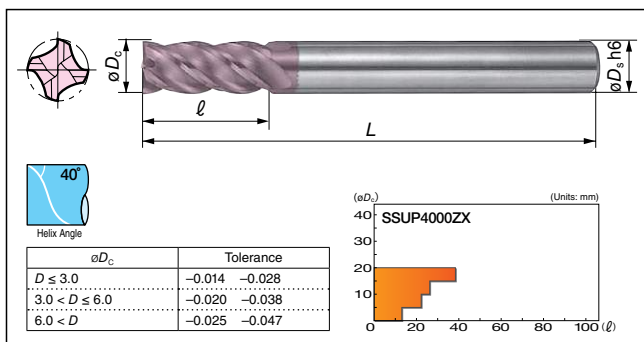
CBN

PCD

## SSUP 4000ZX Type



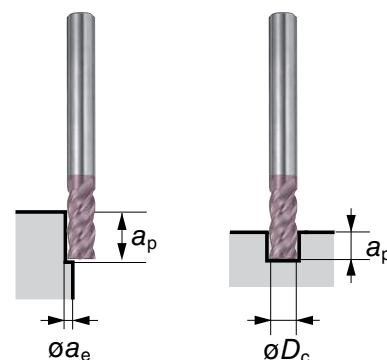
|                |              |              |                |                |                 |              |              |              |              |              |              |
|----------------|--------------|--------------|----------------|----------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Coated Carbide | Carbon Steel | Alloy Steel  | Hardened Steel | Tempered Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy     | Copper Alloy | Graphite     | CFRP         |
| ○              | ○            | ○            | ○              | ○              | ○               | ○            | ○            | ○            | ○            | ○            | ○            |
| 45 to 55 HRC   | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC   | 45 to 55 HRC   | 45 to 55 HRC    | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC |



## Body

| Cat. No.    | Stock | Dimensions (mm) |        |     |            |
|-------------|-------|-----------------|--------|-----|------------|
|             |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSUP 4020ZX | ●     | 2.0             | 6      | 50  | 4          |
| 4030ZX      | ●     | 3.0             | 8      | 50  | 6          |
| 4040ZX      | ●     | 4.0             | 11     | 50  | 6          |
| 4050ZX      | ●     | 5.0             | 13     | 60  | 6          |
| 4060ZX      | ●     | 6.0             | 13     | 60  | 6          |
| SSUP 4070ZX | ●     | 7.0             | 16     | 70  | 8          |
| 4080ZX      | ●     | 8.0             | 19     | 80  | 8          |
| 4090ZX      | ●     | 9.0             | 19     | 90  | 10         |
| 4100ZX      | ●     | 10.0            | 22     | 90  | 10         |
| 4110ZX      | ●     | 11.0            | 22     | 90  | 12         |
| SSUP 4120ZX | ●     | 12.0            | 26     | 90  | 12         |
| 4140ZX      | ●     | 14.0            | 26     | 110 | 16         |
| 4150ZX      | ●     | 15.0            | 26     | 110 | 16         |
| 4160ZX      | ●     | 16.0            | 32     | 115 | 16         |
| 4180ZX      | ●     | 18.0            | 32     | 120 | 20         |
| SSUP 4200ZX | ●     | 20.0            | 38     | 125 | 20         |

Grade: ACZ50M



## Recommended Cutting Conditions

- For groove milling of Stainless steel, use 60% of recommended spindle speed and 40% of recommended feed rate. (\*)
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling and Groove Milling

| Work Material  | Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel,<br>Hardened Steel<br>(40 to 50HRC) |                       | Stainless Steel (*)                   |                       | Heat Resistant Steel<br>Titanium Alloy<br>(20 to 45HRC) |                       |
|----------------|---------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------------------------|-----------------------|
| Conc.          | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )              | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) |
| $D_c$ (mm)     |                                                         |                       |                                       |                       |                                                    |                       |                                       |                       |                                                         |                       |
| 2.0            | 9,000                                                   | 720                   | 6,000                                 | 430                   | 4,000                                              | 320                   | 5,500                                 | 320                   | 2,600                                                   | 120                   |
| 4.0            | 6,600                                                   | 800                   | 4,500                                 | 450                   | 3,000                                              | 380                   | 4,000                                 | 320                   | 2,000                                                   | 120                   |
| 6.0            | 4,800                                                   | 960                   | 3,000                                 | 480                   | 2,500                                              | 380                   | 3,000                                 | 480                   | 1,200                                                   | 120                   |
| 8.0            | 3,600                                                   | 1,000                 | 2,200                                 | 610                   | 2,000                                              | 400                   | 2,000                                 | 520                   | 1,000                                                   | 140                   |
| 10.0           | 2,800                                                   | 1,000                 | 1,800                                 | 610                   | 1,500                                              | 400                   | 1,700                                 | 550                   | 800                                                     | 160                   |
| 12.0           | 2,400                                                   | 950                   | 1,500                                 | 550                   | 1,200                                              | 380                   | 1,500                                 | 500                   | 700                                                     | 140                   |
| 14.0           | 2,200                                                   | 880                   | 1,300                                 | 490                   | 1,000                                              | 360                   | 1,200                                 | 430                   | 600                                                     | 130                   |
| 16.0           | 1,800                                                   | 650                   | 1,100                                 | 420                   | 800                                                | 300                   | 1,000                                 | 360                   | 500                                                     | 120                   |
| 18.0           | 1,600                                                   | 580                   | 1,000                                 | 360                   | 750                                                | 270                   | 900                                   | 340                   | 450                                                     | 110                   |
| 20.0           | 1,400                                                   | 500                   | 900                                   | 330                   | 700                                                | 250                   | 820                                   | 300                   | 400                                                     | 100                   |
| Side Milling   | $a_p$                                                   | $1.5D_c$              |                                       |                       |                                                    |                       |                                       |                       |                                                         |                       |
|                | $a_e$                                                   | $0.1D_c$              |                                       | $0.05D_c$             |                                                    | $0.1D_c$              |                                       | $0.05D_c$             |                                                         |                       |
| Groove Milling | $a_p$                                                   | $1.0D_c$              |                                       | $0.2D_c$              |                                                    | $0.3D_c$              |                                       | $0.2D_c$              |                                                         |                       |

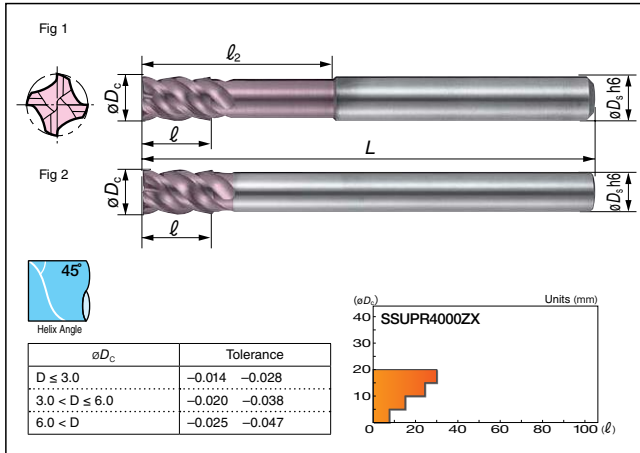


ZX Coated UP Mill Radius

# SSUPR 4000ZX Type



| Coated Carbon Steel | Carbon Steel | Alloy Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|---------------------|--------------|-------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○                   | ○            | ○           | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.     | Stock | Dimensions (mm) |      |     |       |            | Fig |
|--------------|-------|-----------------|------|-----|-------|------------|-----|
|              |       | $\phi D_c$      | $l$  | $L$ | $l_2$ | $\phi D_s$ |     |
| SSUPR 4030ZX | ●     | 3.0             | 4.5  | 60  | 12    | 6          | 1   |
| 4040ZX       | ●     | 4.0             | 6    | 60  | 16    | 6          | 1   |
| 4050ZX       | ●     | 5.0             | 7.5  | 60  | 20    | 6          | 1   |
| 4060ZX       | ●     | 6.0             | 9    | 60  | 24    | 6          | 1   |
| 4070ZX       | ●     | 7.0             | 10.5 | 80  | —     | 6          | 2   |
| SSUPR 4080ZX | ●     | 8.0             | 12   | 80  | 34    | 8          | 1   |
| 4090ZX       | ●     | 9.0             | 13.5 | 90  | —     | 8          | 2   |
| 4100ZX       | ●     | 10.0            | 15   | 100 | 42    | 10         | 1   |
| 4110ZX       | ●     | 11.0            | 16.5 | 120 | —     | 10         | 2   |
| 4120ZX       | ●     | 12.0            | 18   | 120 | 50    | 12         | 1   |
| SSUPR 4130ZX | ●     | 13.0            | 19.5 | 130 | —     | 12         | 2   |
| 4160ZX       | ●     | 16.0            | 24   | 160 | 66    | 16         | 1   |
| 4170ZX       | ●     | 17.0            | 25.5 | 170 | —     | 16         | 2   |
| 4200ZX       | ●     | 20.0            | 30   | 200 | 82    | 20         | 1   |

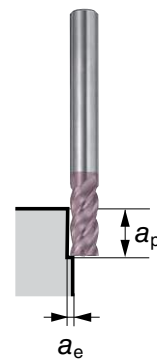
Grade: ACZ50M

## Recommended Cutting Conditions

- The conditions recommended are for endmills with standard overhangs of 4xD. For overhangs of 5xD or more, please use 70% (max.) of recommended conditions.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel                    |                    | Heat Resistant Steel Titanium Alloy (20 to 45HRC) |                    |
|---------------|----------------------------------------|--------------------|------------------------------------|--------------------|----------------------------------------------|--------------------|------------------------------------|--------------------|---------------------------------------------------|--------------------|
| Cond.         |                                        |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> )     | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                | Feed Rate (mm/min) |
| 3.0           | (min <sup>-1</sup> )                   | (mm/min)           | 5,300                              | 400                | 3,100                                        | 200                | 4,200                              | 350                | 2,600                                             | 160                |
| 4.0           | 6,600                                  | 600                | 4,000                              | 400                | 2,400                                        | 200                | 3,200                              | 350                | 2,000                                             | 160                |
| 6.0           | 4,200                                  | 600                | 2,600                              | 400                | 1,600                                        | 200                | 2,100                              | 350                | 1,300                                             | 160                |
| 8.0           | 3,200                                  | 650                | 2,000                              | 450                | 1,200                                        | 200                | 1,600                              | 350                | 1,000                                             | 160                |
| 10.0          | 2,500                                  | 650                | 1,600                              | 450                | 950                                          | 200                | 1,200                              | 400                | 800                                               | 180                |
| 12.0          | 2,100                                  | 650                | 1,300                              | 450                | 800                                          | 200                | 1,000                              | 400                | 650                                               | 180                |
| 13.0          | 1,900                                  | 650                | 1,200                              | 450                | 700                                          | 200                | 950                                | 400                | 600                                               | 180                |
| 16.0          | 1,600                                  | 650                | 1,000                              | 400                | 600                                          | 200                | 800                                | 350                | 500                                               | 160                |
| 17.0          | 1,500                                  | 600                | 900                                | 400                | 550                                          | 200                | 750                                | 350                | 450                                               | 160                |
| 20.0          | 1,200                                  | 600                | 800                                | 400                | 500                                          | 200                | 650                                | 350                | 400                                               | 160                |
| Standard      | 1.2 $D_c$                              |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| Depth-of-cut  | 0.1 $D_c$                              |                    | 0.05 $D_c$                         |                    | 0.1 $D_c$                                    |                    | 0.05 $D_c$                         |                    | 0.05 $D_c$                                        |                    |



I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

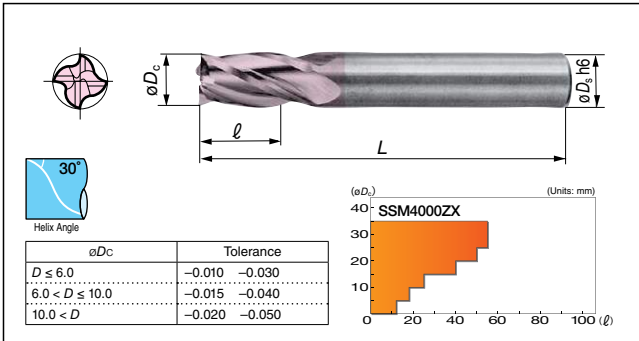
PCD



## SSM 4000ZX Type



|                |              |             |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |

■ Body (Diameter  $\phi 1.5$  to  $14.0\text{mm}$ )

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 4015ZX | ▲     | 1.5             | 5      | 40  | 4          |
| 4020ZX     | ▲     | 2.0             | 6      | 40  | 4          |
| 4025ZX     | ▲     | 2.5             | 8      | 40  | 4          |
| 4030ZX     | ▲     | 3.0             | 8      | 45  | 6          |
| 4035ZX     | ▲     | 3.5             | 8      | 45  | 6          |
| SSM 4040ZX | ▲     | 4.0             | 10     | 45  | 6          |
| 4045ZX     | ▲     | 4.5             | 10     | 45  | 6          |
| 4050ZX     | ▲     | 5.0             | 12     | 50  | 6          |
| 4055ZX     | ▲     | 5.5             | 12     | 50  | 6          |
| 4060ZX     | ▲     | 6.0             | 12     | 50  | 6          |
| SSM 4065ZX | ▲     | 6.5             | 12     | 50  | 8          |
| 4070ZX     | ▲     | 7.0             | 15     | 55  | 8          |
| 4075ZX     | ▲     | 7.5             | 15     | 55  | 8          |
| 4080ZX     | ▲     | 8.0             | 15     | 55  | 8          |
| 4085ZX     | ▲     | 8.5             | 15     | 55  | 10         |
| SSM 4090ZX | ▲     | 9.0             | 15     | 55  | 10         |
| 4095ZX     | ▲     | 9.5             | 15     | 55  | 10         |
| 4100ZX     | ▲     | 10.0            | 18     | 65  | 10         |
| 4105ZX     | *     | 10.5            | 18     | 65  | 12         |
| 4110ZX     | ▲     | 11.0            | 18     | 70  | 12         |
| SSM 4115ZX | *     | 11.5            | 18     | 70  | 12         |
| 4120ZX     | ▲     | 12.0            | 18     | 70  | 12         |
| 4130ZX     | ▲     | 13.0            | 20     | 80  | 16         |
| 4135ZX     | *     | 13.5            | 20     | 80  | 16         |
| 4140ZX     | ▲     | 14.0            | 20     | 80  | 16         |

Grade: ACZ50

■ Body (Diameter  $\phi 15.0$  to  $32.0\text{mm}$ )

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 4150ZX | ▲     | 15.0            | 25     | 80  | 16         |
| 4160ZX     | ▲     | 16.0            | 35     | 90  | 16         |
| 4170ZX     | *     | 17.0            | 35     | 90  | 20         |
| 4180ZX     | ▲     | 18.0            | 40     | 105 | 20         |
| 4190ZX     | *     | 19.0            | 40     | 105 | 20         |
| SSM 4200ZX | ▲     | 20.0            | 40     | 105 | 20         |
| 4220ZX     | *     | 22.0            | 40     | 105 | 25         |
| 4240ZX     | *     | 24.0            | 45     | 115 | 25         |
| 4250ZX     | ▲     | 25.0            | 50     | 120 | 25         |
| 4300ZX     | ▲     | 30.0            | 55     | 130 | 32         |
| SSM 4320ZX | ▲     | 32.0            | 55     | 130 | 32         |

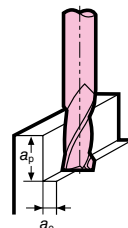
Grade: ACZ50

## ■ General Purpose Machines

1. If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## ● Side Milling

| Work Material         |                           | Carbon Steel, Alloy Steel (Below 25HRC) |     | Carbon Steel, Alloy Steel (Below 45HRC) |     | Cast Iron Special Cast Iron        |     | Stainless Steel Titanium Alloy |     |
|-----------------------|---------------------------|-----------------------------------------|-----|-----------------------------------------|-----|------------------------------------|-----|--------------------------------|-----|
| Cond.                 |                           | Spindle Speed (min <sup>-1</sup> )      |     | Feed Rate (mm/min)                      |     | Spindle Speed (min <sup>-1</sup> ) |     | Feed Rate (mm/min)             |     |
| $D_c$ (mm)            |                           | 1.5                                     |     | 2.0                                     |     | 3.0                                |     | 4.0                            |     |
| 1.5                   |                           | 16,300                                  | 290 | 9,500                                   | 100 | 23,000                             | 390 | 9,500                          | 100 |
| 2.0                   |                           | 12,000                                  | 310 | 7,000                                   | 110 | 17,000                             | 410 | 7,000                          | 110 |
| 3.0                   |                           | 8,100                                   | 390 | 5,200                                   | 120 | 11,500                             | 670 | 5,200                          | 120 |
| 4.0                   |                           | 6,100                                   | 410 | 4,000                                   | 130 | 8,800                              | 700 | 4,000                          | 130 |
| 6.0                   |                           | 4,100                                   | 470 | 2,900                                   | 140 | 5,800                              | 810 | 2,900                          | 140 |
| 8.0                   |                           | 3,000                                   | 460 | 2,150                                   | 140 | 4,400                              | 780 | 2,150                          | 140 |
| 10.0                  |                           | 2,400                                   | 460 | 1,700                                   | 140 | 3,500                              | 780 | 1,700                          | 140 |
| 12.0                  |                           | 2,000                                   | 460 | 1,450                                   | 150 | 2,900                              | 780 | 1,450                          | 150 |
| 16.0                  |                           | 1,500                                   | 460 | 1,100                                   | 130 | 2,150                              | 720 | 1,100                          | 130 |
| 20.0                  |                           | 1,200                                   | 410 | 850                                     | 105 | 1,700                              | 680 | 850                            | 105 |
| 25.0                  |                           | 950                                     | 330 | 700                                     | 80  | 1,400                              | 560 | 700                            | 80  |
| 32.0                  |                           | 750                                     | 280 | 550                                     | 70  | 1,100                              | 450 | 550                            | 70  |
| Standard Depth-of-cut | $a_p$                     | $1.5D_c$                                |     | $1.0D_c$                                |     | $1.5D_c$                           |     | $1.5D_c$                       |     |
|                       | Below $\phi 3$ : $a_e$    | $0.05D_c$                               |     | $0.05D_c$                               |     | $0.05D_c$                          |     | $0.05D_c$                      |     |
|                       | $\phi 3$ and above: $a_e$ | $0.1D_c$                                |     | $0.1D_c$                                |     | $0.1D_c$                           |     | $0.1D_c$                       |     |



▲ mark : To be replaced by new item (Please confirm stock availability)

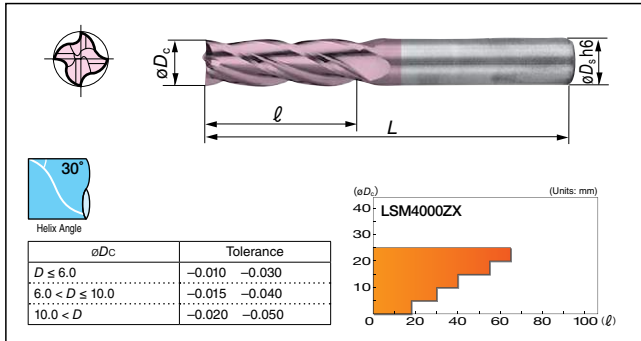


ZX Coated Spiral Long Endmills

## LSM 4000ZX Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ◎            | ◎           | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



- SSM-ZX series, long type
- For deep endmilling

## Body

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LSM 4030ZX | ▲     | 3.0             | 12     | 50  | 6          |
| 4035ZX     | *     | 3.5             | 12     | 50  | 6          |
| 4040ZX     | ▲     | 4.0             | 15     | 50  | 6          |
| 4045ZX     | *     | 4.5             | 15     | 50  | 6          |
| 4050ZX     | ▲     | 5.0             | 18     | 55  | 6          |
| LSM 4055ZX | *     | 5.5             | 18     | 55  | 6          |
| 4060ZX     | ▲     | 6.0             | 18     | 55  | 6          |
| 4065ZX     | *     | 6.5             | 18     | 55  | 8          |
| 4070ZX     | ▲     | 7.0             | 25     | 65  | 8          |
| 4075ZX     | *     | 7.5             | 25     | 65  | 8          |
| LSM 4080ZX | ▲     | 8.0             | 25     | 65  | 8          |
| 4085ZX     | *     | 8.5             | 25     | 65  | 10         |
| 4090ZX     | ▲     | 9.0             | 25     | 65  | 10         |
| 4095ZX     | *     | 9.5             | 25     | 65  | 10         |
| 4100ZX     | ▲     | 10.0            | 30     | 75  | 10         |
| LSM 4110ZX | ▲     | 11.0            | 30     | 80  | 12         |
| 4115ZX     | *     | 11.5            | 30     | 80  | 12         |
| 4120ZX     | ▲     | 12.0            | 30     | 80  | 12         |
| 4130ZX     | ▲     | 13.0            | 35     | 95  | 16         |
| 4140ZX     | ▲     | 14.0            | 40     | 95  | 16         |
| LSM 4150ZX | ▲     | 15.0            | 40     | 95  | 16         |
| 4160ZX     | ▲     | 16.0            | 50     | 105 | 16         |
| 4170ZX     | *     | 17.0            | 50     | 105 | 20         |
| 4180ZX     | ▲     | 18.0            | 50     | 115 | 20         |
| 4190ZX     | *     | 19.0            | 55     | 120 | 20         |
| LSM 4200ZX | ▲     | 20.0            | 55     | 120 | 20         |
| 4220ZX     | *     | 22.0            | 60     | 135 | 25         |
| 4250ZX     | ▲     | 25.0            | 65     | 140 | 25         |

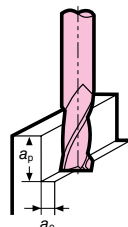
Grade: ACZ50

## General Purpose Machines

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.

## Side Milling

| Work Material | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    | Stainless Steel Titanium Alloy     |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| $D_c$ (mm)    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| 3.0           | 5,800                                   | 210                | 4,100                                   | 140                | 7,000                              | 250                | 4,100                              | 140                |
| 4.0           | 4,300                                   | 210                | 3,000                                   | 140                | 5,200                              | 250                | 3,000                              | 140                |
| 6.0           | 2,900                                   | 210                | 2,000                                   | 140                | 3,500                              | 250                | 2,000                              | 140                |
| 8.0           | 2,100                                   | 210                | 1,500                                   | 140                | 2,600                              | 250                | 1,500                              | 140                |
| 10.0          | 1,700                                   | 210                | 1,200                                   | 140                | 2,100                              | 250                | 1,200                              | 140                |
| 12.0          | 1,450                                   | 210                | 1,000                                   | 120                | 1,700                              | 250                | 1,000                              | 120                |
| 16.0          | 1,100                                   | 210                | 770                                     | 90                 | 1,300                              | 250                | 770                                | 90                 |
| 20.0          | 850                                     | 210                | 600                                     | 70                 | 1,050                              | 250                | 600                                | 70                 |
| 25.0          | 700                                     | 190                | 500                                     | 60                 | 850                                | 230                | 490                                | 60                 |
| $a_p$         | $2.0D_c$                                |                    | $2.0D_c$                                |                    | $2.0D_c$                           |                    | $2.0D_c$                           |                    |
| Standard      | $0.05D_c$                               |                    | $0.05D_c$                               |                    | $0.05D_c$                          |                    | $0.05D_c$                          |                    |
| Depth-of-cut  | $1.0D_c$                                |                    | $1.0D_c$                                |                    | $1.0D_c$                           |                    | $1.0D_c$                           |                    |



▲ mark : To be replaced by new item (Please confirm stock availability)

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long Neck

Uncoated

CBN

PCD

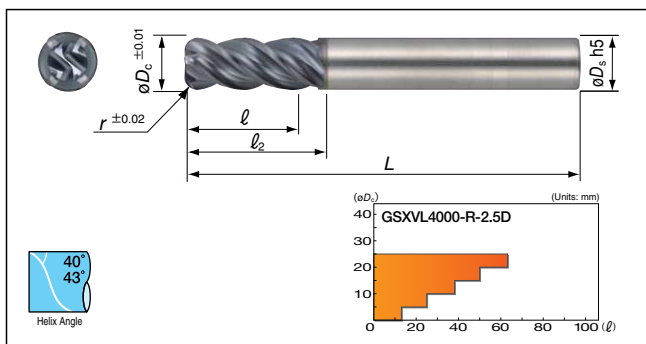
# GSX MILL 4 Flute Radius Endmills Anti-vibration Type GSXVL 4000-R-2.5D Type



SAFE-LOCK™ Applicable Products



| Coated Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|---------------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○                   | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.            | Stock | Dimensions (mm) |     |    |                |     |                 |
|---------------------|-------|-----------------|-----|----|----------------|-----|-----------------|
|                     |       | øD <sub>c</sub> | r   | ℓ  | ℓ <sub>2</sub> | L   | øD <sub>s</sub> |
| GSXVL 4030-R02-2.5D | ●     | 3.0             | 0.2 | 8  | 9.5            | 50  | 6               |
| 4030-R05-2.5D       | ●     | 3.0             | 0.5 | 8  | 9.5            | 50  | 6               |
| 4040-R02-2.5D       | ●     | 4.0             | 0.2 | 10 | 11.5           | 50  | 6               |
| 4040-R05-2.5D       | ●     | 4.0             | 0.5 | 10 | 11.5           | 50  | 6               |
| 4040-R10-2.5D       | ●     | 4.0             | 1.0 | 10 | 11.5           | 50  | 6               |
| GSXVL 4050-R02-2.5D | ●     | 5.0             | 0.2 | 13 | 14.5           | 60  | 6               |
| 4050-R05-2.5D       | ●     | 5.0             | 0.5 | 13 | 14.5           | 60  | 6               |
| 4050-R10-2.5D       | ●     | 5.0             | 1.0 | 13 | 14.5           | 60  | 6               |
| 4060-R03-2.5D       | ●     | 6.0             | 0.3 | 15 | —              | 60  | 6               |
| 4060-R05-2.5D       | ●     | 6.0             | 0.5 | 15 | —              | 60  | 6               |
| GSXVL 4060-R10-2.5D | ●     | 6.0             | 1.0 | 15 | —              | 60  | 6               |
| 4060-R15-2.5D       | ●     | 6.0             | 1.5 | 15 | —              | 60  | 6               |
| 4080-R03-2.5D       | ●     | 8.0             | 0.3 | 20 | —              | 80  | 8               |
| 4080-R05-2.5D       | ●     | 8.0             | 0.5 | 20 | —              | 80  | 8               |
| 4080-R10-2.5D       | ●     | 8.0             | 1.0 | 20 | —              | 80  | 8               |
| GSXVL 4080-R15-2.5D | ●     | 8.0             | 1.5 | 20 | —              | 80  | 8               |
| 4080-R20-2.5D       | ●     | 8.0             | 2.0 | 20 | —              | 80  | 8               |
| 4100-R03-2.5D       | ●     | 10.0            | 0.3 | 25 | —              | 90  | 10              |
| 4100-R05-2.5D       | ●     | 10.0            | 0.5 | 25 | —              | 90  | 10              |
| 4100-R10-2.5D       | ●     | 10.0            | 1.0 | 25 | —              | 90  | 10              |
| GSXVL 4100-R15-2.5D | ●     | 10.0            | 1.5 | 25 | —              | 90  | 10              |
| 4100-R20-2.5D       | ●     | 10.0            | 2.0 | 25 | —              | 90  | 10              |
| 4120-R05-2.5D       | ●     | 12.0            | 0.5 | 30 | —              | 90  | 12              |
| 4120-R10-2.5D       | ●     | 12.0            | 1.0 | 30 | —              | 90  | 12              |
| 4120-R15-2.5D       | ●     | 12.0            | 1.5 | 30 | —              | 90  | 12              |
| GSXVL 4120-R20-2.5D | ●     | 12.0            | 2.0 | 30 | —              | 90  | 12              |
| 4120-R30-2.5D       | ●     | 12.0            | 3.0 | 30 | —              | 90  | 12              |
| 4160-R10-2.5D       | ●     | 16.0            | 1.0 | 40 | —              | 115 | 16              |
| 4160-R15-2.5D       | ●     | 16.0            | 1.5 | 40 | —              | 115 | 16              |
| 4160-R20-2.5D       | ●     | 16.0            | 2.0 | 40 | —              | 115 | 16              |
| GSXVL 4160-R30-2.5D | ●     | 16.0            | 3.0 | 40 | —              | 115 | 16              |
| 4200-R10-2.5D       | ●     | 20.0            | 1.0 | 50 | —              | 125 | 20              |
| 4200-R15-2.5D       | ●     | 20.0            | 1.5 | 50 | —              | 125 | 20              |
| 4200-R20-2.5D       | ●     | 20.0            | 2.0 | 50 | —              | 125 | 20              |
| 4200-R30-2.5D       | ●     | 20.0            | 3.0 | 50 | —              | 125 | 20              |
| GSXVL 4250-R10-2.5D | ●     | 25.0            | 1.0 | 63 | —              | 140 | 25              |
| 4250-R15-2.5D       | ●     | 25.0            | 1.5 | 63 | —              | 140 | 25              |
| 4250-R20-2.5D       | ●     | 25.0            | 2.0 | 63 | —              | 140 | 25              |
| 4250-R30-2.5D       | ●     | 25.0            | 3.0 | 63 | —              | 140 | 25              |

Recommended Cutting Conditions I49

Grade: ACF20

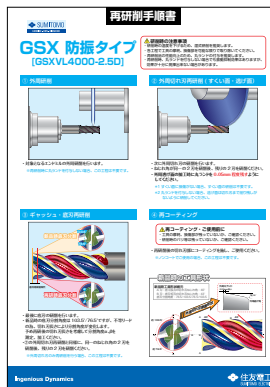
## Body (SAFE-LOCK™ Applicable Products)

| Cat. No.             | Stock | Dimensions (mm) |     |    |                |     |                 |
|----------------------|-------|-----------------|-----|----|----------------|-----|-----------------|
|                      |       | øD <sub>c</sub> | r   | ℓ  | ℓ <sub>2</sub> | L   | øD <sub>s</sub> |
| GSXVL 4120S-R05-2.5D | ●     | 12.0            | 0.5 | 30 | —              | 90  | 12              |
| 4120S-R10-2.5D       | ●     | 12.0            | 1.0 | 30 | —              | 90  | 12              |
| 4120S-R15-2.5D       | ●     | 12.0            | 1.5 | 30 | —              | 90  | 12              |
| 4120S-R20-2.5D       | ●     | 12.0            | 2.0 | 30 | —              | 90  | 12              |
| 4120S-R30-2.5D       | ●     | 12.0            | 3.0 | 30 | —              | 90  | 12              |
| GSXVL 4160S-R10-2.5D | ●     | 16.0            | 1.0 | 40 | —              | 115 | 16              |
| 4160S-R15-2.5D       | ●     | 16.0            | 1.5 | 40 | —              | 115 | 16              |
| 4160S-R20-2.5D       | ●     | 16.0            | 2.0 | 40 | —              | 115 | 16              |
| 4160S-R30-2.5D       | ●     | 16.0            | 3.0 | 40 | —              | 115 | 16              |
| 4200S-R10-2.5D       | ●     | 20.0            | 1.0 | 50 | —              | 125 | 20              |
| GSXVL 4200S-R15-2.5D | ●     | 20.0            | 1.5 | 50 | —              | 125 | 20              |
| 4200S-R20-2.5D       | ●     | 20.0            | 2.0 | 50 | —              | 125 | 20              |
| 4200S-R30-2.5D       | ●     | 20.0            | 3.0 | 50 | —              | 125 | 20              |
| 4250S-R10-2.5D       | ●     | 25.0            | 1.0 | 63 | —              | 140 | 25              |
| 4250S-R15-2.5D       | ●     | 25.0            | 1.5 | 63 | —              | 140 | 25              |
| GSXVL 4250S-R20-2.5D | ●     | 25.0            | 2.0 | 63 | —              | 140 | 25              |
| 4250S-R30-2.5D       | ●     | 25.0            | 3.0 | 63 | —              | 140 | 25              |

Grade: ACF20

## Diameter and Corner Radius Selection Range

| D <sub>c</sub> | r0.2 | r0.3 | r0.5 | r1.0 | r1.5 | r2.0 | r3.0 |
|----------------|------|------|------|------|------|------|------|
| ø3             | ●    |      | ●    |      |      |      |      |
| ø4             | ●    |      | ●    |      |      |      |      |
| ø5             | ●    |      | ●    |      |      |      |      |
| ø6             |      | ●    | ●    |      |      |      |      |
| ø8             |      | ●    | ●    |      |      |      |      |
| ø10            |      | ●    | ●    |      |      |      |      |
| ø12            |      |      | ●    |      |      |      |      |
| ø16            |      |      | ●    |      |      |      |      |
| ø20            |      |      | ●    |      |      |      |      |
| ø25            |      |      | ●    |      |      |      |      |



再研磨手順は、弊社Webサイトよりダウンロードしてください。

[[www.sumitool.com/products/cutting/endmills/gsx.html](http://www.sumitool.com/products/cutting/endmills/gsx.html)]

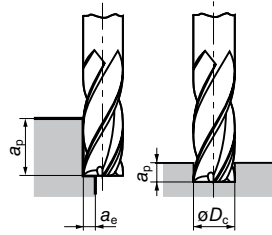
●トップページ>製品情報>切削工具

>エンドミル>GSX MILL シリーズ

## GSXVL 4000-R-2.5D Type

### Recommended Cutting Conditions

1. For stable machining performance use rigid, high-precision machines and holders.
2. Use air blow when dry machining.
3. Use wet machining for stainless steel, heat resistant alloy, and titanium alloy applications.
4. If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



### Side Milling

| Work Material                           | Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Cast Iron<br>(25 to 35HRC)            |                       | Tempered Steel - Hardened Steel<br>NAK, HPM<br>(40 to 50HRC) |                       | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       |
|-----------------------------------------|---------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cond.                                   | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                        | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)                     |                                                         |                       |                                       |                       |                                                              |                       |                                       |                       |                                       |                       |
| 2.0                                     | 13,000                                                  | 1,000                 | 10,000                                | 800                   | 8,000                                                        | 700                   | 10,000                                | 580                   | 5,000                                 | 200                   |
| 4.0                                     | 9,600                                                   | 1,200                 | 8,000                                 | 1,000                 | 6,000                                                        | 800                   | 5,500                                 | 650                   | 3,000                                 | 230                   |
| 6.0                                     | 6,800                                                   | 1,500                 | 5,600                                 | 1,200                 | 4,200                                                        | 900                   | 3,800                                 | 680                   | 2,100                                 | 240                   |
| 8.0                                     | 5,200                                                   | 1,600                 | 4,400                                 | 1,300                 | 3,200                                                        | 950                   | 2,800                                 | 650                   | 1,600                                 | 250                   |
| 10.0                                    | 4,200                                                   | 1,500                 | 3,500                                 | 1,200                 | 2,600                                                        | 800                   | 2,300                                 | 600                   | 1,300                                 | 210                   |
| 12.0                                    | 3,500                                                   | 1,400                 | 3,000                                 | 1,200                 | 2,200                                                        | 700                   | 1,900                                 | 550                   | 1,100                                 | 180                   |
| 14.0                                    | 3,000                                                   | 1,200                 | 2,600                                 | 1,100                 | 1,800                                                        | 600                   | 1,600                                 | 500                   | 900                                   | 150                   |
| 16.0                                    | 2,700                                                   | 1,100                 | 2,200                                 | 1,000                 | 1,600                                                        | 600                   | 1,400                                 | 480                   | 760                                   | 130                   |
| 18.0                                    | 2,400                                                   | 1,000                 | 2,000                                 | 900                   | 1,400                                                        | 570                   | 1,300                                 | 450                   | 680                                   | 120                   |
| 20.0                                    | 2,200                                                   | 900                   | 1,700                                 | 800                   | 1,200                                                        | 550                   | 1,100                                 | 400                   | 600                                   | 100                   |
| 25.0                                    | 1,700                                                   | 680                   | 1,400                                 | 630                   | 1,000                                                        | 450                   | 890                                   | 310                   | 480                                   | 82                    |
| Standard Depth-of-cut<br>a <sub>p</sub> | 1.5D <sub>c</sub>                                       |                       |                                       |                       |                                                              |                       |                                       |                       |                                       |                       |
| a <sub>e</sub>                          | 0.2D <sub>c</sub>                                       |                       | 0.05D <sub>c</sub>                    |                       | 0.1D <sub>c</sub>                                            |                       | 0.05D <sub>c</sub>                    |                       |                                       |                       |

### Groove Milling

| Work Material                           | Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Cast Iron<br>(25 to 35HRC)            |                       | Tempered Steel - Hardened Steel<br>NAK, HPM<br>(40 to 50HRC) |                       | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       |
|-----------------------------------------|---------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|--------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cond.                                   | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                        | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| D <sub>c</sub> (mm)                     |                                                         |                       |                                       |                       |                                                              |                       |                                       |                       |                                       |                       |
| 2.0                                     | 13,000                                                  | 750                   | 10,000                                | 550                   | 8,400                                                        | 500                   | 6,500                                 | 300                   | 4,000                                 | 140                   |
| 4.0                                     | 8,200                                                   | 800                   | 6,000                                 | 600                   | 5,200                                                        | 500                   | 4,000                                 | 330                   | 2,000                                 | 130                   |
| 6.0                                     | 6,100                                                   | 1,100                 | 4,000                                 | 600                   | 3,500                                                        | 580                   | 2,700                                 | 350                   | 1,350                                 | 150                   |
| 8.0                                     | 4,600                                                   | 1,000                 | 3,000                                 | 580                   | 2,600                                                        | 570                   | 2,000                                 | 330                   | 1,000                                 | 140                   |
| 10.0                                    | 3,600                                                   | 1,000                 | 2,400                                 | 550                   | 2,100                                                        | 510                   | 1,600                                 | 200                   | 800                                   | 130                   |
| 12.0                                    | 3,100                                                   | 920                   | 2,000                                 | 500                   | 1,700                                                        | 450                   | 1,300                                 | 280                   | 660                                   | 110                   |
| 14.0                                    | 2,600                                                   | 750                   | 1,700                                 | 450                   | 1,500                                                        | 400                   | 1,100                                 | 250                   | 570                                   | 100                   |
| 16.0                                    | 2,300                                                   | 670                   | 1,500                                 | 420                   | 1,300                                                        | 350                   | 1,000                                 | 230                   | 500                                   | 90                    |
| 18.0                                    | 2,000                                                   | 620                   | 1,300                                 | 380                   | 1,100                                                        | 330                   | 900                                   | 200                   | 430                                   | 80                    |
| 20.0                                    | 1,900                                                   | 600                   | 1,200                                 | 360                   | 1,000                                                        | 320                   | 800                                   | 180                   | 380                                   | 70                    |
| 25.0                                    | 1,500                                                   | 470                   | 1,000                                 | 300                   | 790                                                          | 250                   | 640                                   | 140                   | 300                                   | 55                    |
| Standard Depth-of-cut<br>a <sub>p</sub> | 1.0D <sub>c</sub>                                       |                       | 0.2D <sub>c</sub>                     |                       | 0.5D <sub>c</sub>                                            |                       | 0.2D <sub>c</sub>                     |                       |                                       |                       |

I

Coated  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
CoatLong  
Neck

Uncoated

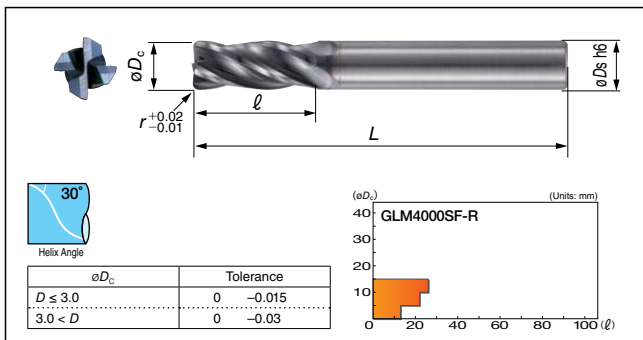
CBN  
PCD



## GLM 4000 SF-R Type



| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ◎              | ◎            | ◎           | ◎                  | ◎              | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |

Body (Diameter  $\phi 3.0$  to  $10.0$  mm)

| Cat. No.       | Stock | Dimensions (mm) |     |     |     |            |
|----------------|-------|-----------------|-----|-----|-----|------------|
|                |       | $\phi D_c$      | $r$ | $l$ | $L$ | $\phi D_s$ |
| GLM 4030SF-R02 | ▲     | 3.0             | 0.2 | 8   | 45  | 6          |
| 4030SF-R05     | ▲     | 3.0             | 0.5 | 8   | 45  | 6          |
| 4040SF-R02     | ▲     | 4.0             | 0.2 | 11  | 45  | 6          |
| 4040SF-R05     | ▲     | 4.0             | 0.5 | 11  | 45  | 6          |
| 4040SF-R10     | ▲     | 4.0             | 1.0 | 11  | 45  | 6          |
| GLM 4050SF-R02 | ▲     | 5.0             | 0.2 | 13  | 50  | 6          |
| 4050SF-R05     | ▲     | 5.0             | 0.5 | 13  | 50  | 6          |
| 4050SF-R10     | ▲     | 5.0             | 1.0 | 13  | 50  | 6          |
| 4060SF-R02     | ▲     | 6.0             | 0.2 | 13  | 50  | 6          |
| 4060SF-R05     | ▲     | 6.0             | 0.5 | 13  | 50  | 6          |
| GLM 4060SF-R10 | ▲     | 6.0             | 1.0 | 13  | 50  | 6          |
| 4060SF-R15     | ▲     | 6.0             | 1.5 | 13  | 50  | 6          |
| 4080SF-R02     | ▲     | 8.0             | 0.2 | 19  | 60  | 8          |
| 4080SF-R05     | ▲     | 8.0             | 0.5 | 19  | 60  | 8          |
| 4080SF-R10     | ▲     | 8.0             | 1.0 | 19  | 60  | 8          |
| GLM 4080SF-R15 | ▲     | 8.0             | 1.5 | 19  | 60  | 8          |
| 4100SF-R02     | ▲     | 10.0            | 0.2 | 22  | 70  | 10         |
| 4100SF-R05     | ▲     | 10.0            | 0.5 | 22  | 70  | 10         |
| 4100SF-R10     | ▲     | 10.0            | 1.0 | 22  | 70  | 10         |
| 4100SF-R15     | ▲     | 10.0            | 1.5 | 22  | 70  | 10         |
| GLM 4100SF-R20 | ▲     | 10.0            | 2.0 | 22  | 70  | 10         |

Grade: ACZ20W

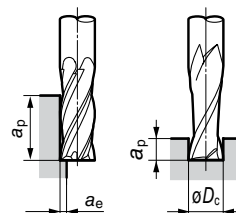
Body (Diameter  $\phi 12.0$  mm)

| Cat. No.       | Stock | Dimensions (mm) |     |     |     |            |
|----------------|-------|-----------------|-----|-----|-----|------------|
|                |       | $\phi D_c$      | $r$ | $l$ | $L$ | $\phi D_s$ |
| GLM 4120SF-R02 | ▲     | 12.0            | 0.2 | 26  | 75  | 12         |
| 4120SF-R05     | ▲     | 12.0            | 0.5 | 26  | 75  | 12         |
| 4120SF-R10     | ▲     | 12.0            | 1.0 | 26  | 75  | 12         |
| 4120SF-R15     | ▲     | 12.0            | 1.5 | 26  | 75  | 12         |
| 4120SF-R20     | ▲     | 12.0            | 2.0 | 26  | 75  | 12         |

Grade: ACZ20W

## Diameter and Corner Radius Selection Range

| $D_c$     | $r0.2$ | $r0.5$ | $r1.0$ | $r1.5$ | $r2.0$ |
|-----------|--------|--------|--------|--------|--------|
| $\phi 3$  | ●      | ●      |        |        |        |
| $\phi 4$  | ●      | ●      | ●      |        |        |
| $\phi 5$  | ●      | ●      | ●      |        |        |
| $\phi 6$  | ●      | ●      | ●      | ●      |        |
| $\phi 8$  | ●      | ●      | ●      | ●      | ●      |
| $\phi 10$ | ●      | ●      | ●      | ●      | ●      |
| $\phi 12$ | ●      | ●      | ●      | ●      | ●      |



## Recommended Cutting Conditions

- If the machine cannot achieve the standard spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please reduce the cutting conditions accordingly.
- For groove milling of Stainless steel, use 60% of recommended spindle speed and 40% of recommended feed rate. (\*)

## Side Milling and Groove Milling

| Work Material  | Structural Steel, Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel (*)<br>SUS304, SUS316 |                       | Heat Resistive Steel<br>Titanium Alloy |                       |
|----------------|---------------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------|-----------------------|
| Cond.          |                                                                           |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |                                        |                       |
| $D_c$ (mm)     | Spindle Speed<br>(min <sup>-1</sup> )                                     | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )  | Feed Rate<br>(mm/min) |
| 2.0            | 12,800                                                                    | 570                   | 12,000                                | 380                   | 8,300                                                       | 230                   | 6,000                                 | 150                   | 6,000                                 | 130                   | 3,700                                  | 70                    |
| 4.0            | 6,800                                                                     | 730                   | 6,400                                 | 490                   | 4,400                                                       | 300                   | 3,200                                 | 200                   | 3,200                                 | 170                   | 2,000                                  | 90                    |
| 6.0            | 4,600                                                                     | 770                   | 4,300                                 | 520                   | 3,000                                                       | 320                   | 2,200                                 | 210                   | 2,200                                 | 180                   | 1,400                                  | 100                   |
| 8.0            | 3,400                                                                     | 770                   | 3,200                                 | 520                   | 2,200                                                       | 320                   | 1,600                                 | 210                   | 1,600                                 | 180                   | 1,000                                  | 100                   |
| 10.0           | 2,800                                                                     | 780                   | 2,600                                 | 520                   | 1,800                                                       | 320                   | 1,300                                 | 210                   | 1,300                                 | 180                   | 800                                    | 100                   |
| 12.0           | 2,300                                                                     | 780                   | 2,200                                 | 530                   | 1,500                                                       | 320                   | 1,100                                 | 210                   | 1,100                                 | 180                   | 700                                    | 100                   |
| Side Milling   | $a_p$                                                                     | $1.5D_c$              | $1.5D_c$                              |                       | $1.5D_c$                                                    |                       | $1.0D_c$                              |                       | $1.5D_c$                              |                       | $1.0D_c$                               |                       |
|                | $a_e$                                                                     | $0.1D_c$              | $0.1D_c$                              |                       | $0.05D_c$                                                   |                       | $0.02D_c$                             |                       | $0.1D_c$                              |                       | $0.05D_c$                              |                       |
| Groove Milling | $a_p$                                                                     | $0.5D_c$              | $0.5D_c$                              |                       | $0.2D_c$                                                    |                       | $0.05D_c$                             |                       | $0.3D_c$                              |                       | $0.1D_c$                               |                       |

## Side Milling (High Speed Machining Centre)

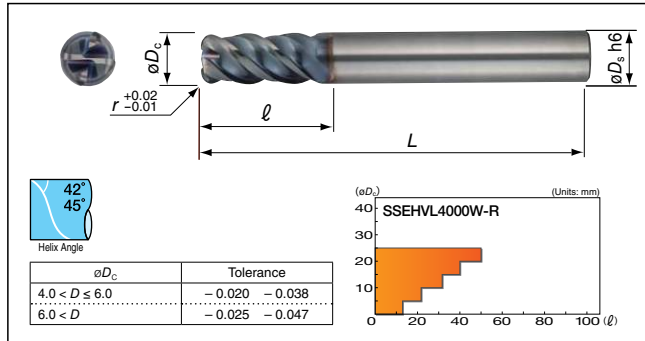
| Work Material | Structural Steel, Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel, Hardened Steel<br>NAK, HPM<br>(35 to 45HRC) |                       | Hardened Steel<br>(45 to 55HRC)       |                       | Stainless Steel (*)<br>SUS304, SUS316 |                       |
|---------------|---------------------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|-------------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cond.         |                                                                           |                       |                                       |                       |                                                             |                       |                                       |                       |                                       |                       |
| $D_c$ (mm)    | Spindle Speed<br>(min <sup>-1</sup> )                                     | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                       | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| 2.0           | 47,800                                                                    | 2,200                 | 47,800                                | 1,600                 | 39,800                                                      | 1,200                 | 31,800                                | 900                   | 15,900                                | 400                   |
| 4.0           | 23,900                                                                    | 2,600                 | 23,900                                | 1,900                 | 19,900                                                      | 1,400                 | 15,900                                | 1,100                 | 8,000                                 | 490                   |
| 6.0           | 16,000                                                                    | 2,700                 | 16,000                                | 2,000                 | 13,300                                                      | 1,500                 | 10,600                                | 1,200                 | 5,300                                 | 510                   |
| 8.0           | 12,000                                                                    | 2,700                 | 12,000                                | 2,000                 | 10,000                                                      | 1,500                 | 8,000                                 | 1,200                 | 4,000                                 | 520                   |
| 10.0          | 9,600                                                                     | 2,700                 | 9,600                                 | 2,000                 | 8,000                                                       | 1,500                 | 6,400                                 | 1,200                 | 3,200                                 | 520                   |
| 12.0          | 8,000                                                                     | 2,700                 | 8,000                                 | 2,000                 | 6,700                                                       | 1,500                 | 5,300                                 | 1,200                 | 2,700                                 | 520                   |
| Standard      | $a_p$                                                                     | $1.5D_c$              | $1.5D_c$                              |                       | $1.5D_c$                                                    |                       | $1.0D_c$                              |                       | $1.5D_c$                              |                       |
| Depth-of-cut  | $a_e$                                                                     | $0.05D_c$             | $0.05D_c$                             |                       | $0.05D_c$                                                   |                       | $0.02D_c$                             |                       | $0.05D_c$                             |                       |



# Radius Endmills for Exotic Alloys Anti-vibration SSEHVL 4000W-R Type



| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○                  | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.         | Stock | Dimensions (mm) |     |        |     |            |
|------------------|-------|-----------------|-----|--------|-----|------------|
|                  |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| SSEHVL 4045W-R05 | ●     | 4.5             | 0.5 | 12     | 50  | 6          |
| 4045W-R10        | ●     | 4.5             | 1.0 | 12     | 50  | 6          |
| 4050W-R05        | ●     | 5.0             | 0.5 | 13     | 60  | 6          |
| 4050W-R10        | ●     | 5.0             | 1.0 | 13     | 60  | 6          |
| 4060W-R10        | ●     | 6.0             | 1.0 | 13     | 60  | 6          |
| SSEHVL 4080W-R10 | ●     | 8.0             | 1.0 | 19     | 80  | 8          |
| 4100W-R10        | ●     | 10.0            | 1.0 | 22     | 90  | 10         |
| 4100W-R30        | ●     | 10.0            | 3.0 | 22     | 90  | 10         |
| 4120W-R10        | ●     | 12.0            | 1.0 | 26     | 90  | 12         |
| 4120W-R30        | ●     | 12.0            | 3.0 | 26     | 90  | 12         |
| SSEHVL 4160W-R10 | ●     | 16.0            | 1.0 | 32     | 115 | 16         |
| 4160W-R30        | ●     | 16.0            | 3.0 | 32     | 115 | 16         |
| 4200W-R10        | ●     | 20.0            | 1.0 | 40     | 125 | 20         |
| 4200W-R30        | ●     | 20.0            | 3.0 | 40     | 125 | 20         |
| 4250W-R10        | ●     | 25.0            | 1.0 | 50     | 140 | 25         |
| SSEHVL 4250W-R30 | ●     | 25.0            | 3.0 | 50     | 140 | 25         |

Grade: ACW52

## Recommended Cutting Conditions

- For stable machining, a more rigid machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material    | Stainless Steel SUS304, SUS316     |                    | Titanium Alloy                     |                    | Heat Resistant Steel               |                    |
|------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                  | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| Cond. $D_c$ (mm) |                                    |                    |                                    |                    |                                    |                    |
| 4.5              | 5,100                              | 480                | 5,300                              | 600                | 2,500                              | 200                |
| 5.0              | 4,600                              | 520                | 4,800                              | 700                | 2,200                              | 220                |
| 6.0              | 3,800                              | 560                | 4,000                              | 800                | 1,800                              | 210                |
| 8.0              | 2,900                              | 520                | 3,000                              | 780                | 1,400                              | 200                |
| 10.0             | 2,300                              | 500                | 2,400                              | 640                | 1,100                              | 180                |
| 12.0             | 1,900                              | 470                | 2,000                              | 600                | 930                                | 160                |
| 16.0             | 1,400                              | 430                | 1,500                              | 500                | 700                                | 140                |
| 20.0             | 1,100                              | 330                | 1,200                              | 260                | 560                                | 110                |
| 25.0             | 890                                | 270                | 950                                | 290                | 450                                | 90                 |
| Standard         | $a_p$                              | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           |
| Depth-of-cut     | $a_e$                              | $0.1D_c$           | $0.05D_c$                          | $0.05D_c$          | $0.05D_c$                          | $0.05D_c$          |

## Groove Milling

| Work Material    | Stainless Steel SUS304, SUS316     |                    | Titanium Alloy                     |                    | Heat Resistant Steel               |                    |
|------------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                  | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| Cond. $D_c$ (mm) |                                    |                    |                                    |                    |                                    |                    |
| 4.5              | 4,200                              | 200                | 3,900                              | 270                | 1,400                              | 100                |
| 5.0              | 3,800                              | 240                | 3,500                              | 300                | 1,300                              | 120                |
| 6.0              | 3,200                              | 260                | 2,900                              | 300                | 1,100                              | 140                |
| 8.0              | 2,400                              | 240                | 2,200                              | 270                | 800                                | 120                |
| 10.0             | 1,900                              | 220                | 1,700                              | 250                | 650                                | 110                |
| 12.0             | 1,600                              | 200                | 1,400                              | 230                | 550                                | 100                |
| 16.0             | 1,200                              | 130                | 1,100                              | 200                | 400                                | 80                 |
| 20.0             | 950                                | 95                 | 890                                | 90                 | 320                                | 60                 |
| 25.0             | 760                                | 75                 | 700                                | 70                 | 250                                | 50                 |
| Standard         | $a_p$                              | $0.3D_c$           | $0.2D_c$                           | $0.15D_c$          | $0.15D_c$                          | $0.15D_c$          |

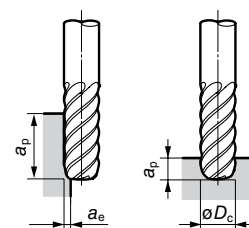
## Body (SAFE-LOCK™ Applicable Products)

| Cat. No.          | Stock | Dimensions (mm) |     |        |     |            |
|-------------------|-------|-----------------|-----|--------|-----|------------|
|                   |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| SSEHVL 4120WS-R10 | ●     | 12.0            | 1.0 | 26     | 90  | 12         |
| 4120WS-R30        | ●     | 12.0            | 3.0 | 26     | 90  | 12         |
| 4160WS-R10        | ●     | 16.0            | 1.0 | 32     | 115 | 16         |
| 4160WS-R30        | ●     | 16.0            | 3.0 | 32     | 115 | 16         |
| 4200WS-R10        | ●     | 20.0            | 1.0 | 40     | 125 | 20         |
| SSEHVL 4200WS-R30 | ●     | 20.0            | 3.0 | 40     | 125 | 20         |
| 4250WS-R10        | ●     | 25.0            | 1.0 | 50     | 140 | 25         |
| 4250WS-R30        | ●     | 25.0            | 3.0 | 50     | 140 | 25         |

Grade: ACW52

## Diameter and Corner Radius Selection Range

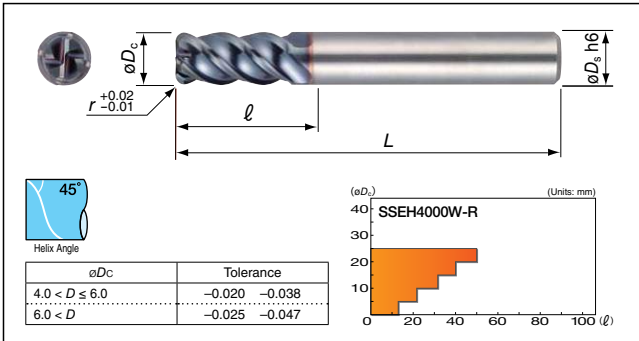
| $D_c$      | $r0.5$ | $r1.0$ | $r3.0$ |
|------------|--------|--------|--------|
| $\phi 4.5$ | ●      | ●      |        |
| $\phi 5$   | ●      | ●      |        |
| $\phi 6$   |        | ●      |        |
| $\phi 8$   |        | ●      |        |
| $\phi 10$  |        | ●      | ●      |
| $\phi 12$  |        | ●      | ●      |
| $\phi 16$  |        | ●      | ●      |
| $\phi 20$  |        | ●      | ●      |
| $\phi 25$  |        | ●      | ●      |



## SSEH 4000W-R Type



| Coated Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|---------------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○                   | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



## Body

| Cat. No.       | Stock | Dimensions (mm) |     |        |     |            |
|----------------|-------|-----------------|-----|--------|-----|------------|
|                |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| SSEH 4045W-R05 | ●     | 4.5             | 0.5 | 12     | 50  | 6          |
| 4045W-R10      | ●     | 4.5             | 1.0 | 12     | 50  | 6          |
| 4050W-R05      | ●     | 5.0             | 0.5 | 13     | 60  | 6          |
| 4050W-R10      | ●     | 5.0             | 1.0 | 13     | 60  | 6          |
| 4060W-R10      | ●     | 6.0             | 1.0 | 13     | 60  | 6          |
| SSEH 4080W-R10 | ●     | 8.0             | 1.0 | 19     | 80  | 8          |
| 4100W-R10      | ●     | 10.0            | 1.0 | 22     | 90  | 10         |
| 4100W-R30      | ●     | 10.0            | 3.0 | 22     | 90  | 10         |
| 4120W-R10      | ●     | 12.0            | 1.0 | 26     | 90  | 12         |
| 4120W-R30      | ●     | 12.0            | 3.0 | 26     | 90  | 12         |
| SSEH 4160W-R10 | ●     | 16.0            | 1.0 | 32     | 115 | 16         |
| 4160W-R30      | ●     | 16.0            | 3.0 | 32     | 115 | 16         |
| 4200W-R10      | ●     | 20.0            | 1.0 | 40     | 125 | 20         |
| 4200W-R30      | ●     | 20.0            | 3.0 | 40     | 125 | 20         |
| 4250W-R10      | ●     | 25.0            | 1.0 | 50     | 140 | 25         |
| SSEH 4250W-R30 | ●     | 25.0            | 3.0 | 50     | 140 | 25         |

Grade: ACW52

## Body (SAFE-LOCK™ Applicable Products)

| Cat. No.        | Stock | Dimensions (mm) |     |        |     |            |
|-----------------|-------|-----------------|-----|--------|-----|------------|
|                 |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| SSEH 4120WS-R10 | ●     | 12.0            | 1.0 | 26     | 90  | 12         |
| 4120WS-R30      | ●     | 12.0            | 3.0 | 26     | 90  | 12         |
| 4160WS-R10      | ●     | 16.0            | 1.0 | 32     | 115 | 16         |
| 4160WS-R30      | ●     | 16.0            | 3.0 | 32     | 115 | 16         |
| 4200WS-R10      | ●     | 20.0            | 1.0 | 40     | 125 | 20         |
| SSEH 4200WS-R30 | ●     | 20.0            | 3.0 | 40     | 125 | 20         |
| 4250WS-R10      | ●     | 25.0            | 1.0 | 50     | 140 | 25         |
| 4250WS-R30      | ●     | 25.0            | 3.0 | 50     | 140 | 25         |

Grade: ACW52

## Diameter and Corner Radius Selection Range

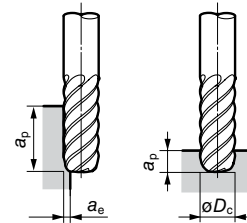
| $D_c$      | $r0.5$ | $r1.0$ | $r3.0$ |
|------------|--------|--------|--------|
| $\phi 4.5$ | ●      | ●      |        |
| $\phi 5$   | ●      | ●      |        |
| $\phi 6$   |        | ●      |        |
| $\phi 8$   |        | ●      |        |
| $\phi 10$  |        | ●      | ●      |
| $\phi 12$  |        | ●      | ●      |
| $\phi 16$  |        | ●      | ●      |
| $\phi 20$  |        | ●      | ●      |
| $\phi 25$  |        | ●      | ●      |

## Recommended Cutting Conditions

- For stable machining, a more rigid machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material | Stainless Steel SUS304, SUS316     |                    | Titanium Alloy                     |                    | Heat Resistant Steel               |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                    |                    |                                    |                    |                                    |                    |
| 4.5           | 3,500                              | 350                | 3,500                              | 280                | 2,100                              | 170                |
| 5.0           | 3,200                              | 380                | 3,200                              | 320                | 1,900                              | 190                |
| 6.0           | 2,700                              | 430                | 2,700                              | 320                | 1,600                              | 190                |
| 8.0           | 2,000                              | 400                | 2,000                              | 280                | 1,200                              | 170                |
| 10.0          | 1,600                              | 380                | 1,600                              | 260                | 1,000                              | 160                |
| 12.0          | 1,300                              | 360                | 1,300                              | 230                | 800                                | 140                |
| 16.0          | 1,000                              | 320                | 1,000                              | 200                | 600                                | 120                |
| 20.0          | 800                                | 260                | 800                                | 160                | 480                                | 100                |
| 25.0          | 640                                | 200                | 640                                | 130                | 380                                | 80                 |
| Standard      | $a_p$                              | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           |
| Depth-of-cut  | $a_e$                              | $0.1D_c$           | $0.05D_c$                          | $0.05D_c$          | $0.05D_c$                          | $0.05D_c$          |



## Groove Milling

| Work Material | Stainless Steel SUS304, SUS316     |                    | Titanium Alloy                     |                    | Heat Resistant Steel               |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                    |                    |                                    |                    |                                    |                    |
| 4.5           | 2,800                              | 140                | 2,500                              | 200                | 1,300                              | 100                |
| 5.0           | 2,500                              | 150                | 2,200                              | 220                | 1,100                              | 110                |
| 6.0           | 2,100                              | 170                | 1,900                              | 230                | 1,000                              | 120                |
| 8.0           | 1,600                              | 160                | 1,400                              | 200                | 700                                | 100                |
| 10.0          | 1,300                              | 160                | 1,100                              | 180                | 600                                | 100                |
| 12.0          | 1,100                              | 150                | 900                                | 160                | 500                                | 90                 |
| 16.0          | 800                                | 130                | 700                                | 140                | 400                                | 80                 |
| 20.0          | 640                                | 100                | 560                                | 110                | 320                                | 65                 |
| 25.0          | 510                                | 85                 | 450                                | 90                 | 250                                | 50                 |
| Standard      | $a_p$                              | $0.3D_c$           | $0.2D_c$                           | $0.15D_c$          | $0.15D_c$                          | $0.15D_c$          |

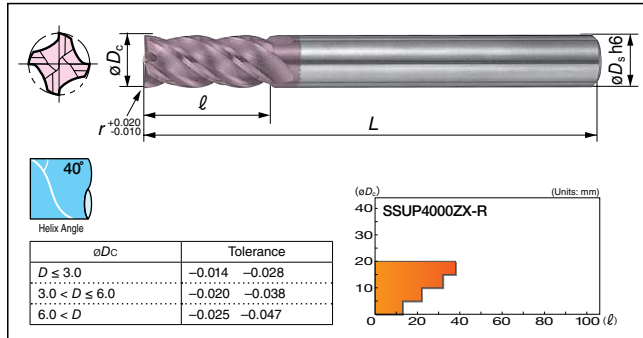


ZX Coated UP Mill Radius

## SSUP 4000ZX-R Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○              | ○               | ○         | ○        | ○            | ○        | ○    |

■ Body (Diameter:  $\phi 3.0$  to  $10.0$  mm)

| Cat. No.        | Stock | Dimensions (mm) |     |     |     |            |
|-----------------|-------|-----------------|-----|-----|-----|------------|
|                 |       | $\phi D_c$      | $r$ | $l$ | $L$ | $\phi D_s$ |
| SSUP 4030ZX-R02 | ●     | 3.0             | 0.2 | 8   | 50  | 6          |
| 4030ZX-R05      | ●     | 3.0             | 0.5 | 8   | 50  | 6          |
| 4040ZX-R02      | ●     | 4.0             | 0.2 | 11  | 50  | 6          |
| 4040ZX-R05      | ●     | 4.0             | 0.5 | 11  | 50  | 6          |
| 4040ZX-R10      | ●     | 4.0             | 1.0 | 11  | 50  | 6          |
| SSUP 4050ZX-R02 | ●     | 5.0             | 0.2 | 13  | 60  | 6          |
| 4050ZX-R05      | ●     | 5.0             | 0.5 | 13  | 60  | 6          |
| 4050ZX-R10      | ●     | 5.0             | 1.0 | 13  | 60  | 6          |
| 4060ZX-R03      | ●     | 6.0             | 0.3 | 13  | 60  | 6          |
| 4060ZX-R05      | ●     | 6.0             | 0.5 | 13  | 60  | 6          |
| SSUP 4060ZX-R10 | ●     | 6.0             | 1.0 | 13  | 60  | 6          |
| 4060ZX-R15      | ●     | 6.0             | 1.5 | 13  | 60  | 6          |
| 4080ZX-R03      | ●     | 8.0             | 0.3 | 19  | 80  | 8          |
| 4080ZX-R05      | ●     | 8.0             | 0.5 | 19  | 80  | 8          |
| 4080ZX-R10      | ●     | 8.0             | 1.0 | 19  | 80  | 8          |
| SSUP 4080ZX-R15 | ●     | 8.0             | 1.5 | 19  | 80  | 8          |
| 4080ZX-R20      | ●     | 8.0             | 2.0 | 19  | 80  | 8          |
| 4100ZX-R03      | ●     | 10.0            | 0.3 | 22  | 90  | 10         |
| 4100ZX-R05      | ●     | 10.0            | 0.5 | 22  | 90  | 10         |
| 4100ZX-R10      | ●     | 10.0            | 1.0 | 22  | 90  | 10         |
| SSUP 4100ZX-R15 | ●     | 10.0            | 1.5 | 22  | 90  | 10         |
| 4100ZX-R20      | ●     | 10.0            | 2.0 | 22  | 90  | 10         |

Grade: ACZ50M

■ Body (Diameter:  $\phi 12.0$  to  $20.0$  mm)

| Cat. No.        | Stock | Dimensions (mm) |     |     |     |            |
|-----------------|-------|-----------------|-----|-----|-----|------------|
|                 |       | $\phi D_c$      | $r$ | $l$ | $L$ | $\phi D_s$ |
| SSUP 4120ZX-R05 | ●     | 12.0            | 0.5 | 26  | 90  | 12         |
| 4120ZX-R10      | ●     | 12.0            | 1.0 | 26  | 90  | 12         |
| 4120ZX-R15      | ●     | 12.0            | 1.5 | 26  | 90  | 12         |
| 4120ZX-R20      | ●     | 12.0            | 2.0 | 26  | 90  | 12         |
| 4120ZX-R30      | ●     | 12.0            | 3.0 | 26  | 90  | 12         |
| SSUP 4160ZX-R10 | ●     | 16.0            | 1.0 | 32  | 115 | 16         |
| 4160ZX-R15      | ●     | 16.0            | 1.5 | 32  | 115 | 16         |
| 4160ZX-R20      | ●     | 16.0            | 2.0 | 32  | 115 | 16         |
| 4160ZX-R30      | ●     | 16.0            | 3.0 | 32  | 115 | 16         |
| 4200ZX-R10      | ●     | 20.0            | 1.0 | 38  | 125 | 20         |
| SSUP 4200ZX-R15 | ●     | 20.0            | 1.5 | 38  | 125 | 20         |
| 4200ZX-R20      | ●     | 20.0            | 2.0 | 38  | 125 | 20         |
| 4200ZX-R30      | ●     | 20.0            | 3.0 | 38  | 125 | 20         |

Grade: ACZ50M

## ● Diameter and Corner Radius Selection Range

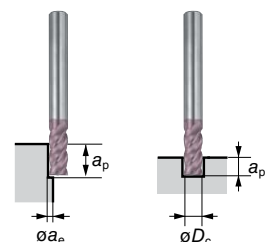
| $D_c$     | $r0.2$ | $r0.3$ | $r0.5$ | $r1.0$ | $r1.5$ | $r2.0$ | $r3.0$ |
|-----------|--------|--------|--------|--------|--------|--------|--------|
| $\phi 3$  | ●      |        | ●      |        |        |        |        |
| $\phi 4$  | ●      |        | ●      | ●      |        |        |        |
| $\phi 5$  | ●      |        | ●      | ●      |        |        |        |
| $\phi 6$  |        | ●      | ●      | ●      | ●      |        |        |
| $\phi 8$  |        | ●      | ●      | ●      | ●      | ●      |        |
| $\phi 10$ |        | ●      | ●      | ●      | ●      | ●      |        |
| $\phi 12$ |        |        | ●      | ●      | ●      | ●      | ●      |
| $\phi 16$ |        |        |        | ●      | ●      | ●      | ●      |
| $\phi 20$ |        |        |        | ●      | ●      | ●      | ●      |

## ■ Recommended Cutting Conditions

- For groove milling of Stainless steel, use 60% of recommended spindle speed and 40% of recommended feed rate. (\*)
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## ● Side Milling and Groove Milling

| Work Material  | Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                       | Alloy Steel<br>SCM<br>(25 to 35HRC)   |                       | Tempered Steel,<br>Hardened Steel<br>(40 to 50HRC) |                       | Stainless Steel (*)                   |                       | Heat Resistant Steel<br>Titanium Alloy<br>(20 to 45HRC) |                       |
|----------------|---------------------------------------------------------|-----------------------|---------------------------------------|-----------------------|----------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------------------------|-----------------------|
|                | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )              | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )                   | Feed Rate<br>(mm/min) |
| $D_c$ (mm)     |                                                         |                       |                                       |                       |                                                    |                       |                                       |                       |                                                         |                       |
| 2.0            | 9,000                                                   | 720                   | 6,000                                 | 430                   | 4,000                                              | 320                   | 5,500                                 | 320                   | 2,600                                                   | 120                   |
| 4.0            | 6,600                                                   | 800                   | 4,500                                 | 450                   | 3,000                                              | 380                   | 4,000                                 | 320                   | 2,000                                                   | 120                   |
| 6.0            | 4,800                                                   | 960                   | 3,000                                 | 480                   | 2,500                                              | 380                   | 3,000                                 | 480                   | 1,200                                                   | 120                   |
| 8.0            | 3,600                                                   | 1,000                 | 2,200                                 | 610                   | 2,000                                              | 400                   | 2,000                                 | 520                   | 1,000                                                   | 140                   |
| 10.0           | 2,800                                                   | 1,000                 | 1,800                                 | 610                   | 1,500                                              | 400                   | 1,700                                 | 550                   | 800                                                     | 160                   |
| 12.0           | 2,400                                                   | 950                   | 1,500                                 | 550                   | 1,200                                              | 380                   | 1,500                                 | 500                   | 700                                                     | 140                   |
| 14.0           | 2,200                                                   | 880                   | 1,300                                 | 490                   | 1,000                                              | 360                   | 1,200                                 | 430                   | 600                                                     | 130                   |
| 16.0           | 1,800                                                   | 650                   | 1,100                                 | 420                   | 800                                                | 300                   | 1,000                                 | 360                   | 500                                                     | 120                   |
| 18.0           | 1,600                                                   | 580                   | 1,000                                 | 360                   | 750                                                | 270                   | 900                                   | 340                   | 450                                                     | 110                   |
| 20.0           | 1,400                                                   | 500                   | 900                                   | 330                   | 700                                                | 250                   | 820                                   | 300                   | 400                                                     | 100                   |
| Side Milling   | $a_p$                                                   | $1.5D_c$              |                                       |                       |                                                    |                       |                                       |                       |                                                         |                       |
| Groove Milling | $a_p$                                                   | $0.1D_c$              |                                       | $0.05D_c$             |                                                    | $0.1D_c$              |                                       | $0.05D_c$             |                                                         |                       |
|                |                                                         | $1.0D_c$              |                                       | $0.2D_c$              |                                                    | $0.3D_c$              |                                       | $0.2D_c$              |                                                         |                       |



I Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA

Coat

Long Neck

Uncoated

CBN

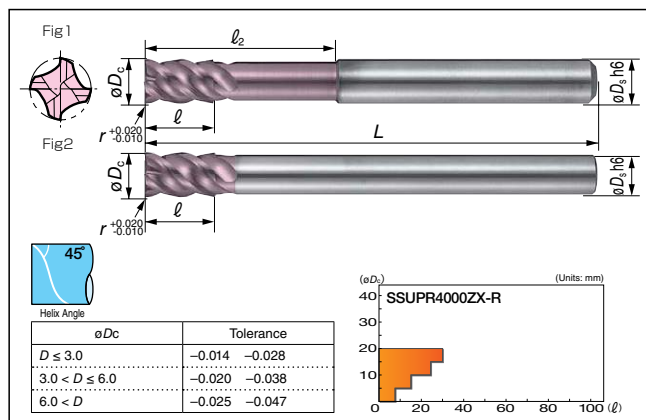
PCD



## SSUPR 4000ZX-R Type



|                |              |             |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ◎              | ◎            | ◎           | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |

■ Body (Diameter:  $\phi 3.0$  to 12.0 mm)

| Cat. No.         | Stock | Dimensions (mm) |     |        |     |          |            | Fig |
|------------------|-------|-----------------|-----|--------|-----|----------|------------|-----|
|                  |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\ell_2$ | $\phi D_s$ |     |
| SSUPR 4030ZX-R02 | ●     | 3.0             | 0.2 | 4.5    | 60  | 12       | 6          | 1   |
| 4030ZX-R05       | ●     | 3.0             | 0.5 | 4.5    | 60  | 12       | 6          | 1   |
| 4040ZX-R02       | ●     | 4.0             | 0.2 | 6      | 60  | 16       | 6          | 1   |
| 4040ZX-R05       | ●     | 4.0             | 0.5 | 6      | 60  | 16       | 6          | 1   |
| 4050ZX-R02       | ●     | 5.0             | 0.2 | 7.5    | 60  | 20       | 6          | 1   |
| SSUPR 4050ZX-R05 | ●     | 5.0             | 0.5 | 7.5    | 60  | 20       | 6          | 1   |
| 4060ZX-R03       | ●     | 6.0             | 0.3 | 9      | 60  | 24       | 6          | 1   |
| 4060ZX-R05       | ●     | 6.0             | 0.5 | 9      | 60  | 24       | 6          | 1   |
| 4070ZX-R03       | ●     | 7.0             | 0.3 | 10.5   | 80  | —        | 6          | 2   |
| 4070ZX-R05       | ●     | 7.0             | 0.5 | 10.5   | 80  | —        | 6          | 2   |
| SSUPR 4080ZX-R05 | ●     | 8.0             | 0.5 | 12     | 80  | 34       | 8          | 1   |
| 4080ZX-R10       | ●     | 8.0             | 1.0 | 12     | 80  | 34       | 8          | 1   |
| 4090ZX-R05       | ●     | 9.0             | 0.5 | 13.5   | 90  | —        | 8          | 2   |
| 4090ZX-R10       | ●     | 9.0             | 1.0 | 13.5   | 90  | —        | 8          | 2   |
| 4100ZX-R05       | ●     | 10.0            | 0.5 | 15     | 100 | 42       | 10         | 1   |
| SSUPR 4100ZX-R10 | ●     | 10.0            | 1.0 | 15     | 100 | 42       | 10         | 1   |
| 4100ZX-R15       | ●     | 10.0            | 1.5 | 15     | 100 | 42       | 10         | 1   |
| 4110ZX-R05       | ●     | 11.0            | 0.5 | 16.5   | 120 | —        | 10         | 2   |
| 4110ZX-R10       | ●     | 11.0            | 1.0 | 16.5   | 120 | —        | 10         | 2   |
| 4110ZX-R15       | ●     | 11.0            | 1.5 | 16.5   | 120 | —        | 10         | 2   |
| SSUPR 4120ZX-R05 | ●     | 12.0            | 0.5 | 18     | 120 | 50       | 12         | 1   |
| 4120ZX-R10       | ●     | 12.0            | 1.0 | 18     | 120 | 50       | 12         | 1   |
| 4120ZX-R15       | ●     | 12.0            | 1.5 | 18     | 120 | 50       | 12         | 1   |

Grade: ACZ50M

■ Body (Diameter:  $\phi 13.0$  to 20.0 mm)

| Cat. No.         | Stock | Dimensions (mm) |     |        |     |          |            | Fig |
|------------------|-------|-----------------|-----|--------|-----|----------|------------|-----|
|                  |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\ell_2$ | $\phi D_s$ |     |
| SSUPR 4130ZX-R05 | ●     | 13.0            | 0.5 | 19.5   | 130 | —        | 12         | 2   |
| 4130ZX-R10       | ●     | 13.0            | 1.0 | 19.5   | 130 | —        | 12         | 2   |
| 4130ZX-R15       | ●     | 13.0            | 1.5 | 19.5   | 130 | —        | 12         | 2   |
| 4160ZX-R10       | ●     | 16.0            | 1.0 | 24     | 160 | 66       | 16         | 1   |
| 4160ZX-R15       | ●     | 16.0            | 1.5 | 24     | 160 | 66       | 16         | 1   |
| SSUPR 4160ZX-R20 | ●     | 16.0            | 2.0 | 24     | 160 | 66       | 16         | 1   |
| 4170ZX-R10       | ●     | 17.0            | 1.0 | 25.5   | 170 | —        | 16         | 2   |
| 4170ZX-R15       | ●     | 17.0            | 1.5 | 25.5   | 170 | —        | 16         | 2   |
| 4170ZX-R20       | ●     | 17.0            | 2.0 | 25.5   | 170 | —        | 16         | 2   |
| 4200ZX-R10       | ●     | 20.0            | 1.0 | 30     | 200 | 82       | 20         | 1   |
| SSUPR 4200ZX-R15 | ●     | 20.0            | 1.5 | 30     | 200 | 82       | 20         | 1   |
| 4200ZX-R20       | ●     | 20.0            | 2.0 | 30     | 200 | 82       | 20         | 1   |

Grade: ACZ50M

## ● Diameter and Corner Radius Selection Range

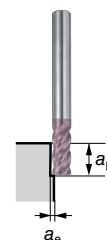
| $D_c$     | $r0.2$ | $r0.3$ | $r0.5$ | $r1.0$ | $r1.5$ | $r2.0$ |
|-----------|--------|--------|--------|--------|--------|--------|
| $\phi 3$  | ●      |        | ●      |        |        |        |
| $\phi 4$  | ●      |        | ●      |        |        |        |
| $\phi 5$  | ●      |        | ●      |        |        |        |
| $\phi 6$  |        | ●      | ●      |        |        |        |
| $\phi 7$  |        | ●      | ●      |        |        |        |
| $\phi 8$  |        |        | ●      | ●      |        |        |
| $\phi 9$  |        |        | ●      | ●      |        |        |
| $\phi 10$ |        |        | ●      | ●      | ●      |        |
| $\phi 11$ |        |        | ●      | ●      | ●      |        |
| $\phi 12$ |        |        | ●      | ●      | ●      |        |
| $\phi 13$ |        |        | ●      | ●      | ●      |        |
| $\phi 16$ |        |        |        | ●      | ●      | ●      |
| $\phi 17$ |        |        |        | ●      | ●      | ●      |
| $\phi 20$ |        |        |        | ●      | ●      | ●      |

## ■ Recommended Cutting Conditions

- The conditions recommended are for endmills with standard overhangs of 4xD. For overhangs of 5xD or more, please use 70% (max.) of recommended conditions.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

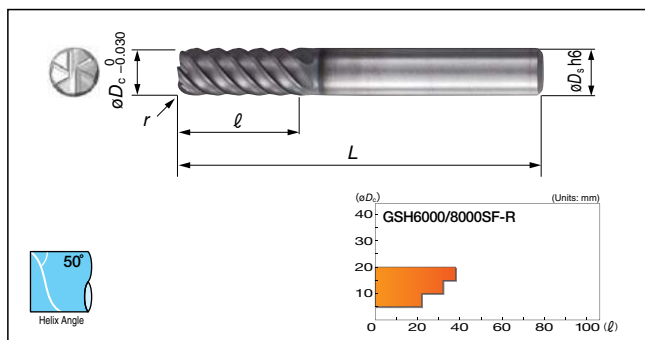
## ● Side Milling

| Work Material | Carbon Steel, Cast Iron (150 to 250HB) |                    | Alloy Steel SCM (25 to 35HRC)      |                    | Tempered Steel, Hardened Steel (40 to 50HRC) |                    | Stainless Steel                    |                    | Heat Resistant Steel Titanium Alloy (20 to 45HRC) |                    |
|---------------|----------------------------------------|--------------------|------------------------------------|--------------------|----------------------------------------------|--------------------|------------------------------------|--------------------|---------------------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )     | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                        |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| 3.0           | 9,000                                  | 600                | 5,300                              | 400                | 3,100                                        | 200                | 4,200                              | 350                | 2,600                                             | 160                |
| 4.0           | 6,600                                  | 600                | 4,000                              | 400                | 2,400                                        | 200                | 3,200                              | 350                | 2,000                                             | 160                |
| 6.0           | 4,200                                  | 600                | 2,600                              | 400                | 1,600                                        | 200                | 2,100                              | 350                | 1,300                                             | 160                |
| 8.0           | 3,200                                  | 650                | 2,000                              | 450                | 1,200                                        | 200                | 1,600                              | 350                | 1,000                                             | 160                |
| 10.0          | 2,500                                  | 650                | 1,600                              | 450                | 950                                          | 200                | 1,200                              | 400                | 800                                               | 180                |
| 12.0          | 2,100                                  | 650                | 1,300                              | 450                | 800                                          | 200                | 1,000                              | 400                | 650                                               | 180                |
| 13.0          | 1,900                                  | 650                | 1,200                              | 450                | 700                                          | 200                | 950                                | 400                | 600                                               | 180                |
| 16.0          | 1,600                                  | 650                | 1,000                              | 400                | 600                                          | 200                | 800                                | 350                | 500                                               | 160                |
| 17.0          | 1,500                                  | 600                | 900                                | 400                | 550                                          | 200                | 750                                | 350                | 450                                               | 160                |
| 20.0          | 1,200                                  | 600                | 800                                | 400                | 500                                          | 200                | 650                                | 350                | 400                                               | 160                |
| Standard      | 1.2D <sub>c</sub>                      |                    |                                    |                    |                                              |                    |                                    |                    |                                                   |                    |
| Depth-of-cut  | 0.1D <sub>c</sub>                      |                    | 0.05D <sub>c</sub>                 |                    | 0.1D <sub>c</sub>                            |                    | 0.05D <sub>c</sub>                 |                    | 0.05D <sub>c</sub>                                |                    |





|         |        |       |              |                |                |              |              |  |                 |          |           |          |              |          |      |
|---------|--------|-------|--------------|----------------|----------------|--------------|--------------|--|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated  | Carbon | Alloy | Pre-Hardened | Tempered Steel | Hardened Steel |              |              |  | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| Carbide | Steel  | Steel | Steel        | Steel          | 45 to 56 HRC   | 55 to 60 HRC | 60 to 65 HRC |  |                 | 钛合金      |           |          |              |          |      |



### ■ Diameter and Corner Radius Selection Range

| $D_c$     | $r=0.2$ | $r=0.5$ | $r=1.0$ | $r=1.5$ | $r=2.0$ |
|-----------|---------|---------|---------|---------|---------|
| $\phi 6$  | ●       | ●       | ●       |         |         |
| $\phi 8$  | ●       | ●       | ●       |         |         |
| $\phi 10$ |         | ●       | ●       | ●       | ●       |
| $\phi 12$ |         | ●       | ●       | ●       | ●       |
| $\phi 16$ |         |         | ●       | ●       | ●       |
| $\phi 20$ |         |         | ●       | ●       | ●       |

■ Body (6 Flutes)

| Cat. No.              | Stock | Dimensions (mm)   |     |        |     |                   |
|-----------------------|-------|-------------------|-----|--------|-----|-------------------|
|                       |       | $\varnothing D_c$ | $r$ | $\ell$ | $L$ | $\varnothing D_s$ |
| <b>GSH 6060SF-R02</b> | ●     | 6.0               | 0.2 | 13     | 50  | 6                 |
| <b>6060SF-R05</b>     | ●     | 6.0               | 0.5 | 13     | 50  | 6                 |
| <b>6060SF-R10</b>     | ●     | 6.0               | 1.0 | 13     | 50  | 6                 |
| <b>6080SF-R02</b>     | ●     | 8.0               | 0.2 | 19     | 60  | 8                 |
| <b>6080SF-R05</b>     | ●     | 8.0               | 0.5 | 19     | 60  | 8                 |
| <b>GSH 6080SF-R10</b> | ●     | 8.0               | 1.0 | 19     | 60  | 8                 |
| <b>6100SF-R05</b>     | ●     | 10.0              | 0.5 | 22     | 70  | 10                |
| <b>6100SF-R10</b>     | ●     | 10.0              | 1.0 | 22     | 70  | 10                |
| <b>6100SF-R15</b>     | ●     | 10.0              | 1.5 | 22     | 70  | 10                |
| <b>6100SF-R20</b>     | ●     | 10.0              | 2.0 | 22     | 70  | 10                |
| <b>GSH 6120SF-R05</b> | ●     | 12.0              | 0.5 | 26     | 75  | 12                |
| <b>6120SF-R10</b>     | ●     | 12.0              | 1.0 | 26     | 75  | 12                |
| <b>6120SF-R15</b>     | ●     | 12.0              | 1.5 | 26     | 75  | 12                |
| <b>6120SF-R20</b>     | ●     | 12.0              | 2.0 | 26     | 75  | 12                |

Grade: ACF07C

■ Body (8 Flutes)

| Cat. No.              | Stock | Dimensions (mm) |     |        |     |            |
|-----------------------|-------|-----------------|-----|--------|-----|------------|
|                       |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| <b>GSH 8160SF-R10</b> | ●     | 16.0            | 1.0 | 32     | 90  | 16         |
| <b>8160SF-R15</b>     | ●     | 16.0            | 1.5 | 32     | 90  | 16         |
| <b>8160SF-R20</b>     | ●     | 16.0            | 2.0 | 32     | 90  | 16         |
| <b>8200SF-R10</b>     | ●     | 20.0            | 1.0 | 38     | 100 | 20         |
| <b>8200SF-R15</b>     | ●     | 20.0            | 1.5 | 38     | 100 | 20         |
| <b>GSH 8200SF-R20</b> | ●     | 20.0            | 2.0 | 38     | 100 | 20         |

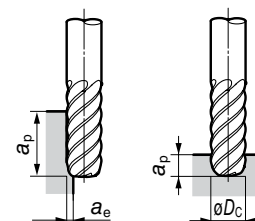
Grade: ACF07C

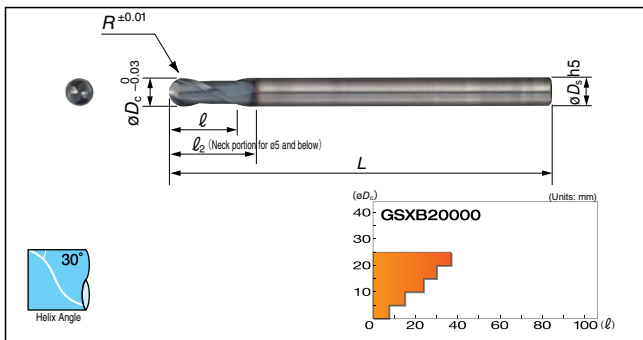
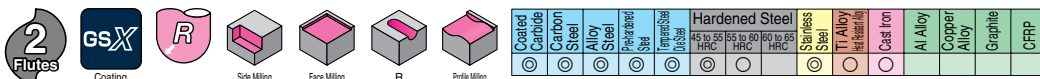
- Side Milling and Groove Milling

| Work Material   | Low Carbon Steel                           |                        | Middle Hardened Steel                          |                       | Hardened Steel                        |                       | Hardened Steel                        |                       | Hardened Steel                        |                            | Hardened Steel                        |                       |
|-----------------|--------------------------------------------|------------------------|------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|----------------------------|---------------------------------------|-----------------------|
| Cond.           | Carbon Steel, Alloy Steel<br>(Up to 35HRC) |                        | Pre-hardened Steel, Die Steel<br>(35 to 45HRC) |                       | SKD61<br>(45 to 55HRC)                |                       | SKD11<br>(55 to 60HRC)                |                       | SKH51<br>(60 to 65HRC)                |                            | SKH55<br>(65 to 70HRC)                |                       |
| $D_c$ (mm)      | Spindle Speed<br>(min <sup>-1</sup> )      | Feed Rate<br>(mm/min)  | Spindle Speed<br>(min <sup>-1</sup> )          | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min)      | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| 6.0             | 7,500                                      | 2,700                  | 6,700                                          | 1,930                 | 5,200                                 | 1,300                 | 4,100                                 | 810                   | 3,700                                 | 670                        | 2,600                                 | 470                   |
| 8.0             | 5,600                                      | 2,700                  | 5,000                                          | 1,930                 | 3,900                                 | 1,300                 | 3,050                                 | 810                   | 2,800                                 | 670                        | 1,950                                 | 470                   |
| 10.0            | 4,500                                      | 2,700                  | 4,000                                          | 1,930                 | 3,100                                 | 1,300                 | 2,450                                 | 810                   | 2,200                                 | 670                        | 1,550                                 | 470                   |
| 12.0            | 3,750                                      | 2,700                  | 3,350                                          | 1,930                 | 2,600                                 | 1,300                 | 2,050                                 | 810                   | 1,850                                 | 670                        | 1,300                                 | 470                   |
| 16.0            | 2,800                                      | 2,500                  | 2,500                                          | 1,800                 | 1,950                                 | 1,220                 | 1,530                                 | 760                   | 1,400                                 | 630                        | 980                                   | 440                   |
| 20.0            | 2,250                                      | 2,100                  | 2,000                                          | 1,540                 | 1,550                                 | 1,050                 | 1,230                                 | 650                   | 1,100                                 | 540                        | 780                                   | 380                   |
| Side<br>Milling | $a_p$                                      | $1 \text{ to } 1.5D_c$ |                                                |                       |                                       | $0.05D_c$             |                                       |                       |                                       | $0.02D_c$                  |                                       |                       |
| Groove Milling  | $a_p$                                      | $0.1D_c$               |                                                |                       |                                       | $0.05D_c$             |                                       |                       |                                       | Up to $0.05D_c$ Max. 0.5mm |                                       |                       |

- Side Milling (High Speed Machining Centre)

| Work Material            |                | Low Carbon Steel                           |                       | Middle Hardened Steel                          |                       | Hardened Steel                        |                       | Hardened Steel                        |                       | Hardened Steel                        |                       |
|--------------------------|----------------|--------------------------------------------|-----------------------|------------------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cond.                    |                | Carbon Steel, Alloy Steel<br>(Up to 35HRC) |                       | Pre-hardened Steel, Die Steel<br>(35 to 45HRC) |                       | SKD61<br>(45 to 55HRC)                |                       | SKD11<br>(55 to 60HRC)                |                       | SKH51<br>(60 to 65HRC)                |                       |
| $D_c$ (mm)               |                | Spindle Speed<br>(min <sup>-1</sup> )      | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )          | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| 6.0                      |                | 16,000                                     | 5,800                 | 16,000                                         | 5,800                 | 16,000                                | 5,800                 | 12,000                                | 3,200                 | 8,000                                 | 2,000                 |
| 8.0                      |                | 12,000                                     | 5,800                 | 12,000                                         | 5,800                 | 12,000                                | 5,800                 | 9,000                                 | 3,200                 | 6,000                                 | 2,000                 |
| 10.0                     |                | 9,600                                      | 5,800                 | 9,600                                          | 5,800                 | 9,600                                 | 5,800                 | 7,200                                 | 3,200                 | 4,800                                 | 2,000                 |
| 12.0                     |                | 8,000                                      | 5,800                 | 8,000                                          | 5,800                 | 8,000                                 | 5,800                 | 6,000                                 | 3,200                 | 4,000                                 | 2,000                 |
| 16.0                     |                | 6,000                                      | 5,400                 | 6,000                                          | 5,400                 | 6,000                                 | 5,400                 | 4,500                                 | 3,000                 | 3,000                                 | 1,900                 |
| 20.0                     |                | 4,800                                      | 4,600                 | 4,800                                          | 4,600                 | 4,800                                 | 4,600                 | 3,600                                 | 2,580                 | 2,400                                 | 1,600                 |
| Standard<br>Depth-of-cut | $a_p$<br>$a_e$ | $0.1D_c$                                   |                       | $0.05D_c$                                      |                       | $0.05D_c$                             |                       | $0.02D_c$                             |                       | $0.01D_c$                             |                       |





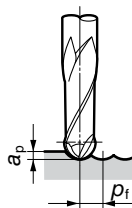
## Body

| Cat. No.   | Stock | Dimensions (mm) |            |        |          |     |            |
|------------|-------|-----------------|------------|--------|----------|-----|------------|
|            |       | R               | $\phi D_c$ | $\ell$ | $\ell_2$ | L   | $\phi D_s$ |
| GSXB 20020 | ●     | 0.20            | 0.4        | 0.6    | 0.8      | 50  | 4          |
| 20030      | ●     | 0.30            | 0.6        | 0.9    | 1.2      | 50  | 4          |
| 20050      | ●     | 0.50            | 1.0        | 1.5    | 2.0      | 50  | 4          |
| 20075      | ●     | 0.75            | 1.5        | 2.5    | 3.0      | 50  | 4          |
| 20100      | ●     | 1.00            | 2.0        | 3.0    | 4.0      | 60  | 6          |
| GSXB 20125 | ●     | 1.25            | 2.5        | 4.0    | 5.0      | 60  | 6          |
| 20150      | ●     | 1.50            | 3.0        | 4.5    | 6.0      | 60  | 6          |
| 20200      | ●     | 2.00            | 4.0        | 6.0    | 8.0      | 70  | 6          |
| 20250      | ●     | 2.50            | 5.0        | 7.5    | 10.0     | 80  | 6          |
| 20300      | ●     | 3.00            | 6.0        | 9.0    | —        | 80  | 6          |
| GSXB 20350 | ●     | 3.50            | 7.0        | 11.0   | 20.0     | 90  | 8          |
| 20400      | ●     | 4.00            | 8.0        | 12.0   | —        | 90  | 8          |
| 20500      | ●     | 5.00            | 10.0       | 15.0   | —        | 100 | 10         |
| 20600      | ●     | 6.00            | 12.0       | 18.0   | —        | 110 | 12         |
| 20700      | ●     | 7.00            | 14.0       | 21.0   | 38.0     | 110 | 16         |
| GSXB 20800 | ●     | 8.00            | 16.0       | 24.0   | —        | 140 | 16         |
| 20900      | ●     | 9.00            | 18.0       | 27.0   | 50.0     | 140 | 20         |
| 21000      | ●     | 10.00           | 20.0       | 30.0   | —        | 160 | 20         |
| 21250      | ●     | 12.50           | 25.0       | 38.0   | —        | 180 | 25         |

Grade: ACB20

## Recommended Cutting Conditions

1. If cutting noise and vibration are present, please change the cutting conditions accordingly.
2. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.

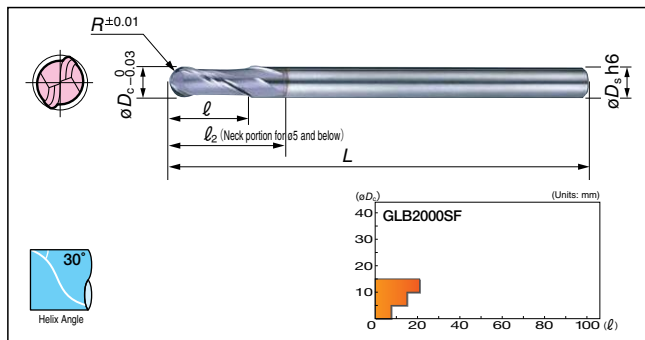


## Radius Milling

| Work Material         | Cutting Conditions | Carbon Steel, Alloy Steel (Below 25HRC) |                    | Carbon Steel, Alloy Steel (Below 50HRC) |                    | Cast Iron Special Cast Iron        |                    | Stainless Steel Titanium Alloy     |                    |
|-----------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                       |                    | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| Radius                | R (mm)             |                                         |                    |                                         |                    |                                    |                    |                                    |                    |
| Ballnose              | 0.20               | 50,000                                  | 2,100              | 35,000                                  | 1,150              | 50,000                             | 2,100              | 50,000                             | 1,750              |
|                       | 0.30               | 50,000                                  | 2,500              | 35,000                                  | 1,350              | 50,000                             | 2,500              | 50,000                             | 2,100              |
| DLC                   | 0.50               | 50,000                                  | 3,000              | 35,000                                  | 1,600              | 50,000                             | 3,000              | 50,000                             | 2,500              |
|                       | 0.75               | 35,000                                  | 3,000              | 24,000                                  | 1,650              | 35,000                             | 3,200              | 34,000                             | 2,500              |
| SUMIDIA Coat          | 1.00               | 27,500                                  | 3,000              | 19,000                                  | 1,700              | 35,000                             | 3,900              | 26,000                             | 2,500              |
|                       | 1.25               | 22,500                                  | 3,000              | 15,500                                  | 1,700              | 28,000                             | 3,900              | 21,000                             | 2,500              |
| Long Neck             | 1.50               | 19,000                                  | 3,000              | 13,000                                  | 1,700              | 24,000                             | 3,900              | 17,500                             | 2,500              |
|                       | 2.00               | 17,000                                  | 3,800              | 12,000                                  | 2,100              | 20,000                             | 4,100              | 15,000                             | 2,700              |
| Uncoated              | 2.50               | 15,500                                  | 4,300              | 11,000                                  | 2,200              | 18,000                             | 4,600              | 12,000                             | 2,500              |
|                       | 3.00               | 14,000                                  | 4,700              | 10,500                                  | 2,500              | 16,500                             | 5,300              | 10,500                             | 2,500              |
| CBN PCD               | 3.50               | 12,500                                  | 4,200              | 9,000                                   | 2,100              | 14,000                             | 4,500              | 9,000                              | 2,200              |
|                       | 4.00               | 11,000                                  | 3,500              | 7,900                                   | 1,900              | 12,500                             | 4,000              | 7,800                              | 1,900              |
|                       | 5.00               | 9,000                                   | 2,800              | 6,300                                   | 1,500              | 10,500                             | 3,300              | 6,300                              | 1,500              |
|                       | 6.00               | 7,500                                   | 2,400              | 5,200                                   | 1,250              | 8,700                              | 2,800              | 5,200                              | 1,250              |
|                       | 7.00               | 6,400                                   | 2,100              | 4,500                                   | 1,100              | 7,400                              | 2,400              | 4,500                              | 1,100              |
|                       | 8.00               | 5,600                                   | 1,800              | 3,900                                   | 950                | 6,500                              | 2,100              | 3,900                              | 950                |
|                       | 9.00               | 5,000                                   | 1,600              | 3,500                                   | 850                | 5,800                              | 1,900              | 3,500                              | 850                |
|                       | 10.00              | 4,500                                   | 1,450              | 3,100                                   | 750                | 5,200                              | 1,700              | 3,150                              | 750                |
|                       | 12.50              | 3,600                                   | 1,150              | 2,500                                   | 600                | 4,200                              | 1,350              | 2,500                              | 600                |
| Standard Depth-of-cut | $a_p$              | 0.02 $D_c$                              |                    | 0.02 $D_c$                              |                    | 0.02 $D_c$                         |                    | 0.02 $D_c$                         |                    |
|                       | $p_f$              | 0.05 $D_c$                              |                    | 0.05 $D_c$                              |                    | 0.05 $D_c$                         |                    | 0.05 $D_c$                         |                    |



| Coated Carbide | Carbon Steel | Alloy Steel  | Phosphor Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy      | Copper Alloy   | Graphite       | CFRP           |
|----------------|--------------|--------------|----------------|----------------|----------------|-----------------|--------------|--------------|---------------|----------------|----------------|----------------|
| ◎              | ◎            | ◎            | ◎              | ◎              | ◎              | ◎               | ◎            | ◎            | ◎             | ◎              | ◎              | ◎              |
| 45 to 55 HRC   | 55 to 60 HRC | 60 to 65 HRC | 65 to 70 HRC   | 70 to 75 HRC   | 75 to 80 HRC   | 80 to 85 HRC    | 85 to 90 HRC | 90 to 95 HRC | 95 to 100 HRC | 100 to 105 HRC | 105 to 110 HRC | 110 to 115 HRC |



### Body

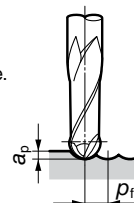
| Cat. No.   | Stock | Dimensions (mm) |                 |      |                |     |                 |
|------------|-------|-----------------|-----------------|------|----------------|-----|-----------------|
|            |       | R               | øD <sub>c</sub> | ℓ    | ℓ <sub>2</sub> | L   | øD <sub>s</sub> |
| GLB 2010SF | ▲     | 0.50            | 1.0             | 1.5  | 2              | 50  | 4               |
| 2015SF     | ▲     | 0.75            | 1.5             | 2.5  | 3              | 50  | 4               |
| 2020SF     | ▲     | 1.00            | 2.0             | 3.0  | 4              | 60  | 6               |
| 2025SF     | ▲     | 1.25            | 2.5             | 4.0  | 5              | 60  | 6               |
| 2030SF     | ▲     | 1.50            | 3.0             | 4.5  | 6              | 60  | 6               |
| GLB 2040SF | ▲     | 2.00            | 4.0             | 6.0  | 8              | 70  | 6               |
| 2050SF     | ▲     | 2.50            | 5.0             | 7.5  | 10             | 80  | 6               |
| 2060SF     | ▲     | 3.00            | 6.0             | 9.0  | —              | 80  | 6               |
| 2080SF     | ▲     | 4.00            | 8.0             | 12.0 | —              | 90  | 8               |
| 2100SF     | ▲     | 5.00            | 10.0            | 15.0 | —              | 100 | 10              |
| GLB 2120SF | ▲     | 6.00            | 12.0            | 21.0 | —              | 110 | 12              |

Grade: ACZ20W



### Recommended Cutting Conditions

- If cutting noise and vibration are present, please change the cutting conditions accordingly.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available.



### Radius Milling

| Work Material<br>Cond. | Structural Steel, Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                    | Alloy Steel<br>SCM<br>(25 to 35HRC) |                    | Tempered Steel, Hardened Steel,<br>NAK, HPM<br>(35 to 45HRC) |                    | Hardened Steel<br>(45 to 55HRC)    |                    | Stainless Steel<br>SUS304, SUS316  |                    | Heat Resistive Steel<br>Titanium Alloy |                    |  |
|------------------------|---------------------------------------------------------------------------|--------------------|-------------------------------------|--------------------|--------------------------------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|----------------------------------------|--------------------|--|
|                        | Spindle Speed (min <sup>-1</sup> )                                        | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )  | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )     | Feed Rate (mm/min) |  |
| R (mm)                 |                                                                           |                    |                                     |                    |                                                              |                    |                                    |                    |                                    |                    |                                        |                    |  |
| 1.0                    | 19,100                                                                    | 770                | 12,800                              | 370                | 10,200                                                       | 270                | 8,900                              | 190                | 8,900                              | 210                | 6,400                                  | 120                |  |
| 2.0                    | 10,800                                                                    | 1,100              | 7,200                               | 550                | 5,700                                                        | 400                | 5,000                              | 280                | 5,000                              | 310                | 3,600                                  | 180                |  |
| 3.0                    | 7,700                                                                     | 1,300              | 5,200                               | 660                | 4,100                                                        | 480                | 3,600                              | 330                | 3,600                              | 380                | 2,600                                  | 210                |  |
| 4.0                    | 6,000                                                                     | 1,400              | 4,000                               | 700                | 3,200                                                        | 510                | 2,800                              | 360                | 2,800                              | 400                | 2,000                                  | 230                |  |
| 5.0                    | 4,800                                                                     | 1,400              | 3,200                               | 700                | 2,600                                                        | 520                | 2,300                              | 370                | 2,300                              | 410                | 1,600                                  | 230                |  |
| 6.0                    | 4,000                                                                     | 1,400              | 2,700                               | 710                | 2,200                                                        | 530                | 1,900                              | 370                | 1,900                              | 410                | 1,400                                  | 240                |  |
| Standard               | a <sub>p</sub>                                                            | 0.1D <sub>c</sub>  |                                     | 0.1D <sub>c</sub>  |                                                              | 0.05D <sub>c</sub> |                                    | 0.05D <sub>c</sub> |                                    | 0.1D <sub>c</sub>  |                                        | 0.05D <sub>c</sub> |  |
| Depth-of-cut           | p <sub>r</sub>                                                            | 0.2D <sub>c</sub>  |                                     | 0.2D <sub>c</sub>  |                                                              | 0.1D <sub>c</sub>  |                                    | 0.1D <sub>c</sub>  |                                    | 0.2D <sub>c</sub>  |                                        | 0.1D <sub>c</sub>  |  |

### Radius Milling (High Speed Machining Centre)

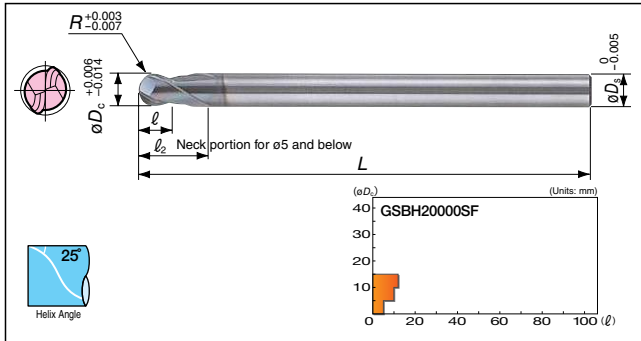
| Work Material<br>Cond.   |                                  | Structural Steel, Carbon Steel, Cast Iron<br>SS, SC, FC<br>(150 to 250HB) |                    | Alloy Steel<br>SCM<br>(25 to 35HRC)     |                    | Tempered Steel, Hardened Steel,<br>NAK, HPM<br>(35 to 45HRC) |                    | Hardened Steel<br>(45 to 55HRC)          |                    | Stainless Steel<br>SUS304, SUS316       |                    |               |                 |
|--------------------------|----------------------------------|---------------------------------------------------------------------------|--------------------|-----------------------------------------|--------------------|--------------------------------------------------------------|--------------------|------------------------------------------|--------------------|-----------------------------------------|--------------------|---------------|-----------------|
|                          |                                  | Spindle Speed (min <sup>-1</sup> )                                        | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )                           | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )       | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) |               |                 |
| R (mm)                   |                                  | 1.0                                                                       | 51,000<br>2,100    | 39,800<br>1,300                         | 35,700<br>960      | 23,700<br>640                                                | 35,700<br>960      | 2.0                                      | 25,500<br>2,700    | 19,900<br>1,700                         | 17,900<br>1,300    | 11,900<br>830 | 17,900<br>1,300 |
|                          |                                  | 3.0                                                                       | 17,000<br>3,000    | 13,300<br>1,900                         | 11,900<br>1,400    | 7,900<br>920                                                 | 11,900<br>1,400    | 4.0                                      | 12,800<br>3,100    | 10,000<br>2,000                         | 9,000<br>1,500     | 6,000<br>960  | 9,000<br>1,500  |
|                          |                                  | 5.0                                                                       | 10,200<br>3,100    | 8,000<br>2,000                          | 7,200<br>1,500     | 4,800<br>960                                                 | 7,200<br>1,500     | 6.0                                      | 8,500<br>3,100     | 6,700<br>2,000                          | 6,000<br>1,500     | 4,000<br>960  | 6,000<br>1,500  |
| Standard<br>Depth-of-cut | a <sub>p</sub><br>D <sub>c</sub> | 0.05D <sub>c</sub><br>0.1D <sub>c</sub>                                   |                    | 0.05D <sub>c</sub><br>0.1D <sub>c</sub> |                    | 0.05D <sub>c</sub><br>0.1D <sub>c</sub>                      |                    | 0.02D <sub>c</sub><br>0.05D <sub>c</sub> |                    | 0.05D <sub>c</sub><br>0.1D <sub>c</sub> |                    |               |                 |



## GSBH 20000 SF Type



|                |              |             |                    |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ◎              | ◎            | ◎           | ◎                  | ◎              | ◎              | ◎               | ◎        | ◎         | ◎        | ◎            | ◎        | ◎    |



## Body

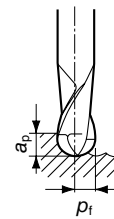
| Cat. No.     | Stock | Dimensions (mm) |                 |      |                |     |                 |  |
|--------------|-------|-----------------|-----------------|------|----------------|-----|-----------------|--|
|              |       | R               | øD <sub>c</sub> | ℓ    | ℓ <sub>2</sub> | L   | øD <sub>s</sub> |  |
| GSBH 20020SF | ●     | 0.20            | 0.4             | 0.4  | 0.6            | 50  | 4               |  |
| 20030SF      | ●     | 0.30            | 0.6             | 0.6  | 0.9            | 50  | 4               |  |
| 20050SF      | ●     | 0.50            | 1.0             | 1.0  | 1.5            | 50  | 4               |  |
| 20075SF      | ●     | 0.75            | 1.5             | 1.5  | 2.3            | 50  | 4               |  |
| 20100SF      | ●     | 1.00            | 2.0             | 2.0  | 3.0            | 60  | 6               |  |
| GSBH 20125SF | ●     | 1.25            | 2.5             | 2.5  | 3.8            | 60  | 6               |  |
| 20150SF      | ●     | 1.50            | 3.0             | 3.0  | 4.5            | 60  | 6               |  |
| 20200SF      | ●     | 2.00            | 4.0             | 4.0  | 6.0            | 70  | 6               |  |
| 20250SF      | ●     | 2.50            | 5.0             | 5.0  | 7.5            | 80  | 6               |  |
| 20300SF      | ●     | 3.00            | 6.0             | 6.0  | —              | 80  | 6               |  |
| GSBH 20400SF | ●     | 4.00            | 8.0             | 8.0  | —              | 90  | 8               |  |
| 20500SF      | ●     | 5.00            | 10.0            | 10.0 | —              | 100 | 10              |  |
| 20600SF      | ●     | 6.00            | 12.0            | 12.0 | —              | 110 | 12              |  |

Grade: ACF07D



## Recommended Cutting Conditions

- When depth of cut is lowered, feed rate can be increased further.
- If the machine cannot achieve the recommended spindle speed, please use the max. spindle speed available. In this case, lower the feed rate by the same ratio.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.



## Radius Milling

| Work Material   | Cond.        | Middle Hardened Steel<br>Pre-hardened Steel, Die Steel<br>(40 to 50HRC) |                       | Hardened Steel<br>SKD61<br>(50 to 55HRC) |                       | Hardened Steel<br>SKD11<br>(55 to 60HRC) |                       | Hardened Steel<br>SKH55<br>(60 to 65HRC) |                       |
|-----------------|--------------|-------------------------------------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------|------------------------------------------|-----------------------|
|                 |              | Spindle Speed<br>(min <sup>-1</sup> )                                   | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )    | Feed Rate<br>(mm/min) |
| SUMIDIA<br>Coat | 0.20         | 50,000                                                                  | 500                   | 50,000                                   | 500                   | 50,000                                   | 500                   | 50,000                                   | 500                   |
|                 | 0.30         | 50,000                                                                  | 800                   | 50,000                                   | 800                   | 50,000                                   | 800                   | 50,000                                   | 700                   |
|                 | 0.50         | 50,000                                                                  | 1,400                 | 50,000                                   | 1,400                 | 50,000                                   | 1,300                 | 42,000                                   | 1,000                 |
|                 | 0.75         | 50,000                                                                  | 2,000                 | 50,000                                   | 2,000                 | 37,300                                   | 1,400                 | 28,000                                   | 1,000                 |
|                 | 1.00         | 38,100                                                                  | 2,100                 | 38,100                                   | 2,100                 | 28,000                                   | 1,400                 | 21,000                                   | 1,000                 |
|                 | 1.25         | 30,500                                                                  | 2,100                 | 30,500                                   | 2,100                 | 22,400                                   | 1,400                 | 16,800                                   | 1,000                 |
|                 | 1.50         | 25,400                                                                  | 2,100                 | 25,400                                   | 2,100                 | 18,700                                   | 1,400                 | 14,000                                   | 1,000                 |
|                 | 2.00         | 19,100                                                                  | 2,100                 | 19,100                                   | 2,100                 | 14,000                                   | 1,400                 | 10,500                                   | 1,000                 |
|                 | 2.50         | 15,300                                                                  | 2,100                 | 15,300                                   | 2,100                 | 11,200                                   | 1,400                 | 8,400                                    | 1,000                 |
|                 | 3.00         | 12,700                                                                  | 2,100                 | 12,700                                   | 2,100                 | 9,300                                    | 1,400                 | 7,000                                    | 1,000                 |
| Uncoated        | 4.00         | 9,500                                                                   | 2,100                 | 9,500                                    | 2,100                 | 7,000                                    | 1,400                 | 5,300                                    | 1,000                 |
|                 | 5.00         | 7,600                                                                   | 2,100                 | 7,600                                    | 2,100                 | 5,600                                    | 1,400                 | 4,200                                    | 1,000                 |
|                 | 6.00         | 6,400                                                                   | 2,100                 | 6,400                                    | 2,100                 | 4,700                                    | 1,400                 | 3,500                                    | 1,000                 |
|                 | Standard     | 0.08D <sub>c</sub>                                                      |                       |                                          |                       | 0.05D <sub>c</sub>                       |                       |                                          |                       |
| CBN<br>PCD      | Depth-of-cut | 0.25D <sub>c</sub>                                                      |                       |                                          |                       | 0.15D <sub>c</sub>                       |                       |                                          |                       |
|                 |              |                                                                         |                       |                                          |                       |                                          |                       |                                          |                       |

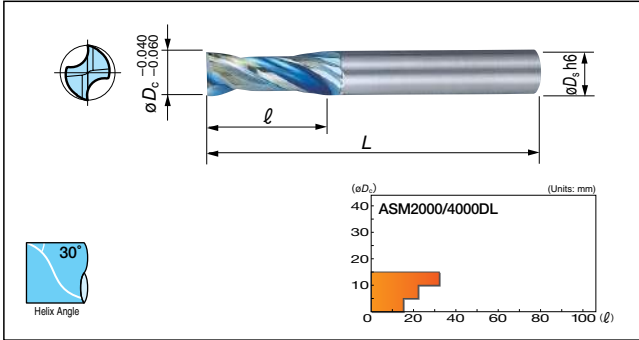


AURORA Coat Endmills

# ASM 2000DL Type



|                |              |             |                   |                |                |              |              |              |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|-------------------|----------------|----------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Prehardened Steel | Tempered Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|-------------------|----------------|----------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|



## Body

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| ASM 2020DL | ●     | 2.0             | 6      | 40  | 4          |
| 2030DL     | ●     | 3.0             | 10     | 45  | 6          |
| 2040DL     | ●     | 4.0             | 12     | 45  | 6          |
| 2050DL     | ●     | 5.0             | 15     | 50  | 6          |
| 2060DL     | ●     | 6.0             | 15     | 50  | 6          |
| ASM 2080DL | ●     | 8.0             | 18     | 60  | 8          |
| 2100DL     | ●     | 10.0            | 22     | 71  | 10         |
| 2120DL     | ●     | 12.0            | 25     | 75  | 12         |
| 2160DL     | ●     | 16.0            | 32     | 90  | 16         |

Grade: DL1000

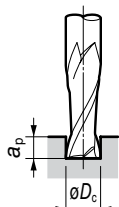
## General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Groove Milling

| Work Material |            | Al Alloy                           |                    |                                    |                    |
|---------------|------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | $D_c$ (mm) | Wet                                |                    | Dry                                |                    |
|               |            | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
|               | 2.0        | 28,000                             | 280                | 28,000                             | 200                |
|               | 3.0        | 22,000                             | 400                | 22,000                             | 280                |
|               | 4.0        | 18,000                             | 520                | 18,000                             | 360                |
|               | 5.0        | 14,000                             | 520                | 14,000                             | 360                |
|               | 6.0        | 12,000                             | 540                | 12,000                             | 370                |
|               | 8.0        | 9,000                              | 540                | 9,000                              | 370                |
|               | 10.0       | 7,200                              | 560                | 7,200                              | 390                |
|               | 12.0       | 6,000                              | 560                | 6,000                              | 390                |
|               | 16.0       | 4,500                              | 560                | 4,500                              | 390                |
| Standard      | $a_p$      | $1.0D_c$                           |                    | $0.5D_c$                           |                    |
| Depth-of-cut  | $a_e$      | $1.0D_c$                           |                    | $1.0D_c$                           |                    |

Groove Milling  
(2 Flutes)



I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

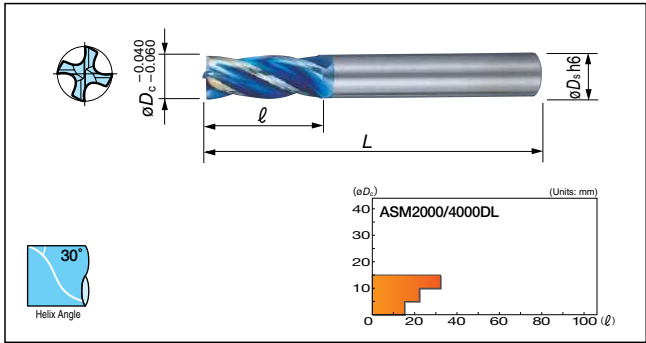
CBN

PCD

# ASM 4000DL Type



|                |              |             |                    |                |                |                 |              |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|-----------------|--------------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|                |              |             |                    |                | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC |           |          |              |          |      |



## Body

| Cat. No.   | Stock | Dimensions (mm) |        |     |            |
|------------|-------|-----------------|--------|-----|------------|
|            |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| ASM 4020DL | ●     | 2.0             | 6      | 40  | 4          |
| 4030DL     | ●     | 3.0             | 10     | 45  | 6          |
| 4040DL     | ●     | 4.0             | 12     | 45  | 6          |
| 4050DL     | ●     | 5.0             | 15     | 50  | 6          |
| 4060DL     | ●     | 6.0             | 15     | 50  | 6          |
| ASM 4080DL | ●     | 8.0             | 18     | 60  | 8          |
| 4100DL     | ●     | 10.0            | 22     | 71  | 10         |
| 4120DL     | ●     | 12.0            | 25     | 75  | 12         |
| 4160DL     | ●     | 16.0            | 32     | 90  | 16         |

Grade: DL1000

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN PCD

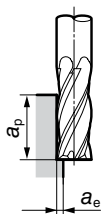
## General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

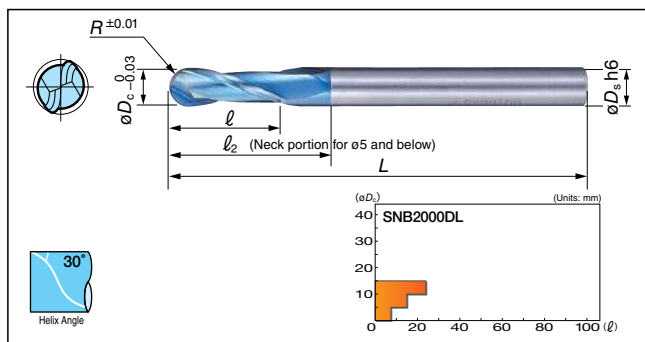
| Work Material |            | Al Alloy                           |                    |                                    |                    |
|---------------|------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | $D_c$ (mm) | Wet                                |                    | Dry                                |                    |
|               |            | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
|               | 2.0        | 40,000                             | 1,400              | 40,000                             | 980                |
|               | 3.0        | 32,000                             | 2,000              | 32,000                             | 1,400              |
|               | 4.0        | 26,000                             | 2,600              | 26,000                             | 1,800              |
|               | 5.0        | 20,000                             | 2,600              | 20,000                             | 1,800              |
|               | 6.0        | 17,000                             | 2,700              | 17,000                             | 1,900              |
|               | 8.0        | 13,000                             | 2,700              | 13,000                             | 1,900              |
|               | 10.0       | 11,000                             | 2,800              | 11,000                             | 2,000              |
|               | 12.0       | 8,500                              | 2,800              | 8,500                              | 2,000              |
|               | 16.0       | 6,400                              | 2,800              | 6,400                              | 2,000              |
| Standard      | $a_p$      | 1.5 $D_c$                          |                    | 1.5 $D_c$                          |                    |
| Depth-of-cut  | $a_e$      | 0.2 $D_c$                          |                    | 0.2 $D_c$                          |                    |

Side Milling (4 Flutes)





|                |              |             |                |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|                |              |             | 45 to 55 HRC   | 55 to 60 HRC   | 60 to 65 HRC   |                 |          |           |          |              |          |      |



## Body

| Cat. No.   | Stock | Dimensions (mm) |            |        |          |     |            |
|------------|-------|-----------------|------------|--------|----------|-----|------------|
|            |       | R               | $\phi D_c$ | $\ell$ | $\ell_2$ | L   | $\phi D_s$ |
| SNB 2020DL | ●     | 1.0             | 2.0        | 3.0    | 5        | 60  | 6          |
| 2030DL     | ●     | 1.5             | 3.0        | 4.5    | 8        | 80  | 6          |
| 2040DL     | ●     | 2.0             | 4.0        | 6.0    | 12       | 80  | 6          |
| 2050DL     | ●     | 2.5             | 5.0        | 7.5    | 14       | 90  | 6          |
| 2060DL     | ●     | 3.0             | 6.0        | 9.0    | —        | 100 | 6          |
| SNB 2080DL | ●     | 4.0             | 8.0        | 12.0   | —        | 100 | 8          |
| 2100DL     | ●     | 5.0             | 10.0       | 15.0   | —        | 120 | 10         |
| 2120DL     | ●     | 6.0             | 12.0       | 18.0   | —        | 120 | 12         |
| 2160DL     | ●     | 8.0             | 16.0       | 24.0   | —        | 160 | 16         |

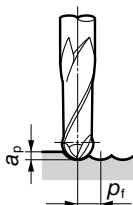
Grade: DL1200

## General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Radius Milling

| Work Material      |       | Aluminium Alloy                    |                    |                                    |                    |
|--------------------|-------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cutting Conditions |       | Wet                                |                    | Dry                                |                    |
| R (mm)             |       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| 1.0                |       | 48,000                             | 1,500              | 48,000                             | 1,000              |
| 1.5                |       | 38,000                             | 2,100              | 38,000                             | 1,500              |
| 2.0                |       | 31,000                             | 2,800              | 31,000                             | 2,000              |
| 2.5                |       | 24,000                             | 2,800              | 24,000                             | 2,000              |
| 3.0                |       | 20,000                             | 2,800              | 20,000                             | 2,000              |
| 4.0                |       | 15,000                             | 2,800              | 15,000                             | 2,000              |
| 5.0                |       | 13,000                             | 3,000              | 13,000                             | 2,100              |
| 6.0                |       | 10,000                             | 3,000              | 10,000                             | 2,100              |
| 8.0                |       | 7,700                              | 3,000              | 7,700                              | 2,100              |
| Standard           | $a_p$ | 0.1 $D_c$                          |                    | 0.1 $D_c$                          |                    |
| Depth-of-cut       | $p_t$ | 0.2 $D_c$                          |                    | 0.2 $D_c$                          |                    |





# SNB2 Type

## 2 Flutes

2 Flutes

DLC Coating

R

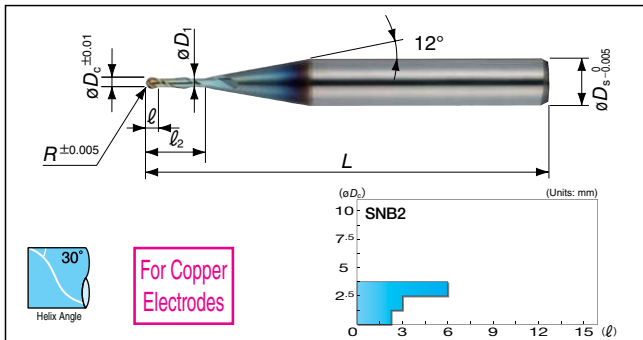
Side Milling

Groove Finishing

R

Profile Milling

|                |              |             |                |                |                |                 |              |           |          |              |          |      |
|----------------|--------------|-------------|----------------|----------------|----------------|-----------------|--------------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Phenolic Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|                |              |             |                |                | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC |           |          |              |          |      |



### Body

| Cat. No.         | Stock | Dimensions (mm) |            |        |          |    |            |            |
|------------------|-------|-----------------|------------|--------|----------|----|------------|------------|
|                  |       | R               | $\phi D_c$ | $\ell$ | $\ell_2$ | L  | $\phi D_1$ | $\phi D_s$ |
| SNB2 0005 0034DL | ●     | 0.05            | 0.1        | 0.1    | 0.3      | 45 | 0.09       | 4          |
| 0005 0064DL      | ●     | 0.05            | 0.1        | 0.1    | 0.6      | 45 | 0.09       | 4          |
| 0010 0054DL      | ●     | 0.10            | 0.2        | 0.2    | 0.5      | 45 | 0.18       | 4          |
| 0010 0104DL      | ●     | 0.10            | 0.2        | 0.2    | 1.0      | 45 | 0.18       | 4          |
| 0010 0204DL      | ●     | 0.10            | 0.2        | 0.2    | 2.0      | 45 | 0.18       | 4          |
| SNB2 0015 0054DL | ●     | 0.15            | 0.3        | 0.3    | 0.5      | 45 | 0.27       | 4          |
| 0015 0104DL      | ●     | 0.15            | 0.3        | 0.3    | 1.0      | 45 | 0.27       | 4          |
| 0015 0204DL      | ●     | 0.15            | 0.3        | 0.3    | 2.0      | 45 | 0.27       | 4          |
| 0015 0304DL      | ●     | 0.15            | 0.3        | 0.3    | 3.0      | 45 | 0.27       | 4          |
| 0020 0104DL      | ●     | 0.20            | 0.4        | 0.4    | 1.0      | 45 | 0.36       | 4          |
| SNB2 0020 0204DL | ●     | 0.20            | 0.4        | 0.4    | 2.0      | 45 | 0.36       | 4          |
| 0020 0304DL      | ●     | 0.20            | 0.4        | 0.4    | 3.0      | 45 | 0.36       | 4          |
| 0020 0404DL      | ●     | 0.20            | 0.4        | 0.4    | 4.0      | 45 | 0.36       | 4          |
| 0025 0104DL      | ●     | 0.25            | 0.5        | 0.45   | 1.0      | 45 | 0.45       | 4          |
| 0025 0204DL      | ●     | 0.25            | 0.5        | 0.45   | 2.0      | 45 | 0.45       | 4          |
| SNB2 0025 0304DL | ●     | 0.25            | 0.5        | 0.45   | 3.0      | 45 | 0.45       | 4          |
| 0025 0404DL      | ●     | 0.25            | 0.5        | 0.45   | 4.0      | 45 | 0.45       | 4          |
| 0030 0204DL      | ●     | 0.30            | 0.6        | 0.6    | 2.0      | 45 | 0.54       | 4          |
| 0030 0304DL      | ●     | 0.30            | 0.6        | 0.6    | 3.0      | 45 | 0.54       | 4          |
| 0030 0404DL      | ●     | 0.30            | 0.6        | 0.6    | 4.0      | 45 | 0.54       | 4          |
| SNB2 0030 0504DL | ●     | 0.30            | 0.6        | 0.6    | 5.0      | 45 | 0.54       | 4          |
| 0030 0604DL      | ●     | 0.30            | 0.6        | 0.6    | 6.0      | 45 | 0.54       | 4          |
| 0050 0304DL      | ●     | 0.50            | 1.0        | 1.5    | 3.0      | 45 | 0.90       | 4          |
| 0050 0404DL      | ●     | 0.50            | 1.0        | 1.5    | 4.0      | 45 | 0.90       | 4          |
| 0050 0604DL      | ●     | 0.50            | 1.0        | 1.5    | 6.0      | 45 | 0.90       | 4          |
| SNB2 0050 0804DL | ●     | 0.50            | 1.0        | 1.5    | 8.0      | 50 | 0.90       | 4          |
| 0050 1004DL      | ●     | 0.50            | 1.0        | 1.5    | 10.0     | 50 | 0.90       | 4          |
| 0075 0304DL      | ●     | 0.75            | 1.5        | 2.3    | 3.0      | 45 | 1.35       | 4          |
| 0075 0604DL      | ●     | 0.75            | 1.5        | 2.3    | 6.0      | 45 | 1.35       | 4          |
| 0075 1004DL      | ●     | 0.75            | 1.5        | 2.3    | 10.0     | 50 | 1.35       | 4          |
| SNB2 0100 0304DL | ●     | 1.00            | 2.0        | 3.0    | 3.0      | 50 | 1.80       | 4          |
| 0100 0604DL      | ●     | 1.00            | 2.0        | 3.0    | 6.0      | 50 | 1.80       | 4          |
| 0100 1004DL      | ●     | 1.00            | 2.0        | 3.0    | 10.0     | 50 | 1.80       | 4          |
| 0100 1504DL      | ●     | 1.00            | 2.0        | 3.0    | 15.0     | 60 | 1.80       | 4          |
| 0100 2004DL      | ●     | 1.00            | 2.0        | 3.0    | 20.0     | 60 | 1.80       | 4          |
| SNB2 0200 1606DL | ●     | 2.00            | 4.0        | 6.0    | 16.0     | 80 | 3.60       | 6          |
| 0200 2006DL      | ●     | 2.00            | 4.0        | 6.0    | 20.0     | 80 | 3.60       | 6          |
| 0200 3006DL      | ●     | 2.00            | 4.0        | 6.0    | 30.0     | 80 | 3.60       | 6          |

Grade: DL1200

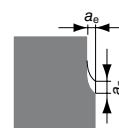
### General Purpose Machines

- For radius processing, reduce the feed to 1/2 of the recommendation.
- Non water soluble coolant is recommended.
- Because of high spindle speeds, run-out of the endmill when mounted should be less than 10  $\mu$ m.

### Side Milling

| Work Material      | Copper Alloy                       |                    |                            |
|--------------------|------------------------------------|--------------------|----------------------------|
| Cutting Conditions | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Standard Depth-of-cut (mm) |
| Cat. No.           |                                    |                    | $a_p$ $a_e$                |
| SNB2 0005 0034DL   | 20,000                             | 90                 | 0.005 0.005                |
| 0005 0064DL        | -50,000                            | 80                 | 0.005 0.005                |
| SNB2 0010 0054DL   |                                    | 350                | 0.01 0.02                  |
| 0010 0104DL        | 20,000                             | 350                | 0.007 0.015                |
| 0010 0204DL        | -50,000                            | 200                | 0.005 0.005                |
| SNB2 0015 0054DL   |                                    | 400                | 0.015 0.025                |
| 0015 0104DL        | 20,000                             | 400                | 0.01 0.02                  |
| 0015 0204DL        | -50,000                            | 300                | 0.007 0.01                 |
| 0015 0304DL        |                                    | 250                | 0.005 0.008                |
| SNB2 0020 0104DL   |                                    | 800                | 0.025 0.05                 |
| 0020 0204DL        | 20,000                             | 700                | 0.02 0.03                  |
| 0020 0304DL        | -30,000                            | 600                | 0.015 0.02                 |
| 0020 0404DL        |                                    | 400                | 0.007 0.015                |
| SNB2 0025 0104DL   |                                    | 1,000              | 0.04 0.07                  |
| 0025 0204DL        | 20,000                             | 800                | 0.03 0.06                  |
| 0025 0304DL        | -30,000                            | 700                | 0.02 0.05                  |
| 0025 0404DL        |                                    | 600                | 0.015 0.04                 |
| SNB2 0030 0204DL   |                                    | 1,400              | 0.05 0.15                  |
| 0030 0304DL        | 20,000                             | 1,200              | 0.04 0.1                   |
| 0030 0404DL        | -30,000                            | 1,000              | 0.03 0.07                  |
| 0030 0504DL        |                                    | 700                | 0.03 0.06                  |
| 0030 0604DL        |                                    | 600                | 0.015 0.03                 |
| SNB2 0050 0304DL   |                                    | 3,500              | 0.2 0.4                    |
| 0050 0404DL        | 20,000                             | 3,000              | 0.15 0.4                   |
| 0050 0604DL        | -30,000                            | 2,500              | 0.13 0.3                   |
| 0050 0804DL        |                                    | 2,000              | 0.07 0.15                  |
| 0050 1004DL        |                                    | 1,200              | 0.04 0.07                  |
| SNB2 0075 0304DL   | 20,000                             | 4,000              | 0.25 0.4                   |
| 0075 0604DL        | 20,000                             | 3,200              | 0.15 0.4                   |
| 0075 1004DL        | 20,000                             | 2,000              | 0.1 0.3                    |
| SNB2 0100 0304DL   | 16,000                             | 4,500              | 0.4 0.6                    |
| 0100 0604DL        | 16,000                             | 3,500              | 0.35 0.6                   |
| 0100 1004DL        | 16,000                             | 3,000              | 0.25 0.4                   |
| 0100 1504DL        | 12,000                             | 2,000              | 0.15 0.3                   |
| 0100 2004DL        | 10,000                             | 1,500              | 0.1 0.2                    |
| SNB2 0200 1606DL   | 16,000                             | 4,000              | 0.4 0.8                    |
| 0200 2006DL        | 16,000                             | 3,500              | 0.4 0.8                    |
| 0200 3006DL        | 12,000                             | 3,000              | 0.2 0.4                    |

Side Milling





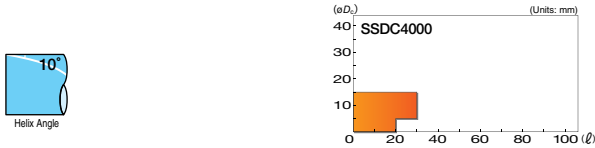
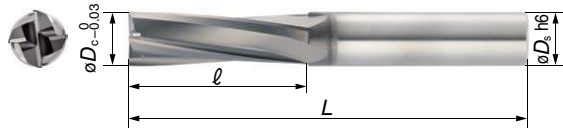
SUMIDIA Coat Endmills for CFRP

# SSDC4000(RL) Type

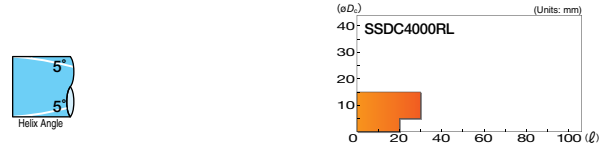
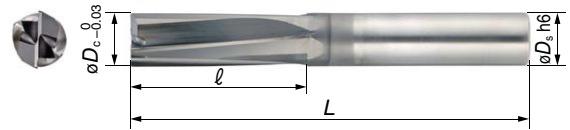


| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tool Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|------------|----------------|-----------------|--------------|-----------|----------|--------------|----------|------|
| ×              | ×            | ×           | ×                  | ×          | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC | ×         | ×        | ×            | ○        | ◎    |

## SSDC4000 (Right-hand Helix Type)



## SSDC4000RL (Right/Left-hand Helix Type)



### Body (SSDC4000)

| Cat. No.  | Stock | Dimensions (mm) |     |     |            |
|-----------|-------|-----------------|-----|-----|------------|
|           |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| SSDC 4060 | ●     | 6.0             | 20  | 70  | 6          |
| 4080      | ●     | 8.0             | 30  | 80  | 8          |
| 4100      | ●     | 10.0            | 30  | 90  | 10         |
| 4120      | ●     | 12.0            | 30  | 100 | 12         |

Grade: DCX20

### Body (SSDC4000RL)

| Cat. No.    | Stock | Dimensions (mm) |     |     |            |
|-------------|-------|-----------------|-----|-----|------------|
|             |       | $\phi D_c$      | $l$ | $L$ | $\phi D_s$ |
| SSDC 4060RL | ●     | 6.0             | 20  | 70  | 6          |
| 4080RL      | ●     | 8.0             | 30  | 80  | 8          |
| 4100RL      | ●     | 10.0            | 30  | 90  | 10         |
| 4120RL      | ●     | 12.0            | 30  | 100 | 12         |

Grade: DCX20

### Endmill Identification

## SSDC 4 060 RL

① Series Code    ② No. of Teeth    ③ Diameter    ④ Helix Shape  
(Right/Left-hand Helix)

### Recommended Cutting Conditions

- Use the cutting conditions as guide.  
Cutting conditions are greatly influenced by clamping state, work grades, work thickness, and machine rigidity. Adjust the conditions accordingly.
- Take sufficient dust control measures.
- When radial cutting depth is 0.7D or more in Groove Milling and trimming, reduce feed rate accordingly.

### Groove Milling (Common)

| Work Material | CFRP                  |                                    |                    |                    |  |
|---------------|-----------------------|------------------------------------|--------------------|--------------------|--|
| Cond.         | Dry                   |                                    |                    |                    |  |
| $D_c$ (mm)    | Spindle Speed (m/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Feed Rate (mm/rev) |  |
| 6.0           | 197.8                 | 10,500                             | 940                | 0.090              |  |
| 8.0           | 201.0                 | 8,000                              | 800                | 0.100              |  |
| 10.0          | 204.1                 | 6,500                              | 720                | 0.111              |  |
| 12.0          | 207.2                 | 5,500                              | 670                | 0.122              |  |

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

PCD

Item List

# GS MILL Long Neck Series

Item List

\* Coloured parts (■) refer to standard stock dimensions.

GS MILL Long Neck (Ballnose) →I66 to I67

GS MILL Long Neck Ball



Long Neck (Ballnose) GSBN2 Type (ø4 Shank Series)

| R    | Length Below Neck | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 30 |
|------|-------------------|-----|---|-----|---|-----|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| 0.10 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.15 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.20 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.25 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.30 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.40 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.60 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.70 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.75 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.80 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 0.90 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 1.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 1.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 2.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 2.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |
| 3.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |

(Units:mm)

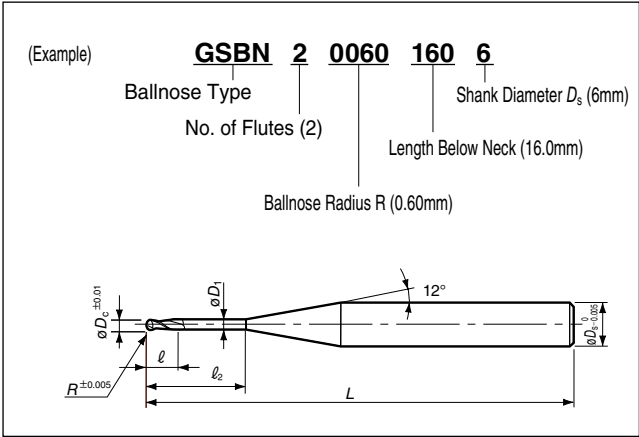
Long Neck (Ballnose) GSBN2 Type (ø6 Shank Series)

| R    | Length Below Neck | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 25 | 30 | 35 | 40 | 45 | 50 |
|------|-------------------|-----|---|-----|---|-----|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0.10 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.15 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.20 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.25 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.30 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.40 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.60 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.70 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.75 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.80 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.90 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.50 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3.00 |                   |     |   |     |   |     |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |

(Units:mm)

Endmill Identification

GS MILL Long Neck (Ballnose)



Item List

\* Coloured parts ( ) refer to standard stock dimensions.

GS MILL Long Neck (Square)

→I68 to I69



GS MILL Long Neck

Long Neck (Square) GSN2 Type (2 Flutes)

| $\phi D_c$ \ Length Below Neck | 0.5 | 1 | 1.5 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 12 | 14 | 15 | 16 | 18 | 20 | 24 | 25 | 30 | 35 | 38 | 40 | 45 | 50 | 60 |
|--------------------------------|-----|---|-----|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0.2                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.3                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.4                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.5                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.6                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.7                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.8                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.9                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.2                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.5                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.5                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8.0                            |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 10.0                           |     |   |     |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

(Units:mm)

Long Neck (Square) GSN4 Type (4 Flutes)

| $\phi D_c$ \ Length Below Neck | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 80 |
|--------------------------------|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0.2                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.3                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.4                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.5                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.6                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.7                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.8                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 0.9                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.2                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1.5                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2.5                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8.0                            |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 10.0                           |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

(Units:mm)

Endmill Identification

GS MILL Long Neck (Square)

(Example)

GSN 4 0120 080 4

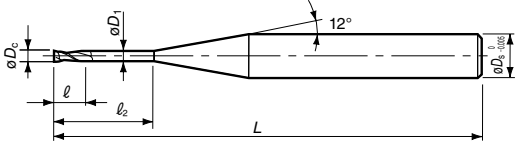
Square Type

No. of Flutes (4)

Length Below Neck (8mm)

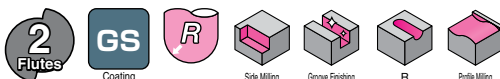
Shank Diameter  $D_s$  (4mm)

External Diameter  $D_c$  (1.20mm)

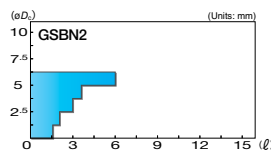
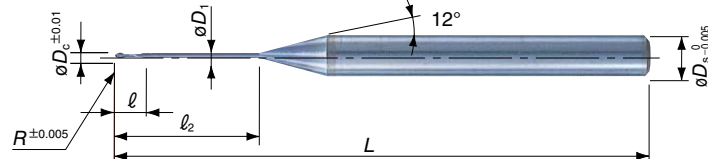




## GSBN 2 Type

2  
Flutes

|                |              |              |                |                 |              |              |              |              |              |              |
|----------------|--------------|--------------|----------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Coated Carbide | Carbon Steel | Alloy Steel  | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy     | Copper Alloy | Graphite     | CFRP         |
| 45 to 55 HRC   | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC   | 45 to 55 HRC    | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC |



## ■ Body (Diameter: Ø0.2 to 1.0 mm) Ø4mm Shank Series

| Cat. No.        | Stock | Dimensions (mm) |     |     |                |    |                 |                 |
|-----------------|-------|-----------------|-----|-----|----------------|----|-----------------|-----------------|
|                 |       | R               | ØDc | ℓ   | ℓ <sub>2</sub> | L  | ØD <sub>1</sub> | ØD <sub>s</sub> |
| GSBN2 0010 0054 | ▲     | 0.10            | 0.2 | 0.2 | 0.5            | 45 | 0.18            | 4               |
| 0010 0104       | ▲     | 0.10            | 0.2 | 0.2 | 1.0            | 45 | 0.18            | 4               |
| 0010 0154       | ▲     | 0.10            | 0.2 | 0.2 | 1.5            | 45 | 0.18            | 4               |
| 0010 0204       | ▲     | 0.10            | 0.2 | 0.2 | 2.0            | 45 | 0.18            | 4               |
| 0010 0254       | ▲     | 0.10            | 0.2 | 0.2 | 2.5            | 45 | 0.18            | 4               |
| GSBN2 0010 0304 | ▲     | 0.10            | 0.2 | 0.2 | 3.0            | 45 | 0.18            | 4               |
| 0015 0104       | ▲     | 0.15            | 0.3 | 0.3 | 1.0            | 45 | 0.28            | 4               |
| 0015 0154       | ▲     | 0.15            | 0.3 | 0.3 | 1.5            | 45 | 0.28            | 4               |
| 0015 0204       | ▲     | 0.15            | 0.3 | 0.3 | 2.0            | 45 | 0.28            | 4               |
| 0015 0254       | ▲     | 0.15            | 0.3 | 0.3 | 2.5            | 45 | 0.28            | 4               |
| GSBN2 0015 0304 | ▲     | 0.15            | 0.3 | 0.3 | 3.0            | 45 | 0.28            | 4               |
| 0020 0104       | ▲     | 0.20            | 0.4 | 0.4 | 1.0            | 45 | 0.37            | 4               |
| 0020 0154       | ▲     | 0.20            | 0.4 | 0.4 | 1.5            | 45 | 0.37            | 4               |
| 0020 0204       | ▲     | 0.20            | 0.4 | 0.4 | 2.0            | 45 | 0.37            | 4               |
| 0020 0254       | ▲     | 0.20            | 0.4 | 0.4 | 2.5            | 45 | 0.37            | 4               |
| GSBN2 0020 0304 | ▲     | 0.20            | 0.4 | 0.4 | 3.0            | 45 | 0.37            | 4               |
| 0020 0404       | ▲     | 0.20            | 0.4 | 0.4 | 4.0            | 45 | 0.37            | 4               |
| 0020 0504       | ▲     | 0.20            | 0.4 | 0.4 | 5.0            | 45 | 0.37            | 4               |
| 0025 0154       | ▲     | 0.25            | 0.5 | 0.5 | 1.5            | 45 | 0.47            | 4               |
| 0025 0204       | ▲     | 0.25            | 0.5 | 0.5 | 2.0            | 45 | 0.47            | 4               |
| GSBN2 0025 0304 | ▲     | 0.25            | 0.5 | 0.5 | 3.0            | 45 | 0.47            | 4               |
| 0025 0404       | ▲     | 0.25            | 0.5 | 0.5 | 4.0            | 45 | 0.47            | 4               |
| 0025 0504       | ▲     | 0.25            | 0.5 | 0.5 | 5.0            | 45 | 0.47            | 4               |
| 0025 0604       | ▲     | 0.25            | 0.5 | 0.5 | 6.0            | 45 | 0.47            | 4               |
| 0025 0804       | ▲     | 0.25            | 0.5 | 0.5 | 8.0            | 45 | 0.47            | 4               |
| GSBN2 0030 0204 | ▲     | 0.30            | 0.6 | 0.6 | 2.0            | 45 | 0.56            | 4               |
| 0030 0304       | ▲     | 0.30            | 0.6 | 0.6 | 3.0            | 45 | 0.56            | 4               |
| 0030 0404       | ▲     | 0.30            | 0.6 | 0.6 | 4.0            | 45 | 0.56            | 4               |
| 0030 0504       | ▲     | 0.30            | 0.6 | 0.6 | 5.0            | 45 | 0.56            | 4               |
| 0030 0604       | ▲     | 0.30            | 0.6 | 0.6 | 6.0            | 45 | 0.56            | 4               |
| GSBN2 0030 0704 | ▲     | 0.30            | 0.6 | 0.6 | 7.0            | 45 | 0.56            | 4               |
| 0030 0804       | ▲     | 0.30            | 0.6 | 0.6 | 8.0            | 45 | 0.56            | 4               |
| 0030 1004       | ▲     | 0.30            | 0.6 | 0.6 | 10.0           | 45 | 0.56            | 4               |
| 0040 0204       | ▲     | 0.40            | 0.8 | 1.4 | 2.0            | 45 | 0.76            | 4               |
| 0040 0304       | ▲     | 0.40            | 0.8 | 1.4 | 3.0            | 45 | 0.76            | 4               |
| GSBN2 0040 0404 | ▲     | 0.40            | 0.8 | 1.4 | 4.0            | 45 | 0.76            | 4               |
| 0040 0504       | ▲     | 0.40            | 0.8 | 1.4 | 5.0            | 45 | 0.76            | 4               |
| 0040 0604       | ▲     | 0.40            | 0.8 | 1.4 | 6.0            | 45 | 0.76            | 4               |
| 0040 0704       | ▲     | 0.40            | 0.8 | 1.4 | 7.0            | 45 | 0.76            | 4               |
| 0040 0804       | ▲     | 0.40            | 0.8 | 1.4 | 8.0            | 45 | 0.76            | 4               |
| GSBN2 0040 1004 | ▲     | 0.40            | 0.8 | 1.4 | 10.0           | 45 | 0.76            | 4               |
| 0050 0304       | ▲     | 0.50            | 1.0 | 1.5 | 3.0            | 45 | 0.96            | 4               |
| 0050 0404       | ▲     | 0.50            | 1.0 | 1.5 | 4.0            | 45 | 0.96            | 4               |
| 0050 0504       | ▲     | 0.50            | 1.0 | 1.5 | 5.0            | 45 | 0.96            | 4               |
| 0050 0604       | ▲     | 0.50            | 1.0 | 1.5 | 6.0            | 45 | 0.96            | 4               |
| GSBN2 0050 0704 | ▲     | 0.50            | 1.0 | 1.5 | 7.0            | 45 | 0.96            | 4               |
| 0050 0804       | ▲     | 0.50            | 1.0 | 1.5 | 8.0            | 45 | 0.96            | 4               |
| 0050 0904       | ▲     | 0.50            | 1.0 | 1.5 | 9.0            | 45 | 0.96            | 4               |
| 0050 1004       | ▲     | 0.50            | 1.0 | 1.5 | 10.0           | 45 | 0.96            | 4               |
| 0050 1204       | ▲     | 0.50            | 1.0 | 1.5 | 12.0           | 45 | 0.96            | 4               |
| GSBN2 0050 1404 | ▲     | 0.50            | 1.0 | 1.5 | 14.0           | 50 | 0.96            | 4               |
| 0050 1604       | ▲     | 0.50            | 1.0 | 1.5 | 16.0           | 50 | 0.96            | 4               |
| 0050 1804       | ▲     | 0.50            | 1.0 | 1.5 | 18.0           | 55 | 0.96            | 4               |
| 0050 2004       | ▲     | 0.50            | 1.0 | 1.5 | 20.0           | 55 | 0.96            | 4               |
| 0050 2204       | ▲     | 0.50            | 1.0 | 1.5 | 22.0           | 60 | 0.96            | 4               |

Recommended Cutting Conditions /70 Grade: ACZ20W

## Body (Diameter: Ø1.2 to 2.0 mm) Ø4mm Shank Series

| Cat. No.        | Stock | Dimensions (mm) |     |     |                |    |                 |                 |
|-----------------|-------|-----------------|-----|-----|----------------|----|-----------------|-----------------|
|                 |       | R               | ØDc | ℓ   | ℓ <sub>2</sub> | L  | ØD <sub>1</sub> | ØD <sub>s</sub> |
| GSBN2 0060 0604 | ▲     | 0.60            | 1.2 | 1.6 | 6.0            | 45 | 1.15            | 4               |
| 0060 0804       | ▲     | 0.60            | 1.2 | 1.6 | 8.0            | 45 | 1.15            | 4               |
| 0060 1004       | ▲     | 0.60            | 1.2 | 1.6 | 10.0           | 45 | 1.15            | 4               |
| 0060 1204       | ▲     | 0.60            | 1.2 | 1.6 | 12.0           | 45 | 1.15            | 4               |
| 0060 1604       | ▲     | 0.60            | 1.2 | 1.6 | 16.0           | 50 | 1.15            | 4               |
| GSBN2 0070 0804 | ▲     | 0.70            | 1.4 | 1.7 | 8.0            | 45 | 1.35            | 4               |
| 0070 1204       | ▲     | 0.70            | 1.4 | 1.7 | 12.0           | 45 | 1.35            | 4               |
| 0070 1604       | ▲     | 0.70            | 1.4 | 1.7 | 16.0           | 50 | 1.35            | 4               |
| 0075 0804       | ▲     | 0.75            | 1.5 | 1.8 | 8.0            | 45 | 1.45            | 4               |
| 0075 1004       | ▲     | 0.75            | 1.5 | 1.8 | 10.0           | 45 | 1.45            | 4               |
| GSBN2 0075 1204 | ▲     | 0.75            | 1.5 | 1.8 | 12.0           | 45 | 1.45            | 4               |
| 0075 1404       | ▲     | 0.75            | 1.5 | 1.8 | 14.0           | 50 | 1.45            | 4               |
| 0075 1604       | ▲     | 0.75            | 1.5 | 1.8 | 16.0           | 50 | 1.45            | 4               |
| 0075 1804       | ▲     | 0.75            | 1.5 | 1.8 | 18.0           | 55 | 1.45            | 4               |
| 0075 2004       | ▲     | 0.75            | 1.5 | 1.8 | 20.0           | 55 | 1.45            | 4               |
| GSBN2 0080 0804 | ▲     | 0.80            | 1.6 | 1.8 | 8.0            | 45 | 1.55            | 4               |
| 0080 1204       | ▲     | 0.80            | 1.6 | 1.8 | 12.0           | 45 | 1.55            | 4               |
| 0080 1604       | ▲     | 0.80            | 1.6 | 1.8 | 16.0           | 50 | 1.55            | 4               |
| 0080 2004       | ▲     | 0.80            | 1.6 | 1.8 | 20.0           | 55 | 1.55            | 4               |
| 0090 0804       | ▲     | 0.90            | 1.8 | 1.8 | 8.0            | 45 | 1.75            | 4               |
| GSBN2 0090 1204 | ▲     | 0.90            | 1.8 | 1.8 | 12.0           | 45 | 1.75            | 4               |
| 0090 1604       | ▲     | 0.90            | 1.8 | 1.8 | 16.0           | 50 | 1.75            | 4               |
| 0090 2004       | ▲     | 0.90            | 1.8 | 1.8 | 20.0           | 55 | 1.75            | 4               |
| 0100 0404       | ▲     | 1.00            | 2.0 | 2.0 | 4.0            | 45 | 1.95            | 4               |
| 0100 0604       | ▲     | 1.00            | 2.0 | 2.0 | 6.0            | 45 | 1.95            | 4               |
| GSBN2 0100 0804 | ▲     | 1.00            | 2.0 | 2.0 | 8.0            | 45 | 1.95            | 4               |
| 0100 1004       | ▲     | 1.00            | 2.0 | 2.0 | 10.0           | 45 | 1.95            | 4               |
| 0100 1204       | ▲     | 1.00            | 2.0 | 2.0 | 12.0           | 45 | 1.95            | 4               |
| 0100 1404       | ▲     | 1.00            | 2.0 | 2.0 | 14.0           | 50 | 1.95            | 4               |
| 0100 1604       | ▲     | 1.00            | 2.0 | 2.0 | 16.0           | 50 | 1.95            | 4               |
| GSBN2 0100 1804 | ▲     | 1.00            | 2.0 | 2.0 | 18.0           | 55 | 1.95            | 4               |
| 0100 2004       | ▲     | 1.00            | 2.0 | 2.0 | 20.0           | 55 | 1.95            | 4               |
| 0100 2204       | ▲     | 1.00            | 2.0 | 2.0 | 22.0           | 60 | 1.95            | 4               |
| 0100 2504       | ▲     | 1.00            | 2.0 | 2.0 | 25.0           | 65 | 1.95            | 4               |
| 0100 3004       | ▲     | 1.00            | 2.0 | 2.0 | 30.0           | 70 | 1.95            | 4               |

Recommended Cutting Conditions /70

Grade: ACZ20W

I

Coated  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

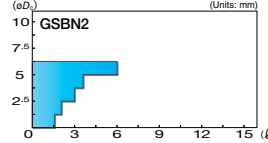
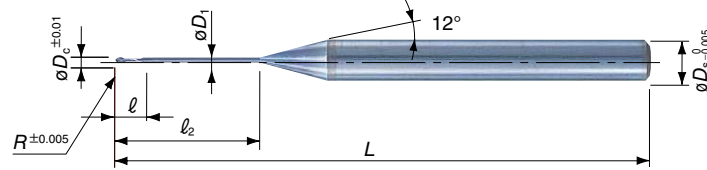
SUMIDIA  
CoatLong  
Neck

Uncoated

CBN  
PCD



|                |              |              |                |                 |              |              |              |              |              |              |
|----------------|--------------|--------------|----------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Coated Carbide | Carbon Steel | Alloy Steel  | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy     | Copper Alloy | Graphite     | CFRP         |
| 45 to 55 HRC   | 55 to 60 HRC | 60 to 65 HRC | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | 45 to 55 HRC | 55 to 60 HRC |



## Body (Diameter: ∅0.2 to 1.5 mm) ∅6mm Shank Series

| Cat. No.        | Stock | Dimensions (mm) |                 |     |                |    |                 |                 |  |
|-----------------|-------|-----------------|-----------------|-----|----------------|----|-----------------|-----------------|--|
|                 |       | R               | ∅D <sub>C</sub> | ℓ   | ℓ <sub>2</sub> | L  | ∅D <sub>1</sub> | ∅D <sub>S</sub> |  |
| GSBN2 0010 0056 | ▲     | 0.10            | 0.2             | 0.2 | 0.5            | 50 | 0.18            | 6               |  |
| 0010 0106       | ▲     | 0.10            | 0.2             | 0.2 | 1.0            | 50 | 0.18            | 6               |  |
| 0010 0156       | ▲     | 0.10            | 0.2             | 0.2 | 1.5            | 50 | 0.18            | 6               |  |
| 0010 0206       | ▲     | 0.10            | 0.2             | 0.2 | 2.0            | 50 | 0.18            | 6               |  |
| 0015 0106       | ▲     | 0.15            | 0.3             | 0.3 | 1.0            | 50 | 0.28            | 6               |  |
| GSBN2 0015 0156 | ▲     | 0.15            | 0.3             | 0.3 | 1.5            | 50 | 0.28            | 6               |  |
| 0015 0206       | ▲     | 0.15            | 0.3             | 0.3 | 2.0            | 50 | 0.28            | 6               |  |
| 0020 0106       | ▲     | 0.20            | 0.4             | 0.4 | 1.0            | 50 | 0.37            | 6               |  |
| 0020 0156       | ▲     | 0.20            | 0.4             | 0.4 | 1.5            | 50 | 0.37            | 6               |  |
| 0020 0206       | ▲     | 0.20            | 0.4             | 0.4 | 2.0            | 50 | 0.37            | 6               |  |
| GSBN2 0020 0256 | ▲     | 0.20            | 0.4             | 0.4 | 2.5            | 50 | 0.37            | 6               |  |
| 0020 0306       | ▲     | 0.20            | 0.4             | 0.4 | 3.0            | 50 | 0.37            | 6               |  |
| 0025 0156       | ▲     | 0.25            | 0.5             | 0.5 | 1.5            | 50 | 0.47            | 6               |  |
| 0025 0206       | ▲     | 0.25            | 0.5             | 0.5 | 2.0            | 50 | 0.47            | 6               |  |
| 0025 0306       | ▲     | 0.25            | 0.5             | 0.5 | 3.0            | 50 | 0.47            | 6               |  |
| GSBN2 0025 0406 | ▲     | 0.25            | 0.5             | 0.5 | 4.0            | 50 | 0.47            | 6               |  |
| 0025 0506       | ▲     | 0.25            | 0.5             | 0.5 | 5.0            | 50 | 0.47            | 6               |  |
| 0025 0606       | ▲     | 0.25            | 0.5             | 0.5 | 6.0            | 50 | 0.47            | 6               |  |
| 0025 0806       | ▲     | 0.25            | 0.5             | 0.5 | 8.0            | 50 | 0.47            | 6               |  |
| 0030 0206       | ▲     | 0.30            | 0.6             | 0.6 | 2.0            | 50 | 0.56            | 6               |  |
| GSBN2 0030 0306 | ▲     | 0.30            | 0.6             | 0.6 | 3.0            | 50 | 0.56            | 6               |  |
| 0030 0406       | ▲     | 0.30            | 0.6             | 0.6 | 4.0            | 50 | 0.56            | 6               |  |
| 0030 0506       | ▲     | 0.30            | 0.6             | 0.6 | 5.0            | 50 | 0.56            | 6               |  |
| 0030 0606       | ▲     | 0.30            | 0.6             | 0.6 | 6.0            | 50 | 0.56            | 6               |  |
| 0030 0806       | ▲     | 0.30            | 0.6             | 0.6 | 8.0            | 50 | 0.56            | 6               |  |
| GSBN2 0030 1006 | ▲     | 0.30            | 0.6             | 0.6 | 10.0           | 50 | 0.56            | 6               |  |
| 0040 0206       | ▲     | 0.40            | 0.8             | 1.4 | 2.0            | 50 | 0.76            | 6               |  |
| 0040 0306       | ▲     | 0.40            | 0.8             | 1.4 | 3.0            | 50 | 0.76            | 6               |  |
| 0040 0406       | ▲     | 0.40            | 0.8             | 1.4 | 4.0            | 50 | 0.76            | 6               |  |
| 0040 0506       | ▲     | 0.40            | 0.8             | 1.4 | 5.0            | 50 | 0.76            | 6               |  |
| GSBN2 0040 0606 | ▲     | 0.40            | 0.8             | 1.4 | 6.0            | 50 | 0.76            | 6               |  |
| 0040 0806       | ▲     | 0.40            | 0.8             | 1.4 | 8.0            | 50 | 0.76            | 6               |  |
| 0040 1006       | ▲     | 0.40            | 0.8             | 1.4 | 10.0           | 50 | 0.76            | 6               |  |
| 0050 0306       | ▲     | 0.50            | 1.0             | 1.5 | 3.0            | 50 | 0.96            | 6               |  |
| 0050 0406       | ▲     | 0.50            | 1.0             | 1.5 | 4.0            | 50 | 0.96            | 6               |  |
| GSBN2 0050 0506 | ▲     | 0.50            | 1.0             | 1.5 | 5.0            | 50 | 0.96            | 6               |  |
| 0050 0606       | ▲     | 0.50            | 1.0             | 1.5 | 6.0            | 50 | 0.96            | 6               |  |
| 0050 0806       | ▲     | 0.50            | 1.0             | 1.5 | 8.0            | 50 | 0.96            | 6               |  |
| 0050 1006       | ▲     | 0.50            | 1.0             | 1.5 | 10.0           | 50 | 0.96            | 6               |  |
| 0050 1206       | ▲     | 0.50            | 1.0             | 1.5 | 12.0           | 50 | 0.96            | 6               |  |
| GSBN2 0050 1406 | ▲     | 0.50            | 1.0             | 1.5 | 14.0           | 50 | 0.96            | 6               |  |
| 0050 1606       | ▲     | 0.50            | 1.0             | 1.5 | 16.0           | 60 | 0.96            | 6               |  |
| 0050 1806       | ▲     | 0.50            | 1.0             | 1.5 | 18.0           | 60 | 0.96            | 6               |  |
| 0050 2006       | ▲     | 0.50            | 1.0             | 1.5 | 20.0           | 60 | 0.96            | 6               |  |
| 0050 2206       | ▲     | 0.50            | 1.0             | 1.5 | 22.0           | 60 | 0.96            | 6               |  |
| GSBN2 0060 0606 | ▲     | 0.60            | 1.2             | 1.6 | 6.0            | 50 | 1.15            | 6               |  |
| 0060 0806       | ▲     | 0.60            | 1.2             | 1.6 | 8.0            | 50 | 1.15            | 6               |  |
| 0060 1006       | ▲     | 0.60            | 1.2             | 1.6 | 10.0           | 50 | 1.15            | 6               |  |
| 0060 1206       | ▲     | 0.60            | 1.2             | 1.6 | 12.0           | 50 | 1.15            | 6               |  |
| 0060 1606       | ▲     | 0.60            | 1.2             | 1.6 | 16.0           | 60 | 1.15            | 6               |  |
| GSBN2 0075 0806 | ▲     | 0.75            | 1.5             | 1.8 | 8.0            | 50 | 1.45            | 6               |  |
| 0075 1006       | ▲     | 0.75            | 1.5             | 1.8 | 10.0           | 50 | 1.45            | 6               |  |
| 0075 1206       | ▲     | 0.75            | 1.5             | 1.8 | 12.0           | 50 | 1.45            | 6               |  |
| 0075 1606       | ▲     | 0.75            | 1.5             | 1.8 | 16.0           | 60 | 1.45            | 6               |  |
| 0075 2006       | ▲     | 0.75            | 1.5             | 1.8 | 20.0           | 60 | 1.45            | 6               |  |

Recommended Cutting Conditions 170 Grade: ACZ20W

## Body (Diameter: ∅2.0 to 6.0 mm) ∅6mm Shank Series

| Cat. No.        | Stock | Dimensions (mm) |                 |     |                |     |                 |                 |  |
|-----------------|-------|-----------------|-----------------|-----|----------------|-----|-----------------|-----------------|--|
|                 |       | R               | ∅D <sub>C</sub> | ℓ   | ℓ <sub>2</sub> | L   | ∅D <sub>1</sub> | ∅D <sub>S</sub> |  |
| GSBN2 0100 0406 | ▲     | 1.00            | 2.0             | 2.0 | 4.0            | 50  | 1.95            | 6               |  |
| 0100 0606       | ▲     | 1.00            | 2.0             | 2.0 | 6.0            | 50  | 1.95            | 6               |  |
| 0100 0806       | ▲     | 1.00            | 2.0             | 2.0 | 8.0            | 50  | 1.95            | 6               |  |
| 0100 1006       | ▲     | 1.00            | 2.0             | 2.0 | 10.0           | 50  | 1.95            | 6               |  |
| 0100 1206       | ▲     | 1.00            | 2.0             | 2.0 | 12.0           | 50  | 1.95            | 6               |  |
| GSBN2 0100 1406 | ▲     | 1.00            | 2.0             | 2.0 | 14.0           | 50  | 1.95            | 6               |  |
| 0100 1606       | ▲     | 1.00            | 2.0             | 2.0 | 16.0           | 60  | 1.95            | 6               |  |
| 0100 1806       | ▲     | 1.00            | 2.0             | 2.0 | 18.0           | 60  | 1.95            | 6               |  |
| 0100 2006       | ▲     | 1.00            | 2.0             | 2.0 | 20.0           | 60  | 1.95            | 6               |  |
| 0100 2206       | ▲     | 1.00            | 2.0             | 2.0 | 22.0           | 60  | 1.95            | 6               |  |
| GSBN2 0100 2506 | ▲     | 1.00            | 2.0             | 2.0 | 25.0           | 80  | 1.95            | 6               |  |
| 0100 3006       | ▲     | 1.00            | 2.0             | 2.0 | 30.0           | 80  | 1.95            | 6               |  |
| 0100 3506       | ▲     | 1.00            | 2.0             | 2.0 | 35.0           | 80  | 1.95            | 6               |  |
| 0150 0806       | ▲     | 1.50            | 3.0             | 2.5 | 8.0            | 60  | 2.90            | 6               |  |
| 0150 1006       | ▲     | 1.50            | 3.0             | 2.5 | 10.0           | 60  | 2.90            | 6               |  |
| GSBN2 0150 1206 | ▲     | 1.50            | 3.0             | 2.5 | 12.0           | 60  | 2.90            | 6               |  |
| 0150 1606       | ▲     | 1.50            | 3.0             | 2.5 | 16.0           | 60  | 2.90            | 6               |  |
| 0150 2006       | ▲     | 1.50            | 3.0             | 2.5 | 20.0           | 65  | 2.90            | 6               |  |
| 0150 2506       | ▲     | 1.50            | 3.0             | 2.5 | 25.0           | 65  | 2.90            | 6               |  |
| 0150 3006       | ▲     | 1.50            | 3.0             | 2.5 | 30.0           | 70  | 2.90            | 6               |  |
| GSBN2 0150 3506 | ▲     | 1.50            | 3.0             | 2.5 | 35.0           | 80  | 2.90            | 6               |  |
| 0200 1006       | ▲     | 2.00            | 4.0             | 3.0 | 10.0           | 65  | 3.90            | 6               |  |
| 0200 1206       | ▲     | 2.00            | 4.0             | 3.0 | 12.0           | 65  | 3.90            | 6               |  |
| 0200 1606       | ▲     | 2.00            | 4.0             | 3.0 | 16.0           | 65  | 3.90            | 6               |  |
| 0200 2006       | ▲     | 2.00            | 4.0             | 3.0 | 20.0           | 65  | 3.90            | 6               |  |
| GSBN2 0200 2506 | ▲     | 2.00            | 4.0             | 3.0 | 25.0           | 70  | 3.90            | 6               |  |
| 0200 3006       | ▲     | 2.00            | 4.0             | 3.0 | 30.0           | 70  | 3.90            | 6               |  |
| 0200 3506       | ▲     | 2.00            | 4.0             | 3.0 | 35.0           | 80  | 3.90            | 6               |  |
| 0200 4006       | ▲     | 2.00            | 4.0             | 3.0 | 40.0           | 85  | 3.90            | 6               |  |
| 0200 4506       | ▲     | 2.00            | 4.0             | 3.0 | 45.0           | 90  | 3.90            | 6               |  |
| GSBN2 0200 5006 | ▲     | 2.00            | 4.0             | 3.0 | 50.0           | 100 | 3.90            | 6               |  |
| 0250 2006       | ▲     | 2.50            | 5.0             | 3.5 | 20.0           | 70  | 4.90            | 6               |  |
| 0250 2506       | ▲     | 2.50            | 5.0             | 3.5 | 25.0           | 70  | 4.90            | 6               |  |
| 0250 3006       | ▲     | 2.50            | 5.0             | 3.5 | 30.0           | 80  | 4.90            | 6               |  |
| 0250 3506       | ▲     | 2.50            | 5.0             | 3.5 | 35.0           | 80  | 4.90            | 6               |  |
| GSBN2 0300 3006 | ▲     | 3.00            | 6.0             | 6.0 | 30.0           | 80  | 5.80            | 6               |  |
| 0300 5006       | ▲     | 3.00            | 6.0             | 6.0 | 50.0           | 120 | 5.80            | 6               |  |

Recommended Cutting Conditions 170 Grade: ACZ20W

I  
Coated  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
Coat

Long  
Neck

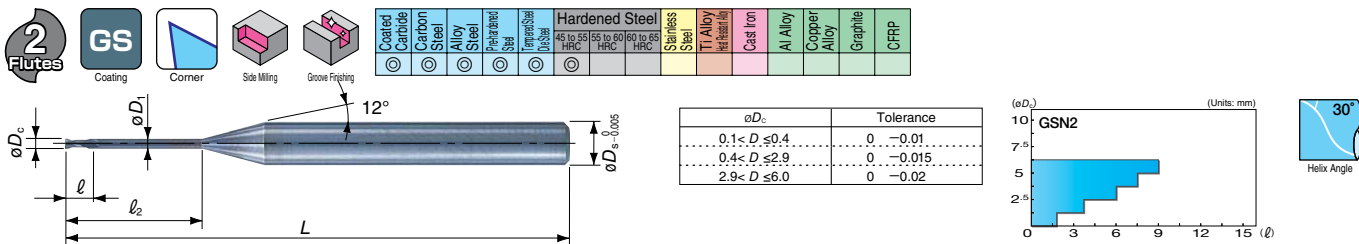
Uncoated

CBN

PCD

# GSN 2 Type (2 flutes)

## 2 Flutes



### Body (Diameter: $\phi 0.2$ to 1.5 mm)

| Cat. No.       | Stock | Dimensions (mm) |        |          |     |            |            |
|----------------|-------|-----------------|--------|----------|-----|------------|------------|
|                |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_1$ | $\phi D_s$ |
| GSN2 0020 0054 | ▲     | 0.2             | 0.3    | 0.5      | 45  | 0.18       | 4          |
| 0020 0104      | ▲     | 0.2             | 0.3    | 1.0      | 45  | 0.18       | 4          |
| 0020 0154      | ▲     | 0.2             | 0.3    | 1.5      | 45  | 0.18       | 4          |
| 0030 0104      | ▲     | 0.3             | 0.4    | 1.0      | 45  | 0.28       | 4          |
| 0030 0204      | ▲     | 0.3             | 0.4    | 2.0      | 45  | 0.28       | 4          |
| GSN2 0030 0304 | ▲     | 0.3             | 0.4    | 3.0      | 45  | 0.28       | 4          |
| 0030 0604      | ▲     | 0.3             | 0.4    | 6.0      | 45  | 0.28       | 4          |
| 0030 0904      | ▲     | 0.3             | 0.4    | 9.0      | 45  | 0.28       | 4          |
| 0040 0204      | ▲     | 0.4             | 0.6    | 2.0      | 45  | 0.37       | 4          |
| 0040 0304      | ▲     | 0.4             | 0.6    | 3.0      | 45  | 0.37       | 4          |
| GSN2 0040 0404 | ▲     | 0.4             | 0.6    | 4.0      | 45  | 0.37       | 4          |
| 0040 0804      | ▲     | 0.4             | 0.6    | 8.0      | 45  | 0.37       | 4          |
| 0040 1204      | ▲     | 0.4             | 0.6    | 12.0     | 45  | 0.37       | 4          |
| 0050 0204      | ▲     | 0.5             | 0.7    | 2.0      | 45  | 0.47       | 4          |
| 0050 0404      | ▲     | 0.5             | 0.7    | 4.0      | 45  | 0.47       | 4          |
| GSN2 0050 0604 | ▲     | 0.5             | 0.7    | 6.0      | 45  | 0.47       | 4          |
| 0050 0804      | ▲     | 0.5             | 0.7    | 8.0      | 50  | 0.47       | 4          |
| 0050 1004      | ▲     | 0.5             | 0.7    | 10.0     | 50  | 0.47       | 4          |
| 0050 1504      | ▲     | 0.5             | 0.7    | 15.0     | 50  | 0.47       | 4          |
| 0060 0204      | ▲     | 0.6             | 0.9    | 2.0      | 45  | 0.57       | 4          |
| GSN2 0060 0404 | ▲     | 0.6             | 0.9    | 4.0      | 45  | 0.57       | 4          |
| 0060 0604      | ▲     | 0.6             | 0.9    | 6.0      | 45  | 0.57       | 4          |
| 0060 0804      | ▲     | 0.6             | 0.9    | 8.0      | 50  | 0.57       | 4          |
| 0060 1004      | ▲     | 0.6             | 0.9    | 10.0     | 50  | 0.57       | 4          |
| 0060 1204      | ▲     | 0.6             | 0.9    | 12.0     | 50  | 0.57       | 4          |
| GSN2 0060 1804 | ▲     | 0.6             | 0.9    | 18.0     | 50  | 0.57       | 4          |
| 0070 0204      | ▲     | 0.7             | 1.0    | 2.0      | 45  | 0.67       | 4          |
| 0070 0404      | ▲     | 0.7             | 1.0    | 4.0      | 45  | 0.67       | 4          |
| 0070 0604      | ▲     | 0.7             | 1.0    | 6.0      | 45  | 0.67       | 4          |
| 0070 0804      | ▲     | 0.7             | 1.0    | 8.0      | 50  | 0.67       | 4          |
| GSN2 0070 1004 | ▲     | 0.7             | 1.0    | 10.0     | 50  | 0.67       | 4          |
| 0080 0404      | ▲     | 0.8             | 1.2    | 4.0      | 45  | 0.77       | 4          |
| 0080 0604      | ▲     | 0.8             | 1.2    | 6.0      | 45  | 0.77       | 4          |
| 0080 0804      | ▲     | 0.8             | 1.2    | 8.0      | 50  | 0.77       | 4          |
| 0080 1004      | ▲     | 0.8             | 1.2    | 10.0     | 50  | 0.77       | 4          |
| GSN2 0080 1204 | ▲     | 0.8             | 1.2    | 12.0     | 50  | 0.77       | 4          |
| 0080 1604      | ▲     | 0.8             | 1.2    | 16.0     | 50  | 0.77       | 4          |
| 0080 2404      | ▲     | 0.8             | 1.2    | 24.0     | 60  | 0.77       | 4          |
| 0090 0604      | ▲     | 0.9             | 1.4    | 6.0      | 45  | 0.87       | 4          |
| 0090 0804      | ▲     | 0.9             | 1.4    | 8.0      | 50  | 0.87       | 4          |
| GSN2 0090 1004 | ▲     | 0.9             | 1.4    | 10.0     | 50  | 0.87       | 4          |
| 0090 1504      | ▲     | 0.9             | 1.4    | 15.0     | 60  | 0.87       | 4          |
| 0100 0404      | ▲     | 1.0             | 1.5    | 4.0      | 50  | 0.97       | 4          |
| 0100 0604      | ▲     | 1.0             | 1.5    | 6.0      | 50  | 0.97       | 4          |
| 0100 0804      | ▲     | 1.0             | 1.5    | 8.0      | 50  | 0.97       | 4          |
| GSN2 0100 1004 | ▲     | 1.0             | 1.5    | 10.0     | 50  | 0.97       | 4          |
| 0100 1204      | ▲     | 1.0             | 1.5    | 12.0     | 50  | 0.97       | 4          |
| 0100 1604      | ▲     | 1.0             | 1.5    | 16.0     | 60  | 0.97       | 4          |
| 0100 2004      | ▲     | 1.0             | 1.5    | 20.0     | 60  | 0.97       | 4          |
| 0100 2504      | ▲     | 1.0             | 1.5    | 25.0     | 70  | 0.97       | 4          |
| GSN2 0100 3004 | ▲     | 1.0             | 1.5    | 30.0     | 70  | 0.97       | 4          |
| 0120 0604      | ▲     | 1.2             | 1.8    | 6.0      | 50  | 1.15       | 4          |
| 0120 0804      | ▲     | 1.2             | 1.8    | 8.0      | 50  | 1.15       | 4          |
| 0120 1004      | ▲     | 1.2             | 1.8    | 10.0     | 50  | 1.15       | 4          |
| 0120 1204      | ▲     | 1.2             | 1.8    | 12.0     | 50  | 1.15       | 4          |
| GSN2 0120 1604 | ▲     | 1.2             | 1.8    | 16.0     | 60  | 1.15       | 4          |
| 0120 2004      | ▲     | 1.2             | 1.8    | 20.0     | 60  | 1.15       | 4          |
| 0150 0604      | ▲     | 1.5             | 2.3    | 6.0      | 50  | 1.45       | 4          |
| 0150 0804      | ▲     | 1.5             | 2.3    | 8.0      | 50  | 1.45       | 4          |
| 0150 1004      | ▲     | 1.5             | 2.3    | 10.0     | 50  | 1.45       | 4          |

### Body (Diameter: $\phi 1.5$ to 6.0 mm)

| Cat. No.       | Stock | Dimensions (mm) |        |          |     |            |            |
|----------------|-------|-----------------|--------|----------|-----|------------|------------|
|                |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_1$ | $\phi D_s$ |
| GSN2 0150 1204 | ▲     | 1.5             | 2.3    | 12.0     | 50  | 1.45       | 4          |
| 0150 1404      | ▲     | 1.5             | 2.3    | 14.0     | 60  | 1.45       | 4          |
| 0150 1604      | ▲     | 1.5             | 2.3    | 16.0     | 60  | 1.45       | 4          |
| 0150 1804      | ▲     | 1.5             | 2.3    | 18.0     | 60  | 1.45       | 4          |
| 0150 2004      | ▲     | 1.5             | 2.3    | 20.0     | 60  | 1.45       | 4          |
| GSN2 0150 2504 | ▲     | 1.5             | 2.3    | 25.0     | 70  | 1.45       | 4          |
| 0150 3004      | ▲     | 1.5             | 2.3    | 30.0     | 70  | 1.45       | 4          |
| 0150 3804      | ▲     | 1.5             | 2.3    | 38.0     | 80  | 1.45       | 4          |
| 0150 4504      | ▲     | 1.5             | 2.3    | 45.0     | 80  | 1.45       | 4          |
| 0200 0604      | ▲     | 2.0             | 3.0    | 6.0      | 50  | 1.95       | 4          |
| GSN2 0200 0804 | ▲     | 2.0             | 3.0    | 8.0      | 50  | 1.95       | 4          |
| 0200 1004      | ▲     | 2.0             | 3.0    | 10.0     | 50  | 1.95       | 4          |
| 0200 1204      | ▲     | 2.0             | 3.0    | 12.0     | 50  | 1.95       | 4          |
| 0200 1404      | ▲     | 2.0             | 3.0    | 14.0     | 60  | 1.95       | 4          |
| 0200 1604      | ▲     | 2.0             | 3.0    | 16.0     | 60  | 1.95       | 4          |
| GSN2 0200 1804 | ▲     | 2.0             | 3.0    | 18.0     | 60  | 1.95       | 4          |
| 0200 2004      | ▲     | 2.0             | 3.0    | 20.0     | 60  | 1.95       | 4          |
| 0200 2504      | ▲     | 2.0             | 3.0    | 25.0     | 70  | 1.95       | 4          |
| 0200 3004      | ▲     | 2.0             | 3.0    | 30.0     | 70  | 1.95       | 4          |
| 0200 3504      | ▲     | 2.0             | 3.0    | 35.0     | 80  | 1.95       | 4          |
| GSN2 0200 4004 | ▲     | 2.0             | 3.0    | 40.0     | 90  | 1.95       | 4          |
| 0200 5004      | ▲     | 2.0             | 3.0    | 50.0     | 100 | 1.95       | 4          |
| 0200 6004      | ▲     | 2.0             | 3.0    | 60.0     | 110 | 1.95       | 4          |
| 0250 0804      | ▲     | 2.5             | 3.7    | 8.0      | 50  | 2.45       | 4          |
| 0250 1204      | ▲     | 2.5             | 3.7    | 12.0     | 50  | 2.45       | 4          |
| GSN2 0250 1604 | ▲     | 2.5             | 3.7    | 16.0     | 60  | 2.45       | 4          |
| 0250 2004      | ▲     | 2.5             | 3.7    | 20.0     | 60  | 2.45       | 4          |
| 0250 2504      | ▲     | 2.5             | 3.7    | 25.0     | 70  | 2.45       | 4          |
| 0250 3004      | ▲     | 2.5             | 3.7    | 30.0     | 70  | 2.45       | 4          |
| 0250 4004      | ▲     | 2.5             | 3.7    | 40.0     | 90  | 2.45       | 4          |
| GSN2 0250 5004 | ▲     | 2.5             | 3.7    | 50.0     | 100 | 2.45       | 4          |
| 0300 0806      | ▲     | 3.0             | 4.5    | 8.0      | 50  | 2.90       | 6          |
| 0300 1206      | ▲     | 3.0             | 4.5    | 12.0     | 50  | 2.90       | 6          |
| 0300 1606      | ▲     | 3.0             | 4.5    | 16.0     | 60  | 2.90       | 6          |
| 0300 2006      | ▲     | 3.0             | 4.5    | 20.0     | 60  | 2.90       | 6          |
| GSN2 0300 2506 | ▲     | 3.0             | 4.5    | 25.0     | 70  | 2.90       | 6          |
| 0300 3006      | ▲     | 3.0             | 4.5    | 30.0     | 70  | 2.90       | 6          |
| 0300 4006      | ▲     | 3.0             | 4.5    | 40.0     | 90  | 2.90       | 6          |
| 0300 5006      | ▲     | 3.0             | 4.5    | 50.0     | 100 | 2.90       | 6          |
| 0400 1206      | ▲     | 4.0             | 6.0    | 12.0     | 50  | 3.90       | 6          |
| GSN2 0400 1606 | ▲     | 4.0             | 6.0    | 16.0     | 60  | 3.90       | 6          |
| 0400 2006      | ▲     | 4.0             | 6.0    | 20.0     | 60  | 3.90       | 6          |
| 0400 2506      | ▲     | 4.0             | 6.0    | 25.0     | 70  | 3.90       | 6          |
| 0400 3006      | ▲     | 4.0             | 6.0    | 30.0     | 70  | 3.90       | 6          |
| 0400 3506      | ▲     | 4.0             | 6.0    | 35.0     | 80  | 3.90       | 6          |
| GSN2 0400 4006 | ▲     | 4.0             | 6.0    | 40.0     | 90  | 3.90       | 6          |
| 0400 4506      | ▲     | 4.0             | 6.0    | 45.0     | 90  | 3.90       | 6          |
| 0400 5006      | ▲     | 4.0             | 6.0    | 50.0     | 100 | 3.90       | 6          |
| 0400 6006      | ▲     | 4.0             | 6.0    | 60.0     | 110 | 3.90       | 6          |
| 0500 1606      | ▲     | 5.0             | 7.5    | 16.0     | 60  | 4.90       | 6          |
| GSN2 0500 2506 | ▲     | 5.0             | 7.5    | 25.0     | 70  | 4.90       | 6          |
| 0500 3506      | ▲     | 5.0             | 7.5    | 35.0     | 80  | 4.90       | 6          |
| 0500 5006      | ▲     | 5.0             | 7.5    | 50.0     | 110 | 4.90       | 6          |
| 0500 6006      | ▲     | 5.0             | 7.5    | 60.0     | 120 | 4.90       | 6          |
| 0600 2006      | ▲     | 6.0             | 9.0    | 20.0     | 80  | 5.90       | 6          |
| GSN2 0600 3006 | ▲     | 6.0             | 9.0    | 30.0     | 90  | 5.90       | 6          |
| 0600 4006      | ▲     | 6.0             | 9.0    | 40.0     | 100 | 5.90       | 6          |
| 0600 5006      | ▲     | 6.0             | 9.0    | 50.0     | 110 | 5.90       | 6          |
| 0600 6006      | ▲     | 6.0             | 9.0    | 60.0     | 120 | 5.90       | 6          |

Recommended Cutting Conditions 172

Grade: ACZ20W

Recommended Cutting Conditions 172

Grade: ACZ20W

▲ mark : To be replaced by new item (Please confirm stock availability)

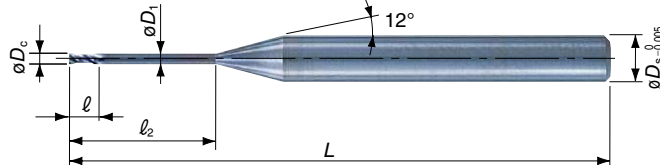


GS MILL Long Neck

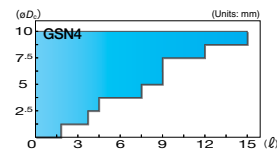
# GSN 4 Type (4 flutes)



|                |              |             |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



| $\phi D_c$          | Tolerance |
|---------------------|-----------|
| $0.9 < D \leq 2.9$  | 0 -0.015  |
| $2.9 < D \leq 10.0$ | 0 -0.02   |



## Body (Diameter: $\phi 1.0$ to $5.0$ mm)

| Cat. No.       | Stock | Dimensions (mm) |        |          |     |            |            |
|----------------|-------|-----------------|--------|----------|-----|------------|------------|
|                |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_1$ | $\phi D_s$ |
| GSN4 0100 0404 | ▲     | 1.0             | 1.5    | 4.0      | 50  | 0.97       | 4          |
| 0100 0604      | ▲     | 1.0             | 1.5    | 6.0      | 50  | 0.97       | 4          |
| 0100 0804      | ▲     | 1.0             | 1.5    | 8.0      | 50  | 0.97       | 4          |
| 0100 1004      | ▲     | 1.0             | 1.5    | 10.0     | 50  | 0.97       | 4          |
| 0100 1204      | ▲     | 1.0             | 1.5    | 12.0     | 50  | 0.97       | 4          |
| GSN4 0100 1604 | ▲     | 1.0             | 1.5    | 16.0     | 60  | 0.97       | 4          |
| 0120 0604      | ▲     | 1.2             | 1.8    | 6.0      | 50  | 1.15       | 4          |
| 0120 0804      | ▲     | 1.2             | 1.8    | 8.0      | 50  | 1.15       | 4          |
| 0120 1004      | ▲     | 1.2             | 1.8    | 10.0     | 50  | 1.15       | 4          |
| 0120 1204      | ▲     | 1.2             | 1.8    | 12.0     | 50  | 1.15       | 4          |
| GSN4 0120 1604 | ▲     | 1.2             | 1.8    | 16.0     | 60  | 1.15       | 4          |
| 0150 0604      | ▲     | 1.5             | 2.3    | 6.0      | 50  | 1.45       | 4          |
| 0150 0804      | ▲     | 1.5             | 2.3    | 8.0      | 50  | 1.45       | 4          |
| 0150 1004      | ▲     | 1.5             | 2.3    | 10.0     | 50  | 1.45       | 4          |
| 0150 1204      | ▲     | 1.5             | 2.3    | 12.0     | 50  | 1.45       | 4          |
| GSN4 0150 1404 | ▲     | 1.5             | 2.3    | 14.0     | 60  | 1.45       | 4          |
| 0150 1604      | ▲     | 1.5             | 2.3    | 16.0     | 60  | 1.45       | 4          |
| 0150 1804      | ▲     | 1.5             | 2.3    | 18.0     | 60  | 1.45       | 4          |
| 0150 2004      | ▲     | 1.5             | 2.3    | 20.0     | 60  | 1.45       | 4          |
| 0200 0604      | ▲     | 2.0             | 3.0    | 6.0      | 50  | 1.95       | 4          |
| GSN4 0200 0804 | ▲     | 2.0             | 3.0    | 8.0      | 50  | 1.95       | 4          |
| 0200 1004      | ▲     | 2.0             | 3.0    | 10.0     | 50  | 1.95       | 4          |
| 0200 1204      | ▲     | 2.0             | 3.0    | 12.0     | 50  | 1.95       | 4          |
| 0200 1404      | ▲     | 2.0             | 3.0    | 14.0     | 60  | 1.95       | 4          |
| 0200 1604      | ▲     | 2.0             | 3.0    | 16.0     | 60  | 1.95       | 4          |
| GSN4 0200 1804 | ▲     | 2.0             | 3.0    | 18.0     | 60  | 1.95       | 4          |
| 0200 2004      | ▲     | 2.0             | 3.0    | 20.0     | 60  | 1.95       | 4          |
| 0200 2504      | ▲     | 2.0             | 3.0    | 25.0     | 70  | 1.95       | 4          |
| 0200 3004      | ▲     | 2.0             | 3.0    | 30.0     | 70  | 1.95       | 4          |
| 0250 0804      | ▲     | 2.5             | 3.7    | 8.0      | 50  | 2.45       | 4          |
| GSN4 0250 1204 | ▲     | 2.5             | 3.7    | 12.0     | 50  | 2.45       | 4          |
| 0250 1604      | ▲     | 2.5             | 3.7    | 16.0     | 60  | 2.45       | 4          |
| 0250 2004      | ▲     | 2.5             | 3.7    | 20.0     | 60  | 2.45       | 4          |
| 0250 2504      | ▲     | 2.5             | 3.7    | 25.0     | 70  | 2.45       | 4          |
| 0300 0806      | ▲     | 3.0             | 4.5    | 8.0      | 50  | 2.90       | 6          |
| GSN4 0300 1206 | ▲     | 3.0             | 4.5    | 12.0     | 50  | 2.90       | 6          |
| 0300 1606      | ▲     | 3.0             | 4.5    | 16.0     | 60  | 2.90       | 6          |
| 0300 2006      | ▲     | 3.0             | 4.5    | 20.0     | 60  | 2.90       | 6          |
| 0300 2506      | ▲     | 3.0             | 4.5    | 25.0     | 70  | 2.90       | 6          |
| 0300 3006      | ▲     | 3.0             | 4.5    | 30.0     | 70  | 2.90       | 6          |
| GSN4 0400 1206 | ▲     | 4.0             | 6.0    | 12.0     | 50  | 3.90       | 6          |
| 0400 1606      | ▲     | 4.0             | 6.0    | 16.0     | 60  | 3.90       | 6          |
| 0400 2006      | ▲     | 4.0             | 6.0    | 20.0     | 60  | 3.90       | 6          |
| 0400 2506      | ▲     | 4.0             | 6.0    | 25.0     | 70  | 3.90       | 6          |
| 0400 3006      | ▲     | 4.0             | 6.0    | 30.0     | 70  | 3.90       | 6          |
| GSN4 0400 3506 | ▲     | 4.0             | 6.0    | 35.0     | 80  | 3.90       | 6          |
| 0400 4006      | ▲     | 4.0             | 6.0    | 40.0     | 90  | 3.90       | 6          |
| 0400 4506      | ▲     | 4.0             | 6.0    | 45.0     | 90  | 3.90       | 6          |
| 0400 5006      | ▲     | 4.0             | 6.0    | 50.0     | 100 | 3.90       | 6          |
| 0500 1606      | ▲     | 5.0             | 7.5    | 16.0     | 60  | 4.90       | 6          |
| GSN4 0500 2506 | ▲     | 5.0             | 7.5    | 25.0     | 70  | 4.90       | 6          |
| 0500 3506      | ▲     | 5.0             | 7.5    | 35.0     | 80  | 4.90       | 6          |
| 0500 5006      | ▲     | 5.0             | 7.5    | 50.0     | 110 | 4.90       | 6          |

Recommended Cutting Conditions T74

Grade: ACZ20W

## Body (Diameter: $\phi 6.0$ to $10.0$ mm)

| Cat. No.       | Stock | Dimensions (mm) |        |          |     |            |            |
|----------------|-------|-----------------|--------|----------|-----|------------|------------|
|                |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_1$ | $\phi D_s$ |
| GSN4 0600 2006 | ▲     | 6.0             | 9.0    | 20.0     | 80  | 5.90       | 6          |
| 0600 3006      | ▲     | 6.0             | 9.0    | 30.0     | 90  | 5.90       | 6          |
| 0600 4006      | ▲     | 6.0             | 9.0    | 40.0     | 100 | 5.90       | 6          |
| 0600 5006      | ▲     | 6.0             | 9.0    | 50.0     | 110 | 5.90       | 6          |
| 0800 3008      | ▲     | 8.0             | 12.0   | 30.0     | 100 | 7.80       | 8          |
| GSN4 0800 5008 | ▲     | 8.0             | 12.0   | 50.0     | 120 | 7.80       | 8          |
| 0800 6008      | ▲     | 8.0             | 12.0   | 60.0     | 130 | 7.80       | 8          |
| 10004 0010     | ▲     | 10.0            | 15.0   | 40.0     | 110 | 9.80       | 10         |
| 10006 0010     | ▲     | 10.0            | 15.0   | 60.0     | 130 | 9.80       | 10         |
| 10008 0010     | ▲     | 10.0            | 15.0   | 80.0     | 150 | 9.80       | 10         |

Recommended Cutting Conditions T74

Grade: ACZ20W

I

Coated Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

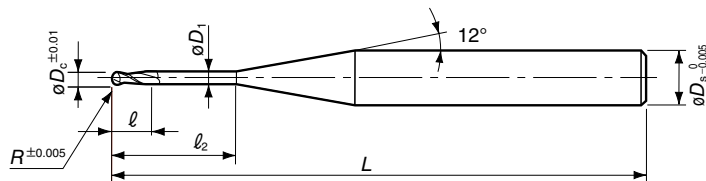
CBN

PCD



# GS MILL Long Neck Ballnose GSBN2

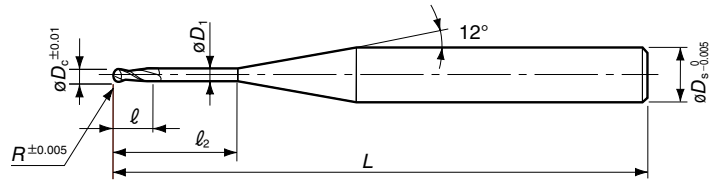
## Recommended Cutting Conditions



### GS MILL Long Neck Ballnose GSBN2

| Work Material<br>Cond. |            |            | Carbon Steel, Alloy Steel<br>(150 to 250HB) |                       |                   |       |             |                                       | Stainless Steel, Die Steel<br>(25 to 35HRC) |                   |       |             |                                       |                       | Pre-hardened Steel<br>(35 to 45HRC) |       |             |                                       |                       |                   | Hardened Steel<br>(45 to 55HRC) |             |                                       |                       |                   |       |             |
|------------------------|------------|------------|---------------------------------------------|-----------------------|-------------------|-------|-------------|---------------------------------------|---------------------------------------------|-------------------|-------|-------------|---------------------------------------|-----------------------|-------------------------------------|-------|-------------|---------------------------------------|-----------------------|-------------------|---------------------------------|-------------|---------------------------------------|-----------------------|-------------------|-------|-------------|
| R<br>(mm)              | Dc<br>(mm) | l2<br>(mm) | Spindle Speed<br>(min <sup>-1</sup> )       | Feed Rate<br>(mm/min) | Depth of Cut (mm) |       |             | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min)                       | Depth of Cut (mm) |       |             | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm)                   |       |             | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm) |                                 |             | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm) |       |             |
|                        |            |            |                                             |                       | ap                | as    | as (Groove) |                                       |                                             | ap                | as    | as (Groove) |                                       |                       | ap                                  | as    | as (Groove) |                                       |                       | ap                | as                              | as (Groove) |                                       |                       | ap                | as    | as (Groove) |
| 0.1                    | 0.2        | 0.5        | 50,000                                      | 410                   | 0.005             | 0.005 | 0.02        | 50,000                                | 370                                         | 0.005             | 0.005 | 0.018       | 50,000                                | 320                   | 0.005                               | 0.005 | 0.015       | 50,000                                | 290                   | 0.005             | 0.005                           | 0.013       | 50,000                                | 290                   | 0.005             | 0.005 | 0.013       |
| 0.1                    | 0.2        | 1.0        | 50,000                                      | 410                   | 0.005             | 0.005 | 0.014       | 50,000                                | 370                                         | 0.005             | 0.005 | 0.013       | 50,000                                | 320                   | 0.005                               | 0.005 | 0.01        | 50,000                                | 290                   | 0.005             | 0.005                           | 0.01        | 50,000                                | 290                   | 0.005             | 0.005 | 0.01        |
| 0.1                    | 0.2        | 2.0        | 50,000                                      | 280                   | 0.005             | 0.005 | 0.006       | 50,000                                | 250                                         | 0.005             | 0.005 | 0.005       | 50,000                                | 220                   | 0.005                               | 0.005 | 0.004       | 50,000                                | 200                   | 0.005             | 0.005                           | 0.004       | 50,000                                | 200                   | 0.005             | 0.005 | 0.004       |
| 0.15                   | 0.3        | 1.0        | 50,000                                      | 600                   | 0.005             | 0.005 | 0.02        | 50,000                                | 540                                         | 0.005             | 0.005 | 0.02        | 50,000                                | 360                   | 0.005                               | 0.005 | 0.02        | 50,000                                | 310                   | 0.005             | 0.005                           | 0.014       | 50,000                                | 310                   | 0.005             | 0.005 | 0.014       |
| 0.15                   | 0.3        | 2.0        | 50,000                                      | 600                   | 0.005             | 0.005 | 0.01        | 50,000                                | 540                                         | 0.005             | 0.005 | 0.01        | 50,000                                | 360                   | 0.005                               | 0.005 | 0.01        | 50,000                                | 310                   | 0.005             | 0.005                           | 0.008       | 50,000                                | 310                   | 0.005             | 0.005 | 0.008       |
| 0.15                   | 0.3        | 3.0        | 50,000                                      | 450                   | 0.005             | 0.005 | 0.01        | 50,000                                | 380                                         | 0.005             | 0.005 | 0.007       | 50,000                                | 330                   | 0.005                               | 0.005 | 0.006       | 50,000                                | 280                   | 0.005             | 0.005                           | 0.005       | 50,000                                | 280                   | 0.005             | 0.005 | 0.005       |
| 0.2                    | 0.4        | 1.0        | 50,000                                      | 900                   | 0.02              | 0.05  | 0.04        | 50,000                                | 810                                         | 0.02              | 0.05  | 0.04        | 50,000                                | 720                   | 0.02                                | 0.05  | 0.03        | 50,000                                | 500                   | 0.02              | 0.05                            | 0.03        | 50,000                                | 500                   | 0.02              | 0.05  | 0.03        |
| 0.2                    | 0.4        | 1.5        | 50,000                                      | 900                   | 0.02              | 0.03  | 0.03        | 50,000                                | 810                                         | 0.02              | 0.03  | 0.03        | 50,000                                | 720                   | 0.02                                | 0.03  | 0.02        | 50,000                                | 500                   | 0.02              | 0.03                            | 0.02        | 50,000                                | 500                   | 0.02              | 0.03  | 0.02        |
| 0.2                    | 0.4        | 2.0        | 50,000                                      | 800                   | 0.01              | 0.02  | 0.03        | 50,000                                | 810                                         | 0.01              | 0.02  | 0.025       | 50,000                                | 640                   | 0.01                                | 0.02  | 0.02        | 50,000                                | 500                   | 0.01              | 0.02                            | 0.02        | 50,000                                | 500                   | 0.01              | 0.02  | 0.02        |
| 0.2                    | 0.4        | 2.5        | 50,000                                      | 800                   | 0.005             | 0.01  | 0.016       | 50,000                                | 740                                         | 0.005             | 0.01  | 0.014       | 50,000                                | 640                   | 0.005                               | 0.01  | 0.01        | 50,000                                | 500                   | 0.005             | 0.01                            | 0.01        | 50,000                                | 500                   | 0.005             | 0.01  | 0.01        |
| 0.2                    | 0.4        | 3.0        | 50,000                                      | 800                   | 0.005             | 0.01  | 0.016       | 50,000                                | 740                                         | 0.005             | 0.01  | 0.014       | 50,000                                | 640                   | 0.005                               | 0.01  | 0.01        | 50,000                                | 500                   | 0.005             | 0.01                            | 0.01        | 50,000                                | 500                   | 0.005             | 0.01  | 0.01        |
| 0.2                    | 0.4        | 4.0        | 50,000                                      | 800                   | 0.005             | 0.005 | 0.01        | 50,000                                | 740                                         | 0.005             | 0.005 | 0.01        | 50,000                                | 640                   | 0.005                               | 0.005 | 0.008       | 50,000                                | 500                   | 0.005             | 0.005                           | 0.008       | 50,000                                | 500                   | 0.005             | 0.005 | 0.008       |
| 0.2                    | 0.4        | 5.0        | 48,000                                      | 480                   | 0.005             | 0.005 | 0.01        | 46,000                                | 420                                         | 0.005             | 0.005 | 0.01        | 44,000                                | 350                   | 0.005                               | 0.005 | 0.008       | 42,000                                | 290                   | 0.005             | 0.005                           | 0.008       | 42,000                                | 290                   | 0.005             | 0.005 | 0.008       |
| 0.25                   | 0.5        | 2.0        | 50,000                                      | 1,100                 | 0.02              | 0.03  | 0.04        | 50,000                                | 990                                         | 0.02              | 0.03  | 0.03        | 45,000                                | 770                   | 0.02                                | 0.03  | 0.03        | 32,000                                | 500                   | 0.02              | 0.03                            | 0.03        | 32,000                                | 500                   | 0.02              | 0.03  | 0.03        |
| 0.25                   | 0.5        | 4.0        | 50,000                                      | 1,100                 | 0.01              | 0.01  | 0.02        | 50,000                                | 990                                         | 0.01              | 0.01  | 0.02        | 40,000                                | 700                   | 0.01                                | 0.01  | 0.016       | 29,000                                | 450                   | 0.01              | 0.01                            | 0.01        | 29,000                                | 450                   | 0.01              | 0.01  | 0.01        |
| 0.25                   | 0.5        | 5.0        | 50,000                                      | 1,100                 | 0.005             | 0.01  | 0.015       | 40,000                                | 790                                         | 0.005             | 0.01  | 0.014       | 40,000                                | 700                   | 0.005                               | 0.01  | 0.01        | 29,000                                | 450                   | 0.005             | 0.01                            | 0.01        | 29,000                                | 450                   | 0.005             | 0.01  | 0.01        |
| 0.25                   | 0.5        | 6.0        | 50,000                                      | 1,100                 | 0.005             | 0.005 | 0.013       | 40,000                                | 790                                         | 0.005             | 0.005 | 0.012       | 31,000                                | 540                   | 0.005                               | 0.005 | 0.009       | 29,000                                | 450                   | 0.005             | 0.005                           | 0.008       | 29,000                                | 450                   | 0.005             | 0.005 | 0.008       |
| 0.25                   | 0.5        | 8.0        | 38,000                                      | 480                   | 0.005             | 0.005 | 0.01        | 34,000                                | 390                                         | 0.005             | 0.005 | 0.01        | 31,000                                | 310                   | 0.005                               | 0.005 | 0.008       | 29,000                                | 270                   | 0.005             | 0.005                           | 0.007       | 29,000                                | 270                   | 0.005             | 0.005 | 0.007       |
| 0.3                    | 0.6        | 2.0        | 50,000                                      | 1,300                 | 0.03              | 0.05  | 0.04        | 48,000                                | 1,110                                       | 0.03              | 0.05  | 0.04        | 37,000                                | 780                   | 0.03                                | 0.05  | 0.035       | 27,000                                | 520                   | 0.03              | 0.05                            | 0.03        | 27,000                                | 520                   | 0.03              | 0.05  | 0.03        |
| 0.3                    | 0.6        | 3.0        | 50,000                                      | 1,300                 | 0.02              | 0.03  | 0.04        | 46,000                                | 1,060                                       | 0.02              | 0.03  | 0.04        | 35,000                                | 740                   | 0.02                                | 0.03  | 0.03        | 25,000                                | 480                   | 0.02              | 0.03                            | 0.03        | 25,000                                | 480                   | 0.02              | 0.03  | 0.03        |
| 0.3                    | 0.6        | 4.0        | 50,000                                      | 1,300                 | 0.01              | 0.02  | 0.02        | 43,000                                | 990                                         | 0.01              | 0.02  | 0.02        | 33,000                                | 700                   | 0.01                                | 0.02  | 0.02        | 24,000                                | 460                   | 0.01              | 0.02                            | 0.02        | 24,000                                | 460                   | 0.01              | 0.02  | 0.02        |
| 0.3                    | 0.6        | 5.0        | 42,000                                      | 1,090                 | 0.01              | 0.02  | 0.02        | 38,000                                | 880                                         | 0.01              | 0.02  | 0.016       | 30,000                                | 630                   | 0.01                                | 0.02  | 0.015       | 24,000                                | 440                   | 0.01              | 0.02                            | 0.015       | 24,000                                | 440                   | 0.01              | 0.02  | 0.01        |
| 0.3                    | 0.6        | 6.0        | 42,000                                      | 1,090                 | 0.01              | 0.01  | 0.02        | 33,000                                | 760                                         | 0.01              | 0.01  | 0.016       | 26,000                                | 550                   | 0.01                                | 0.01  | 0.012       | 24,000                                | 440                   | 0.01              | 0.01                            | 0.012       | 24,000                                | 440                   | 0.01              | 0.01  | 0.01        |
| 0.3                    | 0.6        | 8.0        | 42,000                                      | 840                   | 0.005             | 0.005 | 0.02        | 33,000                                | 600                                         | 0.005             | 0.005 | 0.016       | 26,000                                | 420                   | 0.005                               | 0.005 | 0.01        | 24,000                                | 330                   | 0.005             | 0.005                           | 0.01        | 24,000                                | 330                   | 0.005             | 0.005 | 0.01        |
| 0.3                    | 0.6        | 10.0       | 32,000                                      | 640                   | 0.005             | 0.005 | 0.01        | 30,000                                | 550                                         | 0.005             | 0.005 | 0.01        | 26,000                                | 420                   | 0.005                               | 0.005 | 0.01        | 24,000                                | 330                   | 0.005             | 0.005                           | 0.01        | 24,000                                | 330                   | 0.005             | 0.005 | 0.007       |
| 0.4                    | 0.8        | 2.0        | 48,000                                      | 1,750                 | 0.1               | 0.1   | 0.08        | 36,000                                | 1,180                                       | 0.1               | 0.1   | 0.07        | 28,800                                | 840                   | 0.1                                 | 0.1   | 0.06        | 20,000                                | 500                   | 0.1               | 0.1                             | 0.05        | 20,000                                | 500                   | 0.1               | 0.1   | 0.05        |
| 0.4                    | 0.8        | 4.0        | 48,000                                      | 1,750                 | 0.05              | 0.1   | 0.06        | 36,000                                | 1,180                                       | 0.05              | 0.1   | 0.05        | 28,800                                | 840                   | 0.05                                | 0.1   | 0.04        | 20,000                                | 500                   | 0.05              | 0.1                             | 0.04        | 20,000                                | 500                   | 0.05              | 0.1   | 0.04        |
| 0.4                    | 0.8        | 5.0        | 40,000                                      | 1,460                 | 0.05              | 0.1   | 0.03        | 30,000                                | 980                                         | 0.05              | 0.1   | 0.03        | 24,000                                | 700                   | 0.05                                | 0.1   | 0.03        | 18,000                                | 420                   | 0.05              | 0.1                             | 0.02        | 18,000                                | 420                   | 0.05              | 0.1   | 0.02        |
| 0.4                    | 0.8        | 6.0        | 40,000                                      | 1,460                 | 0.03              | 0.05  | 0.03        | 30,000                                | 980                                         | 0.03              | 0.05  | 0.03        | 24,000                                | 700                   | 0.03                                | 0.05  | 0.024       | 18,000                                | 420                   | 0.03              | 0.05                            | 0.02        | 18,000                                | 420                   | 0.03              | 0.05  | 0.02        |
| 0.4                    | 0.8        | 7.0        | 32,000                                      | 1,120                 | 0.01              | 0.02  | 0.02        | 24,000                                | 780                                         | 0.01              | 0.02  | 0.02        | 20,000                                | 560                   | 0.01                                | 0.02  | 0.02        | 18,000                                | 420                   | 0.01              | 0.02                            | 0.02        | 18,000                                | 420                   | 0.01              | 0.02  | 0.016       |
| 0.4                    | 0.8        | 8.0        | 32,000                                      | 1,120                 | 0.005             | 0.01  | 0.02        | 24,000                                | 780                                         | 0.005             | 0.01  | 0.02        | 20,000                                | 560                   | 0.005                               | 0.01  | 0.016       | 18,000                                | 420                   | 0.005             | 0.01                            | 0.016       | 18,000                                | 420                   | 0.005             | 0.01  | 0.016       |
| 0.4                    | 0.8        | 10.0       | 24,000                                      | 840                   | 0.005             | 0.005 | 0.02        | 21,000                                | 680                                         | 0.005             | 0.005 | 0.02        | 18,000                                | 500                   | 0.005                               | 0.005 | 0.016       | 16,000                                | 380                   | 0.005             | 0.005                           | 0.016       | 16,000                                | 380                   | 0.005             | 0.005 | 0.016       |
| 0.5                    | 1.0        | 3.0        | 38,000                                      | 1,710                 | 0.2               | 0.3   | 0.1         | 29,000                                | 1,160                                       | 0.2               | 0.3   | 0.09        | 22,800                                | 770                   | 0.2                                 | 0.3   | 0.08        | 16,000                                | 480                   | 0.2               | 0.3                             | 0.07        | 16,000                                | 480                   | 0.2               | 0.3   | 0.07        |
| 0.5                    | 1.0        | 4.0        | 38,000                                      | 1,710                 | 0.2               | 0.3   | 0.07        | 29,000                                | 1,160                                       | 0.2               | 0.3   | 0.06        | 22,800                                | 770                   | 0.2                                 | 0.3   | 0.06        | 16,000                                | 480                   | 0.2               | 0.3                             | 0.05        | 16,000                                | 480                   | 0.2               | 0.3   | 0.05        |
| 0.5                    | 1.0        | 5.0        | 38,000                                      | 1,710                 | 0.1               | 0.3   | 0.07        | 29,000                                | 1,160                                       | 0.1               | 0.3   | 0.06        | 22,800                                | 770                   | 0.1                                 | 0.3   | 0.05        | 16,000                                | 480                   | 0.1               | 0.3                             | 0.04        | 16,000                                | 480                   | 0.1               | 0.3   | 0.04        |
| 0.5                    | 1.0        | 6.0        | 32,000                                      | 1,440                 | 0.1               | 0.3   | 0.04        | 24,000                                | 960                                         | 0.1               | 0.3   | 0.04        | 19,200                                | 650                   | 0.1                                 | 0.3   | 0.03        | 14,500                                | 435                   | 0.1               | 0.3                             | 0.03        | 14,500                                | 435                   | 0.1               | 0.3   | 0.03        |
| 0.5                    | 1.0        | 7.0        | 32,000                                      | 1,440                 | 0.1               | 0.2   | 0.04        | 24,000                                | 960                                         | 0.1               | 0.2   | 0.04        | 19,200                                | 650                   | 0.1                                 | 0.2   | 0.03        | 14,500                                | 435                   | 0.1               | 0.2                             | 0.03        | 14,500                                | 435                   | 0.1               | 0.2   | 0.03        |
| 0.5                    | 1.0        | 8.0        | 32,000                                      | 1,440                 | 0.05              | 0.1   | 0.04        | 24,000                                | 960                                         | 0.05              | 0.1   | 0.04        | 19,200                                | 650                   | 0.05                                | 0.1   | 0.03        | 14,500                                | 435                   | 0.05              | 0.1                             | 0.03        | 14,500                                | 435                   | 0.05              | 0.1   | 0.03        |
| 0.5                    | 1.0        | 9.0        | 26,000                                      | 1,170                 | 0.03              | 0.05  | 0.03        | 20,000                                | 800                                         | 0.03              | 0.05  | 0.03        | 15,600                                | 530                   | 0.03                                | 0.05  | 0.02        | 14,500                                | 435                   | 0.03              | 0.05                            | 0.02        | 14,500                                | 435                   | 0.03              | 0.05  | 0.02        |
| 0.5                    | 1.0        | 10.0       | 26,000                                      | 1,170                 | 0.01              | 0.01  | 0.03        | 20,000                                | 800                                         | 0.01              | 0.01  | 0.03        | 15,600                                | 530                   | 0.01                                | 0.01  | 0.02        | 13,000                                | 390                   | 0.01              | 0.01                            | 0.02        | 13,000                                | 390                   | 0.01              | 0.01  | 0.02        |
| 0.5                    | 1.0        | 12.0       | 26,000                                      | 1,170                 | 0.01              | 0.01  | 0.03        | 20,000                                | 800                                         | 0.01              | 0.01  | 0.03        | 15,600                                | 530                   | 0.01                                | 0.01  | 0.02        | 13,000                                | 390                   | 0.01              | 0.01                            | 0.02        | 13,000                                | 390                   | 0.01              | 0.01  | 0.02        |
| 0.5                    | 1.0        | 14.0       | 20,000                                      | 900                   | 0.005             | 0.01  | 0.03        | 16,000                                | 640                                         | 0.005             | 0.01  | 0.03        | 12,000                                | 410                   | 0.005                               | 0.01  | 0.02        | 13,000                                |                       |                   |                                 |             |                                       |                       |                   |       |             |

# GS MILL Long Neck Ballnose GSBN2 Recommended Cutting Conditions

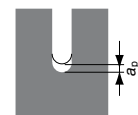


## GS MILL Long Neck Ballnose GSBN2

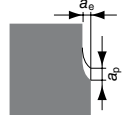
| Work Material<br>Cond. |                |                         | Carbon Steel, Alloy Steel<br>(150 to 250HB) |                       |                   |                |                         |                                       | Stainless Steel, Die Steel<br>(25 to 35HRC) |                   |                |                         |                                       |                       | Pre-hardened Steel<br>(35 to 45HRC) |                |                         |                                       |                       |                   | Hardened Steel<br>(45 to 55HRC) |                         |  |  |  |  |
|------------------------|----------------|-------------------------|---------------------------------------------|-----------------------|-------------------|----------------|-------------------------|---------------------------------------|---------------------------------------------|-------------------|----------------|-------------------------|---------------------------------------|-----------------------|-------------------------------------|----------------|-------------------------|---------------------------------------|-----------------------|-------------------|---------------------------------|-------------------------|--|--|--|--|
|                        |                |                         | Spindle Speed<br>(min <sup>-1</sup> )       | Feed Rate<br>(mm/min) | Depth of Cut (mm) |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min)                       | Depth of Cut (mm) |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm)                   |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm) |                                 |                         |  |  |  |  |
| a <sub>p</sub>         | a <sub>e</sub> | a <sub>i</sub> (Groove) |                                             |                       | a <sub>p</sub>    | a <sub>e</sub> | a <sub>i</sub> (Groove) |                                       |                                             | a <sub>p</sub>    | a <sub>e</sub> | a <sub>i</sub> (Groove) |                                       |                       | a <sub>p</sub>                      | a <sub>e</sub> | a <sub>i</sub> (Groove) |                                       |                       | a <sub>p</sub>    | a <sub>e</sub>                  | a <sub>i</sub> (Groove) |  |  |  |  |
| 1.0                    | 2.0            | 14                      | 16,000                                      | 1,440                 | 0.1               | 0.2            | 0.08                    | 12,000                                | 1,010                                       | 0.1               | 0.2            | 0.07                    | 9,600                                 | 650                   | 0.1                                 | 0.2            | 0.06                    | 6,400                                 | 430                   | 0.1               | 0.2                             | 0.05                    |  |  |  |  |
| 1.0                    | 2.0            | 16                      | 16,000                                      | 1,440                 | 0.1               | 0.1            | 0.08                    | 12,000                                | 1,010                                       | 0.1               | 0.1            | 0.07                    | 9,600                                 | 650                   | 0.1                                 | 0.1            | 0.06                    | 6,400                                 | 430                   | 0.1               | 0.1                             | 0.05                    |  |  |  |  |
| 1.0                    | 2.0            | 18                      | 12,800                                      | 1,150                 | 0.1               | 0.1            | 0.06                    | 9,600                                 | 810                                         | 0.1               | 0.1            | 0.05                    | 7,680                                 | 520                   | 0.1                                 | 0.1            | 0.05                    | 5,120                                 | 350                   | 0.1               | 0.1                             | 0.04                    |  |  |  |  |
| 1.0                    | 2.0            | 20                      | 12,800                                      | 1,150                 | 0.05              | 0.1            | 0.06                    | 9,600                                 | 810                                         | 0.05              | 0.1            | 0.05                    | 7,680                                 | 520                   | 0.05                                | 0.1            | 0.05                    | 5,120                                 | 350                   | 0.05              | 0.1                             | 0.04                    |  |  |  |  |
| 1.0                    | 2.0            | 22                      | 12,800                                      | 1,150                 | 0.03              | 0.05           | 0.06                    | 9,600                                 | 810                                         | 0.03              | 0.05           | 0.05                    | 7,680                                 | 520                   | 0.03                                | 0.05           | 0.05                    | 5,120                                 | 350                   | 0.03              | 0.05                            | 0.04                    |  |  |  |  |
| 1.0                    | 2.0            | 25                      | 10,000                                      | 900                   | 0.02              | 0.03           | 0.06                    | 7,500                                 | 630                                         | 0.02              | 0.03           | 0.05                    | 6,000                                 | 410                   | 0.02                                | 0.03           | 0.05                    | 4,000                                 | 270                   | 0.02              | 0.03                            | 0.04                    |  |  |  |  |
| 1.0                    | 2.0            | 30                      | 10,000                                      | 900                   | 0.01              | 0.02           | 0.04                    | 7,500                                 | 630                                         | 0.01              | 0.02           | 0.04                    | 6,000                                 | 410                   | 0.01                                | 0.02           | 0.03                    | 4,000                                 | 270                   | 0.01              | 0.02                            | 0.03                    |  |  |  |  |
| 1.5                    | 3.0            | 8                       | 12,800                                      | 2,180                 | 0.3               | 0.5            | 0.3                     | 9,600                                 | 1,530                                       | 0.3               | 0.5            | 0.27                    | 7,680                                 | 980                   | 0.3                                 | 0.5            | 0.24                    | 5,120                                 | 650                   | 0.3               | 0.5                             | 0.2                     |  |  |  |  |
| 1.5                    | 3.0            | 10                      | 12,800                                      | 2,180                 | 0.2               | 0.5            | 0.21                    | 9,600                                 | 1,530                                       | 0.2               | 0.5            | 0.19                    | 7,680                                 | 980                   | 0.2                                 | 0.5            | 0.17                    | 5,120                                 | 650                   | 0.2               | 0.5                             | 0.14                    |  |  |  |  |
| 1.5                    | 3.0            | 16                      | 10,600                                      | 1,800                 | 0.1               | 0.3            | 0.12                    | 7,950                                 | 1,260                                       | 0.1               | 0.3            | 0.11                    | 6,360                                 | 810                   | 0.1                                 | 0.3            | 0.1                     | 4,240                                 | 540                   | 0.1               | 0.3                             | 0.08                    |  |  |  |  |
| 1.5                    | 3.0            | 20                      | 10,600                                      | 1,800                 | 0.1               | 0.2            | 0.12                    | 7,950                                 | 1,260                                       | 0.1               | 0.2            | 0.11                    | 6,360                                 | 810                   | 0.1                                 | 0.2            | 0.1                     | 4,240                                 | 540                   | 0.1               | 0.2                             | 0.08                    |  |  |  |  |
| 1.5                    | 3.0            | 25                      | 8,500                                       | 1,450                 | 0.05              | 0.1            | 0.09                    | 6,375                                 | 1,020                                       | 0.05              | 0.1            | 0.08                    | 5,100                                 | 650                   | 0.05                                | 0.1            | 0.07                    | 3,400                                 | 440                   | 0.05              | 0.1                             | 0.06                    |  |  |  |  |
| 1.5                    | 3.0            | 30                      | 8,500                                       | 1,450                 | 0.03              | 0.05           | 0.09                    | 6,375                                 | 1,020                                       | 0.03              | 0.05           | 0.08                    | 5,100                                 | 650                   | 0.03                                | 0.05           | 0.07                    | 3,400                                 | 440                   | 0.03              | 0.05                            | 0.06                    |  |  |  |  |
| 1.5                    | 3.0            | 35                      | 8,500                                       | 1,450                 | 0.02              | 0.03           | 0.09                    | 6,375                                 | 1,020                                       | 0.02              | 0.03           | 0.08                    | 5,100                                 | 650                   | 0.02                                | 0.03           | 0.07                    | 3,400                                 | 440                   | 0.02              | 0.03                            | 0.06                    |  |  |  |  |
| 2.0                    | 4.0            | 10                      | 10,000                                      | 2,200                 | 0.3               | 0.5            | 0.4                     | 7,500                                 | 1,540                                       | 0.3               | 0.5            | 0.36                    | 6,000                                 | 990                   | 0.3                                 | 0.5            | 0.32                    | 4,000                                 | 660                   | 0.3               | 0.5                             | 0.26                    |  |  |  |  |
| 2.0                    | 4.0            | 16                      | 10,000                                      | 2,200                 | 0.2               | 0.5            | 0.28                    | 7,500                                 | 1,540                                       | 0.2               | 0.5            | 0.25                    | 6,000                                 | 990                   | 0.2                                 | 0.5            | 0.22                    | 4,000                                 | 660                   | 0.2               | 0.5                             | 0.18                    |  |  |  |  |
| 2.0                    | 4.0            | 20                      | 10,000                                      | 2,200                 | 0.1               | 0.3            | 0.28                    | 7,500                                 | 1,540                                       | 0.1               | 0.3            | 0.25                    | 6,000                                 | 990                   | 0.1                                 | 0.3            | 0.22                    | 4,000                                 | 660                   | 0.1               | 0.3                             | 0.18                    |  |  |  |  |
| 2.0                    | 4.0            | 25                      | 8,000                                       | 1,760                 | 0.1               | 0.3            | 0.16                    | 6,000                                 | 1,230                                       | 0.1               | 0.3            | 0.14                    | 4,800                                 | 790                   | 0.1                                 | 0.3            | 0.13                    | 3,200                                 | 530                   | 0.1               | 0.3                             | 0.1                     |  |  |  |  |
| 2.0                    | 4.0            | 30                      | 8,000                                       | 1,760                 | 0.1               | 0.2            | 0.16                    | 6,000                                 | 1,230                                       | 0.1               | 0.2            | 0.14                    | 4,800                                 | 790                   | 0.1                                 | 0.2            | 0.13                    | 3,200                                 | 530                   | 0.1               | 0.2                             | 0.1                     |  |  |  |  |
| 2.0                    | 4.0            | 35                      | 6,400                                       | 1,410                 | 0.1               | 0.2            | 0.12                    | 4,800                                 | 990                                         | 0.1               | 0.2            | 0.11                    | 3,840                                 | 630                   | 0.1                                 | 0.2            | 0.1                     | 2,560                                 | 420                   | 0.1               | 0.2                             | 0.08                    |  |  |  |  |
| 2.0                    | 4.0            | 40                      | 6,400                                       | 1,410                 | 0.05              | 0.1            | 0.12                    | 4,800                                 | 990                                         | 0.05              | 0.1            | 0.11                    | 3,840                                 | 630                   | 0.05                                | 0.1            | 0.1                     | 2,560                                 | 420                   | 0.05              | 0.1                             | 0.08                    |  |  |  |  |
| 2.0                    | 4.0            | 45                      | 6,400                                       | 1,410                 | 0.03              | 0.05           | 0.12                    | 4,800                                 | 990                                         | 0.03              | 0.05           | 0.11                    | 3,840                                 | 630                   | 0.03                                | 0.05           | 0.1                     | 2,560                                 | 420                   | 0.03              | 0.05                            | 0.08                    |  |  |  |  |
| 2.0                    | 4.0            | 50                      | 4,800                                       | 1,060                 | 0.02              | 0.03           | 0.12                    | 3,600                                 | 740                                         | 0.02              | 0.03           | 0.11                    | 2,880                                 | 480                   | 0.02                                | 0.03           | 0.1                     | 1,920                                 | 320                   | 0.02              | 0.03                            | 0.08                    |  |  |  |  |
| 2.5                    | 5.0            | 20                      | 7,700                                       | 1,930                 | 0.2               | 0.3            | 0.35                    | 5,775                                 | 1,350                                       | 0.2               | 0.3            | 0.32                    | 4,620                                 | 870                   | 0.2                                 | 0.3            | 0.28                    | 3,080                                 | 580                   | 0.2               | 0.3                             | 0.23                    |  |  |  |  |
| 2.5                    | 5.0            | 25                      | 7,700                                       | 1,930                 | 0.2               | 0.3            | 0.35                    | 5,775                                 | 1,350                                       | 0.2               | 0.3            | 0.32                    | 4,620                                 | 870                   | 0.2                                 | 0.3            | 0.28                    | 3,080                                 | 580                   | 0.2               | 0.3                             | 0.23                    |  |  |  |  |
| 2.5                    | 5.0            | 30                      | 6,400                                       | 1,600                 | 0.1               | 0.3            | 0.2                     | 4,800                                 | 1,120                                       | 0.1               | 0.3            | 0.18                    | 3,840                                 | 720                   | 0.1                                 | 0.3            | 0.16                    | 2,560                                 | 480                   | 0.1               | 0.3                             | 0.13                    |  |  |  |  |
| 2.5                    | 5.0            | 35                      | 6,400                                       | 1,600                 | 0.1               | 0.3            | 0.2                     | 4,800                                 | 1,120                                       | 0.1               | 0.3            | 0.18                    | 3,840                                 | 720                   | 0.1                                 | 0.3            | 0.16                    | 2,560                                 | 480                   | 0.1               | 0.3                             | 0.13                    |  |  |  |  |
| 3.0                    | 6.0            | 30                      | 6,400                                       | 1,860                 | 0.3               | 0.5            | 0.42                    | 4,800                                 | 1,300                                       | 0.3               | 0.5            | 0.38                    | 3,840                                 | 840                   | 0.3                                 | 0.5            | 0.34                    | 2,560                                 | 560                   | 0.3               | 0.5                             | 0.27                    |  |  |  |  |
| 3.0                    | 6.0            | 50                      | 4,200                                       | 1,220                 | 0.2               | 0.3            | 0.18                    | 3,150                                 | 850                                         | 0.2               | 0.3            | 0.16                    | 2,520                                 | 550                   | 0.2                                 | 0.3            | 0.14                    | 1,680                                 | 370                   | 0.2               | 0.3                             | 0.12                    |  |  |  |  |

- For radius processing, reduce the feed to 1/2 of the recommendation.
- Insoluble cutting oil is recommended.
- Use the shortest neck length possible in accordance with the depth of the grooves.
- Because of high spindle speeds, run-out of the endmill when mounted should be less than 10 µm.

Groove Milling



Side Milling



I

Coated  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
Coat

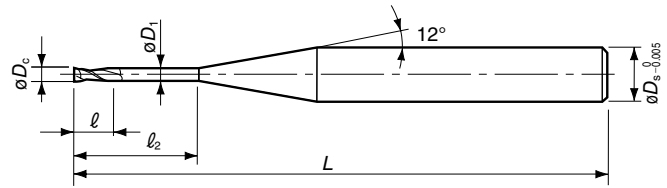
Long  
Neck

Uncoated

CBN  
PCD

# GS MILL Long Neck 2 Flutes GSN2

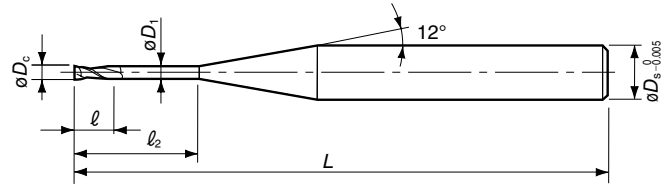
## Recommended Cutting Conditions



### GS MILL Long Neck 2 Flutes GSN2

| Work Material |         | Carbon Steel, Alloy Steel (150 to 250HB) |                    |                   |       |             |                                    | Stainless Steel, Die Steel (25 to 35HRC) |                   |       |             |                                    |                    | Pre-hardened Steel (35 to 45HRC) |       |             |                                    |                    |                   | Hardened Steel (45 to 55HRC) |             |                                    |                    |                   |       |             |
|---------------|---------|------------------------------------------|--------------------|-------------------|-------|-------------|------------------------------------|------------------------------------------|-------------------|-------|-------------|------------------------------------|--------------------|----------------------------------|-------|-------------|------------------------------------|--------------------|-------------------|------------------------------|-------------|------------------------------------|--------------------|-------------------|-------|-------------|
| Cond.         |         |                                          |                    |                   |       |             |                                    |                                          |                   |       |             |                                    |                    |                                  |       |             |                                    |                    |                   |                              |             |                                    |                    |                   |       |             |
| Dc (mm)       | l2 (mm) | Spindle Speed (min <sup>-1</sup> )       | Feed Rate (mm/min) | Depth of Cut (mm) |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)                       | Depth of Cut (mm) |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm)                |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm) |                              |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm) |       |             |
|               |         |                                          |                    | ap                | ae    | az (Groove) |                                    |                                          | ap                | ae    | az (Groove) |                                    |                    | ap                               | ae    | az (Groove) |                                    |                    | ap                | ae                           | az (Groove) |                                    |                    | ap                | ae    | az (Groove) |
| 0.2           | 0.5     | 50,000                                   | 300                | 0.02              | 0.005 | 0.02        | 50,000                             | 270                                      | 0.02              | 0.005 | 0.02        | 50,000                             | 240                | 0.02                             | 0.004 | 0.014       | 50,000                             | 210                | 0.02              | 0.003                        | 0.01        | 50,000                             | 210                | 0.02              | 0.003 | 0.01        |
| 0.2           | 1.0     | 50,000                                   | 300                | 0.02              | 0.005 | 0.014       | 50,000                             | 270                                      | 0.02              | 0.005 | 0.013       | 50,000                             | 240                | 0.02                             | 0.004 | 0.01        | 50,000                             | 210                | 0.02              | 0.003                        | 0.007       | 50,000                             | 210                | 0.02              | 0.003 | 0.007       |
| 0.2           | 1.5     | 50,000                                   | 300                | 0.02              | 0.005 | 0.008       | 50,000                             | 270                                      | 0.02              | 0.005 | 0.007       | 50,000                             | 240                | 0.02                             | 0.004 | 0.006       | 50,000                             | 210                | 0.02              | 0.003                        | 0.004       | 50,000                             | 210                | 0.02              | 0.003 | 0.004       |
| 0.3           | 1.0     | 50,000                                   | 500                | 0.03              | 0.005 | 0.021       | 50,000                             | 450                                      | 0.03              | 0.005 | 0.02        | 50,000                             | 400                | 0.03                             | 0.004 | 0.015       | 42,000                             | 300                | 0.03              | 0.003                        | 0.011       | 42,000                             | 300                | 0.03              | 0.003 | 0.011       |
| 0.3           | 2.0     | 50,000                                   | 500                | 0.03              | 0.005 | 0.012       | 50,000                             | 450                                      | 0.03              | 0.005 | 0.011       | 50,000                             | 400                | 0.03                             | 0.004 | 0.008       | 42,000                             | 300                | 0.03              | 0.003                        | 0.006       | 42,000                             | 300                | 0.03              | 0.003 | 0.006       |
| 0.3           | 3.0     | 50,000                                   | 500                | 0.03              | 0.005 | 0.009       | 50,000                             | 450                                      | 0.03              | 0.005 | 0.008       | 45,000                             | 400                | 0.03                             | 0.004 | 0.006       | 42,000                             | 300                | 0.03              | 0.003                        | 0.005       | 42,000                             | 300                | 0.03              | 0.003 | 0.005       |
| 0.3           | 6.0     | 50,000                                   | 500                | 0.03              | 0.005 | 0.006       | 50,000                             | 450                                      | 0.03              | 0.005 | 0.005       | 42,000                             | 400                | 0.03                             | 0.004 | 0.004       | 42,000                             | 300                | 0.03              | 0.003                        | 0.003       | 42,000                             | 300                | 0.03              | 0.003 | 0.003       |
| 0.3           | 9.0     | 50,000                                   | 500                | 0.03              | 0.005 | 0.003       | 50,000                             | 350                                      | 0.03              | 0.005 | 0.003       | 40,000                             | 300                | 0.03                             | 0.004 | 0.002       | 42,000                             | 250                | 0.03              | 0.003                        | 0.002       | 42,000                             | 250                | 0.03              | 0.003 | 0.002       |
| 0.4           | 2.0     | 50,000                                   | 750                | 0.04              | 0.01  | 0.028       | 50,000                             | 680                                      | 0.04              | 0.009 | 0.03        | 50,000                             | 560                | 0.04                             | 0.007 | 0.02        | 34,000                             | 340                | 0.04              | 0.005                        | 0.014       | 34,000                             | 340                | 0.04              | 0.005 | 0.014       |
| 0.4           | 3.0     | 50,000                                   | 750                | 0.04              | 0.01  | 0.016       | 50,000                             | 680                                      | 0.04              | 0.009 | 0.014       | 50,000                             | 560                | 0.04                             | 0.007 | 0.011       | 34,000                             | 340                | 0.04              | 0.005                        | 0.008       | 34,000                             | 340                | 0.04              | 0.005 | 0.008       |
| 0.4           | 4.0     | 50,000                                   | 750                | 0.04              | 0.008 | 0.012       | 50,000                             | 680                                      | 0.04              | 0.007 | 0.011       | 35,000                             | 560                | 0.04                             | 0.006 | 0.008       | 34,000                             | 340                | 0.04              | 0.004                        | 0.006       | 34,000                             | 340                | 0.04              | 0.004 | 0.006       |
| 0.4           | 8.0     | 48,000                                   | 550                | 0.04              | 0.006 | 0.008       | 38,000                             | 500                                      | 0.04              | 0.005 | 0.007       | 32,000                             | 410                | 0.04                             | 0.004 | 0.006       | 34,000                             | 250                | 0.04              | 0.003                        | 0.004       | 34,000                             | 250                | 0.04              | 0.003 | 0.004       |
| 0.4           | 12.0    | 48,000                                   | 450                | 0.04              | 0.005 | 0.004       | 38,000                             | 410                                      | 0.04              | 0.005 | 0.004       | 32,000                             | 340                | 0.04                             | 0.004 | 0.003       | 34,000                             | 200                | 0.04              | 0.003                        | 0.002       | 34,000                             | 200                | 0.04              | 0.003 | 0.002       |
| 0.5           | 2.0     | 50,000                                   | 900                | 0.1               | 0.02  | 0.035       | 43,000                             | 770                                      | 0.05              | 0.02  | 0.03        | 30,000                             | 450                | 0.05                             | 0.014 | 0.02        | 25,000                             | 320                | 0.05              | 0.01                         | 0.018       | 25,000                             | 320                | 0.05              | 0.01  | 0.018       |
| 0.5           | 4.0     | 50,000                                   | 900                | 0.1               | 0.015 | 0.02        | 43,000                             | 770                                      | 0.05              | 0.014 | 0.02        | 30,000                             | 450                | 0.05                             | 0.011 | 0.014       | 25,000                             | 320                | 0.05              | 0.008                        | 0.01        | 25,000                             | 320                | 0.05              | 0.008 | 0.01        |
| 0.5           | 6.0     | 48,000                                   | 860                | 0.1               | 0.012 | 0.015       | 41,000                             | 730                                      | 0.05              | 0.011 | 0.014       | 29,000                             | 430                | 0.05                             | 0.008 | 0.011       | 24,000                             | 300                | 0.05              | 0.006                        | 0.008       | 24,000                             | 300                | 0.05              | 0.006 | 0.008       |
| 0.5           | 8.0     | 38,000                                   | 680                | 0.1               | 0.01  | 0.01        | 32,000                             | 580                                      | 0.05              | 0.009 | 0.009       | 23,000                             | 340                | 0.05                             | 0.007 | 0.007       | 19,000                             | 240                | 0.05              | 0.005                        | 0.005       | 19,000                             | 240                | 0.05              | 0.005 | 0.005       |
| 0.5           | 10.0    | 38,000                                   | 600                | 0.1               | 0.008 | 0.01        | 32,000                             | 510                                      | 0.05              | 0.007 | 0.009       | 23,000                             | 300                | 0.05                             | 0.006 | 0.007       | 19,000                             | 210                | 0.05              | 0.004                        | 0.005       | 19,000                             | 210                | 0.05              | 0.004 | 0.005       |
| 0.5           | 15.0    | 38,000                                   | 500                | 0.1               | 0.006 | 0.005       | 32,000                             | 430                                      | 0.05              | 0.005 | 0.005       | 23,000                             | 250                | 0.05                             | 0.004 | 0.004       | 19,000                             | 180                | 0.05              | 0.003                        | 0.003       | 19,000                             | 180                | 0.05              | 0.003 | 0.003       |
| 0.6           | 2.0     | 50,000                                   | 1,000              | 0.12              | 0.02  | 0.04        | 43,000                             | 850                                      | 0.06              | 0.02  | 0.04        | 30,000                             | 500                | 0.06                             | 0.014 | 0.03        | 25,000                             | 350                | 0.06              | 0.01                         | 0.021       | 25,000                             | 350                | 0.06              | 0.01  | 0.021       |
| 0.6           | 4.0     | 50,000                                   | 1,000              | 0.12              | 0.02  | 0.02        | 43,000                             | 850                                      | 0.06              | 0.02  | 0.02        | 30,000                             | 500                | 0.06                             | 0.014 | 0.02        | 25,000                             | 350                | 0.06              | 0.01                         | 0.012       | 25,000                             | 350                | 0.06              | 0.01  | 0.012       |
| 0.6           | 6.0     | 42,000                                   | 840                | 0.12              | 0.015 | 0.02        | 36,000                             | 710                                      | 0.06              | 0.014 | 0.016       | 25,000                             | 420                | 0.06                             | 0.011 | 0.013       | 21,000                             | 290                | 0.06              | 0.008                        | 0.009       | 21,000                             | 290                | 0.06              | 0.008 | 0.009       |
| 0.6           | 8.0     | 32,000                                   | 640                | 0.12              | 0.012 | 0.02        | 27,000                             | 540                                      | 0.06              | 0.011 | 0.016       | 19,000                             | 320                | 0.06                             | 0.008 | 0.013       | 16,000                             | 220                | 0.06              | 0.006                        | 0.009       | 16,000                             | 220                | 0.06              | 0.006 | 0.009       |
| 0.6           | 10.0    | 32,000                                   | 640                | 0.12              | 0.012 | 0.012       | 27,000                             | 540                                      | 0.06              | 0.011 | 0.011       | 19,000                             | 320                | 0.06                             | 0.008 | 0.008       | 16,000                             | 220                | 0.06              | 0.006                        | 0.006       | 16,000                             | 220                | 0.06              | 0.006 | 0.006       |
| 0.6           | 12.0    | 32,000                                   | 640                | 0.12              | 0.01  | 0.012       | 27,000                             | 540                                      | 0.06              | 0.009 | 0.011       | 19,000                             | 320                | 0.06                             | 0.007 | 0.008       | 16,000                             | 220                | 0.06              | 0.005                        | 0.006       | 16,000                             | 220                | 0.06              | 0.005 | 0.006       |
| 0.6           | 18.0    | 32,000                                   | 640                | 0.12              | 0.005 | 0.006       | 27,000                             | 540                                      | 0.06              | 0.005 | 0.005       | 19,000                             | 320                | 0.06                             | 0.004 | 0.004       | 16,000                             | 220                | 0.06              | 0.003                        | 0.003       | 16,000                             | 220                | 0.06              | 0.003 | 0.003       |
| 0.7           | 2.0     | 45,000                                   | 990                | 0.14              | 0.02  | 0.07        | 38,000                             | 840                                      | 0.07              | 0.02  | 0.06        | 27,000                             | 500                | 0.07                             | 0.014 | 0.05        | 23,000                             | 350                | 0.07              | 0.01                         | 0.035       | 23,000                             | 350                | 0.07              | 0.01  | 0.035       |
| 0.7           | 4.0     | 45,000                                   | 990                | 0.14              | 0.015 | 0.03        | 38,000                             | 840                                      | 0.07              | 0.014 | 0.03        | 27,000                             | 500                | 0.07                             | 0.011 | 0.02        | 23,000                             | 350                | 0.07              | 0.008                        | 0.014       | 23,000                             | 350                | 0.07              | 0.008 | 0.014       |
| 0.7           | 6.0     | 36,000                                   | 790                | 0.14              | 0.015 | 0.02        | 31,000                             | 670                                      | 0.07              | 0.014 | 0.02        | 22,000                             | 400                | 0.07                             | 0.011 | 0.015       | 18,000                             | 280                | 0.07              | 0.008                        | 0.011       | 18,000                             | 280                | 0.07              | 0.008 | 0.011       |
| 0.7           | 8.0     | 36,000                                   | 790                | 0.14              | 0.01  | 0.02        | 31,000                             | 670                                      | 0.07              | 0.009 | 0.02        | 22,000                             | 400                | 0.07                             | 0.007 | 0.015       | 18,000                             | 280                | 0.07              | 0.005                        | 0.011       | 18,000                             | 280                | 0.07              | 0.005 | 0.011       |
| 0.7           | 10.0    | 28,000                                   | 620                | 0.14              | 0.005 | 0.014       | 24,000                             | 530                                      | 0.07              | 0.005 | 0.013       | 17,000                             | 310                | 0.07                             | 0.004 | 0.01        | 14,000                             | 220                | 0.07              | 0.003                        | 0.007       | 14,000                             | 220                | 0.07              | 0.003 | 0.007       |
| 0.8           | 4.0     | 40,000                                   | 1,000              | 0.24              | 0.04  | 0.06        | 34,000                             | 850                                      | 0.08              | 0.04  | 0.05        | 24,000                             | 500                | 0.08                             | 0.03  | 0.04        | 20,000                             | 350                | 0.08              | 0.02                         | 0.03        | 20,000                             | 350                | 0.08              | 0.02  | 0.03        |
| 0.8           | 6.0     | 40,000                                   | 1,000              | 0.24              | 0.03  | 0.03        | 34,000                             | 850                                      | 0.08              | 0.03  | 0.03        | 24,000                             | 500                | 0.08                             | 0.02  | 0.02        | 20,000                             | 350                | 0.08              | 0.015                        | 0.016       | 20,000                             | 350                | 0.08              | 0.015 | 0.016       |
| 0.8           | 8.0     | 32,000                                   | 800                | 0.24              | 0.02  | 0.02        | 27,000                             | 680                                      | 0.08              | 0.02  | 0.02        | 19,000                             | 400                | 0.08                             | 0.014 | 0.02        | 16,000                             | 280                | 0.08              | 0.01                         | 0.012       | 16,000                             | 280                | 0.08              | 0.01  | 0.012       |
| 0.8           | 10.0    | 24,000                                   | 600                | 0.24              | 0.02  | 0.02        | 20,000                             | 510                                      | 0.08              | 0.02  | 0.02        | 14,000                             | 300                | 0.08                             | 0.014 | 0.02        | 12,000                             | 210                | 0.08              | 0.01                         | 0.012       | 12,000                             | 210                | 0.08              | 0.01  | 0.012       |
| 0.8           | 12.0    | 24,000                                   | 600                | 0.24              | 0.015 | 0.016       | 20,000                             | 510                                      | 0.08              | 0.014 | 0.014       | 14,000                             | 300                | 0.08                             | 0.011 | 0.011       | 12,000                             | 210                | 0.08              | 0.008                        | 0.008       | 12,000                             | 210                | 0.08              | 0.008 | 0.008       |
| 0.8           | 16.0    | 24,000                                   | 600                | 0.24              | 0.01  | 0.016       | 20,000                             | 510                                      | 0.08              | 0.009 | 0.014       | 14,000                             | 300                | 0.08                             | 0.007 | 0.011       | 12,000                             | 210                | 0.08              | 0.005                        | 0.008       | 12,000                             | 210                | 0.08              | 0.005 | 0.008       |
| 0.8           | 24.0    | 24,000                                   | 600                | 0.24              | 0.008 | 0.008       | 20,000                             | 510                                      | 0.08              | 0.007 | 0.007       | 14,000                             | 300                | 0.08                             | 0.006 | 0.006       | 12,000                             | 210                | 0.08              | 0.004                        | 0.004       | 12,000                             | 210                | 0.08              | 0.004 | 0.004       |
| 0.9           | 6.0     | 36,000                                   | 1,190              | 0.27              | 0.05  | 0.04        | 31,000                             | 1,010                                    | 0.09              | 0.05  | 0.03        | 22,000                             | 600                | 0.09                             | 0.04  | 0.03        | 18,000                             | 420                | 0.09              | 0.03                         | 0.02        | 18,000                             | 420                | 0.09              | 0.03  | 0.02        |
| 0.9           | 8.0     | 30,000                                   | 990                | 0.27              | 0.03  | 0.03        | 26,000                             | 840                                      | 0.09              | 0.03  | 0.02        | 18,000                             | 500                | 0.09                             | 0.02  | 0.02        | 15,000                             | 350                | 0.09              | 0.015                        | 0.014       | 15,000                             | 350                | 0.09              | 0.015 | 0.014       |
| 0.9           | 10.0    | 30,000                                   | 990                | 0.27              | 0.02  | 0.03        | 26,000                             | 840                                      | 0.09              | 0.02  | 0.02        | 18,000                             | 500                | 0.09                             | 0.014 | 0.02        | 15,000                             | 350                | 0.09              | 0.01                         | 0.014       | 15,000                             | 350                | 0.09              | 0.01  | 0.014       |
| 0.9           | 15.0    | 22,000                                   | 730                | 0.27              | 0.01  | 0.02        | 19,000                             | 620                                      | 0.09              | 0.01  | 0.016       | 13,000                             | 370                | 0.09                             | 0.007 | 0.013       | 11,000                             | 260                | 0.09              | 0.005                        | 0.009       | 11,000                             | 260                | 0.09              | 0.005 | 0.009       |
| 1.0           | 4.0     | 32,000                                   | 1,280              | 0.5               | 0.08  | 0.07        | 27,000                             | 900                                      | 0.1               | 0.07  | 0.06        | 22,000                             | 640                | 0.1                              | 0.06  | 0.05        | 11,000                             | 300                | 0.1               | 0.04                         | 0           |                                    |                    |                   |       |             |

# GS MILL Long Neck 2 Flutes GSN2 Recommended Cutting Conditions



## GS MILL Long Neck 2 Flutes GSN2

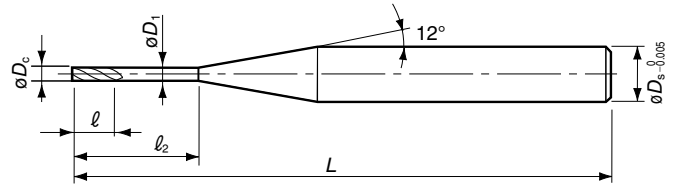
| Work Material |         | Carbon Steel, Alloy Steel (150 to 250HB) |                    |                   |       |             |                                    | Stainless Steel, Die Steel (25 to 35HRC) |                   |       |             |                                    |                    | Pre-hardened Steel (35 to 45HRC) |       |             |                                    |                    |                   | Hardened Steel (45 to 55HRC) |             |                                    |                    |                   |   |             |
|---------------|---------|------------------------------------------|--------------------|-------------------|-------|-------------|------------------------------------|------------------------------------------|-------------------|-------|-------------|------------------------------------|--------------------|----------------------------------|-------|-------------|------------------------------------|--------------------|-------------------|------------------------------|-------------|------------------------------------|--------------------|-------------------|---|-------------|
| Dc (mm)       | l2 (mm) | Spindle Speed (min <sup>-1</sup> )       | Feed Rate (mm/min) | Depth of Cut (mm) |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min)                       | Depth of Cut (mm) |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm)                |       |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm) |                              |             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Depth of Cut (mm) |   |             |
|               |         |                                          |                    | ap                | a     | ag (Groove) |                                    |                                          | ap                | a     | ag (Groove) |                                    |                    | ap                               | a     | ag (Groove) |                                    |                    | ap                | a                            | ag (Groove) |                                    |                    | ap                | a | ag (Groove) |
| 1.5           | 25      | 12,800                                   | 690                | 0.75              | 0.02  | 0.03        | 11,000                             | 480                                      | 0.15              | 0.02  | 0.03        | 9,000                              | 350                | 0.15                             | 0.014 | 0.02        | 6,000                              | 260                | 0.15              | 0.01                         | 0.015       |                                    |                    |                   |   |             |
| 1.5           | 30      | 12,800                                   | 690                | 0.75              | 0.02  | 0.03        | 11,000                             | 480                                      | 0.15              | 0.02  | 0.03        | 9,000                              | 350                | 0.15                             | 0.014 | 0.02        | 6,000                              | 260                | 0.15              | 0.01                         | 0.015       |                                    |                    |                   |   |             |
| 1.5           | 38      | 12,800                                   | 690                | 0.75              | 0.015 | 0.015       | 11,000                             | 480                                      | 0.15              | 0.014 | 0.014       | 9,000                              | 350                | 0.15                             | 0.011 | 0.011       | 6,000                              | 260                | 0.15              | 0.008                        | 0.008       |                                    |                    |                   |   |             |
| 1.5           | 45      | 12,800                                   | 690                | 0.75              | 0.01  | 0.015       | 11,000                             | 480                                      | 0.15              | 0.009 | 0.014       | 9,000                              | 350                | 0.15                             | 0.007 | 0.011       | 6,000                              | 260                | 0.15              | 0.005                        | 0.008       |                                    |                    |                   |   |             |
| 2.0           | 6       | 16,000                                   | 1,120              | 1                 | 0.15  | 0.2         | 14,000                             | 780                                      | 0.2               | 0.14  | 0.18        | 11,000                             | 560                | 0.2                              | 0.11  | 0.14        | 6,000                              | 360                | 0.2               | 0.08                         | 0.1         |                                    |                    |                   |   |             |
| 2.0           | 8       | 16,000                                   | 1,120              | 1                 | 0.12  | 0.14        | 14,000                             | 780                                      | 0.2               | 0.11  | 0.13        | 11,000                             | 560                | 0.2                              | 0.08  | 0.1         | 6,000                              | 360                | 0.2               | 0.06                         | 0.07        |                                    |                    |                   |   |             |
| 2.0           | 10      | 16,000                                   | 1,120              | 1                 | 0.11  | 0.14        | 14,000                             | 780                                      | 0.2               | 0.1   | 0.13        | 11,000                             | 560                | 0.2                              | 0.08  | 0.1         | 6,000                              | 360                | 0.2               | 0.06                         | 0.07        |                                    |                    |                   |   |             |
| 2.0           | 12      | 16,000                                   | 1,120              | 1                 | 0.1   | 0.08        | 14,000                             | 780                                      | 0.2               | 0.09  | 0.07        | 11,000                             | 560                | 0.2                              | 0.07  | 0.06        | 6,000                              | 360                | 0.2               | 0.05                         | 0.04        |                                    |                    |                   |   |             |
| 2.0           | 14      | 16,000                                   | 1,120              | 1                 | 0.08  | 0.08        | 14,000                             | 780                                      | 0.2               | 0.07  | 0.07        | 11,000                             | 560                | 0.2                              | 0.06  | 0.06        | 6,000                              | 360                | 0.2               | 0.04                         | 0.04        |                                    |                    |                   |   |             |
| 2.0           | 16      | 16,000                                   | 1,120              | 1                 | 0.08  | 0.08        | 14,000                             | 780                                      | 0.2               | 0.07  | 0.07        | 11,000                             | 560                | 0.2                              | 0.05  | 0.06        | 6,000                              | 360                | 0.2               | 0.04                         | 0.04        |                                    |                    |                   |   |             |
| 2.0           | 18      | 12,000                                   | 840                | 1                 | 0.07  | 0.06        | 10,000                             | 590                                      | 0.2               | 0.06  | 0.05        | 8,000                              | 420                | 0.2                              | 0.05  | 0.04        | 5,000                              | 300                | 0.2               | 0.04                         | 0.03        |                                    |                    |                   |   |             |
| 2.0           | 20      | 12,000                                   | 840                | 1                 | 0.05  | 0.06        | 10,000                             | 590                                      | 0.2               | 0.05  | 0.05        | 8,000                              | 420                | 0.2                              | 0.04  | 0.04        | 5,000                              | 300                | 0.2               | 0.03                         | 0.03        |                                    |                    |                   |   |             |
| 2.0           | 25      | 10,000                                   | 700                | 1                 | 0.03  | 0.06        | 9,000                              | 490                                      | 0.2               | 0.02  | 0.05        | 7,000                              | 350                | 0.2                              | 0.02  | 0.04        | 5,000                              | 300                | 0.2               | 0.01                         | 0.03        |                                    |                    |                   |   |             |
| 2.0           | 30      | 10,000                                   | 700                | 1                 | 0.03  | 0.04        | 9,000                              | 490                                      | 0.2               | 0.02  | 0.04        | 7,000                              | 350                | 0.2                              | 0.02  | 0.03        | 5,000                              | 300                | 0.2               | 0.01                         | 0.02        |                                    |                    |                   |   |             |
| 2.0           | 35      | 10,000                                   | 700                | 1                 | 0.02  | 0.04        | 9,000                              | 490                                      | 0.2               | 0.02  | 0.04        | 7,000                              | 350                | 0.2                              | 0.014 | 0.03        | 5,000                              | 300                | 0.2               | 0.01                         | 0.02        |                                    |                    |                   |   |             |
| 2.0           | 40      | 10,000                                   | 700                | 1                 | 0.02  | 0.04        | 9,000                              | 490                                      | 0.2               | 0.02  | 0.04        | 7,000                              | 350                | 0.2                              | 0.014 | 0.03        | 5,000                              | 300                | 0.2               | 0.01                         | 0.02        |                                    |                    |                   |   |             |
| 2.0           | 50      | 10,000                                   | 700                | 1                 | 0.015 | 0.02        | 9,000                              | 490                                      | 0.2               | 0.014 | 0.02        | 7,000                              | 350                | 0.2                              | 0.011 | 0.014       | 5,000                              | 300                | 0.2               | 0.008                        | 0.01        |                                    |                    |                   |   |             |
| 2.0           | 60      | 10,000                                   | 700                | 1                 | 0.01  | 0.02        | 9,000                              | 490                                      | 0.2               | 0.01  | 0.02        | 7,000                              | 350                | 0.2                              | 0.007 | 0.014       | 5,000                              | 300                | 0.2               | 0.005                        | 0.01        |                                    |                    |                   |   |             |
| 2.5           | 8       | 13,000                                   | 1,300              | 1.25              | 0.15  | 0.18        | 11,000                             | 910                                      | 0.25              | 0.14  | 0.16        | 9,000                              | 650                | 0.25                             | 0.11  | 0.12        | 5,000                              | 400                | 0.25              | 0.08                         | 0.09        |                                    |                    |                   |   |             |
| 2.5           | 10      | 13,000                                   | 1,300              | 1.25              | 0.12  | 0.18        | 11,000                             | 910                                      | 0.25              | 0.11  | 0.16        | 9,000                              | 650                | 0.25                             | 0.08  | 0.12        | 5,000                              | 400                | 0.25              | 0.06                         | 0.09        |                                    |                    |                   |   |             |
| 2.5           | 12      | 13,000                                   | 1,300              | 1.25              | 0.1   | 0.18        | 11,000                             | 910                                      | 0.25              | 0.09  | 0.16        | 9,000                              | 650                | 0.25                             | 0.07  | 0.12        | 5,000                              | 400                | 0.25              | 0.05                         | 0.09        |                                    |                    |                   |   |             |
| 2.5           | 14      | 13,000                                   | 1,300              | 1.25              | 0.07  | 0.1         | 11,000                             | 910                                      | 0.25              | 0.06  | 0.09        | 9,000                              | 650                | 0.25                             | 0.05  | 0.07        | 5,000                              | 400                | 0.25              | 0.04                         | 0.05        |                                    |                    |                   |   |             |
| 2.5           | 16      | 13,000                                   | 1,300              | 1.25              | 0.06  | 0.1         | 11,000                             | 910                                      | 0.25              | 0.05  | 0.09        | 9,000                              | 650                | 0.25                             | 0.04  | 0.07        | 5,000                              | 400                | 0.25              | 0.03                         | 0.05        |                                    |                    |                   |   |             |
| 2.5           | 18      | 13,000                                   | 1,300              | 1.25              | 0.05  | 0.1         | 11,000                             | 910                                      | 0.25              | 0.05  | 0.09        | 9,000                              | 650                | 0.25                             | 0.04  | 0.07        | 5,000                              | 400                | 0.25              | 0.03                         | 0.05        |                                    |                    |                   |   |             |
| 2.5           | 20      | 13,000                                   | 1,300              | 1.25              | 0.04  | 0.1         | 11,000                             | 910                                      | 0.25              | 0.04  | 0.09        | 9,000                              | 650                | 0.25                             | 0.03  | 0.07        | 5,000                              | 400                | 0.25              | 0.02                         | 0.05        |                                    |                    |                   |   |             |
| 2.5           | 25      | 10,000                                   | 1,000              | 1.25              | 0.03  | 0.08        | 9,000                              | 700                                      | 0.25              | 0.03  | 0.07        | 7,000                              | 500                | 0.25                             | 0.02  | 0.05        | 4,000                              | 320                | 0.25              | 0.015                        | 0.04        |                                    |                    |                   |   |             |
| 2.5           | 30      | 10,000                                   | 1,000              | 1.25              | 0.02  | 0.08        | 9,000                              | 700                                      | 0.25              | 0.02  | 0.07        | 7,000                              | 500                | 0.25                             | 0.014 | 0.05        | 4,000                              | 320                | 0.25              | 0.01                         | 0.04        |                                    |                    |                   |   |             |
| 2.5           | 40      | 8,300                                    | 830                | 1.25              | 0.015 | 0.05        | 7,000                              | 580                                      | 0.25              | 0.014 | 0.05        | 6,000                              | 420                | 0.25                             | 0.01  | 0.04        | 4,000                              | 320                | 0.25              | 0.008                        | 0.03        |                                    |                    |                   |   |             |
| 2.5           | 50      | 8,300                                    | 830                | 1.25              | 0.01  | 0.05        | 7,000                              | 580                                      | 0.25              | 0.01  | 0.05        | 6,000                              | 420                | 0.25                             | 0.007 | 0.04        | 4,000                              | 320                | 0.25              | 0.005                        | 0.03        |                                    |                    |                   |   |             |
| 3.0           | 8       | 11,000                                   | 1,760              | 1.5               | 0.15  | 0.3         | 9,000                              | 1,230                                    | 0.3               | 0.14  | 0.27        | 8,000                              | 880                | 0.3                              | 0.11  | 0.21        | 4,000                              | 450                | 0.3               | 0.08                         | 0.15        |                                    |                    |                   |   |             |
| 3.0           | 10      | 11,000                                   | 1,760              | 1.5               | 0.13  | 0.21        | 9,000                              | 1,230                                    | 0.3               | 0.12  | 0.19        | 8,000                              | 880                | 0.3                              | 0.09  | 0.15        | 4,000                              | 450                | 0.3               | 0.07                         | 0.11        |                                    |                    |                   |   |             |
| 3.0           | 12      | 11,000                                   | 1,760              | 1.5               | 0.12  | 0.21        | 9,000                              | 1,230                                    | 0.3               | 0.11  | 0.19        | 8,000                              | 880                | 0.3                              | 0.08  | 0.15        | 4,000                              | 450                | 0.3               | 0.06                         | 0.11        |                                    |                    |                   |   |             |
| 3.0           | 14      | 11,000                                   | 1,760              | 1.5               | 0.11  | 0.21        | 9,000                              | 1,230                                    | 0.3               | 0.1   | 0.19        | 8,000                              | 880                | 0.3                              | 0.08  | 0.15        | 4,000                              | 450                | 0.3               | 0.06                         | 0.11        |                                    |                    |                   |   |             |
| 3.0           | 16      | 11,000                                   | 1,760              | 1.5               | 0.1   | 0.12        | 9,000                              | 1,230                                    | 0.3               | 0.09  | 0.11        | 8,000                              | 880                | 0.3                              | 0.07  | 0.08        | 4,000                              | 450                | 0.3               | 0.05                         | 0.06        |                                    |                    |                   |   |             |
| 3.0           | 18      | 11,000                                   | 1,760              | 1.5               | 0.08  | 0.12        | 9,000                              | 1,230                                    | 0.3               | 0.07  | 0.11        | 8,000                              | 880                | 0.3                              | 0.06  | 0.08        | 4,000                              | 450                | 0.3               | 0.04                         | 0.06        |                                    |                    |                   |   |             |
| 3.0           | 20      | 11,000                                   | 1,760              | 1.5               | 0.07  | 0.12        | 9,000                              | 1,230                                    | 0.3               | 0.06  | 0.11        | 8,000                              | 880                | 0.3                              | 0.05  | 0.08        | 4,000                              | 450                | 0.3               | 0.04                         | 0.06        |                                    |                    |                   |   |             |
| 3.0           | 25      | 8,000                                    | 1,280              | 1.5               | 0.06  | 0.09        | 7,000                              | 900                                      | 0.3               | 0.05  | 0.08        | 6,000                              | 640                | 0.3                              | 0.04  | 0.06        | 3,000                              | 330                | 0.3               | 0.03                         | 0.05        |                                    |                    |                   |   |             |
| 3.0           | 30      | 8,000                                    | 1,280              | 1.5               | 0.04  | 0.09        | 7,000                              | 900                                      | 0.3               | 0.04  | 0.08        | 6,000                              | 640                | 0.3                              | 0.03  | 0.06        | 3,000                              | 330                | 0.3               | 0.02                         | 0.05        |                                    |                    |                   |   |             |
| 3.0           | 40      | 6,900                                    | 1,100              | 1.5               | 0.02  | 0.09        | 6,000                              | 770                                      | 0.3               | 0.02  | 0.08        | 5,000                              | 550                | 0.3                              | 0.014 | 0.06        | 3,000                              | 330                | 0.3               | 0.01                         | 0.05        |                                    |                    |                   |   |             |
| 3.0           | 50      | 6,900                                    | 1,100              | 1.5               | 0.01  | 0.06        | 6,000                              | 770                                      | 0.3               | 0.01  | 0.05        | 5,000                              | 550                | 0.3                              | 0.007 | 0.04        | 3,000                              | 330                | 0.3               | 0.005                        | 0.03        |                                    |                    |                   |   |             |
| 4.0           | 12      | 8,000                                    | 1,440              | 2                 | 0.15  | 0.4         | 7,000                              | 1,010                                    | 0.4               | 0.14  | 0.36        | 6,000                              | 720                | 0.4                              | 0.11  | 0.28        | 3,000                              | 420                | 0.4               | 0.08                         | 0.2         |                                    |                    |                   |   |             |
| 4.0           | 20      | 8,000                                    | 1,440              | 2                 | 0.1   | 0.28        | 7,000                              | 1,010                                    | 0.4               | 0.09  | 0.25        | 6,000                              | 720                | 0.4                              | 0.07  | 0.2         | 3,000                              | 420                | 0.4               | 0.05                         | 0.14        |                                    |                    |                   |   |             |
| 4.0           | 25      | 8,000                                    | 1,440              | 2                 | 0.07  | 0.16        | 7,000                              | 1,010                                    | 0.4               | 0.06  | 0.14        | 6,000                              | 720                | 0.4                              | 0.05  | 0.11        | 3,000                              | 420                | 0.4               | 0.04                         | 0.08        |                                    |                    |                   |   |             |
| 4.0           | 30      | 8,000                                    | 1,440              | 2                 | 0.05  | 0.16        | 7,000                              | 1,010                                    | 0.4               | 0.05  | 0.14        | 6,000                              | 720                | 0.4                              | 0.04  | 0.11        | 3,000                              | 420                | 0.4               | 0.03                         | 0.08        |                                    |                    |                   |   |             |
| 4.0           | 35      | 6,000                                    | 1,080              | 2                 | 0.04  | 0.12        | 5,000                              | 760                                      | 0.4               | 0.04  | 0.11        | 4,000                              | 540                | 0.4                              | 0.03  | 0.08        | 2,500                              | 350                | 0.4               | 0.02                         | 0.06        |                                    |                    |                   |   |             |
| 4.0           | 40      | 6,000                                    | 1,080              | 2                 | 0.03  | 0.12        | 5,000                              | 760                                      | 0.4               | 0.03  | 0.11        | 4,000                              | 540                | 0.4                              | 0.02  | 0.08        | 2,500                              | 350                | 0.4               | 0.015                        | 0.06        |                                    |                    |                   |   |             |
| 4.0           | 45      | 6,000                                    | 1,080              | 2                 | 0.02  | 0.12        | 5,000                              | 760                                      | 0.4               | 0.02  | 0.11        | 4,000                              | 540                | 0.4                              | 0.014 | 0.08        | 2,500                              | 350                | 0.4               | 0.01                         | 0.06        |                                    |                    |                   |   |             |
| 4.0           | 50      | 5,200                                    | 940                | 2                 | 0.015 | 0.12        | 4,000                              | 660                                      | 0.4               | 0.014 | 0.11        | 4,000                              | 470                | 0.4                              | 0.01  | 0.08        | 2,500                              | 350                | 0.4               | 0.008                        | 0.06        |                                    |                    |                   |   |             |
| 4.0           | 60      | 5,200                                    | 940                | 2                 | 0.01  | 0.08        | 4,000                              | 660                                      | 0.4               | 0.01  | 0.07        | 4,000                              | 470                | 0.4                              | 0.007 | 0.06        | 2,500                              | 350                | 0.4               | 0.005                        | 0.04        |                                    |                    |                   |   |             |
| 5.0           | 16      | 6,400                                    | 1,280              | 2.5               | 0.15  | 0.35        | 5,000                              | 900                                      | 0.5               | 0.14  | 0.32        | 4,000                              | 640                | 0.5                              | 0.11  | 0.25        | 2,000                              | 360                | 0.5               | 0.08                         | 0.18        |                                    |                    |                   |   |             |
| 5.0           | 25      | 6,400                                    | 1,280              | 2.5               | 0.1   | 0.35        | 5,000                              | 900                                      | 0.5               | 0.09  | 0.32        | 4,000                              | 640                | 0.5                              | 0.07  | 0.25        | 2,000                              |                    |                   |                              |             |                                    |                    |                   |   |             |





# GS MILL Long Neck 4 Flutes GSN4

## Recommended Cutting Conditions

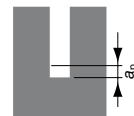


### GS MILL Long Neck 4 Flutes GSN4

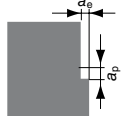
| Work Material<br>Cond. |                        | Carbon Steel, Alloy Steel<br>(150 to 250HB) |                       |                   |                |                         |                                       | Stainless Steel, Die Steel<br>(25 to 35HRC) |                   |                |                         |                                       |                       | Pre-hardened Steel<br>(35 to 45HRC) |                |                         |                                       |                       |                   | Hardened Steel<br>(45 to 55HRC) |                         |  |  |                |                |                         |
|------------------------|------------------------|---------------------------------------------|-----------------------|-------------------|----------------|-------------------------|---------------------------------------|---------------------------------------------|-------------------|----------------|-------------------------|---------------------------------------|-----------------------|-------------------------------------|----------------|-------------------------|---------------------------------------|-----------------------|-------------------|---------------------------------|-------------------------|--|--|----------------|----------------|-------------------------|
|                        |                        | Spindle Speed<br>(min <sup>-1</sup> )       | Feed Rate<br>(mm/min) | Depth of Cut (mm) |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min)                       | Depth of Cut (mm) |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm)                   |                |                         | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Depth of Cut (mm) |                                 |                         |  |  |                |                |                         |
| D <sub>c</sub><br>(mm) | ℓ <sub>2</sub><br>(mm) |                                             |                       | a <sub>p</sub>    | a <sub>e</sub> | a <sub>g</sub> (Groove) |                                       |                                             | a <sub>p</sub>    | a <sub>e</sub> | a <sub>g</sub> (Groove) |                                       |                       | a <sub>p</sub>                      | a <sub>e</sub> | a <sub>g</sub> (Groove) |                                       |                       | a <sub>p</sub>    | a <sub>e</sub>                  | a <sub>g</sub> (Groove) |  |  | a <sub>p</sub> | a <sub>e</sub> | a <sub>g</sub> (Groove) |
| 4.0                    | 25                     | 8,000                                       | 2,160                 | 2                 | 0.07           | 0.16                    | 7,000                                 | 2,270                                       | 0.4               | 0.06           | 0.14                    | 6,000                                 | 1,620                 | 0.4                                 | 0.05           | 0.11                    | 3,000                                 | 630                   | 0.4               | 0.04                            | 0.08                    |  |  |                |                |                         |
| 4.0                    | 30                     | 8,000                                       | 2,160                 | 2                 | 0.05           | 0.16                    | 7,000                                 | 2,270                                       | 0.4               | 0.05           | 0.14                    | 6,000                                 | 1,620                 | 0.4                                 | 0.04           | 0.11                    | 3,000                                 | 630                   | 0.4               | 0.03                            | 0.08                    |  |  |                |                |                         |
| 4.0                    | 35                     | 6,000                                       | 1,620                 | 2                 | 0.04           | 0.12                    | 5,000                                 | 1,700                                       | 0.4               | 0.04           | 0.11                    | 4,000                                 | 1,220                 | 0.4                                 | 0.03           | 0.08                    | 2,500                                 | 530                   | 0.4               | 0.02                            | 0.06                    |  |  |                |                |                         |
| 4.0                    | 40                     | 6,000                                       | 1,620                 | 2                 | 0.03           | 0.12                    | 5,000                                 | 1,700                                       | 0.4               | 0.03           | 0.11                    | 4,000                                 | 1,220                 | 0.4                                 | 0.02           | 0.08                    | 2,500                                 | 530                   | 0.4               | 0.015                           | 0.06                    |  |  |                |                |                         |
| 4.0                    | 45                     | 6,000                                       | 1,620                 | 2                 | 0.02           | 0.12                    | 5,000                                 | 1,700                                       | 0.4               | 0.02           | 0.11                    | 4,000                                 | 1,220                 | 0.4                                 | 0.014          | 0.08                    | 2,500                                 | 530                   | 0.4               | 0.01                            | 0.06                    |  |  |                |                |                         |
| 4.0                    | 50                     | 5,200                                       | 1,410                 | 2                 | 0.015          | 0.12                    | 4,000                                 | 1,490                                       | 0.4               | 0.014          | 0.11                    | 4,000                                 | 1,070                 | 0.4                                 | 0.01           | 0.08                    | 2,500                                 | 530                   | 0.4               | 0.008                           | 0.06                    |  |  |                |                |                         |
| 4.0                    | 60                     | 5,200                                       | 1,410                 | 2                 | 0.01           | 0.08                    | 4,000                                 | 1,490                                       | 0.4               | 0.01           | 0.07                    | 4,000                                 | 1,070                 | 0.4                                 | 0.007          | 0.06                    | 2,500                                 | 530                   | 0.4               | 0.005                           | 0.04                    |  |  |                |                |                         |
| 5.0                    | 16                     | 6,400                                       | 1,920                 | 2.5               | 0.15           | 0.35                    | 5,000                                 | 2,010                                       | 0.5               | 0.14           | 0.32                    | 4,000                                 | 1,440                 | 0.5                                 | 0.11           | 0.25                    | 2,000                                 | 540                   | 0.5               | 0.08                            | 0.18                    |  |  |                |                |                         |
| 5.0                    | 25                     | 6,400                                       | 1,920                 | 2.5               | 0.1            | 0.35                    | 5,000                                 | 2,010                                       | 0.5               | 0.09           | 0.32                    | 4,000                                 | 1,440                 | 0.5                                 | 0.07           | 0.25                    | 2,000                                 | 540                   | 0.5               | 0.05                            | 0.18                    |  |  |                |                |                         |
| 5.0                    | 35                     | 6,400                                       | 1,920                 | 2.5               | 0.07           | 0.2                     | 5,000                                 | 2,010                                       | 0.5               | 0.06           | 0.18                    | 4,000                                 | 1,440                 | 0.5                                 | 0.05           | 0.14                    | 2,000                                 | 540                   | 0.5               | 0.04                            | 0.1                     |  |  |                |                |                         |
| 5.0                    | 50                     | 4,800                                       | 1,440                 | 2.5               | 0.04           | 0.15                    | 4,000                                 | 1,520                                       | 0.5               | 0.04           | 0.14                    | 3,000                                 | 1,080                 | 0.5                                 | 0.03           | 0.11                    | 2,000                                 | 540                   | 0.5               | 0.02                            | 0.08                    |  |  |                |                |                         |
| 5.0                    | 60                     | 4,800                                       | 1,440                 | 2.5               | 0.015          | 0.15                    | 4,000                                 | 1,520                                       | 0.5               | 0.014          | 0.14                    | 3,000                                 | 1,080                 | 0.5                                 | 0.01           | 0.11                    | 2,000                                 | 540                   | 0.5               | 0.008                           | 0.08                    |  |  |                |                |                         |
| 6.0                    | 20                     | 5,300                                       | 1,760                 | 3                 | 0.15           | 0.42                    | 5,000                                 | 1,850                                       | 0.6               | 0.14           | 0.38                    | 4,000                                 | 1,320                 | 0.6                                 | 0.11           | 0.29                    | 2,000                                 | 600                   | 0.6               | 0.08                            | 0.21                    |  |  |                |                |                         |
| 6.0                    | 30                     | 5,300                                       | 1,760                 | 3                 | 0.1            | 0.42                    | 5,000                                 | 1,850                                       | 0.6               | 0.09           | 0.38                    | 4,000                                 | 1,320                 | 0.6                                 | 0.07           | 0.29                    | 2,000                                 | 600                   | 0.6               | 0.05                            | 0.21                    |  |  |                |                |                         |
| 6.0                    | 40                     | 5,300                                       | 1,760                 | 3                 | 0.07           | 0.24                    | 5,000                                 | 1,850                                       | 0.6               | 0.06           | 0.22                    | 4,000                                 | 1,320                 | 0.6                                 | 0.05           | 0.17                    | 2,000                                 | 600                   | 0.6               | 0.04                            | 0.12                    |  |  |                |                |                         |
| 6.0                    | 50                     | 4,000                                       | 1,320                 | 3                 | 0.04           | 0.18                    | 3,000                                 | 1,380                                       | 0.6               | 0.04           | 0.16                    | 3,000                                 | 990                   | 0.6                                 | 0.03           | 0.13                    | 2,000                                 | 600                   | 0.6               | 0.02                            | 0.09                    |  |  |                |                |                         |
| 6.0                    | 60                     | 4,000                                       | 1,320                 | 3                 | 0.015          | 0.18                    | 3,000                                 | 1,380                                       | 0.6               | 0.014          | 0.16                    | 3,000                                 | 990                   | 0.6                                 | 0.01           | 0.13                    | 2,000                                 | 600                   | 0.6               | 0.008                           | 0.09                    |  |  |                |                |                         |

1. For radius processing, reduce the feed to 1/2 of the recommendation.
2. Insoluble cutting oil is recommended.
3. Use the shortest neck length possible in accordance with the depth of the grooves.
4. Because of high spindle speeds, run-out of the endmill when mounted should be less than 10  $\mu$ m.

Groove Milling



Side Milling



I

Coated  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
Coat

Long  
Neck

Uncoated

CBN  
PCD

## SSM 2000 Type

2  
Flutes2  
Flutes

Uncoated

Corner

Side Milling

Groove Finishing

Coated Carbide

Carbon Steel

Alloy Steel

Pre-hardened Steel

Tempered Steel

In-Stock

Hardened Steel

45 to 55 HRC

55 to 60 HRC

60 to 65 HRC

Stainless Steel

Ti Alloy

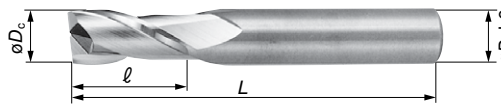
Cast Iron

Al Alloy

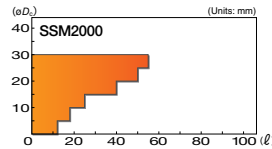
Copper Alloy

Graphite

CFRP



| $\phi D_c$          | Tolerance |        |
|---------------------|-----------|--------|
| $D \leq 6.0$        | -0.010    | -0.030 |
| $6.0 < D \leq 10.0$ | -0.015    | -0.040 |
| $10.0 < D$          | -0.020    | -0.050 |

■ Body (Diameter  $\phi 0.2$  to 3.1mm)

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 2002 | ●     | 0.2             | 0.5    | 40  | 3          |
| 2003     | ●     | 0.3             | 1.0    | 40  | 3          |
| 2004     | ●     | 0.4             | 1.0    | 40  | 3          |
| 2005     | ●     | 0.5             | 1.5    | 40  | 3          |
| 2006     | ●     | 0.6             | 1.5    | 40  | 3          |
| SSM 2007 | ●     | 0.7             | 1.5    | 40  | 3          |
| 2008     | ●     | 0.8             | 2.0    | 40  | 3          |
| 2009     | ●     | 0.9             | 2.0    | 40  | 3          |
| 2010     | ●     | 1.0             | 3.0    | 40  | 4          |
| 2011     | ●     | 1.1             | 3.0    | 40  | 4          |
| SSM 2012 | ●     | 1.2             | 3.0    | 40  | 4          |
| 2013     | ●     | 1.3             | 3.0    | 40  | 4          |
| 2014     | ●     | 1.4             | 3.0    | 40  | 4          |
| 2015     | ●     | 1.5             | 5.0    | 40  | 4          |
| 2016     | ●     | 1.6             | 5.0    | 40  | 4          |
| SSM 2017 | ●     | 1.7             | 5.0    | 40  | 4          |
| 2018     | ●     | 1.8             | 5.0    | 40  | 4          |
| 2019     | ●     | 1.9             | 5.0    | 40  | 4          |
| 2020     | ●     | 2.0             | 6.0    | 40  | 4          |
| 2021     | ●     | 2.1             | 6.0    | 40  | 4          |
| SSM 2022 | ●     | 2.2             | 6.0    | 40  | 4          |
| 2023     | ●     | 2.3             | 6.0    | 40  | 4          |
| 2024     | ●     | 2.4             | 6.0    | 40  | 4          |
| 2025     | ●     | 2.5             | 8.0    | 40  | 4          |
| 2026     | ●     | 2.6             | 8.0    | 40  | 4          |
| SSM 2027 | ●     | 2.7             | 8.0    | 40  | 4          |
| 2028     | ●     | 2.8             | 8.0    | 40  | 4          |
| 2029     | ●     | 2.9             | 8.0    | 40  | 4          |
| 2030     | ●     | 3.0             | 8.0    | 45  | 6          |
| 2031     | ●     | 3.1             | 8.0    | 45  | 6          |

Grade: A1

■ Body (Diameter  $\phi 3.2$  to 6.1mm)

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 2032 | ●     | 3.2             | 8      | 45  | 6          |
| 2033     | ●     | 3.3             | 8      | 45  | 6          |
| 2034     | ●     | 3.4             | 8      | 45  | 6          |
| 2035     | ●     | 3.5             | 8      | 45  | 6          |
| 2036     | ●     | 3.6             | 10     | 45  | 6          |
| SSM 2037 | ●     | 3.7             | 10     | 45  | 6          |
| 2038     | ●     | 3.8             | 10     | 45  | 6          |
| 2039     | ●     | 3.9             | 10     | 45  | 6          |
| 2040     | ●     | 4.0             | 10     | 45  | 6          |
| 2041     | ●     | 4.1             | 10     | 45  | 6          |
| SSM 2042 | ●     | 4.2             | 10     | 45  | 6          |
| 2043     | ●     | 4.3             | 10     | 45  | 6          |
| 2044     | ●     | 4.4             | 10     | 45  | 6          |
| 2045     | ●     | 4.5             | 10     | 45  | 6          |
| 2046     | ●     | 4.6             | 12     | 50  | 6          |
| SSM 2047 | ●     | 4.7             | 12     | 50  | 6          |
| 2048     | ●     | 4.8             | 12     | 50  | 6          |
| 2049     | ●     | 4.9             | 12     | 50  | 6          |
| 2050     | ●     | 5.0             | 12     | 50  | 6          |
| 2051     | ●     | 5.1             | 12     | 50  | 6          |
| SSM 2052 | ●     | 5.2             | 12     | 50  | 6          |
| 2053     | ●     | 5.3             | 12     | 50  | 6          |
| 2054     | ●     | 5.4             | 12     | 50  | 6          |
| 2055     | ●     | 5.5             | 12     | 50  | 6          |
| 2056     | ●     | 5.6             | 12     | 50  | 6          |
| SSM 2057 | ●     | 5.7             | 12     | 50  | 6          |
| 2058     | ●     | 5.8             | 12     | 50  | 6          |
| 2059     | ●     | 5.9             | 12     | 50  | 6          |
| 2060     | ●     | 6.0             | 12     | 50  | 6          |
| 2061     | ●     | 6.1             | 12     | 50  | 8          |

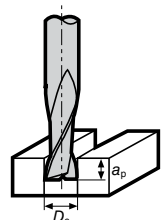
Grade: A1

## ■ General Purpose Machines

- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

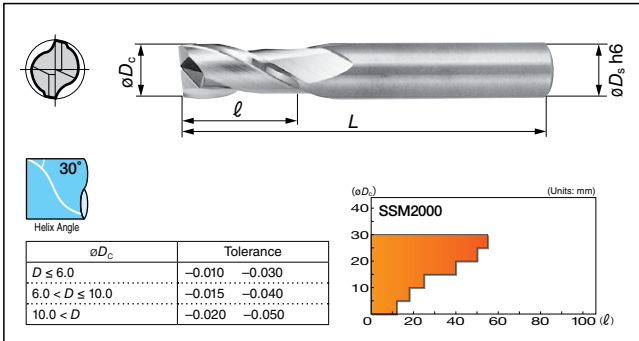
## ● Groove Milling

| Work Material         | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|-----------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
|                       | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $\phi D_c$ (mm)       |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 0.2                   | 35,000                                  | 30                 | 35,000                                  | 20                 | 28,000                                  | 15                 | 35,000                             | 30                 |
| 0.6                   | 20,000                                  | 45                 | 16,000                                  | 30                 | 13,000                                  | 20                 | 26,000                             | 80                 |
| 1.0                   | 12,000                                  | 45                 | 9,600                                   | 35                 | 7,800                                   | 30                 | 15,600                             | 150                |
| 2.0                   | 6,000                                   | 70                 | 4,800                                   | 35                 | 3,900                                   | 30                 | 7,800                              | 165                |
| 3.0                   | 4,000                                   | 90                 | 3,200                                   | 35                 | 2,600                                   | 30                 | 5,200                              | 170                |
| 4.0                   | 3,000                                   | 90                 | 2,400                                   | 35                 | 1,950                                   | 30                 | 3,900                              | 170                |
| 6.0                   | 2,000                                   | 90                 | 1,600                                   | 35                 | 1,300                                   | 30                 | 2,600                              | 210                |
| 8.0                   | 1,500                                   | 90                 | 1,200                                   | 35                 | 980                                     | 30                 | 1,950                              | 250                |
| 10.0                  | 1,200                                   | 90                 | 960                                     | 35                 | 780                                     | 30                 | 1,560                              | 250                |
| 12.0                  | 1,000                                   | 90                 | 800                                     | 35                 | 650                                     | 30                 | 1,300                              | 250                |
| 16.0                  | 750                                     | 90                 | 600                                     | 40                 | 490                                     | 30                 | 970                                | 260                |
| 20.0                  | 600                                     | 90                 | 480                                     | 40                 | 390                                     | 30                 | 780                                | 260                |
| 25.0                  | 480                                     | 90                 | 380                                     | 40                 | 310                                     | 30                 | 620                                | 250                |
| 30.0                  | 400                                     | 90                 | 320                                     | 40                 | 260                                     | 30                 | 520                                | 250                |
| Standard Depth-of-cut | $\phi 1$ or more $a_p$                  | $0.1D_c$           | $0.1D_c$                                | $0.1D_c$           | $0.1D_c$                                | $0.1D_c$           | $0.1D_c$                           | $0.1D_c$           |
|                       | $\phi 1.1$ - $\phi 2.9$ $a_p$           | $0.3D_c$           | $0.3D_c$                                | $0.3D_c$           | $0.3D_c$                                | $0.3D_c$           | $0.3D_c$                           | $0.3D_c$           |
|                       | $\phi 3$ or more $a_p$                  | $0.5D_c$           | $0.5D_c$                                | $0.5D_c$           | $0.5D_c$                                | $0.5D_c$           | $0.5D_c$                           | $0.5D_c$           |





|                |              |             |                    |                |                |              |              |              |                 |          |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|----------------|----------------|--------------|--------------|--------------|-----------------|----------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Tempered Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | Stainless Steel | Ti Alloy | Al Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|----------------|----------------|--------------|--------------|--------------|-----------------|----------|----------|-----------|----------|--------------|----------|------|



## ■ Body (Diameter $\phi 6.2$ to $9.1\text{mm}$ )

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 2062 | ●     | 6.2             | 12     | 50  | 8          |
| 2063     | ●     | 6.3             | 12     | 50  | 8          |
| 2064     | ●     | 6.4             | 12     | 50  | 8          |
| 2065     | ●     | 6.5             | 12     | 50  | 8          |
| 2066     | ●     | 6.6             | 15     | 55  | 8          |
| SSM 2067 | ●     | 6.7             | 15     | 55  | 8          |
| 2068     | ●     | 6.8             | 15     | 55  | 8          |
| 2069     | ●     | 6.9             | 15     | 55  | 8          |
| 2070     | ●     | 7.0             | 15     | 55  | 8          |
| 2071     | ●     | 7.1             | 15     | 55  | 8          |
| SSM 2072 | ●     | 7.2             | 15     | 55  | 8          |
| 2073     | ●     | 7.3             | 15     | 55  | 8          |
| 2074     | ●     | 7.4             | 15     | 55  | 8          |
| 2075     | ●     | 7.5             | 15     | 55  | 8          |
| 2076     | ●     | 7.6             | 15     | 55  | 8          |
| SSM 2077 | ●     | 7.7             | 15     | 55  | 8          |
| 2078     | ●     | 7.8             | 15     | 55  | 8          |
| 2079     | ●     | 7.9             | 15     | 55  | 8          |
| 2080     | ●     | 8.0             | 15     | 55  | 8          |
| 2081     | ●     | 8.1             | 15     | 55  | 10         |
| SSM 2082 | ●     | 8.2             | 15     | 55  | 10         |
| 2083     | ●     | 8.3             | 15     | 55  | 10         |
| 2084     | ●     | 8.4             | 15     | 55  | 10         |
| 2085     | ●     | 8.5             | 15     | 55  | 10         |
| 2086     | ●     | 8.6             | 15     | 55  | 10         |
| SSM 2087 | ●     | 8.7             | 15     | 55  | 10         |
| 2088     | ●     | 8.8             | 15     | 55  | 10         |
| 2089     | ●     | 8.9             | 15     | 55  | 10         |
| 2090     | ●     | 9.0             | 15     | 55  | 10         |
| 2091     | ●     | 9.1             | 15     | 55  | 10         |

Grade: A1

## ■ Body (Diameter $\phi 9.2$ to $30.0\text{mm}$ )

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 2092 | ●     | 9.2             | 15     | 55  | 10         |
| 2093     | ●     | 9.3             | 15     | 55  | 10         |
| 2094     | ●     | 9.4             | 15     | 55  | 10         |
| 2095     | ●     | 9.5             | 15     | 55  | 10         |
| 2096     | ●     | 9.6             | 18     | 65  | 10         |
| SSM 2097 | ●     | 9.7             | 18     | 65  | 10         |
| 2098     | ●     | 9.8             | 18     | 65  | 10         |
| 2099     | ●     | 9.9             | 18     | 65  | 10         |
| 2100     | ●     | 10.0            | 18     | 65  | 10         |
| 2105     | ●     | 10.5            | 18     | 70  | 12         |
| SSM 2110 | ●     | 11.0            | 18     | 70  | 12         |
| 2115     | ●     | 11.5            | 18     | 70  | 12         |
| 2120     | ●     | 12.0            | 18     | 70  | 12         |
| 2125     | ●     | 12.5            | 20     | 80  | 16         |
| 2130     | ●     | 13.0            | 20     | 80  | 16         |
| SSM 2135 | ●     | 13.5            | 20     | 80  | 16         |
| 2140     | ●     | 14.0            | 20     | 80  | 16         |
| 2145     | ●     | 14.5            | 25     | 80  | 16         |
| 2150     | ●     | 15.0            | 25     | 80  | 16         |
| 2155     | ●     | 15.5            | 35     | 90  | 16         |
| SSM 2160 | ●     | 16.0            | 35     | 90  | 16         |
| 2165     | ●     | 16.5            | 35     | 90  | 20         |
| 2170     | ●     | 17.0            | 35     | 90  | 20         |
| 2175     | ●     | 17.5            | 40     | 105 | 20         |
| 2180     | ●     | 18.0            | 40     | 105 | 20         |
| SSM 2185 | ●     | 18.5            | 40     | 105 | 20         |
| 2190     | ●     | 19.0            | 40     | 105 | 20         |
| 2195     | ●     | 19.5            | 40     | 105 | 20         |
| 2200     | ●     | 20.0            | 40     | 105 | 20         |
| 2210     | ●     | 21.0            | 40     | 105 | 25         |
| SSM 2220 | ●     | 22.0            | 40     | 105 | 25         |
| 2230     | ●     | 23.0            | 45     | 115 | 25         |
| 2240     | ●     | 24.0            | 45     | 115 | 25         |
| 2250     | ●     | 25.0            | 50     | 120 | 25         |
| 2300     | ●     | 30.0            | 55     | 130 | 32         |

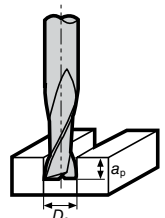
Grade: A1

## ■ General Purpose Machines

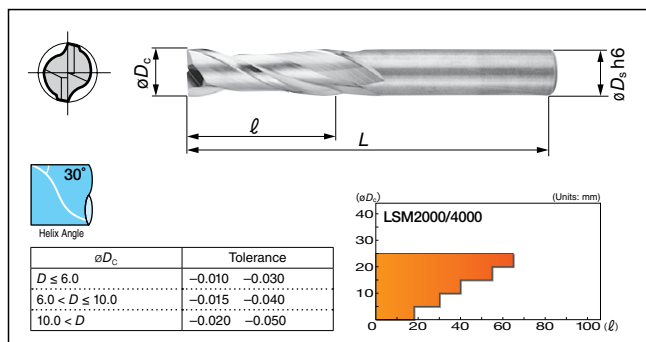
- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## ● Groove Milling

| Work Material   | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|-----------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
|                 | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $\phi D_c$ (mm) |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 0.2             | 35,000                                  | 30                 | 35,000                                  | 20                 | 28,000                                  | 15                 | 35,000                             | 30                 |
| 0.6             | 20,000                                  | 45                 | 16,000                                  | 30                 | 13,000                                  | 20                 | 26,000                             | 80                 |
| 1.0             | 12,000                                  | 45                 | 9,600                                   | 35                 | 7,800                                   | 30                 | 15,600                             | 150                |
| 2.0             | 6,000                                   | 70                 | 4,800                                   | 35                 | 3,900                                   | 30                 | 7,800                              | 165                |
| 3.0             | 4,000                                   | 90                 | 3,200                                   | 35                 | 2,600                                   | 30                 | 5,200                              | 170                |
| 4.0             | 3,000                                   | 90                 | 2,400                                   | 35                 | 1,950                                   | 30                 | 3,900                              | 170                |
| 6.0             | 2,000                                   | 90                 | 1,600                                   | 35                 | 1,300                                   | 30                 | 2,600                              | 210                |
| 8.0             | 1,500                                   | 90                 | 1,200                                   | 35                 | 980                                     | 30                 | 1,950                              | 250                |
| 10.0            | 1,200                                   | 90                 | 960                                     | 35                 | 780                                     | 30                 | 1,560                              | 250                |
| 12.0            | 1,000                                   | 90                 | 800                                     | 35                 | 650                                     | 30                 | 1,300                              | 250                |
| 16.0            | 750                                     | 90                 | 600                                     | 40                 | 490                                     | 30                 | 970                                | 260                |
| 20.0            | 600                                     | 90                 | 480                                     | 40                 | 390                                     | 30                 | 780                                | 260                |
| 25.0            | 480                                     | 90                 | 380                                     | 40                 | 310                                     | 30                 | 620                                | 250                |
| 30.0            | 400                                     | 90                 | 320                                     | 40                 | 260                                     | 30                 | 520                                | 250                |
| Standard        | $\phi 1$ or more $a_p$                  | $0.1D_c$           | $0.1D_c$                                | $0.1D_c$           | $0.1D_c$                                | $0.1D_c$           | $0.1D_c$                           | $0.1D_c$           |
| Depth-of-cut    | $\phi 1.1$ - $\phi 2.9$ $a_p$           | $0.3D_c$           | $0.3D_c$                                | $0.3D_c$           | $0.3D_c$                                | $0.3D_c$           | $0.3D_c$                           | $0.3D_c$           |
|                 | $\phi 3$ or more $a_p$                  | $0.5D_c$           | $0.5D_c$                                | $0.5D_c$           | $0.5D_c$                                | $0.5D_c$           | $0.5D_c$                           | $0.5D_c$           |





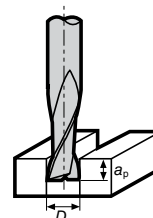


- SSM series long type
- For deep endmilling

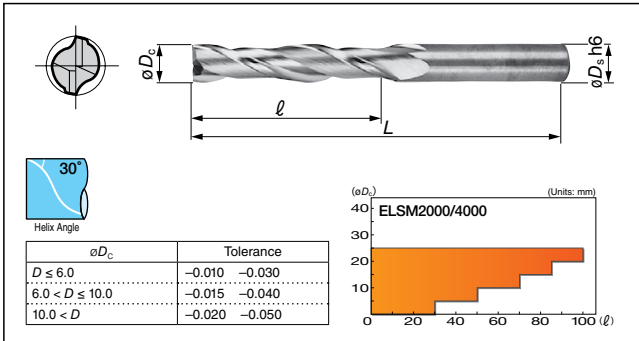
| Cat. No.        | Stock | Dimensions (mm)   |        |     |                   |
|-----------------|-------|-------------------|--------|-----|-------------------|
|                 |       | $\varnothing D_c$ | $\ell$ | $L$ | $\varnothing D_s$ |
| <b>LSM 2030</b> | ▲     | 3.0               | 12     | 50  | 6                 |
| <b>2035</b>     | *     | 3.5               | 12     | 50  | 6                 |
| <b>2040</b>     | ▲     | 4.0               | 15     | 50  | 6                 |
| <b>2045</b>     | *     | 4.5               | 15     | 50  | 6                 |
| <b>2050</b>     | ▲     | 5.0               | 18     | 55  | 6                 |
| <b>LSM 2055</b> | *     | 5.5               | 18     | 55  | 6                 |
| <b>2060</b>     | ▲     | 6.0               | 18     | 55  | 6                 |
| <b>2065</b>     | *     | 6.5               | 18     | 55  | 8                 |
| <b>2070</b>     | ▲     | 7.0               | 25     | 65  | 8                 |
| <b>2075</b>     | *     | 7.5               | 25     | 65  | 8                 |
| <b>LSM 2080</b> | ▲     | 8.0               | 25     | 65  | 8                 |
| <b>2085</b>     | *     | 8.5               | 25     | 65  | 10                |
| <b>2090</b>     | ▲     | 9.0               | 25     | 65  | 10                |
| <b>2095</b>     | *     | 9.5               | 25     | 65  | 10                |
| <b>2100</b>     | ▲     | 10.0              | 30     | 75  | 10                |
| <b>LSM 2105</b> | *     | 10.5              | 30     | 80  | 12                |
| <b>2110</b>     | ▲     | 11.0              | 30     | 80  | 12                |
| <b>2120</b>     | ▲     | 12.0              | 30     | 80  | 12                |
| <b>2130</b>     | ▲     | 13.0              | 35     | 95  | 16                |
| <b>2140</b>     | ▲     | 14.0              | 40     | 95  | 16                |

| Cat. No.        | Stock | Dimensions (mm)   |        |     |                   |
|-----------------|-------|-------------------|--------|-----|-------------------|
|                 |       | $\varnothing D_c$ | $\ell$ | $L$ | $\varnothing D_s$ |
| <b>LSM 2150</b> | ▲     | <b>15.0</b>       | 40     | 95  | 16                |
| <b>2160</b>     | ▲     | <b>16.0</b>       | 50     | 105 | 16                |
| <b>2170</b>     | *     | <b>17.0</b>       | 50     | 105 | 20                |
| <b>2180</b>     | ▲     | <b>18.0</b>       | 50     | 115 | 20                |
| <b>2190</b>     | *     | <b>19.0</b>       | 55     | 120 | 20                |
| <b>LSM 2200</b> | ▲     | <b>20.0</b>       | 55     | 120 | 20                |
| <b>2210</b>     | *     | <b>21.0</b>       | 60     | 125 | 25                |
| <b>2220</b>     | *     | <b>22.0</b>       | 60     | 135 | 25                |
| <b>2230</b>     | *     | <b>23.0</b>       | 60     | 135 | 25                |
| <b>2240</b>     | *     | <b>24.0</b>       | 65     | 140 | 25                |
| <b>LSM 2250</b> | ▲     | <b>25.0</b>       | 65     | 140 | 25                |

| Work Material<br>Cutting Conditions | Carbon Steel, Alloy Steel<br>(Below 30HRC) |                       | Carbon Steel, Alloy Steel<br>(Below 40HRC) |                       | Carbon Steel, Alloy Steel<br>(Below 45HRC) |                       | Cast Iron<br>Special Cast Iron        |                       |
|-------------------------------------|--------------------------------------------|-----------------------|--------------------------------------------|-----------------------|--------------------------------------------|-----------------------|---------------------------------------|-----------------------|
|                                     | Spindle Speed<br>(min <sup>-1</sup> )      | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )      | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> )      | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $\phi D_c$ (mm)                     |                                            |                       |                                            |                       |                                            |                       |                                       |                       |
| 3.0                                 | 3,500                                      | 80                    | 2,950                                      | 35                    | 2,350                                      | 30                    | 4,600                                 | 140                   |
| 4.0                                 | 2,630                                      | 80                    | 2,220                                      | 35                    | 1,760                                      | 30                    | 3,450                                 | 150                   |
| 6.0                                 | 1,750                                      | 80                    | 1,480                                      | 35                    | 1,170                                      | 30                    | 2,300                                 | 180                   |
| 8.0                                 | 1,320                                      | 80                    | 1,110                                      | 35                    | 880                                        | 30                    | 1,720                                 | 180                   |
| 10.0                                | 1,050                                      | 80                    | 890                                        | 35                    | 700                                        | 30                    | 1,380                                 | 190                   |
| 12.0                                | 880                                        | 80                    | 740                                        | 35                    | 580                                        | 30                    | 1,150                                 | 190                   |
| 16.0                                | 660                                        | 70                    | 555                                        | 35                    | 440                                        | 30                    | 860                                   | 170                   |
| 20.0                                | 530                                        | 60                    | 445                                        | 35                    | 350                                        | 30                    | 690                                   | 160                   |
| 25.0                                | 420                                        | 55                    | 355                                        | 35                    | 280                                        | 30                    | 550                                   | 140                   |
| Standard Depth of Cut $a_p$         | 1.0D <sub>c</sub>                          |                       | 1.0D <sub>c</sub>                          |                       | 1.0D <sub>c</sub>                          |                       | 1.0D <sub>c</sub>                     |                       |



|                |              |             |                 |                |            |                |              |              |              |        |                 |          |          |           |          |              |          |      |
|----------------|--------------|-------------|-----------------|----------------|------------|----------------|--------------|--------------|--------------|--------|-----------------|----------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Permalloy Steel | Tempered Steel | Tool Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | 65 HRC | Stainless Steel | Ti Alloy | Al Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|-----------------|----------------|------------|----------------|--------------|--------------|--------------|--------|-----------------|----------|----------|-----------|----------|--------------|----------|------|



- SSM series extra long type
- Longest flute length in the SSM series, excellent for high precision deep step milling

### Body

| Cat. No.  | Stock | Dimensions (mm) |        |     |            |
|-----------|-------|-----------------|--------|-----|------------|
|           |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| ELSM 2030 | ▲     | 3.0             | 20     | 55  | 6          |
| 2040      | ▲     | 4.0             | 25     | 60  | 6          |
| 2050      | ▲     | 5.0             | 30     | 65  | 6          |
| 2060      | ▲     | 6.0             | 30     | 65  | 6          |
| 2070      | *     | 7.0             | 40     | 85  | 8          |
| ELSM 2080 | ▲     | 8.0             | 40     | 85  | 8          |
| 2090      | *     | 9.0             | 40     | 85  | 10         |
| 2100      | ▲     | 10.0            | 50     | 100 | 10         |
| 2110      | *     | 11.0            | 50     | 100 | 12         |
| 2120      | ▲     | 12.0            | 50     | 100 | 12         |
| ELSM 2130 | *     | 13.0            | 70     | 140 | 16         |
| 2140      | ▲     | 14.0            | 70     | 140 | 16         |
| 2150      | ▲     | 15.0            | 70     | 140 | 16         |
| 2160      | ▲     | 16.0            | 70     | 140 | 16         |
| 2180      | ▲     | 18.0            | 80     | 160 | 20         |
| ELSM 2200 | ▲     | 20.0            | 85     | 165 | 20         |
| 2220      | *     | 22.0            | 95     | 180 | 25         |
| 2250      | ▲     | 25.0            | 100    | 185 | 25         |

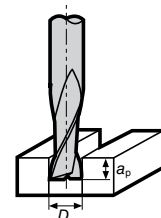
Grade: A1

### General Purpose Machines

- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

### Groove Milling

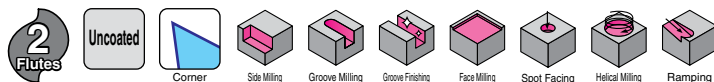
| Work Material      | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
| Cutting Conditions | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $\phi D_c$ (mm)    |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 3.0                | 3,100                                   | 70                 | 2,580                                   | 30                 | 2,100                                   | 20                 | 5,200                              | 175                |
| 4.0                | 2,320                                   | 70                 | 1,940                                   | 30                 | 1,580                                   | 20                 | 3,900                              | 175                |
| 6.0                | 1,550                                   | 70                 | 1,290                                   | 30                 | 1,050                                   | 20                 | 2,600                              | 215                |
| 8.0                | 1,160                                   | 70                 | 970                                     | 30                 | 790                                     | 20                 | 1,950                              | 250                |
| 10.0               | 930                                     | 70                 | 780                                     | 30                 | 630                                     | 20                 | 1,560                              | 250                |
| 12.0               | 770                                     | 70                 | 650                                     | 30                 | 525                                     | 20                 | 1,300                              | 250                |
| 16.0               | 580                                     | 70                 | 485                                     | 30                 | 395                                     | 20                 | 975                                | 260                |
| 20.0               | 465                                     | 70                 | 390                                     | 30                 | 315                                     | 20                 | 780                                | 260                |
| 25.0               | 370                                     | 70                 | 310                                     | 30                 | 250                                     | 20                 | 625                                | 250                |
| Standard $a_p$     | $2.5D_c$                                |                    | $2.5D_c$                                |                    | $2.5D_c$                                |                    | $2.5D_c$                           |                    |
| Depth-of-cut $a_e$ | $0.05D_c$                               |                    | $0.05D_c$                               |                    | $0.05D_c$                               |                    | $0.05D_c$                          |                    |



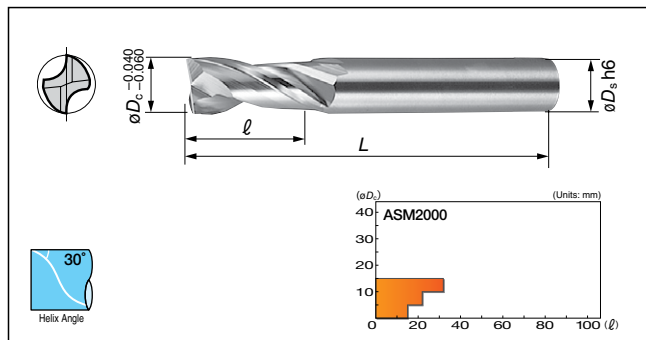
# Solid Carbide Endmills for Non-Ferrous Metals

## ASM 2000 Type

2  
Flutes



|                |              |             |                    |                   |                |              |              |              |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|--------------------|-------------------|----------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Pre-hardened Steel | Impressible Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|--------------------|-------------------|----------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|



### Body

| Cat. No.        | Stock | Dimensions (mm) |        |     |            |
|-----------------|-------|-----------------|--------|-----|------------|
|                 |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| <b>ASM 2020</b> | ●     | 2.0             | 6      | 40  | 4          |
| <b>2030</b>     | ●     | 3.0             | 10     | 45  | 6          |
| <b>2040</b>     | ●     | 4.0             | 12     | 45  | 6          |
| <b>2050</b>     | ●     | 5.0             | 15     | 50  | 6          |
| <b>2060</b>     | ●     | 6.0             | 15     | 50  | 6          |
| <b>ASM 2080</b> | ●     | 8.0             | 18     | 60  | 8          |
| <b>2100</b>     | ●     | 10.0            | 22     | 71  | 10         |
| <b>2120</b>     | ●     | 12.0            | 25     | 75  | 12         |
| <b>2140</b>     | ●     | 14.0            | 32     | 90  | 16         |
| <b>2150</b>     | ●     | 15.0            | 32     | 90  | 16         |
| <b>ASM 2160</b> | ●     | 16.0            | 32     | 90  | 16         |

Grade: H1

### Application

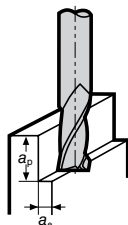
|                   |                            |
|-------------------|----------------------------|
|                   | Al-alloy & Copper          |
| Application Range | Finishing to Light Cutting |

### General Purpose Machines

- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

### Side Milling

| Work Material | Aluminium Alloy    |                    | Cast Iron |                    |
|---------------|--------------------|--------------------|-----------|--------------------|
|               | Cond.              | Feed Rate (mm/min) | Cond.     | Feed Rate (mm/min) |
| $D_c$ (mm)    | 2.0                | 35,000             | 460       | 13,000             |
|               | 3.0                | 23,400             | 770       | 8,750              |
|               | 4.0                | 17,500             | 800       | 6,550              |
|               | 6.0                | 11,700             | 910       | 4,370              |
|               | 8.0                | 8,750              | 980       | 3,280              |
|               | 10.0               | 7,000              | 1,100     | 2,620              |
|               | 12.0               | 5,850              | 1,150     | 2,185              |
|               | 16.0               | 4,380              | 1,150     | 1,640              |
| Standard      | $a_p$              | 1.5 $D_c$          |           | 1.5 $D_c$          |
|               | Depth-of-cut $a_e$ | 0.1 $D_c$          |           | 0.1 $D_c$          |



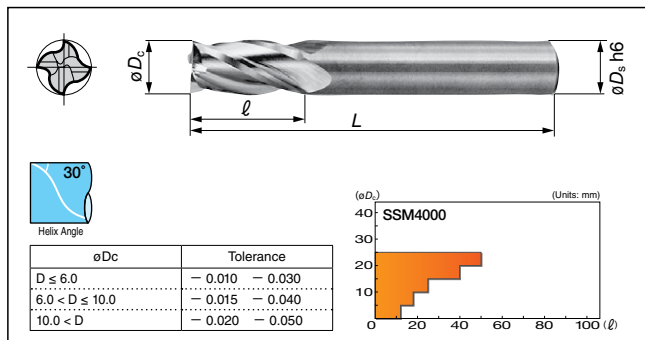


Solid Carbide Spiral Endmills

## SSM 4000 Type



| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ●            | ●           | ●              | ●               | ●        | ●         | ●        | ●            | ●        | ●    |

■ Body (Diameter  $\phi 1.5$  to 16.0mm)

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 4015 | ●     | 1.5             | 5      | 40  | 4          |
| 4020     | ●     | 2.0             | 6      | 40  | 4          |
| 4025     | ●     | 2.5             | 8      | 40  | 4          |
| 4030     | ●     | 3.0             | 8      | 45  | 6          |
| 4035     | ●     | 3.5             | 8      | 45  | 6          |
| SSM 4040 | ●     | 4.0             | 10     | 45  | 6          |
| 4045     | ●     | 4.5             | 10     | 45  | 6          |
| 4050     | ●     | 5.0             | 12     | 50  | 6          |
| 4055     | ●     | 5.5             | 12     | 50  | 6          |
| 4060     | ●     | 6.0             | 12     | 50  | 6          |
| SSM 4065 | ●     | 6.5             | 12     | 50  | 8          |
| 4070     | ●     | 7.0             | 15     | 55  | 8          |
| 4075     | ●     | 7.5             | 15     | 55  | 8          |
| 4080     | ●     | 8.0             | 15     | 55  | 8          |
| 4085     | ●     | 8.5             | 15     | 55  | 10         |
| SSM 4090 | ●     | 9.0             | 15     | 55  | 10         |
| 4095     | ●     | 9.5             | 15     | 55  | 10         |
| 4100     | ●     | 10.0            | 18     | 65  | 10         |
| 4105     | *     | 10.5            | 18     | 65  | 12         |
| 4110     | ●     | 11.0            | 18     | 70  | 12         |
| SSM 4120 | ●     | 12.0            | 18     | 70  | 12         |
| 4130     | ●     | 13.0            | 20     | 80  | 16         |
| 4140     | ●     | 14.0            | 20     | 80  | 16         |
| 4150     | ●     | 15.0            | 25     | 80  | 16         |
| 4160     | ●     | 16.0            | 35     | 90  | 16         |

Grade:A1

■ Body (Diameter  $\phi 17.0$  to 25.0mm)

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| SSM 4170 | *     | 17.0            | 35     | 90  | 20         |
| 4180     | ●     | 18.0            | 40     | 105 | 20         |
| 4190     | *     | 19.0            | 40     | 105 | 20         |
| 4200     | ●     | 20.0            | 40     | 105 | 20         |
| 4210     | *     | 21.0            | 40     | 105 | 25         |
| SSM 4220 | *     | 22.0            | 40     | 105 | 25         |
| 4230     | *     | 23.0            | 45     | 115 | 25         |
| 4240     | *     | 24.0            | 45     | 115 | 25         |
| 4250     | ●     | 25.0            | 50     | 120 | 25         |

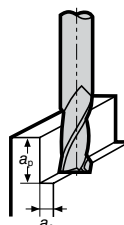
Grade:A1

## ■ General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## ● Side Milling

| Work Material      | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
| Cutting Conditions | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)         |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 1.5                | 7,600                                   | 250                | 7,000                                   | 100                | 5,600                                   | 85                 | 9,800                              | 550                |
| 2.0                | 5,720                                   | 250                | 5,250                                   | 100                | 4,200                                   | 85                 | 7,350                              | 550                |
| 3.0                | 3,800                                   | 250                | 3,500                                   | 100                | 2,800                                   | 80                 | 4,900                              | 550                |
| 6.0                | 1,900                                   | 280                | 1,750                                   | 100                | 1,400                                   | 80                 | 2,450                              | 650                |
| 8.0                | 1,430                                   | 280                | 1,310                                   | 100                | 1,050                                   | 80                 | 1,840                              | 650                |
| 10.0               | 1,140                                   | 280                | 1,050                                   | 100                | 840                                     | 80                 | 1,470                              | 670                |
| 12.0               | 950                                     | 280                | 880                                     | 100                | 700                                     | 80                 | 1,230                              | 680                |
| 16.0               | 710                                     | 320                | 660                                     | 100                | 525                                     | 80                 | 920                                | 830                |
| 20.0               | 570                                     | 300                | 530                                     | 95                 | 420                                     | 80                 | 740                                | 920                |
| 25.0               | 460                                     | 260                | 420                                     | 80                 | 335                                     | 65                 | 590                                | 740                |
| Standard           | $a_p$                                   | $1.5D_c$           | $1.5D_c$                                |                    | $1.5D_c$                                |                    | $1.5D_c$                           |                    |
| Depth-of-cut       | $a_e$                                   | $0.1D_c$           | $0.1D_c$                                |                    | $0.1D_c$                                |                    | $0.1D_c$                           |                    |



\* mark : Semi-standard stock (Please confirm stock availability)

I

Solid Carbide Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

CBN

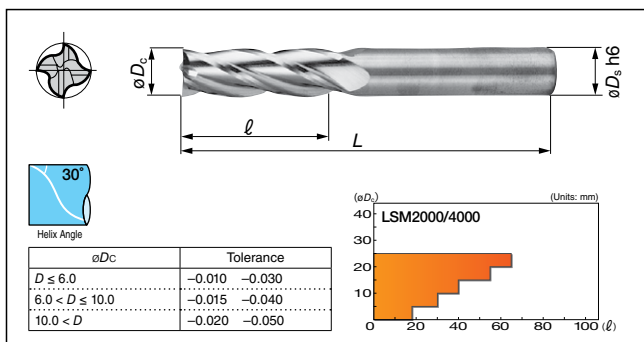
PCD



# LSM 4000 Type



|                |              |             |                |              |              |              |              |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|----------------|--------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | 65 to 68 HRC | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|--------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|



- SSM series long type
- For deep endmilling

## Body (Diameter $\phi 3.0$ to $19.0\text{mm}$ )

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LSM 4030 | ▲     | 3.0             | 12     | 50  | 6          |
| 4035     | *     | 3.5             | 12     | 50  | 6          |
| 4040     | ▲     | 4.0             | 15     | 50  | 6          |
| 4045     | *     | 4.5             | 15     | 50  | 6          |
| 4050     | ▲     | 5.0             | 18     | 55  | 6          |
| LSM 4055 | *     | 5.5             | 18     | 55  | 6          |
| 4060     | ▲     | 6.0             | 18     | 55  | 6          |
| 4065     | *     | 6.5             | 18     | 55  | 8          |
| 4070     | ▲     | 7.0             | 25     | 65  | 8          |
| 4075     | *     | 7.5             | 25     | 65  | 8          |
| LSM 4080 | ▲     | 8.0             | 25     | 65  | 8          |
| 4085     | *     | 8.5             | 25     | 65  | 10         |
| 4090     | ▲     | 9.0             | 25     | 65  | 10         |
| 4095     | *     | 9.5             | 25     | 65  | 10         |
| 4100     | ▲     | 10.0            | 30     | 75  | 10         |
| LSM 4105 | *     | 10.5            | 30     | 80  | 12         |
| 4110     | ▲     | 11.0            | 30     | 80  | 12         |
| 4120     | ▲     | 12.0            | 30     | 80  | 12         |
| 4130     | ▲     | 13.0            | 35     | 95  | 16         |
| 4140     | ▲     | 14.0            | 40     | 95  | 16         |
| LSM 4150 | ▲     | 15.0            | 40     | 95  | 16         |
| 4160     | ▲     | 16.0            | 50     | 105 | 16         |
| 4170     | *     | 17.0            | 50     | 105 | 20         |
| 4180     | ▲     | 18.0            | 50     | 115 | 20         |
| 4190     | *     | 19.0            | 55     | 120 | 20         |

Grade: A1

## Body (Diameter $\phi 20.0$ to $25.0\text{mm}$ )

| Cat. No. | Stock | Dimensions (mm) |        |     |            |
|----------|-------|-----------------|--------|-----|------------|
|          |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| LSM 4200 | ▲     | 20.0            | 55     | 120 | 20         |
| 4210     | *     | 21.0            | 60     | 125 | 25         |
| 4220     | *     | 22.0            | 60     | 135 | 25         |
| 4230     | *     | 23.0            | 60     | 135 | 25         |
| 4240     | *     | 24.0            | 65     | 140 | 25         |
| LSM 4250 | ▲     | 25.0            | 65     | 140 | 25         |

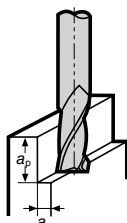
Grade: A1

## General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 3.0           | 3,000                                   | 115                | 2,900                                   | 80                 | 2,350                                   | 65                 | 4,000                              | 450                |
| 4.0           | 2,250                                   | 115                | 2,170                                   | 80                 | 1,750                                   | 65                 | 3,000                              | 530                |
| 6.0           | 1,500                                   | 130                | 1,450                                   | 80                 | 1,170                                   | 65                 | 2,000                              | 530                |
| 8.0           | 1,130                                   | 130                | 1,090                                   | 80                 | 875                                     | 65                 | 1,500                              | 530                |
| 10.0          | 900                                     | 130                | 870                                     | 80                 | 700                                     | 65                 | 1,200                              | 545                |
| 12.0          | 750                                     | 130                | 725                                     | 80                 | 585                                     | 65                 | 1,000                              | 560                |
| 16.0          | 565                                     | 150                | 545                                     | 80                 | 440                                     | 65                 | 750                                | 680                |
| 20.0          | 450                                     | 150                | 435                                     | 75                 | 350                                     | 60                 | 600                                | 720                |
| 25.0          | 360                                     | 120                | 350                                     | 65                 | 280                                     | 50                 | 480                                | 600                |
| Standard      | $a_p$                                   | $2.0D_c$           | $2.0D_c$                                | $2.0D_c$           | $2.0D_c$                                | $2.0D_c$           | $2.0D_c$                           | $2.0D_c$           |
| Depth-of-cut  | $a_e$                                   | $0.05D_c$          | $0.05D_c$                               | $0.05D_c$          | $0.05D_c$                               | $0.05D_c$          | $0.05D_c$                          | $0.05D_c$          |



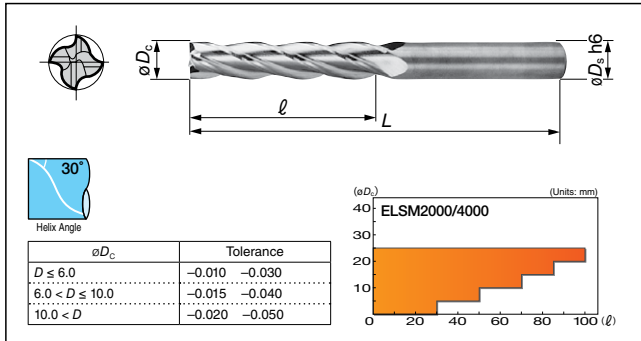


Extra Long Solid Carbide Spiral Endmills

# ELSM 4000 Type



|                |              |             |         |                |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|---------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Plastic | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○       | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



- SSM series extra long type
- Longest flute length in the SSM series, excellent for high precision deep step milling

## Body

| Cat. No.  | Stock | Dimensions (mm) |        |     |            |
|-----------|-------|-----------------|--------|-----|------------|
|           |       | $\phi D_c$      | $\ell$ | $L$ | $\phi D_s$ |
| ELSM 4030 | ▲     | 3.0             | 20     | 55  | 6          |
| 4040      | ▲     | 4.0             | 25     | 60  | 6          |
| 4050      | ▲     | 5.0             | 30     | 65  | 6          |
| 4060      | ▲     | 6.0             | 30     | 65  | 6          |
| 4070      | *     | 7.0             | 40     | 85  | 8          |
| ELSM 4080 | ▲     | 8.0             | 40     | 85  | 8          |
| 4090      | *     | 9.0             | 40     | 85  | 10         |
| 4100      | ▲     | 10.0            | 50     | 100 | 10         |
| 4110      | *     | 11.0            | 50     | 100 | 12         |
| 4120      | ▲     | 12.0            | 50     | 100 | 12         |
| ELSM 4130 | *     | 13.0            | 70     | 140 | 16         |
| 4140      | ▲     | 14.0            | 70     | 140 | 16         |
| 4150      | ▲     | 15.0            | 70     | 140 | 16         |
| 4160      | ▲     | 16.0            | 70     | 140 | 16         |
| 4170      | *     | 17.0            | 80     | 160 | 20         |
| ELSM 4180 | ▲     | 18.0            | 80     | 160 | 20         |
| 4190      | *     | 19.0            | 85     | 165 | 20         |
| 4200      | ▲     | 20.0            | 85     | 165 | 20         |
| 4210      | *     | 21.0            | 95     | 180 | 25         |
| 4220      | *     | 22.0            | 95     | 180 | 25         |
| ELSM 4230 | *     | 23.0            | 95     | 180 | 25         |
| 4240      | *     | 24.0            | 100    | 185 | 25         |
| 4250      | ▲     | 25.0            | 100    | 185 | 25         |

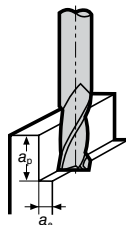
Grade: A1

## General Purpose Machines

1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material | Carbon Steel, Alloy Steel (Below 30HRC) |                    | Carbon Steel, Alloy Steel (Below 40HRC) |                    | Carbon Steel, Alloy Steel (Below 45HRC) |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|-----------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> )      | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                         |                    |                                         |                    |                                         |                    |                                    |                    |
| 3.0           | 2,350                                   | 80                 | 1,850                                   | 55                 | 1,600                                   | 45                 | 2,900                              | 140                |
| 4.0           | 1,750                                   | 80                 | 1,400                                   | 55                 | 1,200                                   | 45                 | 2,180                              | 140                |
| 6.0           | 1,180                                   | 80                 | 930                                     | 55                 | 800                                     | 50                 | 1,450                              | 140                |
| 8.0           | 880                                     | 80                 | 700                                     | 55                 | 600                                     | 50                 | 1,090                              | 140                |
| 10.0          | 700                                     | 80                 | 560                                     | 55                 | 480                                     | 50                 | 870                                | 140                |
| 12.0          | 590                                     | 80                 | 470                                     | 55                 | 400                                     | 45                 | 725                                | 140                |
| 16.0          | 440                                     | 80                 | 350                                     | 50                 | 300                                     | 45                 | 545                                | 120                |
| 20.0          | 350                                     | 75                 | 280                                     | 50                 | 240                                     | 45                 | 435                                | 110                |
| 25.0          | 280                                     | 65                 | 225                                     | 50                 | 190                                     | 45                 | 350                                | 105                |
| Standard      | $a_p$                                   | $2.5D_c$           | $2.5D_c$                                | $2.5D_c$           | $2.5D_c$                                | $2.5D_c$           | $2.5D_c$                           | $2.5D_c$           |
| Depth-of-cut  | $a_e$                                   | $0.03D_c$          | $0.03D_c$                               | $0.03D_c$          | $0.03D_c$                               | $0.03D_c$          | $0.03D_c$                          | $0.03D_c$          |



\* mark: Semi-standard stock (Please confirm stock availability) ▲ mark : To be replaced by new item (Please confirm stock availability)

I

Solid Carbide Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA Coat

Long Neck

Uncoated

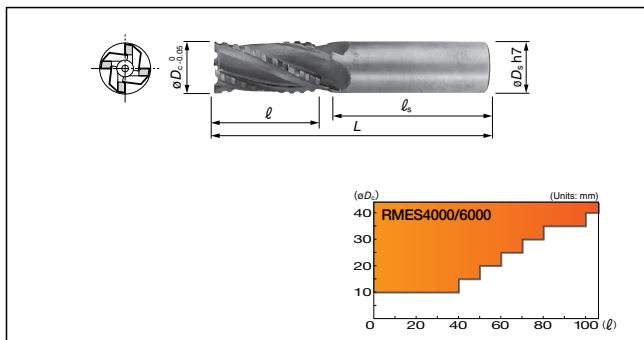
CBN

PCD

# Roughing Brazed Endmills RMES 4000/6000 Type



| Coated Carbide | Carbon Steel | Alloy Steel  | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy     | Copper Alloy | Graphite     | CFRP         |
|----------------|--------------|--------------|--------------------|----------------|----------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 45 to 55 HRC   | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC       | 45 to 55 HRC   | 45 to 55 HRC   | 45 to 55 HRC    | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC | 45 to 55 HRC |



## Body (4 Flutes)

| Cat. No.  | Stock | Dimensions (mm) |            |        |     |
|-----------|-------|-----------------|------------|--------|-----|
|           |       | $\phi D_c$      | $\phi D_s$ | $\ell$ | $L$ |
| RMES 4140 |       | 14.0            | 16         | 40     | 110 |
| 4150      |       | 15.0            | 16         | 40     | 110 |
| 4160      | ▲     | 16.0            | 16         | 40     | 110 |
| 4170      |       | 17.0            | 16         | 40     | 110 |
| 4180      | ▲     | 18.0            | 20         | 50     | 132 |
| RMES 4190 |       | 19.0            | 20         | 50     | 132 |
| 4200      | ▲     | 20.0            | 20         | 50     | 132 |
| 4210      |       | 21.0            | 20         | 50     | 132 |
| 4220      |       | 22.0            | 20         | 50     | 132 |
| 4230      |       | 23.0            | 25         | 60     | 145 |
| RMES 4240 |       | 24.0            | 25         | 60     | 145 |
| 4250      | ▲     | 25.0            | 25         | 60     | 145 |
| 4260      |       | 26.0            | 25         | 60     | 145 |
| 4270      |       | 27.0            | 25         | 60     | 145 |
| 4280      |       | 28.0            | 25         | 60     | 145 |
| RMES 4290 |       | 29.0            | 32         | 70     | 170 |
| 4300      | ▲     | 30.0            | 32         | 70     | 170 |
| 4310      |       | 31.0            | 32         | 70     | 170 |
| 4320      | ▲     | 32.0            | 32         | 70     | 170 |
| 4330      |       | 33.0            | 32         | 70     | 170 |
| RMES 4340 |       | 34.0            | 32         | 80     | 180 |
| 4350      |       | 35.0            | 32         | 80     | 180 |
| 4360      |       | 36.0            | 32         | 80     | 180 |
| 4370      |       | 37.0            | 32         | 80     | 180 |
| 4380      | *     | 38.0            | 32         | 80     | 180 |
| RMES 4390 |       | 39.0            | 32         | 100    | 200 |
| 4400      | ▲     | 40.0            | 32         | 100    | 200 |
| 4400-42   | *     | 40.0            | 42         | 100    | 215 |

Grade: A1

## Body (6 Flutes)

| Cat. No.  | Stock | Dimensions (mm) |            |        |     |
|-----------|-------|-----------------|------------|--------|-----|
|           |       | $\phi D_c$      | $\phi D_s$ | $\ell$ | $L$ |
| RMES 6450 |       | 45.0            | 32         | 120    | 222 |
| 6450-42   | *     | 45.0            | 42         | 120    | 237 |
| 6500      |       | 50.0            | 32         | 120    | 222 |
| 6500-42   | *     | 50.0            | 42         | 120    | 237 |

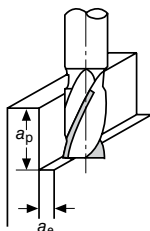
Grade: A1

## General Purpose Machines

- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material |       | Carbon Steel (S40C to S55C)        |                    | Alloy Steel (Below 40HRC)          |                    | Cast Iron Special Cast Iron        |                    |
|---------------|-------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         |       | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |       |                                    |                    |                                    |                    |                                    |                    |
| 14.0          |       | 1,650                              | 260                | 820                                | 110                | 2,000                              | 320                |
| 16.0          |       | 1,450                              | 250                | 720                                | 110                | 1,750                              | 315                |
| 20.0          |       | 1,160                              | 240                | 575                                | 110                | 1,400                              | 310                |
| 25.0          |       | 930                                | 220                | 460                                | 100                | 1,120                              | 290                |
| 32.0          |       | 725                                | 190                | 360                                | 85                 | 875                                | 260                |
| 40.0          |       | 580                                | 160                | 290                                | 80                 | 700                                | 240                |
| 45.0          |       | 510                                | 230                | 260                                | 110                | 610                                | 330                |
| 50.0          |       | 460                                | 220                | 235                                | 110                | 550                                | 320                |
| Standard      | $a_p$ | $1.5D_c$                           |                    | $1.5D_c$                           |                    | $1.5D_c$                           |                    |
| Depth-of-cut  | $a_e$ | $0.4D_c$                           |                    | $0.3D_c$                           |                    | $0.4D_c$                           |                    |



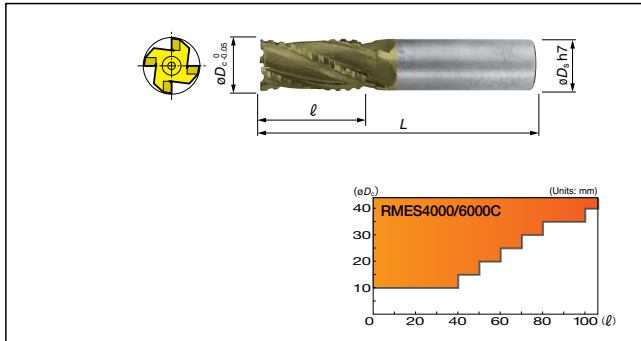
\* mark : Semi-standard stock (Please confirm stock availability) ▲ mark : To be replaced by new item (Please confirm stock availability)



# Roughing Coated Brazen Endmills RMES 4000/6000C Type



|                |              |             |         |          |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|---------|----------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Plastic | Aluminum | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| 40             | 40           | 40          | 40      | 40       | 40             | 40              | 40       | 40        | 40       | 40           | 40       | 40   |



## Body (4 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |            |        |     |
|------------|-------|-----------------|------------|--------|-----|
|            |       | $\phi D_c$      | $\phi D_s$ | $\ell$ | $L$ |
| RMES 4140C |       | 14.0            | 16         | 40     | 110 |
| 4150C      |       | 15.0            | 16         | 40     | 110 |
| 4160C      | ▲     | 16.0            | 16         | 40     | 110 |
| 4170C      |       | 17.0            | 16         | 40     | 110 |
| 4180C      |       | 18.0            | 20         | 50     | 132 |
| RMES 4190C |       | 19.0            | 20         | 50     | 132 |
| 4200C      | ▲     | 20.0            | 20         | 50     | 132 |
| 4210C      |       | 21.0            | 20         | 50     | 132 |
| 4220C      |       | 22.0            | 20         | 50     | 132 |
| 4230C      |       | 23.0            | 25         | 60     | 145 |
| RMES 4240C |       | 24.0            | 25         | 60     | 145 |
| 4250C      | ▲     | 25.0            | 25         | 60     | 145 |
| 4260C      |       | 26.0            | 25         | 60     | 145 |
| 4270C      |       | 27.0            | 25         | 60     | 145 |
| 4280C      |       | 28.0            | 25         | 60     | 145 |
| RMES 4290C |       | 29.0            | 32         | 70     | 170 |
| 4300C      | ▲     | 30.0            | 32         | 70     | 170 |
| 4310C      |       | 31.0            | 32         | 70     | 170 |
| 4320C      |       | 32.0            | 32         | 70     | 170 |
| 4330C      |       | 33.0            | 32         | 70     | 170 |
| RMES 4340C |       | 34.0            | 32         | 80     | 180 |
| 4350C      |       | 35.0            | 32         | 80     | 180 |
| 4360C      |       | 36.0            | 32         | 80     | 180 |
| 4370C      |       | 37.0            | 32         | 80     | 180 |
| 4380C      |       | 38.0            | 32         | 80     | 180 |
| RMES 4390C |       | 39.0            | 32         | 100    | 200 |
| 4400C      | ▲     | 40.0            | 32         | 100    | 200 |
| 4400C-42   |       | 40.0            | 42         | 100    | 215 |

Grade: GAC50

## Body (6 Flutes)

| Cat. No.   | Stock | Dimensions (mm) |            |        |     |
|------------|-------|-----------------|------------|--------|-----|
|            |       | $\phi D_c$      | $\phi D_s$ | $\ell$ | $L$ |
| RMES 6450C |       | 45.0            | 32         | 120    | 222 |
| 6450C-42   |       | 45.0            | 42         | 120    | 237 |
| 6500C      |       | 50.0            | 32         | 120    | 222 |
| 6500C-42   |       | 50.0            | 42         | 120    | 237 |

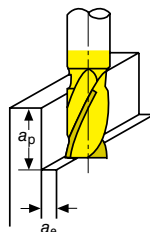
Grade: GAC50

## General Purpose Machines

- If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Side Milling

| Work Material | Carbon Steel (S40C to S55C)        |                    | Alloy Steel (Below 40HRC)          |                    | Cast Iron Special Cast Iron        |                    |
|---------------|------------------------------------|--------------------|------------------------------------|--------------------|------------------------------------|--------------------|
| Cond.         | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| $D_c$ (mm)    |                                    |                    |                                    |                    |                                    |                    |
| 14.0          | 1,650                              | 260                | 830                                | 110                | 2,000                              | 320                |
| 16.0          | 1,450                              | 250                | 730                                | 110                | 1,750                              | 315                |
| 20.0          | 1,160                              | 240                | 580                                | 110                | 1,400                              | 310                |
| 25.0          | 925                                | 220                | 465                                | 100                | 1,120                              | 300                |
| 30.0          | 770                                | 190                | 390                                | 90                 | 930                                | 275                |
| 40.0          | 580                                | 160                | 290                                | 80                 | 700                                | 240                |
| 45.0          | 510                                | 230                | 250                                | 105                | 610                                | 330                |
| 50.0          | 460                                | 220                | 225                                | 105                | 550                                | 320                |
| Standard      | $a_p$                              | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           | $1.5D_c$                           | $1.5D_c$           |
| Depth-of-cut  | $a_e$                              | $0.4D_c$           | $0.3D_c$                           | $0.4D_c$           | $0.4D_c$                           | $0.4D_c$           |



▲ mark : To be replaced by new item (Please confirm stock availability)

# Radius Endmills for Exotic Alloys Anti-vibration Type (Uncoated)

## SSEHVL 4000-R Type

4  
Flutes

4  
Flutes

Uncoated

R

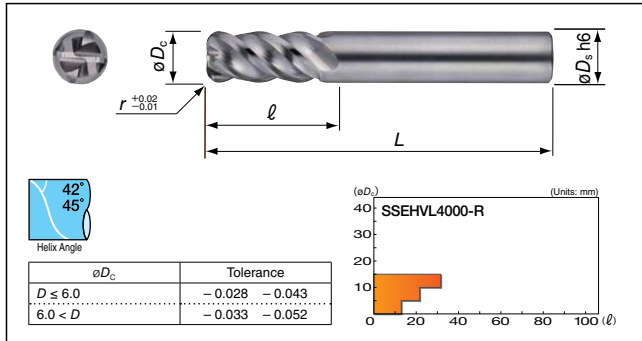
Side Milling

Groove Finishing

Face Milling

Probe Milling

|                 |              |              |                 |              |              |              |              |              |
|-----------------|--------------|--------------|-----------------|--------------|--------------|--------------|--------------|--------------|
| Coated Carbide  | Carbon Steel | Alloy Steel  | Stainless Steel | Cast Iron    | Aluminum     | Copper Alloy | Graphite     | CFRP         |
| Hardened Steel  | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC    | 65 to 70 HRC | 70 to 75 HRC | 75 to 80 HRC | 80 to 85 HRC | 85 to 90 HRC |
| Stainless Steel | 17 to 18% Cr | 19 to 20% Cr | 21 to 22% Cr    | 23 to 24% Cr | 25 to 26% Cr | 27 to 28% Cr | 29 to 30% Cr | 31 to 32% Cr |
| Cast Iron       | HT100        | HT150        | HT200           | HT250        | HT300        | HT350        | HT400        | HT450        |
| Aluminum        | 6061         | 7075         | 2024            | 7050         | 7055         | 7060         | 7065         | 7070         |
| Copper Alloy    | C101         | C102         | C103            | C104         | C105         | C106         | C107         | C108         |
| Graphite        | GC100        | GC101        | GC102           | GC103        | GC104        | GC105        | GC106        | GC107        |
| CFRP            | CFRP100      | CFRP101      | CFRP102         | CFRP103      | CFRP104      | CFRP105      | CFRP106      | CFRP107      |



### Body

| Cat. No.               | Stock | Dimensions (mm) |     |        |     |            |
|------------------------|-------|-----------------|-----|--------|-----|------------|
|                        |       | $\phi D_c$      | $r$ | $\ell$ | $L$ | $\phi D_s$ |
| <b>SSEHVL 4045-R05</b> | ●     | 4.5             | 0.5 | 12     | 50  | 6          |
| <b>4045-R10</b>        | ●     | 4.5             | 1.0 | 12     | 50  | 6          |
| <b>4050-R05</b>        | ●     | 5.0             | 0.5 | 13     | 60  | 6          |
| <b>4050-R10</b>        | ●     | 5.0             | 1.0 | 13     | 60  | 6          |
| <b>4060-R10</b>        | ●     | 6.0             | 1.0 | 13     | 60  | 6          |
| <b>SSEHVL 4080-R10</b> | ●     | 8.0             | 1.0 | 19     | 80  | 8          |
| <b>4100-R10</b>        | ●     | 10.0            | 1.0 | 22     | 90  | 10         |
| <b>4100-R30</b>        | ●     | 10.0            | 3.0 | 22     | 90  | 10         |
| <b>4120-R10</b>        | ●     | 12.0            | 1.0 | 26     | 90  | 12         |
| <b>4120-R30</b>        | ●     | 12.0            | 3.0 | 26     | 90  | 12         |
| <b>SSEHVL 4160-R10</b> | ●     | 16.0            | 1.0 | 32     | 115 | 16         |
| <b>4160-R30</b>        | ●     | 16.0            | 3.0 | 32     | 115 | 16         |

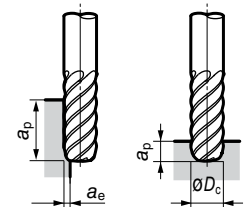
Grade: EH520

### Diameter and Corner Radius Selection Range

| $D_c$ | $r0.5$ | $r1.0$ | $r3.0$ |
|-------|--------|--------|--------|
| 4.5   | ●      | ●      |        |
| 5     | ●      | ●      |        |
| 6     |        | ●      |        |
| 8     |        | ●      |        |
| 10    |        | ●      | ●      |
| 12    |        | ●      | ●      |
| 16    |        | ●      | ●      |

### Recommended Cutting Conditions

- For stable machining, a high rigidity machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.



### Side Milling

| Work Material         | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       | Heat Resistant Steel                  |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cutting Conditions    | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $D_c$ (mm)            |                                       |                       |                                       |                       |                                       |                       |
| 4.5                   | 2,300                                 | 120                   | 4,600                                 | 370                   | 1,600                                 | 130                   |
| 5.0                   | 2,000                                 | 130                   | 4,100                                 | 410                   | 1,500                                 | 150                   |
| 6.0                   | 1,700                                 | 130                   | 3,400                                 | 400                   | 1,200                                 | 140                   |
| 8.0                   | 1,300                                 | 130                   | 2,600                                 | 360                   | 900                                   | 130                   |
| 10.0                  | 1,000                                 | 130                   | 2,100                                 | 340                   | 700                                   | 110                   |
| 12.0                  | 800                                   | 110                   | 1,700                                 | 300                   | 600                                   | 100                   |
| 16.0                  | 600                                   | 90                    | 1,300                                 | 260                   | 500                                   | 100                   |
| Standard Depth-of-cut | $a_p$                                 | $1.5D_c$              | $1.5D_c$                              | $1.5D_c$              | $1.5D_c$                              | $1.5D_c$              |
|                       | $p_t$                                 | $0.1D_c$              | $0.05D_c$                             | $0.05D_c$             | $0.05D_c$                             | $0.05D_c$             |

### Groove Milling

| Work Material         | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       | Heat Resistant Steel                  |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cutting Conditions    | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $D_c$ (mm)            |                                       |                       |                                       |                       |                                       |                       |
| 4.5                   | 1,800                                 | 50                    | 3,200                                 | 250                   | 1,300                                 | 110                   |
| 5.0                   | 1,600                                 | 50                    | 2,900                                 | 290                   | 1,200                                 | 120                   |
| 6.0                   | 1,400                                 | 50                    | 2,400                                 | 290                   | 1,000                                 | 120                   |
| 8.0                   | 1,000                                 | 50                    | 1,800                                 | 250                   | 700                                   | 90                    |
| 10.0                  | 800                                   | 50                    | 1,400                                 | 230                   | 600                                   | 100                   |
| 12.0                  | 600                                   | 50                    | 1,200                                 | 210                   | 500                                   | 90                    |
| 16.0                  | 500                                   | 40                    | 900                                   | 180                   | 400                                   | 80                    |
| Standard Depth-of-cut | $a_p$                                 | $0.3D_c$              | $0.2D_c$                              | $0.2D_c$              | $0.15D_c$                             | $0.15D_c$             |



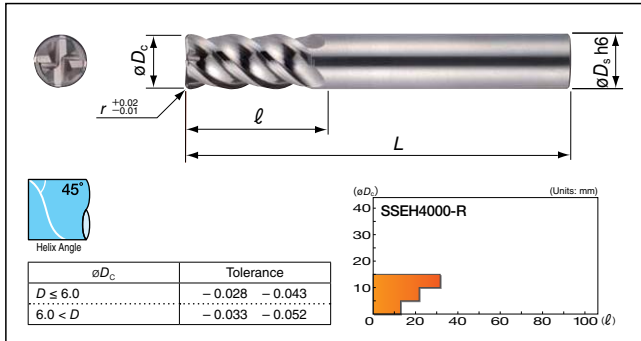


Radius Endmills for Exotic Alloys (Uncoated)

# SSEH 4000-R Type



|                |              |             |                   |                |                |                 |              |           |          |              |          |      |
|----------------|--------------|-------------|-------------------|----------------|----------------|-----------------|--------------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Prehardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|                |              |             |                   |                | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC |           |          |              |          |      |



## Body

| Cat. No.             | Stock | Dimensions (mm) |     |     |     |            |
|----------------------|-------|-----------------|-----|-----|-----|------------|
|                      |       | $\phi D_c$      | $r$ | $l$ | $L$ | $\phi D_s$ |
| <b>SSEH 4045-R05</b> | ●     | 4.5             | 0.5 | 12  | 50  | 6          |
| <b>4045-R10</b>      | ●     | 4.5             | 1.0 | 12  | 50  | 6          |
| <b>4050-R05</b>      | ●     | 5.0             | 0.5 | 13  | 60  | 6          |
| <b>4050-R10</b>      | ●     | 5.0             | 1.0 | 13  | 60  | 6          |
| <b>4060-R10</b>      | ●     | 6.0             | 1.0 | 13  | 60  | 6          |
| <b>SSEH 4080-R10</b> | ●     | 8.0             | 1.0 | 19  | 80  | 8          |
| <b>4100-R10</b>      | ●     | 10.0            | 1.0 | 22  | 90  | 10         |
| <b>4100-R30</b>      | ●     | 10.0            | 3.0 | 22  | 90  | 10         |
| <b>4120-R10</b>      | ●     | 12.0            | 1.0 | 26  | 90  | 12         |
| <b>4120-R30</b>      | ●     | 12.0            | 3.0 | 26  | 90  | 12         |
| <b>SSEH 4160-R10</b> | ●     | 16.0            | 1.0 | 32  | 115 | 16         |
| <b>4160-R30</b>      | ●     | 16.0            | 3.0 | 32  | 115 | 16         |

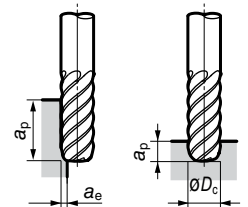
Grade: EH520

## Diameter and Corner Radius Selection Range

| $D_c$ | $r0.5$ | $r1.0$ | $r3.0$ |
|-------|--------|--------|--------|
| 4.5   | ●      | ●      |        |
| 5     | ●      | ●      |        |
| 6     |        | ●      |        |
| 8     |        | ●      |        |
| 10    |        | ●      | ●      |
| 12    |        | ●      | ●      |
| 16    |        | ●      | ●      |

## Recommended Cutting Conditions

- For stable machining, a high rigidity machine is recommended.
- Wet machining is recommended for stainless steel and heat resistant alloy applications.
- If cutting noise and vibration are present, please change the cutting conditions accordingly.



## Side Milling

| Work Material         | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       | Heat Resistive Steel                  |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cutting Conditions    | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $D_c$ (mm)            |                                       |                       |                                       |                       |                                       |                       |
| 4.5                   | 1,800                                 | 90                    | 3,500                                 | 280                   | 1,400                                 | 110                   |
| 5.0                   | 1,600                                 | 100                   | 3,200                                 | 320                   | 1,300                                 | 130                   |
| 6.0                   | 1,300                                 | 100                   | 2,700                                 | 320                   | 1,100                                 | 130                   |
| 8.0                   | 1,000                                 | 100                   | 2,000                                 | 280                   | 800                                   | 110                   |
| 10.0                  | 800                                   | 100                   | 1,600                                 | 260                   | 600                                   | 100                   |
| 12.0                  | 700                                   | 100                   | 1,300                                 | 230                   | 500                                   | 90                    |
| 16.0                  | 500                                   | 80                    | 1,000                                 | 200                   | 400                                   | 80                    |
| Standard Depth-of-cut | $a_p$                                 | $1.5D_c$              | $1.5D_c$                              | $1.5D_c$              | $1.5D_c$                              | $1.5D_c$              |
|                       | $a_e$                                 | $0.1D_c$              | $0.05D_c$                             | $0.05D_c$             | $0.05D_c$                             | $0.05D_c$             |

## Groove Milling

| Work Material         | Stainless Steel<br>SUS304, SUS316     |                       | Titanium Alloy                        |                       | Heat Resistive Steel                  |                       |
|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|---------------------------------------|-----------------------|
| Cutting Conditions    | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $D_c$ (mm)            |                                       |                       |                                       |                       |                                       |                       |
| 4.5                   | 1,400                                 | 40                    | 2,500                                 | 200                   | 1,100                                 | 90                    |
| 5.0                   | 1,300                                 | 40                    | 2,200                                 | 220                   | 1,000                                 | 100                   |
| 6.0                   | 1,100                                 | 40                    | 1,900                                 | 230                   | 800                                   | 100                   |
| 8.0                   | 800                                   | 40                    | 1,400                                 | 200                   | 600                                   | 80                    |
| 10.0                  | 600                                   | 40                    | 1,100                                 | 180                   | 500                                   | 80                    |
| 12.0                  | 500                                   | 40                    | 900                                   | 160                   | 400                                   | 70                    |
| 16.0                  | 400                                   | 30                    | 700                                   | 140                   | 300                                   | 60                    |
| Standard Depth-of-cut | $a_p$                                 | $0.3D_c$              | $0.2D_c$                              | $0.15D_c$             | $0.15D_c$                             | $0.15D_c$             |

I

Solid Carbide  
Endmills

Square

2 Flutes

3 Flutes

4 Flutes

6 Flutes

8 Flutes

Radius

Ballnose

DLC

SUMIDIA  
Coat

Long  
Neck

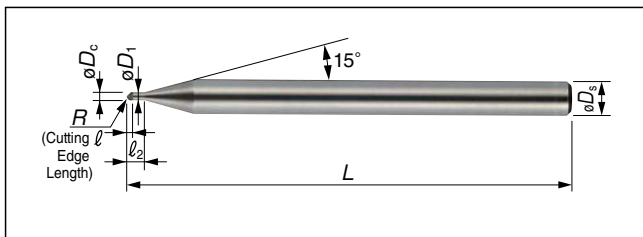
Uncoated

CBN

PCD



|                |              |             |                   |                |                |                 |              |           |          |              |          |      |         |                    |
|----------------|--------------|-------------|-------------------|----------------|----------------|-----------------|--------------|-----------|----------|--------------|----------|------|---------|--------------------|
| Coated Carbide | Carbon Steel | Alloy Steel | Prehardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP | Carbide | Hardening Material |
|                |              |             |                   |                | 45 to 55 HRC   | 55 to 60 HRC    | 60 to 65 HRC |           |          |              |          |      | ⊙       | ○                  |



## Endmill Identification

**NPDB 1 030 - 010**

Series Code

No. of Flutes

Ballnose Radius

Length Below Neck

## Body

| Cat. No.             | Stock | Dimensions (mm) |            |        |          |     |            |            |
|----------------------|-------|-----------------|------------|--------|----------|-----|------------|------------|
|                      |       | $R$             | $\phi D_c$ | $\ell$ | $\ell_2$ | $L$ | $\phi D_1$ | $\phi D_s$ |
| <b>NPDB 1010-004</b> |       | 0.1             | 0.2        | 0.1    | 0.4      | 40  | 0.18       | 4          |
| <b>1020-008</b>      |       | 0.2             | 0.4        | 0.2    | 0.8      | 40  | 0.38       | 4          |
| <b>1030-010</b>      | ●     | 0.3             | 0.6        | 0.3    | 1.0      | 40  | 0.58       | 4          |
| <b>1050-020</b>      | ●     | 0.5             | 1.0        | 0.5    | 2.0      | 40  | 0.95       | 4          |
| <b>1100-030</b>      | ●     | 1.0             | 2.0        | 1.0    | 3.0      | 40  | 1.95       | 4          |

Grade: NPD10

## Recommended Cutting Conditions

- Use a machine with high rigidity for stable cutting.
- Non-water soluble coolant recommended. Supply as a mist or external coolant.  
Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
- Shorten overhang as much as possible.
- Adjust cuttings conditions as necessary as machine rigidity and other conditions may vary.
- Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.



## Flat Surface Finishing

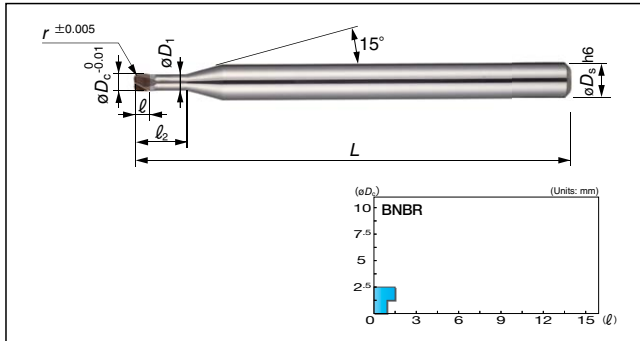
| Work Material |               | Carbide                             |                    |            |            |  |
|---------------|---------------|-------------------------------------|--------------------|------------|------------|--|
| $R$ (mm)      | $\ell_2$ (mm) | Spindle Speed ( $\text{min}^{-1}$ ) | Feed Rate (mm/min) | $a_p$ (mm) | $p_t$ (mm) |  |
| 0.3           | 1.0           | 40,000                              | 200                | 0.001      | 0.001      |  |
| 0.5           | 2.0           | 40,000                              | 400                | 0.001      | 0.003      |  |
| 1.0           | 3.0           | 40,000                              | 600                | 0.001      | 0.005      |  |

## Profile Finishing

| Work Material |               | Carbide                             |                    |            |            |  |
|---------------|---------------|-------------------------------------|--------------------|------------|------------|--|
| $R$ (mm)      | $\ell_2$ (mm) | Spindle Speed ( $\text{min}^{-1}$ ) | Feed Rate (mm/min) | $a_p$ (mm) | $p_t$ (mm) |  |
| 0.3           | 1.0           | 40,000                              | 200                | 0.003      | 0.001      |  |
| 0.5           | 2.0           | 40,000                              | 400                | 0.005      | 0.003      |  |
| 1.0           | 3.0           | 40,000                              | 600                | 0.010      | 0.005      |  |



| Coated Carbide | Carbon Steel | Alloy Steel | Polymers | Aluminum | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------|----------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○        | ○        | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



■ Diameter and Corner Radius Selection Range

| D <sub>c</sub> | r0.05 | r0.1 | r0.2 | r0.3 | r0.5 |
|----------------|-------|------|------|------|------|
| 0.2            | ●     |      |      |      |      |
| 0.3            | ●     |      |      |      |      |
| 0.4            | ●     |      |      |      |      |
| 0.5            | ●     | ●    |      |      |      |
| 1.0            | ●     | ●    | ●    | ●    |      |
| 1.5            |       | ●    | ●    | ●    |      |
| 2.0            |       | ●    | ●    | ●    | ●    |

### Body

| Cat. No.            | Stock | Dimensions (mm) |      |      |                |    |                 |                 | Face Relief Angle |
|---------------------|-------|-----------------|------|------|----------------|----|-----------------|-----------------|-------------------|
|                     |       | øD <sub>c</sub> | r    | ℓ    | ℓ <sub>2</sub> | L  | øD <sub>1</sub> | øD <sub>s</sub> |                   |
| BNBR 2D020R005-0054 | ●     | 0.2             | 0.05 | 0.1  | 0.5            | 50 | 0.17            | 4               | No                |
| 2D030R005-0054      | ●     | 0.3             | 0.05 | 0.15 | 0.5            | 50 | 0.27            | 4               |                   |
| 2D040R005-0054      | ●     | 0.4             | 0.05 | 0.2  | 0.5            | 50 | 0.37            | 4               |                   |
| 2D050R005-0054      | ●     | 0.5             | 0.05 | 0.3  | 0.5            | 50 | 0.47            | 4               |                   |
| 2D050R005-0154      | ●     | 0.5             | 0.05 | 0.3  | 1.5            | 50 | 0.47            | 4               | No                |
| BNBR 2D050R005-0254 | ●     | 0.5             | 0.05 | 0.3  | 2.5            | 50 | 0.47            | 4               |                   |
| 2D050R010-0154      | ●     | 0.5             | 0.10 | 0.3  | 1.5            | 50 | 0.47            | 4               |                   |
| 2D050R010-0254      | ●     | 0.5             | 0.10 | 0.3  | 2.5            | 50 | 0.47            | 4               |                   |
| 2D100R005-0304      | ●     | 1.0             | 0.05 | 0.7  | 3.0            | 50 | 0.97            | 4               | Yes               |
| 2D100R005-0504      | ●     | 1.0             | 0.05 | 0.7  | 5.0            | 50 | 0.97            | 4               |                   |
| BNBR 2D100R010-0304 | ●     | 1.0             | 0.10 | 0.7  | 3.0            | 50 | 0.97            | 4               |                   |
| 2D100R010-0504      | ●     | 1.0             | 0.10 | 0.7  | 5.0            | 50 | 0.97            | 4               |                   |
| 2D100R020-0304      | ●     | 1.0             | 0.20 | 0.7  | 3.0            | 50 | 0.97            | 4               | Yes               |
| 2D100R020-0504      | ●     | 1.0             | 0.20 | 0.7  | 5.0            | 50 | 0.97            | 4               |                   |
| 2D100R030-0304      | ●     | 1.0             | 0.30 | 0.7  | 3.0            | 50 | 0.97            | 4               |                   |
| 2D100R030-0504      | ●     | 1.0             | 0.30 | 0.7  | 5.0            | 50 | 0.97            | 4               |                   |
| BNBR 2D150R010-0454 | ●     | 1.5             | 0.10 | 1.2  | 4.5            | 50 | 1.47            | 4               | Yes               |
| 2D150R010-0754      | ●     | 1.5             | 0.10 | 1.2  | 7.5            | 50 | 1.47            | 4               |                   |
| 2D150R020-0454      | ●     | 1.5             | 0.20 | 1.2  | 4.5            | 50 | 1.47            | 4               |                   |
| 2D150R020-0754      | ●     | 1.5             | 0.20 | 1.2  | 7.5            | 50 | 1.47            | 4               |                   |
| BNBR 2D150R030-0454 | ●     | 1.5             | 0.30 | 1.2  | 4.5            | 50 | 1.47            | 4               | Yes               |
| 2D150R030-0754      | ●     | 1.5             | 0.30 | 1.2  | 7.5            | 50 | 1.47            | 4               |                   |
| 2D200R010-0604      | ●     | 2.0             | 0.10 | 1.5  | 6.0            | 50 | 1.97            | 4               |                   |
| 2D200R020-0604      | ●     | 2.0             | 0.20 | 1.5  | 6.0            | 50 | 1.97            | 4               |                   |
| 2D200R030-0604      | ●     | 2.0             | 0.30 | 1.5  | 6.0            | 50 | 1.97            | 4               | Yes               |
| BNBR 2D200R050-0604 | ●     | 2.0             | 0.50 | 1.5  | 6.0            | 50 | 1.97            | 4               |                   |

Grade: BNX20

### Endmill Identification

**BNBR 2 D050 R010-015 4**

No. of Flutes Diameter Corner Radius Length Below Neck Shank Diameter



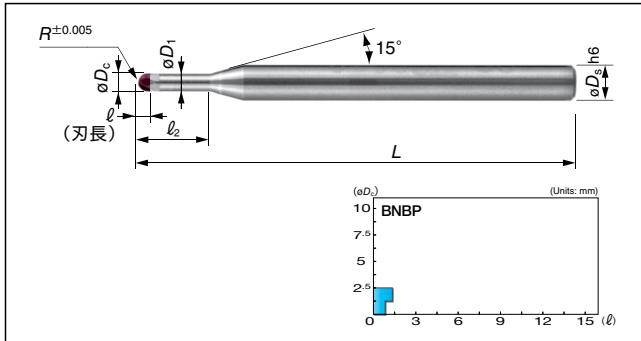
### Recommended Cutting Conditions

1. Use a machine with high rigidity for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cutting conditions as necessary as machine rigidity and other conditions may vary.
5. Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.

| Work Material |                    |                        | STAVAX, NAK80, SKD61 (Up to 52HRC) |                    |                     |                     | ELMAX, DC53, SKD11 improved (Up to 62HRC) |                    |                     |                     | YXR3, SKH (Up to 70HRC)            |                    |                     |                     |
|---------------|--------------------|------------------------|------------------------------------|--------------------|---------------------|---------------------|-------------------------------------------|--------------------|---------------------|---------------------|------------------------------------|--------------------|---------------------|---------------------|
| Diameter (mm) | Corner Radius (mm) | Length Below Neck (mm) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | a <sub>e</sub> (mm) | Spindle Speed (min <sup>-1</sup> )        | Feed Rate (mm/min) | a <sub>p</sub> (mm) | a <sub>e</sub> (mm) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | a <sub>e</sub> (mm) |
| 0.2           | 0.05               | 0.5                    | 40,000                             | 400                | 0.005               | 0.03                | 40,000                                    | 400                | 0.005               | 0.03                | 40,000                             | 250                | 0.005               | 0.02                |
| 0.3           | 0.05               | 0.5                    | 40,000                             | 500                | 0.010               | 0.05                | 40,000                                    | 500                | 0.010               | 0.05                | 40,000                             | 300                | 0.005               | 0.03                |
| 0.4           | 0.05               | 0.5                    | 40,000                             | 600                | 0.015               | 0.1                 | 40,000                                    | 600                | 0.015               | 0.1                 | 40,000                             | 400                | 0.01                | 0.05                |
| 0.5           | 0.05               | 0.5                    | 40,000                             | 600                | 0.02                | 0.15                | 40,000                                    | 600                | 0.02                | 0.15                | 40,000                             | 400                | 0.01                | 0.1                 |
|               | 0.05               | 1.5                    | 40,000                             |                    | 0.02                | 0.1                 | 40,000                                    |                    | 0.02                | 0.1                 | 35,000                             |                    |                     |                     |
|               | 0.1                | 1.5                    | 40,000                             |                    | 0.02                | 0.1                 | 40,000                                    |                    | 0.02                | 0.1                 | 35,000                             |                    |                     |                     |
|               | 0.05               | 2.5                    | 40,000                             |                    | 0.01                | 0.05                | 40,000                                    |                    | 0.01                | 0.05                | 35,000                             |                    |                     |                     |
| 1.0           | 0.05               | 3.0                    | 35,000                             | 800                | 0.03                | 0.3                 | 35,000                                    | 800                | 0.03                | 0.2                 | 30,000                             | 600                | 0.01                | 0.1                 |
|               | 0.1                |                        | 35,000                             |                    |                     |                     | 35,000                                    |                    |                     |                     | 30,000                             |                    |                     |                     |
|               | 0.2                |                        | 35,000                             |                    |                     |                     | 35,000                                    |                    |                     |                     | 30,000                             |                    |                     |                     |
|               | 0.3                |                        | 35,000                             |                    |                     |                     | 35,000                                    |                    |                     |                     | 30,000                             |                    |                     |                     |
|               | 0.05               | 5.0                    | 35,000                             |                    | 0.02                | 0.2                 | 35,000                                    |                    | 0.02                | 0.1                 | 30,000                             |                    | 0.01                | 0.1                 |
|               | 0.1                |                        | 35,000                             |                    |                     |                     | 35,000                                    |                    |                     |                     | 30,000                             |                    |                     |                     |
| 1.5           | 0.2                |                        | 35,000                             |                    |                     |                     | 35,000                                    |                    |                     |                     | 30,000                             |                    |                     |                     |
|               | 0.3                | 4.5                    | 26,000                             | 800                | 0.03                | 0.5                 | 26,000                                    | 800                | 0.03                | 0.3                 | 20,000                             | 600                | 0.02                | 0.3                 |
|               | 0.1                |                        | 26,000                             |                    |                     |                     | 26,000                                    |                    |                     |                     | 20,000                             |                    |                     |                     |
|               | 0.2                |                        | 26,000                             |                    |                     |                     | 26,000                                    |                    |                     |                     | 20,000                             |                    |                     |                     |
|               | 0.3                |                        | 26,000                             |                    |                     |                     | 26,000                                    |                    |                     |                     | 20,000                             |                    |                     |                     |
|               | 0.1                | 7.5                    | 26,000                             |                    | 0.03                | 0.5                 | 26,000                                    |                    | 0.03                | 0.3                 | 20,000                             |                    | 0.02                | 0.3                 |
| 2.0           | 0.2                |                        | 20,000                             |                    |                     |                     | 20,000                                    |                    |                     |                     | 15,000                             |                    |                     |                     |
|               | 0.3                |                        | 20,000                             |                    |                     |                     | 20,000                                    |                    |                     |                     | 15,000                             |                    |                     |                     |
|               | 0.4                | 6.0                    | 20,000                             |                    | 0.03                | 0.7                 | 20,000                                    |                    | 0.03                | 0.7                 | 15,000                             |                    | 0.03                | 0.7                 |
|               | 0.5                |                        | 20,000                             |                    |                     |                     | 20,000                                    |                    |                     |                     | 15,000                             |                    |                     |                     |



| Coated Carbide | Carbon Steel | Alloy Steel  | Pre-hardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron    | Al Alloy      | Copper Alloy   | Graphite       | CFRP           |
|----------------|--------------|--------------|--------------------|----------------|----------------|-----------------|--------------|--------------|---------------|----------------|----------------|----------------|
| ○              | ○            | ○            | ○                  | ○              | ○              | ○               | ○            | ○            | ○             | ○              | ○              | ○              |
| 45 to 55 HRC   | 55 to 60 HRC | 60 to 65 HRC | 65 to 70 HRC       | 70 to 75 HRC   | 75 to 80 HRC   | 80 to 85 HRC    | 85 to 90 HRC | 90 to 95 HRC | 95 to 100 HRC | 100 to 105 HRC | 105 to 110 HRC | 110 to 115 HRC |



- Utilising CBN SUMIBORON BN350 for excellent fracture resistance!
- Achieving longer tool life in high speed, high precision machining of Pre-hardened and Hardened Steel (up to HRC70)!

## Body (φ4mmShank)

| Cat. No.        | Stock | Dimensions (mm) |                 |     |                |    |                 |                 |
|-----------------|-------|-----------------|-----------------|-----|----------------|----|-----------------|-----------------|
|                 |       | R               | φD <sub>c</sub> | ℓ   | ℓ <sub>2</sub> | L  | φD <sub>1</sub> | φD <sub>s</sub> |
| BNBP 2R020-0124 | ●     | 0.20            | 0.4             | 0.3 | 1.2            | 50 | 0.37            | 4               |
| 2R020-0204      | ●     | 0.20            | 0.4             | 0.3 | 2.0            | 50 | 0.37            | 4               |
| 2R020-0304      | ●     | 0.20            | 0.4             | 0.3 | 3.0            | 50 | 0.37            | 4               |
| 2R020-0404      | ●     | 0.20            | 0.4             | 0.3 | 4.0            | 50 | 0.37            | 4               |
| 2R030-0154      | ●     | 0.30            | 0.6             | 0.4 | 1.5            | 50 | 0.57            | 4               |
| BNBP 2R030-0204 | ●     | 0.30            | 0.6             | 0.4 | 2.0            | 50 | 0.57            | 4               |
| 2R030-0304      | ●     | 0.30            | 0.6             | 0.4 | 3.0            | 50 | 0.57            | 4               |
| 2R030-0404      | ●     | 0.30            | 0.6             | 0.4 | 4.0            | 50 | 0.57            | 4               |
| 2R030-0504      | ●     | 0.30            | 0.6             | 0.4 | 5.0            | 50 | 0.57            | 4               |
| 2R030-0604      | ●     | 0.30            | 0.6             | 0.4 | 6.0            | 50 | 0.57            | 4               |
| BNBP 2R050-0254 | ●     | 0.50            | 1.0             | 0.6 | 2.5            | 50 | 0.97            | 4               |
| 2R050-0304      | ●     | 0.50            | 1.0             | 0.6 | 3.0            | 50 | 0.97            | 4               |
| 2R050-0404      | ●     | 0.50            | 1.0             | 0.6 | 4.0            | 50 | 0.97            | 4               |
| 2R050-0604      | ●     | 0.50            | 1.0             | 0.6 | 6.0            | 50 | 0.97            | 4               |
| 2R050-0804      | ●     | 0.50            | 1.0             | 0.6 | 8.0            | 50 | 0.97            | 4               |
| BNBP 2R075-0404 | ●     | 0.75            | 1.5             | 0.9 | 4.0            | 50 | 1.47            | 4               |
| 2R100-0554      | ●     | 1.00            | 2.0             | 1.4 | 5.5            | 50 | 1.97            | 4               |
| 2R100-0804      | ●     | 1.00            | 2.0             | 1.4 | 8.0            | 50 | 1.97            | 4               |

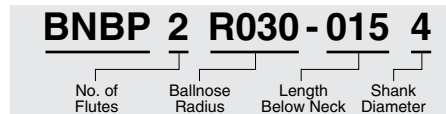
Grade: BN350

## Body (φ6mmShank)

| Cat. No.        | Stock | Dimensions (mm) |                 |     |                |    |                 |                 |
|-----------------|-------|-----------------|-----------------|-----|----------------|----|-----------------|-----------------|
|                 |       | R               | φD <sub>c</sub> | ℓ   | ℓ <sub>2</sub> | L  | φD <sub>1</sub> | φD <sub>s</sub> |
| BNBP 2R020-0126 | ●     | 0.20            | 0.4             | 0.3 | 1.2            | 50 | 0.37            | 6               |
| 2R030-0156      | ●     | 0.30            | 0.6             | 0.4 | 1.5            | 50 | 0.57            | 6               |
| 2R050-0256      | ●     | 0.50            | 1.0             | 0.6 | 2.5            | 50 | 0.97            | 6               |
| 2R075-0406      | ●     | 0.75            | 1.5             | 0.9 | 4.0            | 50 | 1.47            | 6               |
| 2R100-0556      | ●     | 1.00            | 2.0             | 1.4 | 5.5            | 50 | 1.97            | 6               |

Grade: BN350

## Endmill Identification



## Recommended Cutting Conditions

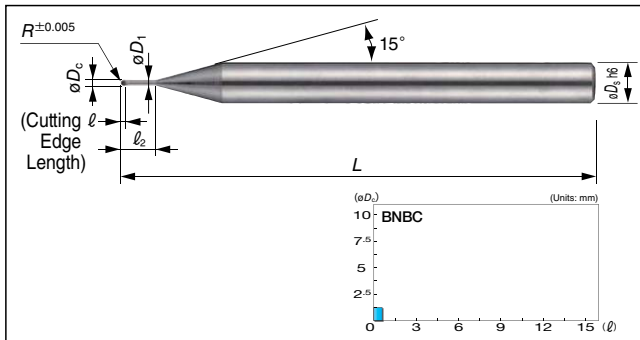
1. Use a machine with high rigidity for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cuttings conditions as necessary as machine rigidity and other conditions may vary.
5. Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.



| Work Material | STAVAX, NAK80, SKD61 (Up to 52HRC) |                     |                                    |                    |                     |                     | ELMAX, DC53, SKD11 improved (Up to 62HRC) |                    |                     |                     | YXR3, SKH (Up to 70HRC)            |                    |                     |                     |
|---------------|------------------------------------|---------------------|------------------------------------|--------------------|---------------------|---------------------|-------------------------------------------|--------------------|---------------------|---------------------|------------------------------------|--------------------|---------------------|---------------------|
|               | R(mm)                              | ℓ <sub>2</sub> (mm) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | p <sub>t</sub> (mm) | Spindle Speed (min <sup>-1</sup> )        | Feed Rate (mm/min) | a <sub>p</sub> (mm) | p <sub>t</sub> (mm) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | a <sub>p</sub> (mm) | p <sub>t</sub> (mm) |
| 0.2           | 1.2                                | 40,000              | 1,000                              | 0.005              | 0.010               | 40,000              | 800                                       | 0.005              | 0.010               | 40,000              | 600                                | 0.005              | 0.005               | 0.005               |
|               | 2.0                                | 40,000              | 800                                | 0.005              | 0.010               | 40,000              | 600                                       | 0.005              | 0.010               | 40,000              | 400                                | 0.005              | 0.005               | 0.005               |
|               | 3.0                                | 40,000              | 600                                | 0.005              | 0.010               | 40,000              | 500                                       | 0.005              | 0.010               | 40,000              | 300                                | 0.005              | 0.005               | 0.005               |
|               | 4.0                                | 40,000              | 500                                | 0.005              | 0.010               | 40,000              | 400                                       | 0.005              | 0.005               | 40,000              | 200                                | 0.005              | 0.005               | 0.005               |
| 0.3           | 1.5                                | 40,000              | 1,600                              | 0.020              | 0.020               | 40,000              | 1,400                                     | 0.010              | 0.020               | 40,000              | 1,200                              | 0.010              | 0.020               | 0.020               |
|               | 2.0                                | 40,000              | 1,500                              | 0.010              | 0.020               | 40,000              | 1,300                                     | 0.010              | 0.020               | 40,000              | 1,100                              | 0.010              | 0.010               | 0.010               |
|               | 3.0                                | 40,000              | 1,400                              | 0.010              | 0.020               | 40,000              | 1,200                                     | 0.010              | 0.020               | 40,000              | 1,000                              | 0.010              | 0.010               | 0.010               |
|               | 4.0                                | 30,000              | 1,200                              | 0.010              | 0.010               | 30,000              | 1,000                                     | 0.010              | 0.010               | 30,000              | 700                                | 0.005              | 0.010               | 0.010               |
|               | 5.0                                | 30,000              | 800                                | 0.010              | 0.010               | 30,000              | 700                                       | 0.005              | 0.010               | 30,000              | 600                                | 0.005              | 0.005               | 0.005               |
|               | 6.0                                | 30,000              | 600                                | 0.005              | 0.010               | 30,000              | 500                                       | 0.005              | 0.005               | 30,000              | 400                                | 0.005              | 0.005               | 0.005               |
| 0.5           | 2.5                                | 40,000              | 2,800                              | 0.040              | 0.050               | 40,000              | 2,800                                     | 0.030              | 0.040               | 40,000              | 2,200                              | 0.020              | 0.030               | 0.030               |
|               | 3.0                                | 40,000              | 2,600                              | 0.040              | 0.050               | 40,000              | 2,600                                     | 0.030              | 0.040               | 40,000              | 2,100                              | 0.020              | 0.020               | 0.020               |
|               | 4.0                                | 40,000              | 2,400                              | 0.030              | 0.050               | 40,000              | 2,400                                     | 0.020              | 0.030               | 40,000              | 2,000                              | 0.020              | 0.020               | 0.020               |
|               | 6.0                                | 25,000              | 1,500                              | 0.020              | 0.030               | 25,000              | 1,500                                     | 0.010              | 0.020               | 25,000              | 1,300                              | 0.010              | 0.010               | 0.010               |
|               | 8.0                                | 16,000              | 1,200                              | 0.020              | 0.020               | 16,000              | 1,100                                     | 0.010              | 0.020               | 16,000              | 850                                | 0.010              | 0.010               | 0.010               |
| 0.75          | 4.0                                | 32,000              | 2,400                              | 0.030              | 0.030               | 32,000              | 2,200                                     | 0.020              | 0.030               | 32,000              | 2,000                              | 0.020              | 0.020               | 0.020               |
| 1.0           | 5.5                                | 40,000              | 4,000                              | 0.050              | 0.050               | 40,000              | 4,000                                     | 0.030              | 0.030               | 40,000              | 3,000                              | 0.020              | 0.030               | 0.030               |
|               | 8.0                                | 32,000              | 3,000                              | 0.030              | 0.050               | 32,000              | 2,600                                     | 0.020              | 0.030               | 32,000              | 2,200                              | 0.010              | 0.020               | 0.020               |



| Coated Carbide | Carbon Steel | Alloy Steel  | Pre-hardened Steel | Temper Steel | Tool Steel   | Hardened Steel | Stainless Steel | Ti Alloy     | Cast Iron     | Al Alloy       | Copper Alloy   | Graphite       | CFRP           |
|----------------|--------------|--------------|--------------------|--------------|--------------|----------------|-----------------|--------------|---------------|----------------|----------------|----------------|----------------|
| 45 to 55 HRC   | 55 to 60 HRC | 60 to 65 HRC | 65 to 70 HRC       | 70 to 75 HRC | 75 to 80 HRC | 80 to 85 HRC   | 85 to 90 HRC    | 90 to 95 HRC | 95 to 100 HRC | 100 to 105 HRC | 105 to 110 HRC | 110 to 115 HRC | 115 to 120 HRC |



## Body

| Cat. No.               | Stock | Dimensions (mm) |            |        |          |    |            |            |  |
|------------------------|-------|-----------------|------------|--------|----------|----|------------|------------|--|
|                        |       | R               | $\phi D_c$ | $\ell$ | $\ell_2$ | L  | $\phi D_1$ | $\phi D_s$ |  |
| <b>BNBC 2R010-0034</b> | ●     | 0.1             | 0.2        | 0.2    | 0.3      | 50 | 0.17       | 4          |  |
| <b>2R010-0104</b>      | ●     | 0.1             | 0.2        | 0.2    | 1.0      | 50 | 0.17       | 4          |  |
| <b>2R020-0054</b>      | ●     | 0.2             | 0.4        | 0.3    | 0.5      | 50 | 0.37       | 4          |  |
| <b>2R020-0204</b>      | ●     | 0.2             | 0.4        | 0.3    | 2.0      | 50 | 0.37       | 4          |  |
| <b>2R030-0104</b>      | ●     | 0.3             | 0.6        | 0.4    | 1.0      | 50 | 0.57       | 4          |  |
| <b>BNBC 2R030-0304</b> | ●     | 0.3             | 0.6        | 0.4    | 3.0      | 50 | 0.57       | 4          |  |
| <b>2R050-0304</b>      | ●     | 0.5             | 1.0        | 0.6    | 3.0      | 50 | 0.97       | 4          |  |

\* Long neck types with R0.3mm or larger can be produce. For details, please contact us. Grade: BN700

## Endmill Identification

|                          |                 |                   |                |
|--------------------------|-----------------|-------------------|----------------|
| <b>BNBC 2 R030-010 4</b> |                 |                   |                |
| No. of Flutes            | Ballnose Radius | Length Below Neck | Shank Diameter |

## Recommended Cutting Conditions

1. Use a machine with high rigidity for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant.  
Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cuttings conditions as necessary as machine rigidity and other conditions may vary.
5. Depth of cut shown in the table of conditions are maximum depths. Adjust the actual depth of cut to the desired machined surface finish.

## Side Milling

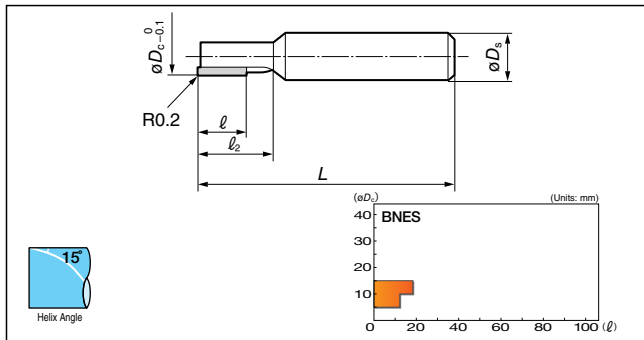
| Work Material          | Copper Alloy                           |                                  |                            |       |
|------------------------|----------------------------------------|----------------------------------|----------------------------|-------|
| Cutting Conditions     | Spindle Speed<br>( $\text{min}^{-1}$ ) | Feed Rate<br>( $\text{mm/min}$ ) | Standard Depth-of-cut (mm) |       |
| Cat. No.               |                                        |                                  | $a_p$                      | $p_t$ |
| <b>BNBC 2R010-0034</b> | 20,000                                 | 350                              | 0.01                       | 0.02  |
| <b>2R010-0104</b>      | -50,000                                | 350                              | 0.007                      | 0.015 |
| <b>BNBC 2R020-0054</b> | 20,000                                 | 800                              | 0.025                      | 0.05  |
| <b>2R020-0204</b>      | -50,000                                | 700                              | 0.02                       | 0.03  |
| <b>BNBC 2R030-0104</b> | 20,000                                 | 1,400                            | 0.05                       | 0.15  |
| <b>2R030-0304</b>      | -50,000                                | 1,200                            | 0.04                       | 0.1   |
| <b>BNBC 2R050-0304</b> | 20,000                                 | 2,200                            | 0.15                       | 0.35  |
|                        | -50,000                                |                                  |                            |       |







|                |              |             |                   |                |            |                |                 |          |           |          |              |          |      |
|----------------|--------------|-------------|-------------------|----------------|------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| Coated Carbide | Carbon Steel | Alloy Steel | Prehardened Steel | Tempered Steel | Tool Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
| ○              | ○            | ○           | ○                 | ○              | ○          | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |
| ○              | ○            | ○           | ○                 | ○              | ○          | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |

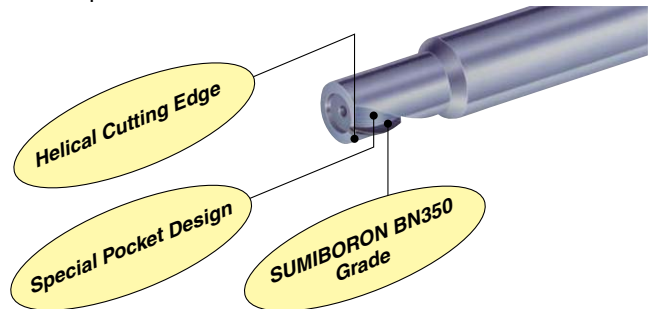


### Body

| Cat. No.         | Stock | Dimensions (mm) |        |          |     |            |
|------------------|-------|-----------------|--------|----------|-----|------------|
|                  |       | $\phi D_c$      | $\ell$ | $\ell_2$ | $L$ | $\phi D_s$ |
| <b>BNES 1060</b> | ●     | 6.0             | 7.0    | 11.0     | 60  | 10         |
| <b>1080</b>      | ●     | 8.0             | 10.0   | 14.0     | 70  | 10         |
| <b>1100</b>      | ●     | 10.0            | 12.0   | 17.0     | 75  | 12         |
| <b>1120</b>      | ●     | 12.0            | 14.0   | 20.0     | 80  | 12         |
| <b>1140</b>      | ●     | 14.0            | 16.0   | 21.5     | 80  | 16         |
| <b>BNES 1160</b> | ●     | 16.0            | 18.0   | 24.0     | 80  | 16         |

Grade: BN350

### ● Special Endmill for Hardened Steel



- For 3-dimensional profile milling, use SUMIBORON Ball Endmill BNBS type, or MOLD FINISH MASTER BNBR/BNBP Type.

### General Purpose Machines

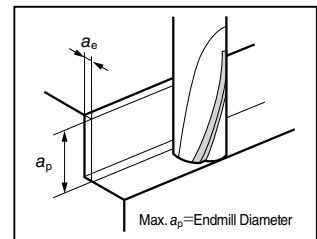
1. Use dry cutting (air blow) conditions.
2. Down cut recommended.
3. Make overhang as short as possible and, use a rigid machine.

### ● Side Milling

| Hardness of Work Material |                                        | 50 to 57 HRC                  |                         |  |
|---------------------------|----------------------------------------|-------------------------------|-------------------------|--|
| Cutting Conditions        |                                        | Cutting Speed 100 to 170m/min |                         |  |
| $D_c$ (mm)                | Spindle Speed $n$ (min <sup>-1</sup> ) | Feed Rate $v_f$ (mm/min)      | Depth of Cut $a_e$ (mm) |  |
| $\phi 6$ to 8             | 4,000 to 9,000                         | 240 to 540                    | Up to 0.1               |  |
| $\phi 10$ to 12           | 2,700 to 5,400                         | 180 to 360                    | Up to 0.15              |  |
| $\phi 14$ to 16           | 2,000 to 3,800                         | 140 to 260                    | Up to 0.2               |  |

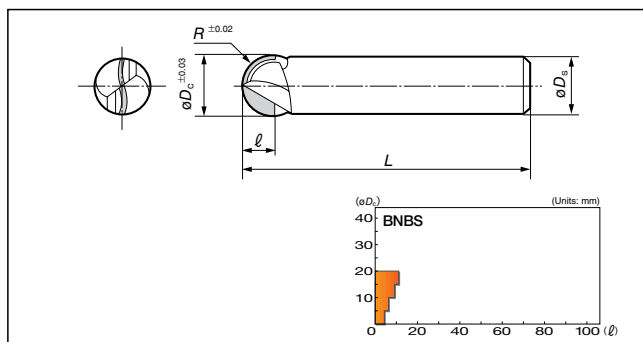
| Hardness of Work Material |                                        | 58 to 65 HRC                 |                         |  |
|---------------------------|----------------------------------------|------------------------------|-------------------------|--|
| Cutting Conditions        |                                        | Cutting Speed 80 to 150m/min |                         |  |
| $D_c$ (mm)                | Spindle Speed $n$ (min <sup>-1</sup> ) | Feed Rate $v_f$ (mm/min)     | Depth of Cut $a_e$ (mm) |  |
| $\phi 6$ to 8             | 3,200 to 8,000                         | 150 to 370                   | Up to 0.08              |  |
| $\phi 10$ to 12           | 2,100 to 4,800                         | 120 to 370                   | Up to 0.12              |  |
| $\phi 14$ to 16           | 1,600 to 3,400                         | 110 to 230                   | Up to 0.15              |  |

See L119 for details





| Coated Carbide | Carbon Steel | Alloy Steel | Prehardened Steel | Tempered Steel | Hardened Steel | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|-------------------|----------------|----------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ○              | ○            | ○           | ○                 | ○              | ○              | ○               | ○        | ○         | ○        | ○            | ○        | ○    |



- Combination of Special Grade and Spiral Cutting Edge  
The combination of special SUMIBORON grade with unique tool design is a break-through for high efficiency and smooth endmilling of hardened steels.

## Body

| Cat. No.          | Stock | Dimensions (mm) |                 |      |     |                 |
|-------------------|-------|-----------------|-----------------|------|-----|-----------------|
|                   |       | R               | øD <sub>c</sub> | l    | L   | øD <sub>s</sub> |
| <b>BNBS 2020S</b> | ●     | 1.0             | 2.0             | 1.5  | 50  | 4               |
| <b>2030S</b>      | ●     | 1.5             | 3.0             | 2.0  | 60  | 6               |
| <b>2040S</b>      | ●     | 2.0             | 4.0             | 3.0  | 70  | 6               |
| <b>2060S</b>      | ●     | 3.0             | 6.0             | 4.5  | 80  | 6               |
| <b>2080S</b>      | ●     | 4.0             | 8.0             | 5.5  | 90  | 8               |
| <b>BNBS 2100S</b> | ●     | 5.0             | 10.0            | 6.5  | 100 | 10              |
| <b>2120S</b>      | ●     | 6.0             | 12.0            | 7.5  | 110 | 12              |
| <b>2140S</b>      |       | 7.0             | 14.0            | 8.5  | 120 | 16              |
| <b>2160S</b>      |       | 8.0             | 16.0            | 9.5  | 120 | 16              |
| <b>2180S</b>      |       | 9.0             | 18.0            | 10.5 | 130 | 20              |
| <b>BNBS 2200S</b> |       | 10.0            | 20.0            | 11.5 | 130 | 20              |

Grade: BN350

## General Purpose Machines

1. Use a rigid machine and select a high cutting speed with low feed rate.
2. Use dry cutting conditions.
3. Make overhang as short as possible.
4. If work material hardness is lower than HRC50, try a coated or uncoated carbide ballnose endmill instead. (→I58)

## Radius Milling

| Work Material               | Hardened Steel (50 to 57 HRC)      |                    | Hardened Steel (58 to 65 HRC)      |                    |
|-----------------------------|------------------------------------|--------------------|------------------------------------|--------------------|
|                             | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) | Spindle Speed (min <sup>-1</sup> ) | Feed Rate (mm/min) |
| 1.0                         | 26,000                             | 1,100              | 22,000                             | 670                |
| 1.5                         | 18,000                             | 700                | 15,000                             | 450                |
| 2.0                         | 13,000                             | 530                | 11,000                             | 330                |
| 3.0                         | 8,800                              | 610                | 7,400                              | 450                |
| 4.0                         | 6,600                              | 460                | 5,600                              | 330                |
| 5.0                         | 5,300                              | 630                | 4,500                              | 400                |
| 6.0                         | 4,400                              | 530                | 3,700                              | 330                |
| 8.0                         | 3,300                              | 390                | 2,800                              | 250                |
| 10.0                        | 2,600                              | 320                | 2,200                              | 200                |
| Standard a <sub>p</sub>     | 0.01D <sub>c</sub>                 |                    | 0.01D <sub>c</sub>                 |                    |
| Depth-of-cut p <sub>r</sub> | 0.02D <sub>c</sub>                 |                    | 0.02D <sub>c</sub>                 |                    |

See L123 for details

# SUMIDIA Endmills DFE Type



2  
Flutes

4  
Flutes

2  
Flutes

4  
Flutes

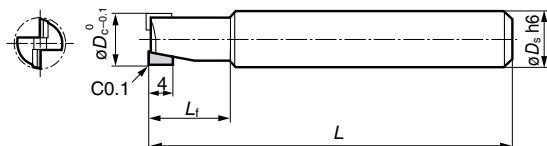
PCD  
Grade

Side Milling

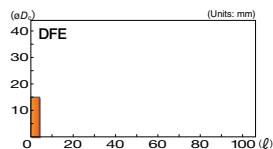
Face Milling

| Coated Carbide | Carbon Steel | Alloy Steel | Hardened Steel | 45 to 55 HRC | 55 to 60 HRC | 60 to 65 HRC | Stainless Steel | Ti Alloy | Cast Iron | Al Alloy | Copper Alloy | Graphite | CFRP |
|----------------|--------------|-------------|----------------|--------------|--------------|--------------|-----------------|----------|-----------|----------|--------------|----------|------|
| ×              | ×            | ×           | ×              | ×            | ×            | ×            | ×               | ×        | ×         | ×        | ×            | ×        | ×    |

DFE2000S (2 Flutes)



A.R. :  $\phi 4, \phi 5 = +3^\circ$   
 $\phi 8, \phi 9, \phi 10 = +5^\circ$   
 R.R. :  $0^\circ$



DFE4000S (4 Flutes)

Fig 1

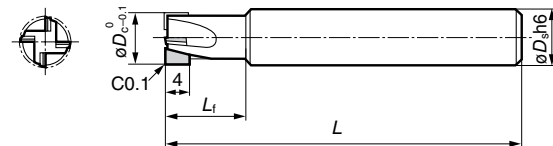
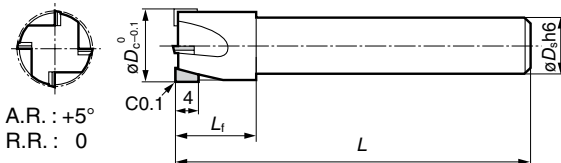


Fig 2



A.R. :  $+5^\circ$   
 R.R. :  $0^\circ$

## Body (2 Flutes)

| Cat. No.  | Stock | Dimensions (mm) |       |     |            |
|-----------|-------|-----------------|-------|-----|------------|
|           |       | $\phi D_c$      | $L_f$ | $L$ | $\phi D_s$ |
| DFE 2040S | ●     | 4.0             | 15    | 50  | 6          |
| 2050S     | ●     | 5.0             | 15    | 50  | 6          |
| 2080S     | ●     | 8.0             | 15    | 60  | 10         |
| 2090S     | ●     | 9.0             | 15    | 70  | 10         |
| 2100S     | ●     | 10.0            | 15    | 70  | 10         |

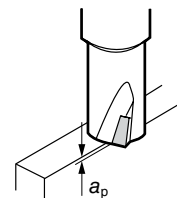
Grade: DA2200

## Body (4 Flutes)

| Cat. No.  | Stock | Dimensions (mm) |       |     |            | Fig |
|-----------|-------|-----------------|-------|-----|------------|-----|
|           |       | $\phi D_c$      | $L_f$ | $L$ | $\phi D_s$ |     |
| DFE 4090S | ●     | 9.0             | 15    | 70  | 10         | 1   |
| 4100S     | ●     | 10.0            | 15    | 70  | 10         | 1   |
| 4130GS    | ●     | 13.0            | 15    | 70  | 10         | 2   |

Grade: DA2200

- High rake Cutting Edge with DA2200 grade reduces burrs and enables high-speed, high-efficiency machining.
- For face milling of Al-alloy, such as computer parts.



## General Purpose Machines

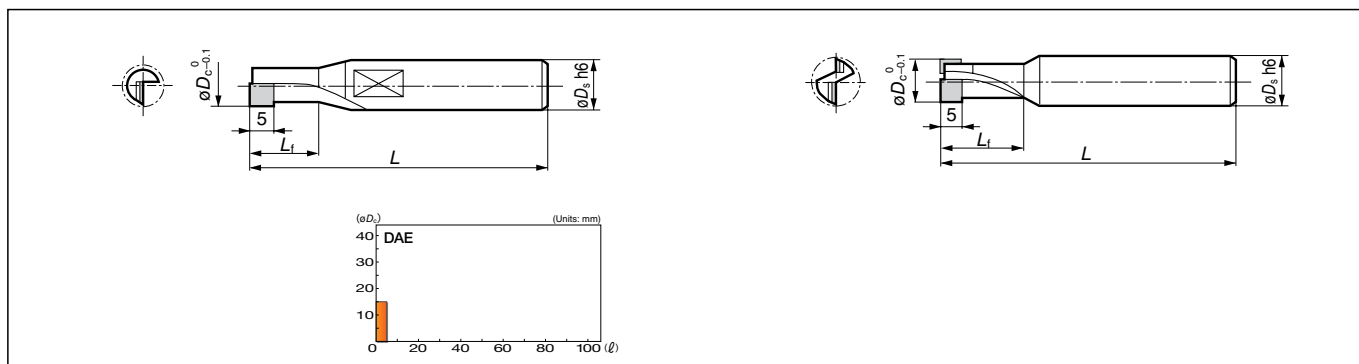
1. If the machine is not designed to achieve the recommended spindle speed, please use the max. spindle speed available.
2. If cutting noise and vibration are present, please change the cutting conditions accordingly.

## Face Milling (2 Flutes)

| Work Material                  | Aluminium Alloy<br>Copper Alloy       |                       |
|--------------------------------|---------------------------------------|-----------------------|
| Cond.                          |                                       |                       |
| $D_c$ (mm)                     | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| 4.0                            | 40,000                                | 4,000                 |
| 5.0                            | 32,000                                | 3,200                 |
| 8.0                            | 20,000                                | 2,000                 |
| 9.0                            | 17,800                                | 1,780                 |
| 10.0                           | 16,000                                | 1,600                 |
| Standard Depth of cut<br>$a_p$ | 0.4 $D_c$                             |                       |

## Face Milling (4 Flutes)

| Work Material                  | Aluminium Alloy<br>Copper Alloy       |                       |
|--------------------------------|---------------------------------------|-----------------------|
| Cond.                          |                                       |                       |
| $D_c$ (mm)                     | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| 9.0                            | 17,800                                | 3,560                 |
| 10.0                           | 16,000                                | 3,200                 |
| 13.0                           | 12,300                                | 2,460                 |
| Standard Depth of cut<br>$a_p$ | 0.4 $D_c$                             |                       |



| Cat. No.        | Stock | Dimensions (mm)   |       |     |                   |
|-----------------|-------|-------------------|-------|-----|-------------------|
|                 |       | $\varnothing D_c$ | $L_f$ | $L$ | $\varnothing D_s$ |
| <b>DAE 1040</b> | ●     | <b>4.0</b>        | 10    | 45  | 6                 |
| <b>1050</b>     | ●     | <b>5.0</b>        | 12    | 50  | 6                 |

| Cat. No.        | Stock | Dimensions (mm)   |       |     |                   |
|-----------------|-------|-------------------|-------|-----|-------------------|
|                 |       | $\varnothing D_c$ | $L_f$ | $L$ | $\varnothing D_s$ |
| <b>DAE 2060</b> | ●     | <b>6.0</b>        | 20    | 50  | 6                 |
| <b>2070</b>     | ●     | <b>7.0</b>        | 20    | 60  | 8                 |
| <b>2080</b>     | ●     | <b>8.0</b>        | 20    | 60  | 8                 |
| <b>2090</b>     | ●     | <b>9.0</b>        | 25    | 71  | 10                |
| <b>2100</b>     | ●     | <b>10.0</b>       | 25    | 71  | 10                |
| <b>DAE 2110</b> | ●     | <b>11.0</b>       | 25    | 75  | 12                |
| <b>2120</b>     | ●     | <b>12.0</b>       | 25    | 75  | 12                |

|                                |                                        |                                  |
|--------------------------------|----------------------------------------|----------------------------------|
| Work Material                  | Aluminium Alloy<br>Copper Alloy        |                                  |
| Cond.                          |                                        |                                  |
| $D_c$ (mm)                     | Spindle Speed<br>( $\text{min}^{-1}$ ) | Feed Rate<br>( $\text{mm/min}$ ) |
| 4.0                            | 6,000                                  | 210                              |
| 5.0                            | 5,000                                  | 175                              |
| Standard Depth of cut<br>$a_p$ | $0.4D_c$                               |                                  |

| Work Material               | Aluminium Alloy<br>Copper Alloy       |                       |
|-----------------------------|---------------------------------------|-----------------------|
| Cond.                       | Spindle Speed<br>(min <sup>-1</sup> ) | Feed Rate<br>(mm/min) |
| $D_c$ (mm)                  |                                       |                       |
| 6.0                         | 6,400                                 | 580                   |
| 7.0                         | 5,500                                 | 500                   |
| 8.0                         | 5,400                                 | 500                   |
| 9.0                         | 5,300                                 | 480                   |
| 10.0                        | 4,800                                 | 440                   |
| 11.0                        | 4,400                                 | 400                   |
| 12.0                        | 4,000                                 | 360                   |
| Standard Depth of Cut $a_p$ | $0.4D_c$                              |                       |