

TOOL  
UNION

# Tungsten Carbide End Mills UNIMAX Series

2023年10月発売  
Launched October 2023

超硬エンドミル ユニマックスシリーズ

UTCOT 4枚刃 不等分割 不等リード 高能率スクエアエンドミル  
UTCOT 4 Flute Highly Efficient Square End Mills with Variable Pitch and Helix

## CXES

ショート刃長追加

Models with short length of cut have been added.

PRICE  
CUT

価格改定  
New Price



UNION TOOL CO.



UTCOAT 4 枚刃 不等分割 不等リード 高能率スクエアエンドミル  
4 Flute Highly Efficient Square End Mills with Variable Pitch and Helix

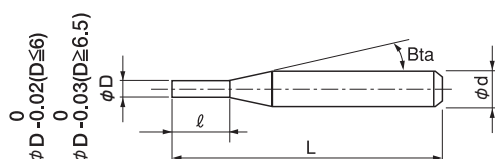
φ1～φ16



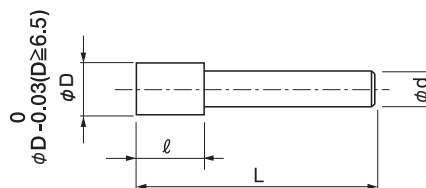
対応被削材表 (★●○の順に推奨) Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

| 被 削 材 Work Material                     |                                           |                                             |                         |             |             |             |             |                 |                             |                    |             |                |                                        |                             |                                      |                             |                                                        |
|-----------------------------------------|-------------------------------------------|---------------------------------------------|-------------------------|-------------|-------------|-------------|-------------|-----------------|-----------------------------|--------------------|-------------|----------------|----------------------------------------|-----------------------------|--------------------------------------|-----------------------------|--------------------------------------------------------|
| 炭素鋼<br>CARBON<br>STEELS<br>S45C<br>S55C | 合金鋼<br>ALLOY<br>STEELS<br>SK / SCM<br>SUS | プリハードン鋼<br>PREHARDENED<br>STEELS<br>NAK HPM | 焼入れ鋼<br>HARDENED STEELS |             |             |             |             | 鋳鉄<br>CAST IRON | アルミ合金<br>ALUMINUM<br>ALLOYS | グラファイト<br>GRAPHITE | 銅<br>COPPER | 樹脂<br>PLASTICS | ガラス入り樹脂<br>GLASS<br>FILLED<br>PLASTICS | チタン合金<br>TITANIUM<br>ALLOYS | 超耐熱合金<br>HEAT<br>RESISTANT<br>ALLOYS | 超硬合金<br>CEMENTED<br>CARBIDE | 硬脆材<br>HARD BRITTLE<br>(NON-<br>METALLIC)<br>MATERIALS |
|                                         |                                           |                                             | ～ 50<br>HRC             | ～ 55<br>HRC | ～ 60<br>HRC | ～ 65<br>HRC | ～ 70<br>HRC |                 |                             |                    |             |                |                                        |                             |                                      |                             |                                                        |
| ●                                       | ●                                         | ●                                           | ●                       | ○           |             |             |             | ○               | ○                           |                    | ●           |                |                                        | ○                           | ○                                    |                             |                                                        |

形状 A Shape A



形状 B Shape B



シャンクテーパ角は目安です。  
The shank taper angle shown is not an exact value.

## ビビリ振動抑制 Minimized vibration and chattering

不等分割・不等リード仕様でビビリ振動を抑制  
Variable Division & Helix design minimizes vibration and chattering.

不等分割  
Variable Division



$\alpha_1 \neq \alpha_2$

不等リード  
Variable Helix



$\beta_1 \neq \beta_2$

## 抜群の切りくず排出性 Excellent chip evacuation

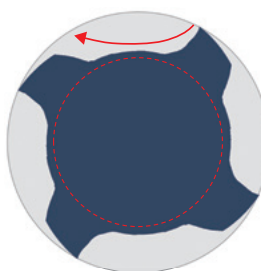
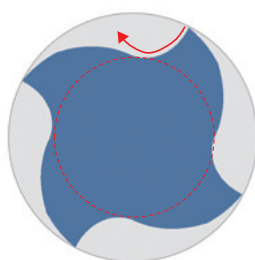
独自の溝形状により、高い切りくず排出性と工具剛性の両立を実現

Both chip evacuation and tool rigidity are offered by the implementation of a redesigned chip pocket.

従来品  
Conventional tool

CXES

溝形状  
Chip pocket shape



荒加工～仕上げまで 1 本で加工 Roughing and finishing with a single tool

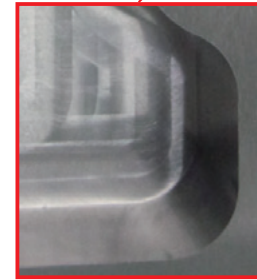
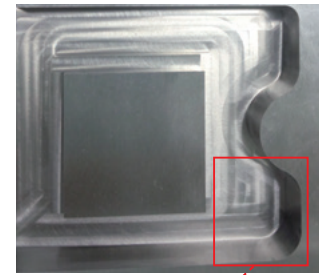
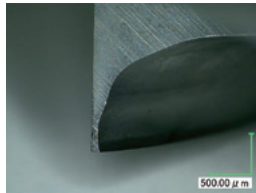
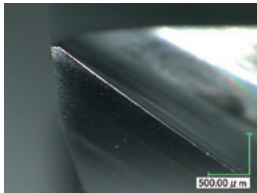
サイズ size : 105 × 92 × 20 mm

|                          | 荒加工 Roughing                   |                           | 仕上げ加工 Finishing           |              |
|--------------------------|--------------------------------|---------------------------|---------------------------|--------------|
| 使用工具<br>Tool             | 従来4枚刃<br>Conventional 4 Flutes | CXES $\phi 10 \times L25$ | CXES $\phi 10 \times L25$ |              |
| 加工部位<br>Milling Part     | 側面 Side                        |                           | 底面 Bottom                 | 側面 Side      |
| 回転速度<br>Spindle Speed    | 2,600 min <sup>-1</sup>        | 2,500 min <sup>-1</sup>   | 1,600 min <sup>-1</sup>   |              |
| 送り速度<br>Feed Rate        | 525 mm/min                     | 1,500 mm/min              | 380 mm/min                | 1,000 mm/min |
| $a_p$<br>Axial Depth     | 19.9 mm                        | 19.9 mm                   | 0.1 mm                    | 20 mm        |
| $a_e$<br>Radial Depth    | 0.7 mm                         | 1.2 mm                    | 4 mm                      | 0.1 mm       |
| クーラント<br>Coolant         | 油性切削油 Oil                      |                           | 油性切削油 Oil                 |              |
| 加工距離<br>Milling Distance | —                              | 11.5 m                    | 1.5 m                     | 0.7 m        |
| 能率*<br>Efficiency        | 1                              | 4.8                       | —                         |              |

※ 能率 : 送り速度 ×  $a_p$  ×  $a_e$  Efficiency : Feed rate ×  $a_p$  ×  $a_e$ 

荒加工では従来の4枚刃に対し 4.8倍 の加工能率を実現

4.8 times milling efficiency compared to conventional 4 flutes when roughing



仕上げ面 Finishing surface

底面、側面、どちらも加工面のムシレ、ビビリなし

Both bottom and side surfaces are burr and chatter free.

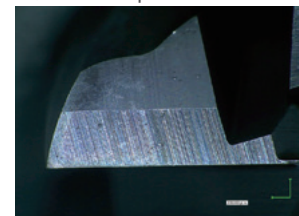
|                          | 荒加工 Roughing            | 仕上げ加工 Finishing                                                |
|--------------------------|-------------------------|----------------------------------------------------------------|
| 回転速度<br>Spindle Speed    | 4,500 min <sup>-1</sup> | 4,500 min <sup>-1</sup>                                        |
| 送り速度<br>Feed Rate        | 810 mm/min              | 400 mm/min                                                     |
| $a_p$<br>Axial Depth     | 15 mm                   | 15 mm                                                          |
| $a_e$<br>Radial Depth    | 0.6 mm                  | 2.5 mm (立壁仕上げ代0.1mm)<br>(Stand wall finishing allowance 0.1mm) |
| 突き出し長<br>Overhang Length | 20 mm                   | 20 mm                                                          |
| クーラント<br>Coolant         | 水溶性切削油 Water soluble    |                                                                |
| 加工時間<br>Cycle Time       | 1:11:29                 | 0:18:43                                                        |

加工動画  
Milling Video

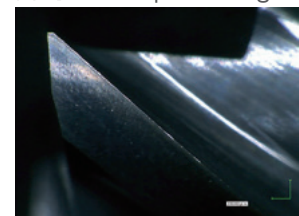
荒加工後の工具逃げ面

Tool wearing after roughing process

底刃 End profile



外周刃 Peripheral edge



仕上げ面 Finishing surface

底面、側面、どちらも加工面のムシレ、ビビリなし

Both bottom and side surfaces are burr and chatter free.

UTCOAT 4 枚刃 不等分割 不等リード 高能率スクエアエンドミル  
4 Flute Highly Efficient Square End Mills with Variable Pitch and Helix

合計 66 型番 Total 66 models

単位 Unit (mm)

|   | 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | 刃長<br>Length<br>of Cut<br>ℓ | シャンクテーパ角<br>Shank Taper<br>Angle<br>Bta | 全長<br>Overall<br>Length<br>L | シャンク径<br>Shank<br>Diameter<br>φd | 形状<br>Shape | 希望小売価格<br>Suggested<br>Retail Price<br>¥ |
|---|-----------------------|---------------------------------|-----------------------------|-----------------------------------------|------------------------------|----------------------------------|-------------|------------------------------------------|
| ※ | CXES 4010-0150        | 1                               | 1.5                         | 16°                                     | 50                           | 4                                | A           | 4,240                                    |
| □ | CXES 4010-0250        |                                 | 2.5                         |                                         | 50                           | 4                                |             | 4,240                                    |
| □ | CXES 4010-0300        |                                 | 3                           |                                         | 60                           | 4                                |             | 4,670                                    |
| □ | CXES 4010-0400        |                                 | 4                           |                                         | 60                           | 4                                |             | 5,140                                    |
| □ | CXES 4010-0500        |                                 | 5                           |                                         | 60                           | 4                                |             | 6,680                                    |
| ※ | CXES 4015-0225        | 1.5                             | 2.25                        | 16°                                     | 50                           | 4                                | A           | 4,240                                    |
| □ | CXES 4015-0375        |                                 | 3.75                        |                                         | 50                           | 4                                |             | 4,240                                    |
| □ | CXES 4015-0600        |                                 | 6                           |                                         | 50                           | 4                                |             | 5,140                                    |
| ※ | CXES 4020-0300        | 2                               | 3                           | 16°                                     | 50                           | 4                                | A           | 3,970                                    |
| □ | CXES 4020-0500        |                                 | 5                           |                                         | 50                           | 4                                |             | 3,970                                    |
| □ | CXES 4020-0600        |                                 | 6                           |                                         | 60                           | 4                                |             | 4,360                                    |
| □ | CXES 4020-0800        |                                 | 8                           |                                         | 60                           | 4                                |             | 4,800                                    |
| □ | CXES 4020-1000        |                                 | 10                          |                                         | 60                           | 4                                |             | 6,250                                    |
| ※ | CXES 4025-0375        | 2.5                             | 3.75                        | 16°                                     | 50                           | 4                                | A           | 3,970                                    |
| □ | CXES 4025-0625        |                                 | 6.25                        |                                         | 50                           | 4                                |             | 3,970                                    |
| □ | CXES 4025-1000        |                                 | 10                          |                                         | 50                           | 4                                |             | 4,800                                    |
| ※ | CXES 4030-0450        | 3                               | 4.5                         | 16°                                     | 50                           | 6                                | A           | 4,550                                    |
| □ | CXES 4030-0750        |                                 | 7.5                         |                                         | 50                           | 6                                |             | 4,550                                    |
| □ | CXES 4030-0900        |                                 | 9                           |                                         | 60                           | 6                                |             | 5,010                                    |
| □ | CXES 4030-1200        |                                 | 12                          |                                         | 60                           | 6                                |             | 5,510                                    |
| □ | CXES 4030-1500        |                                 | 15                          |                                         | 60                           | 6                                |             | 7,160                                    |
| □ | CXES 4035-0900        | 3.5                             | 9                           | 16°                                     | 60                           | 6                                | A           | 5,380                                    |
| ※ | CXES 4040-0600        | 4                               | 6                           | 16°                                     | 50                           | 6                                | A           | 4,780                                    |
| □ | CXES 4040-1000        |                                 | 10                          |                                         | 50                           | 6                                |             | 4,780                                    |
| □ | CXES 4040-1200        |                                 | 12                          |                                         | 60                           | 6                                |             | 5,260                                    |
| □ | CXES 4040-1600        |                                 | 16                          |                                         | 60                           | 6                                |             | 5,790                                    |
| □ | CXES 4040-2000        |                                 | 20                          |                                         | 60                           | 6                                |             | 7,520                                    |
| □ | CXES 4045-1150        | 4.5                             | 11.5                        | 16°                                     | 60                           | 6                                | A           | 5,750                                    |
| ※ | CXES 4050-0750        | 5                               | 7.5                         | 16°                                     | 50                           | 6                                | A           | 5,140                                    |
| □ | CXES 4050-1250        |                                 | 12.5                        |                                         | 50                           | 6                                |             | 5,140                                    |
| □ | CXES 4050-1500        |                                 | 15                          |                                         | 60                           | 6                                |             | 5,650                                    |
| □ | CXES 4050-2000        |                                 | 20                          |                                         | 60                           | 6                                |             | 6,210                                    |
| □ | CXES 4050-2500        |                                 | 25                          |                                         | 70                           | 6                                |             | 8,080                                    |
| □ | CXES 4055-1400        | 5.5                             | 14                          | 16°                                     | 60                           | 6                                | A           | 5,930                                    |
| ※ | CXES 4060-0900        | 6                               | 9                           | —                                       | 50                           | 6                                | A           | 5,530                                    |
| □ | CXES 4060-1500        |                                 | 15                          |                                         | 50                           | 6                                |             | 5,530                                    |
| □ | CXES 4060-1800        |                                 | 18                          |                                         | 60                           | 6                                |             | 6,080                                    |
| □ | CXES 4060-2400        |                                 | 24                          |                                         | 70                           | 6                                |             | 7,000                                    |
| □ | CXES 4060-3000        |                                 | 30                          |                                         | 80                           | 6                                |             | 9,100                                    |
| □ | CXES 4065-1650        | 6.5                             | 16.5                        | 16°                                     | 60                           | 8                                | A           | 9,580                                    |
|   | CXES 4070-1050        | 7                               | 10.5                        | —                                       | 100                          | 6                                | B           | 14,880                                   |
| □ | CXES 4070-1750        |                                 | 17.5                        | 16°                                     | 70                           | 8                                | A           | 8,400                                    |
| □ | CXES 4075-1900        | 7.5                             | 19                          | 16°                                     | 60                           | 8                                | A           | 9,580                                    |

※追加型番 Additional model □価格改定 New Price

UTCOAT 4 枚刃 不等分割 不等リード 高能率スクエアエンドミル  
4 Flute Highly Efficient Square End Mills with Variable Pitch and Helix

|   | 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | 刃長<br>Length<br>of Cut<br>ℓ | シャンクテーパ角<br>Shank Taper<br>Angle<br>Bta | 全長<br>Overall<br>Length<br>L | シャンク径<br>Shank<br>Diameter<br>φd | 形状<br>Shape | 希望小売価格<br>Suggested<br>Retail Price<br>¥ |
|---|-----------------------|---------------------------------|-----------------------------|-----------------------------------------|------------------------------|----------------------------------|-------------|------------------------------------------|
| ※ | CXES 4080-1200        | 8                               | 12                          | —                                       | 60                           | 8                                | A           | 8,400                                    |
| □ | CXES 4080-2000        |                                 | 20                          |                                         | 60                           | 8                                |             | 8,400                                    |
| □ | CXES 4080-2400        |                                 | 24                          |                                         | 70                           | 8                                |             | 9,240                                    |
| □ | CXES 4080-3200        |                                 | 32                          |                                         | 80                           | 8                                |             | 12,480                                   |
| □ | CXES 4080-4000        |                                 | 40                          |                                         | 90                           | 8                                |             | 16,230                                   |
| □ | CXES 4085-2150        | 8.5                             | 21.5                        | 16°                                     | 70                           | 10                               | A           | 11,100                                   |
|   | CXES 4090-1350        | 9                               | 13.5                        | —                                       | 140                          | 8                                | B           | 19,390                                   |
| □ | CXES 4090-2250        |                                 | 22.5                        | 16°                                     | 80                           | 10                               | A           | 10,000                                   |
| □ | CXES 4095-2400        | 9.5                             | 24                          | 16°                                     | 70                           | 10                               | A           | 11,100                                   |
| ※ | CXES 4100-1500        | 10                              | 15                          | —                                       | 70                           | 10                               | A           | 10,000                                   |
| □ | CXES 4100-2500        |                                 | 25                          |                                         | 70                           | 10                               |             | 10,000                                   |
| □ | CXES 4100-3000        |                                 | 30                          |                                         | 80                           | 10                               |             | 11,000                                   |
| □ | CXES 4100-4000        |                                 | 40                          |                                         | 90                           | 10                               |             | 14,860                                   |
| □ | CXES 4100-5000        |                                 | 50                          |                                         | 100                          | 10                               |             | 19,320                                   |
|   | CXES 4110-1650        | 11                              | 16.5                        | —                                       | 150                          | 10                               | B           | 24,200                                   |
| □ | CXES 4110-2750        |                                 | 27.5                        | 16°                                     | 100                          | 12                               | A           | 14,240                                   |
| ※ | CXES 4120-1800        | 12                              | 18                          | —                                       | 90                           | 12                               | A           | 14,240                                   |
| □ | CXES 4120-3000        |                                 | 30                          |                                         | 90                           | 12                               |             | 14,240                                   |
| □ | CXES 4120-3600        |                                 | 36                          |                                         | 100                          | 12                               |             | 15,670                                   |
| □ | CXES 4120-4800        |                                 | 48                          |                                         | 110                          | 12                               |             | 21,160                                   |
| □ | CXES 4120-6000        |                                 | 60                          |                                         | 120                          | 12                               |             | 27,510                                   |
|   | CXES 4130-1950        | 13                              | 19.5                        | —                                       | 160                          | 12                               | B           | 30,390                                   |
| □ | CXES 4160-4000        | 16                              | 40                          | —                                       | 110                          | 16                               | A           | 43,320                                   |

※追加型番 Additional model □価格改定 New Price

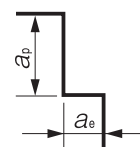
## 側面切削 Side Milling

| 被削材<br>WORK MATERIAL  |                                   |                                | 炭素鋼<br>CARBON STEELS<br>S45C / S50C焼鈍材 Annealed Materials<br>(~225HB) |                                  |                                          |                                           | 合金鋼<br>ALLOY STEELS<br>SK / SCM焼鈍材 Annealed Materials<br>(225~325HB) |                                  |                                          |                                           | ステンレス鋼<br>STAINLESS STEELS<br>SUS304<br>注: 切削油の使用が必須です。<br>* Use water soluble or oil coolant. |                                  |                                          |                                           |
|-----------------------|-----------------------------------|--------------------------------|-----------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|----------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                      | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                     | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                               | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) |
| 4010-0150             | 1                                 | 1.5                            | 18,000                                                                | 620                              | 1.5                                      | 0.2                                       | 18,000                                                               | 460                              | 1.5                                      | 0.2                                       | 14,500                                                                                         | 320                              | 1.5                                      | 0.1                                       |
| 4010-0250             |                                   | 2.5                            | 18,000                                                                | 620                              | 2.5                                      | 0.2                                       | 18,000                                                               | 460                              | 2.5                                      | 0.2                                       | 14,500                                                                                         | 320                              | 2.5                                      | 0.1                                       |
| 4010-0300             |                                   | 3                              | 18,000                                                                | 620                              | 3                                        | 0.03                                      | 18,000                                                               | 460                              | 3                                        | 0.03                                      | 14,300                                                                                         | 310                              | 3                                        | 0.015                                     |
| 4010-0400             |                                   | 4                              | 18,000                                                                | 620                              | 4                                        | 0.02                                      | 18,000                                                               | 460                              | 4                                        | 0.02                                      | 13,900                                                                                         | 290                              | 4                                        | 0.01                                      |
| 4010-0500             |                                   | 5                              | 18,000                                                                | 620                              | 5                                        | 0.02                                      | 18,000                                                               | 460                              | 5                                        | 0.02                                      | 13,900                                                                                         | 290                              | 5                                        | 0.01                                      |
| 4015-0225             | 1.5                               | 2.25                           | 13,500                                                                | 770                              | 2.25                                     | 0.3                                       | 13,500                                                               | 570                              | 2.25                                     | 0.3                                       | 13,300                                                                                         | 340                              | 2.25                                     | 0.15                                      |
| 4015-0375             |                                   | 3.75                           | 13,500                                                                | 770                              | 3.75                                     | 0.3                                       | 13,500                                                               | 570                              | 3.75                                     | 0.3                                       | 13,300                                                                                         | 340                              | 3.75                                     | 0.15                                      |
| 4015-0600             |                                   | 6                              | 13,500                                                                | 770                              | 6                                        | 0.03                                      | 13,500                                                               | 570                              | 6                                        | 0.03                                      | 12,700                                                                                         | 310                              | 6                                        | 0.015                                     |
| 4020-0300             | 2                                 | 3                              | 11,000                                                                | 930                              | 3                                        | 0.4                                       | 11,000                                                               | 690                              | 3                                        | 0.4                                       | 12,200                                                                                         | 360                              | 3                                        | 0.2                                       |
| 4020-0500             |                                   | 5                              | 11,000                                                                | 930                              | 5                                        | 0.4                                       | 11,000                                                               | 690                              | 5                                        | 0.4                                       | 12,200                                                                                         | 360                              | 5                                        | 0.2                                       |
| 4020-0600             |                                   | 6                              | 11,000                                                                | 930                              | 6                                        | 0.06                                      | 11,000                                                               | 690                              | 6                                        | 0.06                                      | 12,000                                                                                         | 340                              | 6                                        | 0.03                                      |
| 4020-0800             |                                   | 8                              | 11,000                                                                | 930                              | 8                                        | 0.04                                      | 11,000                                                               | 690                              | 8                                        | 0.04                                      | 11,600                                                                                         | 300                              | 8                                        | 0.02                                      |
| 4020-1000             |                                   | 10                             | 11,000                                                                | 930                              | 10                                       | 0.04                                      | 11,000                                                               | 690                              | 10                                       | 0.04                                      | 11,600                                                                                         | 300                              | 10                                       | 0.02                                      |
| 4025-0375             | 2.5                               | 3.75                           | 9,500                                                                 | 1,060                            | 3.75                                     | 0.5                                       | 9,500                                                                | 800                              | 3.75                                     | 0.5                                       | 11,000                                                                                         | 490                              | 3.75                                     | 0.25                                      |
| 4025-0625             |                                   | 6.25                           | 9,500                                                                 | 1,060                            | 6.25                                     | 0.5                                       | 9,500                                                                | 800                              | 6.25                                     | 0.5                                       | 11,000                                                                                         | 490                              | 6.25                                     | 0.25                                      |
| 4025-1000             |                                   | 10                             | 9,500                                                                 | 1,060                            | 10                                       | 0.05                                      | 9,500                                                                | 800                              | 10                                       | 0.05                                      | 10,400                                                                                         | 430                              | 10                                       | 0.025                                     |
| 4030-0450             | 3                                 | 4.5                            | 8,500                                                                 | 1,200                            | 4.5                                      | 0.6                                       | 8,500                                                                | 900                              | 4.5                                      | 0.6                                       | 10,000                                                                                         | 640                              | 4.5                                      | 0.3                                       |
| 4030-0750             |                                   | 7.5                            | 8,500                                                                 | 1,200                            | 7.5                                      | 0.6                                       | 8,500                                                                | 900                              | 7.5                                      | 0.6                                       | 10,000                                                                                         | 640                              | 7.5                                      | 0.3                                       |
| 4030-0900             |                                   | 9                              | 8,500                                                                 | 1,200                            | 9                                        | 0.3                                       | 8,500                                                                | 900                              | 9                                        | 0.3                                       | 9,100                                                                                          | 580                              | 9                                        | 0.15                                      |
| 4030-1200             |                                   | 12                             | 8,500                                                                 | 1,200                            | 12                                       | 0.06                                      | 8,500                                                                | 900                              | 12                                       | 0.06                                      | 7,300                                                                                          | 460                              | 12                                       | 0.03                                      |
| 4030-1500             |                                   | 15                             | 8,500                                                                 | 1,200                            | 15                                       | 0.06                                      | 8,500                                                                | 900                              | 15                                       | 0.06                                      | 7,300                                                                                          | 460                              | 15                                       | 0.03                                      |
| 4035-0900             | 3.5                               | 9                              | 7,800                                                                 | 1,250                            | 9                                        | 0.7                                       | 7,500                                                                | 950                              | 9                                        | 0.7                                       | 8,600                                                                                          | 680                              | 9                                        | 0.35                                      |
| 4040-0600             | 4                                 | 6                              | 7,200                                                                 | 1,350                            | 6                                        | 0.8                                       | 6,700                                                                | 1,000                            | 6                                        | 0.8                                       | 7,500                                                                                          | 730                              | 6                                        | 0.4                                       |
| 4040-1000             |                                   | 10                             | 7,200                                                                 | 1,350                            | 10                                       | 0.8                                       | 6,700                                                                | 1,000                            | 10                                       | 0.8                                       | 7,500                                                                                          | 730                              | 10                                       | 0.4                                       |
| 4040-1200             |                                   | 12                             | 7,200                                                                 | 1,350                            | 12                                       | 0.4                                       | 6,700                                                                | 1,000                            | 12                                       | 0.4                                       | 6,600                                                                                          | 640                              | 12                                       | 0.2                                       |
| 4040-1600             |                                   | 16                             | 7,200                                                                 | 1,350                            | 16                                       | 0.08                                      | 6,700                                                                | 1,000                            | 16                                       | 0.08                                      | 4,800                                                                                          | 460                              | 16                                       | 0.08                                      |
| 4040-2000             |                                   | 20                             | 7,200                                                                 | 1,350                            | 20                                       | 0.08                                      | 6,700                                                                | 1,000                            | 20                                       | 0.08                                      | 4,800                                                                                          | 460                              | 20                                       | 0.08                                      |
| 4045-1150             | 4.5                               | 11.5                           | 6,550                                                                 | 1,400                            | 11.5                                     | 0.9                                       | 6,000                                                                | 1,050                            | 11.5                                     | 0.9                                       | 6,300                                                                                          | 770                              | 11.5                                     | 0.45                                      |
| 4050-0750             | 5                                 | 7.5                            | 6,000                                                                 | 1,500                            | 7.5                                      | 1                                         | 5,400                                                                | 1,100                            | 7.5                                      | 1                                         | 5,400                                                                                          | 810                              | 7.5                                      | 0.5                                       |
| 4050-1250             |                                   | 12.5                           | 6,000                                                                 | 1,500                            | 12.5                                     | 1                                         | 5,400                                                                | 1,100                            | 12.5                                     | 1                                         | 5,400                                                                                          | 810                              | 12.5                                     | 0.5                                       |
| 4050-1500             |                                   | 15                             | 6,000                                                                 | 1,500                            | 15                                       | 0.5                                       | 5,400                                                                | 1,100                            | 15                                       | 0.5                                       | 4,600                                                                                          | 690                              | 15                                       | 0.25                                      |
| 4050-2000             |                                   | 20                             | 6,000                                                                 | 1,500                            | 20                                       | 0.1                                       | 5,400                                                                | 1,100                            | 20                                       | 0.1                                       | 3,700                                                                                          | 450                              | 20                                       | 0.1                                       |
| 4050-2500             |                                   | 25                             | 6,000                                                                 | 1,500                            | 25                                       | 0.1                                       | 5,400                                                                | 1,100                            | 25                                       | 0.1                                       | 3,700                                                                                          | 450                              | 25                                       | 0.1                                       |
| 4055-1400             | 5.5                               | 14                             | 5,450                                                                 | 1,550                            | 14                                       | 1.1                                       | 4,900                                                                | 1,150                            | 14                                       | 1.1                                       | 4,900                                                                                          | 810                              | 14                                       | 0.55                                      |
| 4060-0900             | 6                                 | 9                              | 5,000                                                                 | 1,600                            | 9                                        | 1.2                                       | 4,500                                                                | 1,200                            | 9                                        | 1.2                                       | 4,500                                                                                          | 810                              | 9                                        | 0.6                                       |
| 4060-1500             |                                   | 15                             | 5,000                                                                 | 1,600                            | 15                                       | 1.2                                       | 4,500                                                                | 1,200                            | 15                                       | 1.2                                       | 4,500                                                                                          | 810                              | 15                                       | 0.6                                       |
| 4060-1800             |                                   | 18                             | 5,000                                                                 | 1,600                            | 18                                       | 0.6                                       | 4,500                                                                | 1,200                            | 18                                       | 0.6                                       | 3,700                                                                                          | 660                              | 18                                       | 0.3                                       |
| 4060-2400             |                                   | 24                             | 5,000                                                                 | 1,400                            | 24                                       | 0.12                                      | 4,500                                                                | 1,050                            | 24                                       | 0.12                                      | 2,900                                                                                          | 360                              | 24                                       | 0.12                                      |
| 4060-3000             |                                   | 30                             | 5,000                                                                 | 1,400                            | 30                                       | 0.12                                      | 4,500                                                                | 1,050                            | 30                                       | 0.12                                      | 2,900                                                                                          | 360                              | 30                                       | 0.12                                      |
| 4065-1650             | 6.5                               | 16.5                           | 4,400                                                                 | 1,500                            | 16.5                                     | 1.3                                       | 3,950                                                                | 1,150                            | 16.5                                     | 1.3                                       | 3,950                                                                                          | 780                              | 16.5                                     | 0.65                                      |
| 4070-1050             | 7                                 | 10.5                           | 3,900                                                                 | 1,450                            | 10.5                                     | 0.7                                       | 3,550                                                                | 1,120                            | 10.5                                     | 0.7                                       | 3,550                                                                                          | 760                              | 10.5                                     | 0.35                                      |
| 4070-1750             |                                   | 17.5                           | 3,900                                                                 | 1,450                            | 17.5                                     | 1.4                                       | 3,550                                                                | 1,120                            | 17.5                                     | 1.4                                       | 3,550                                                                                          | 760                              | 17.5                                     | 0.7                                       |
| 4075-1900             | 7.5                               | 19                             | 3,500                                                                 | 1,400                            | 19                                       | 1.5                                       | 3,250                                                                | 1,100                            | 19                                       | 1.5                                       | 3,250                                                                                          | 750                              | 19                                       | 0.75                                      |

## 側面切削 Side Milling

| 被削材<br>WORK MATERIAL  |                                   |                                | プリハードン鋼<br>PREHARDENED STEELS<br>HPM / NAK<br>(30~45HRC) |                                  |                                 |                                  | 焼入れ鋼<br>HARDENED STEELS<br>SKD / SKT / STAVAX<br>(45~55HRC) |                                  |                                 |                                  |
|-----------------------|-----------------------------------|--------------------------------|----------------------------------------------------------|----------------------------------|---------------------------------|----------------------------------|-------------------------------------------------------------|----------------------------------|---------------------------------|----------------------------------|
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )         | 送り速度<br>Feed<br>Rate<br>(mm/min) | $a_p$<br>Axial<br>Depth<br>(mm) | $a_e$<br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )            | 送り速度<br>Feed<br>Rate<br>(mm/min) | $a_p$<br>Axial<br>Depth<br>(mm) | $a_e$<br>Radial<br>Depth<br>(mm) |
| 4010-0150             | 1                                 | 1.5                            | 12,900                                                   | 320                              | 1.5                             | 0.2                              | 12,900                                                      | 180                              | 1.5                             | 0.05                             |
| 4010-0250             |                                   | 2.5                            | 12,900                                                   | 320                              | 2.5                             | 0.2                              | 12,900                                                      | 180                              | 2.5                             | 0.05                             |
| 4010-0300             |                                   | 3                              | 12,800                                                   | 320                              | 3                               | 0.03                             | 12,900                                                      | 180                              | 3                               | 0.015                            |
| 4010-0400             |                                   | 4                              | 12,600                                                   | 320                              | 4                               | 0.02                             | 12,900                                                      | 180                              | 4                               | 0.01                             |
| 4010-0500             |                                   | 5                              | 12,600                                                   | 320                              | 5                               | 0.01                             | 12,900                                                      | 180                              | 5                               | 0.005                            |
| 4015-0225             | 1.5                               | 2.25                           | 10,500                                                   | 390                              | 2.25                            | 0.3                              | 9,300                                                       | 280                              | 2.25                            | 0.075                            |
| 4015-0375             |                                   | 3.75                           | 10,500                                                   | 390                              | 3.75                            | 0.3                              | 9,300                                                       | 280                              | 3.75                            | 0.075                            |
| 4015-0600             |                                   | 6                              | 10,200                                                   | 390                              | 6                               | 0.03                             | 9,300                                                       | 280                              | 6                               | 0.015                            |
| 4020-0300             | 2                                 | 3                              | 9,350                                                    | 450                              | 3                               | 0.4                              | 7,600                                                       | 390                              | 3                               | 0.1                              |
| 4020-0500             |                                   | 5                              | 9,350                                                    | 450                              | 5                               | 0.4                              | 7,600                                                       | 390                              | 5                               | 0.1                              |
| 4020-0600             |                                   | 6                              | 9,250                                                    | 450                              | 6                               | 0.06                             | 7,600                                                       | 390                              | 6                               | 0.03                             |
| 4020-0800             |                                   | 8                              | 9,050                                                    | 450                              | 8                               | 0.04                             | 7,600                                                       | 390                              | 8                               | 0.02                             |
| 4020-1000             |                                   | 10                             | 9,050                                                    | 450                              | 10                              | 0.01                             | 7,600                                                       | 390                              | 10                              | 0.01                             |
| 4025-0375             | 2.5                               | 3.75                           | 8,300                                                    | 540                              | 3.75                            | 0.5                              | 6,500                                                       | 510                              | 3.75                            | 0.125                            |
| 4025-0625             |                                   | 6.25                           | 8,300                                                    | 540                              | 6.25                            | 0.5                              | 6,500                                                       | 510                              | 6.25                            | 0.125                            |
| 4025-1000             |                                   | 10                             | 8,000                                                    | 540                              | 10                              | 0.05                             | 6,500                                                       | 510                              | 10                              | 0.025                            |
| 4030-0450             | 3                                 | 4.5                            | 7,400                                                    | 630                              | 4.5                             | 0.6                              | 5,900                                                       | 500                              | 4.5                             | 0.3                              |
| 4030-0750             |                                   | 7.5                            | 7,400                                                    | 630                              | 7.5                             | 0.6                              | 5,900                                                       | 500                              | 7.5                             | 0.3                              |
| 4030-0900             |                                   | 9                              | 7,050                                                    | 630                              | 9                               | 0.3                              | 5,900                                                       | 500                              | 9                               | 0.15                             |
| 4030-1200             |                                   | 12                             | 6,350                                                    | 630                              | 12                              | 0.06                             | 5,900                                                       | 500                              | 12                              | 0.03                             |
| 4030-1500             |                                   | 15                             | 6,350                                                    | 630                              | 15                              | 0.03                             | 5,900                                                       | 500                              | 15                              | 0.015                            |
| 4035-0900             | 3.5                               | 9                              | 6,500                                                    | 640                              | 9                               | 0.7                              | 5,200                                                       | 510                              | 9                               | 0.35                             |
| 4040-0600             | 4                                 | 6                              | 5,900                                                    | 650                              | 6                               | 0.8                              | 4,700                                                       | 520                              | 6                               | 0.4                              |
| 4040-1000             |                                   | 10                             | 5,900                                                    | 650                              | 10                              | 0.8                              | 4,700                                                       | 520                              | 10                              | 0.4                              |
| 4040-1200             |                                   | 12                             | 5,500                                                    | 650                              | 12                              | 0.4                              | 4,700                                                       | 520                              | 12                              | 0.2                              |
| 4040-1600             |                                   | 16                             | 4,700                                                    | 580                              | 16                              | 0.08                             | 4,700                                                       | 520                              | 16                              | 0.04                             |
| 4040-2000             |                                   | 20                             | 4,700                                                    | 580                              | 20                              | 0.04                             | 4,700                                                       | 520                              | 20                              | 0.02                             |
| 4045-1150             | 4.5                               | 11.5                           | 5,300                                                    | 660                              | 11.5                            | 0.9                              | 4,250                                                       | 520                              | 11.5                            | 0.45                             |
| 4050-0750             | 5                                 | 7.5                            | 4,800                                                    | 680                              | 7.5                             | 1                                | 3,850                                                       | 530                              | 7.5                             | 0.5                              |
| 4050-1250             |                                   | 12.5                           | 4,800                                                    | 680                              | 12.5                            | 1                                | 3,850                                                       | 530                              | 12.5                            | 0.5                              |
| 4050-1500             |                                   | 15                             | 4,400                                                    | 680                              | 15                              | 0.5                              | 3,850                                                       | 530                              | 15                              | 0.25                             |
| 4050-2000             |                                   | 20                             | 3,600                                                    | 580                              | 20                              | 0.1                              | 3,850                                                       | 530                              | 20                              | 0.05                             |
| 4050-2500             |                                   | 25                             | 3,600                                                    | 580                              | 25                              | 0.05                             | 3,850                                                       | 530                              | 25                              | 0.025                            |
| 4055-1400             | 5.5                               | 14                             | 4,350                                                    | 680                              | 14                              | 1.1                              | 3,500                                                       | 530                              | 14                              | 0.55                             |
| 4060-0900             | 6                                 | 9                              | 4,000                                                    | 680                              | 9                               | 1.2                              | 3,200                                                       | 540                              | 9                               | 0.6                              |
| 4060-1500             |                                   | 15                             | 4,000                                                    | 680                              | 15                              | 1.2                              | 3,200                                                       | 540                              | 15                              | 0.6                              |
| 4060-1800             |                                   | 18                             | 3,600                                                    | 680                              | 18                              | 0.6                              | 3,200                                                       | 540                              | 18                              | 0.3                              |
| 4060-2400             |                                   | 24                             | 2,800                                                    | 560                              | 24                              | 0.12                             | 3,200                                                       | 540                              | 24                              | 0.06                             |
| 4060-3000             |                                   | 30                             | 2,800                                                    | 560                              | 30                              | 0.06                             | 3,200                                                       | 540                              | 30                              | 0.03                             |
| 4065-1650             | 6.5                               | 16.5                           | 3,500                                                    | 660                              | 16.5                            | 1.3                              | 2,850                                                       | 530                              | 16.5                            | 0.65                             |
| 4070-1050             | 7                                 | 10.5                           | 3,150                                                    | 640                              | 10.5                            | 0.7                              | 2,550                                                       | 520                              | 10.5                            | 0.35                             |
| 4070-1750             |                                   | 17.5                           | 3,150                                                    | 640                              | 17.5                            | 1.4                              | 2,550                                                       | 520                              | 17.5                            | 0.7                              |
| 4075-1900             | 7.5                               | 19                             | 2,850                                                    | 620                              | 19                              | 1.5                              | 2,250                                                       | 510                              | 19                              | 0.75                             |

側面切削 Side Milling



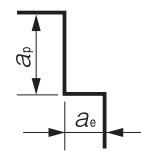
## 側面切削 Side Milling

| 被削材<br>WORK MATERIAL  |                                   |                                | 炭素鋼<br>CARBON STEELS<br>S45C / S50C焼鈍材 Annealed Materials<br>(~225HB) |                                  |                                          |                                           | 合金鋼<br>ALLOY STEELS<br>SK / SCM焼鈍材 Annealed Materials<br>(225~325HB) |                                  |                                          |                                           | ステンレス鋼<br>STAINLESS STEELS<br>SUS304<br>注: 切削油の使用が必須です。<br>* Use water soluble or oil coolant. |                                  |                                          |                                           |
|-----------------------|-----------------------------------|--------------------------------|-----------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|----------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                      | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                     | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                               | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | a <sub>e</sub><br>Radial<br>Depth<br>(mm) |
| 4080-1200             | 8                                 | 12                             | 3,000                                                                 | 1,300                            | 12                                       | 1.6                                       | 2,900                                                                | 1,050                            | 12                                       | 1.6                                       | 2,900                                                                                          | 720                              | 12                                       | 0.8                                       |
| 4080-2000             |                                   | 20                             | 3,000                                                                 | 1,300                            | 20                                       | 1.6                                       | 2,900                                                                | 1,050                            | 20                                       | 1.6                                       | 2,900                                                                                          | 720                              | 20                                       | 0.8                                       |
| 4080-2400             |                                   | 24                             | 2,800                                                                 | 1,230                            | 24                                       | 0.8                                       | 2,600                                                                | 1,050                            | 24                                       | 0.8                                       | 2,600                                                                                          | 600                              | 24                                       | 0.4                                       |
| 4080-3200             |                                   | 32                             | 2,400                                                                 | 1,090                            | 32                                       | 0.16                                      | 2,000                                                                | 800                              | 32                                       | 0.16                                      | 2,100                                                                                          | 360                              | 32                                       | 0.16                                      |
| 4080-4000             |                                   | 40                             | 2,400                                                                 | 1,090                            | 40                                       | 0.16                                      | 2,000                                                                | 800                              | 40                                       | 0.16                                      | 2,100                                                                                          | 360                              | 40                                       | 0.16                                      |
| 4085-2150             | 8.5                               | 21.5                           | 2,550                                                                 | 1,200                            | 21.5                                     | 1.7                                       | 2,450                                                                | 1,000                            | 21.5                                     | 1.7                                       | 2,450                                                                                          | 680                              | 21.5                                     | 0.85                                      |
| 4090-1350             | 9                                 | 13.5                           | 2,250                                                                 | 1,150                            | 13.5                                     | 0.9                                       | 2,150                                                                | 980                              | 13.5                                     | 0.9                                       | 2,150                                                                                          | 650                              | 13.5                                     | 0.45                                      |
| 4090-2250             |                                   | 22.5                           | 2,250                                                                 | 1,150                            | 22.5                                     | 1.8                                       | 2,150                                                                | 980                              | 22.5                                     | 1.8                                       | 2,150                                                                                          | 650                              | 22.5                                     | 0.9                                       |
| 4095-2400             | 9.5                               | 24                             | 1,950                                                                 | 1,050                            | 24                                       | 1.9                                       | 1,900                                                                | 950                              | 24                                       | 1.9                                       | 1,900                                                                                          | 620                              | 24                                       | 0.95                                      |
| 4100-1500             | 10                                | 15                             | 1,600                                                                 | 1,000                            | 15                                       | 2                                         | 1,500                                                                | 900                              | 15                                       | 2                                         | 1,500                                                                                          | 580                              | 15                                       | 1                                         |
| 4100-2500             |                                   | 25                             | 1,600                                                                 | 1,000                            | 25                                       | 2                                         | 1,500                                                                | 900                              | 25                                       | 2                                         | 1,500                                                                                          | 580                              | 25                                       | 1                                         |
| 4100-3000             |                                   | 30                             | 1,500                                                                 | 900                              | 30                                       | 1                                         | 1,500                                                                | 850                              | 30                                       | 1                                         | 1,500                                                                                          | 580                              | 30                                       | 0.5                                       |
| 4100-4000             |                                   | 40                             | 1,300                                                                 | 800                              | 40                                       | 0.2                                       | 1,500                                                                | 750                              | 40                                       | 0.2                                       | 1,500                                                                                          | 580                              | 40                                       | 0.2                                       |
| 4100-5000             |                                   | 50                             | 1,300                                                                 | 800                              | 50                                       | 0.2                                       | 1,500                                                                | 750                              | 50                                       | 0.2                                       | 1,500                                                                                          | 580                              | 50                                       | 0.2                                       |
| 4110-1650             | 11                                | 16.5                           | 1,400                                                                 | 900                              | 16.5                                     | 1.1                                       | 1,350                                                                | 830                              | 16.5                                     | 1.1                                       | 1,350                                                                                          | 560                              | 16.5                                     | 0.55                                      |
| 4110-2750             |                                   | 27.5                           | 1,400                                                                 | 900                              | 27.5                                     | 2.2                                       | 1,350                                                                | 830                              | 27.5                                     | 2.2                                       | 1,350                                                                                          | 560                              | 27.5                                     | 1.1                                       |
| 4120-1800             | 12                                | 18                             | 1,200                                                                 | 800                              | 18                                       | 2.4                                       | 1,200                                                                | 750                              | 18                                       | 2.4                                       | 1,200                                                                                          | 540                              | 18                                       | 1.2                                       |
| 4120-3000             |                                   | 30                             | 1,200                                                                 | 800                              | 30                                       | 2.4                                       | 1,200                                                                | 750                              | 30                                       | 2.4                                       | 1,200                                                                                          | 540                              | 30                                       | 1.2                                       |
| 4120-3600             |                                   | 36                             | 1,150                                                                 | 750                              | 36                                       | 1.2                                       | 1,150                                                                | 720                              | 36                                       | 1.2                                       | 1,150                                                                                          | 540                              | 36                                       | 0.6                                       |
| 4120-4800             |                                   | 48                             | 1,050                                                                 | 700                              | 48                                       | 0.24                                      | 1,050                                                                | 660                              | 48                                       | 0.24                                      | 1,050                                                                                          | 500                              | 48                                       | 0.24                                      |
| 4120-6000             |                                   | 60                             | 1,050                                                                 | 700                              | 60                                       | 0.24                                      | 1,050                                                                | 660                              | 60                                       | 0.24                                      | 1,050                                                                                          | 500                              | 60                                       | 0.24                                      |
| 4130-1950             | 13                                | 19.5                           | 1,100                                                                 | 650                              | 19.5                                     | 1.3                                       | 1,100                                                                | 600                              | 19.5                                     | 1.3                                       | 1,000                                                                                          | 460                              | 19.5                                     | 0.65                                      |
| 4160-4000             | 16                                | 40                             | 1,000                                                                 | 500                              | 40                                       | 3.2                                       | 1,000                                                                | 440                              | 40                                       | 3.2                                       | 720                                                                                            | 340                              | 40                                       | 1.6                                       |

## 側面切削 Side Milling

| 被削材<br>WORK MATERIAL  |                                   |                                | プリハードン鋼<br>PREHARDENED STEELS<br>HPM / NAK<br>(30~45HRC) |                                  |                                 |                                  | 焼入れ鋼<br>HARDENED STEELS<br>SKD / SKT / STAVAX<br>(45~55HRC) |                                  |                                 |                                  |
|-----------------------|-----------------------------------|--------------------------------|----------------------------------------------------------|----------------------------------|---------------------------------|----------------------------------|-------------------------------------------------------------|----------------------------------|---------------------------------|----------------------------------|
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )         | 送り速度<br>Feed<br>Rate<br>(mm/min) | $a_p$<br>Axial<br>Depth<br>(mm) | $a_e$<br>Radial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )            | 送り速度<br>Feed<br>Rate<br>(mm/min) | $a_p$<br>Axial<br>Depth<br>(mm) | $a_e$<br>Radial<br>Depth<br>(mm) |
| 4080-1200             | 8                                 | 12                             | 2,500                                                    | 600                              | 12                              | 1.6                              | 2,000                                                       | 500                              | 12                              | 0.8                              |
| 4080-2000             |                                   | 20                             | 2,500                                                    | 600                              | 20                              | 1.6                              | 2,000                                                       | 500                              | 20                              | 0.8                              |
| 4080-2400             |                                   | 24                             | 2,350                                                    | 600                              | 24                              | 0.8                              | 2,150                                                       | 500                              | 24                              | 0.4                              |
| 4080-3200             |                                   | 32                             | 2,050                                                    | 530                              | 32                              | 0.16                             | 2,150                                                       | 400                              | 32                              | 0.08                             |
| 4080-4000             |                                   | 40                             | 2,050                                                    | 530                              | 40                              | 0.08                             | 2,150                                                       | 400                              | 40                              | 0.04                             |
| 4085-2150             | 8.5                               | 21.5                           | 2,150                                                    | 550                              | 21.5                            | 1.7                              | 1,700                                                       | 490                              | 21.5                            | 0.85                             |
| 4090-1350             | 9                                 | 13.5                           | 1,950                                                    | 520                              | 13.5                            | 0.9                              | 1,500                                                       | 480                              | 13.5                            | 0.45                             |
| 4090-2250             |                                   | 22.5                           | 1,950                                                    | 520                              | 22.5                            | 1.8                              | 1,500                                                       | 480                              | 22.5                            | 0.9                              |
| 4095-2400             | 9.5                               | 24                             | 1,750                                                    | 480                              | 24                              | 1.9                              | 1,350                                                       | 470                              | 24                              | 0.95                             |
| 4100-1500             | 10                                | 15                             | 1,500                                                    | 430                              | 15                              | 2                                | 1,200                                                       | 450                              | 15                              | 1                                |
| 4100-2500             |                                   | 25                             | 1,500                                                    | 430                              | 25                              | 2                                | 1,200                                                       | 450                              | 25                              | 1                                |
| 4100-3000             |                                   | 30                             | 1,500                                                    | 430                              | 30                              | 1                                | 1,200                                                       | 450                              | 30                              | 0.5                              |
| 4100-4000             |                                   | 40                             | 1,500                                                    | 430                              | 40                              | 0.2                              | 1,200                                                       | 450                              | 40                              | 0.1                              |
| 4100-5000             |                                   | 50                             | 1,500                                                    | 430                              | 50                              | 0.1                              | 1,200                                                       | 450                              | 50                              | 0.05                             |
| 4110-1650             | 11                                | 16.5                           | 1,250                                                    | 380                              | 16.5                            | 1.1                              | 1,060                                                       | 430                              | 16.5                            | 0.55                             |
| 4110-2750             |                                   | 27.5                           | 1,250                                                    | 380                              | 27.5                            | 2.2                              | 1,060                                                       | 430                              | 27.5                            | 1.1                              |
| 4120-1800             | 12                                | 18                             | 1,000                                                    | 320                              | 18                              | 2.4                              | 960                                                         | 420                              | 18                              | 1.2                              |
| 4120-3000             |                                   | 30                             | 1,000                                                    | 320                              | 30                              | 2.4                              | 960                                                         | 420                              | 30                              | 1.2                              |
| 4120-3600             |                                   | 36                             | 1,000                                                    | 320                              | 36                              | 1.2                              | 930                                                         | 400                              | 36                              | 0.6                              |
| 4120-4800             |                                   | 48                             | 1,000                                                    | 320                              | 48                              | 0.24                             | 870                                                         | 360                              | 48                              | 0.12                             |
| 4120-6000             |                                   | 60                             | 1,000                                                    | 320                              | 60                              | 0.12                             | 870                                                         | 360                              | 60                              | 0.06                             |
| 4130-1950             | 13                                | 19.5                           | 1,000                                                    | 260                              | 19.5                            | 1.3                              | 890                                                         | 350                              | 19.5                            | 0.65                             |
| 4160-4000             | 16                                | 40                             | 1,000                                                    | 220                              | 40                              | 3.2                              | 720                                                         | 280                              | 40                              | 1.6                              |

側面切削 Side Milling



## 溝切削 Slotting

| 被削材<br>WORK MATERIAL            |                                   |                                | 炭素鋼<br>CARBON STEELS<br>S45C / S50C焼鈍材<br>Annealed Materials<br>(～225HB) |                                  |                                          | 合金鋼<br>ALLOY STEELS<br>SK / SCM焼鈍材<br>Annealed Materials<br>(225～325HB) |                                  |                                          | ステンレス鋼<br>STAINLESS STEELS<br>SUS304<br><br>注:切削油の使用が必須です。<br>* Use water soluble or oil coolant. |                                  |                                          | プリハードン鋼<br>PREHARDENED STEELS<br>HPM / NAK<br>(30～45HRC)                                             |                                  |                                          | 焼入れ鋼<br>HARDENED STEELS<br>SKD / SKT / STAVAX<br>(45～55HRC) |                                  |                                          |
|---------------------------------|-----------------------------------|--------------------------------|--------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------------------------------------|----------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------------------------|----------------------------------|------------------------------------------|
| 型番<br>Model<br>Number           | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                         | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                        | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                                  | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                                     | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )            | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) |
| 4010-0150                       | 1                                 | 1.5                            | 18,000                                                                   | 200                              | 1                                        | 18,000                                                                  | 200                              | 1                                        | 14,500                                                                                            | 220                              | 1                                        | 12,900                                                                                               | 130                              | 1                                        | 12,900                                                      | 50                               | 0.3 <sup>*</sup>                         |
| 4010-0250                       |                                   | 2.5                            | 18,000                                                                   | 200                              | 1                                        | 18,000                                                                  | 200                              | 1                                        | 14,500                                                                                            | 220                              | 0.5                                      | 12,900                                                                                               | 130                              | 1                                        | 12,900                                                      | 50                               | 0.3 <sup>*</sup>                         |
| 4010-0300                       |                                   | 3                              | 18,000                                                                   | 190                              | 0.5 <sup>*</sup>                         | 18,000                                                                  | 190                              | 0.5 <sup>*</sup>                         | 14,300                                                                                            | 210                              | 0.25 <sup>*</sup>                        | 12,800                                                                                               | 120                              | 0.5 <sup>*2</sup>                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4010-0400                       |                                   | 4                              | 18,000                                                                   | 170                              | 0.5 <sup>*</sup>                         | 18,000                                                                  | 170                              | 0.5 <sup>*</sup>                         | 12,500                                                                                            | 190                              | 0.25 <sup>*</sup>                        | 12,100                                                                                               | 100                              | 0.5 <sup>*2</sup>                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4010-0500                       |                                   | 5                              | 18,000                                                                   | 170                              | 0.5 <sup>*</sup>                         | 18,000                                                                  | 170                              | 0.5 <sup>*</sup>                         | 12,500                                                                                            | 190                              | 0.25 <sup>*</sup>                        | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4015-0225                       | 1.5                               | 2.25                           | 13,500                                                                   | 320                              | 1.5                                      | 13,500                                                                  | 280                              | 1.5                                      | 13,300                                                                                            | 240                              | 1.5                                      | 10,500                                                                                               | 180                              | 1.5                                      | 10,500                                                      | 100                              | 0.45 <sup>*</sup>                        |
| 4015-0375                       |                                   | 3.75                           | 13,500                                                                   | 320                              | 1.5                                      | 13,500                                                                  | 280                              | 1.5                                      | 13,300                                                                                            | 240                              | 0.75                                     | 10,500                                                                                               | 180                              | 1.5                                      | 10,500                                                      | 100                              | 0.45 <sup>*</sup>                        |
| 4015-0600                       |                                   | 6                              | 13,500                                                                   | 290                              | 0.75 <sup>*</sup>                        | 13,500                                                                  | 250                              | 0.75 <sup>*</sup>                        | 12,700                                                                                            | 210                              | 0.375 <sup>*</sup>                       | 10,200                                                                                               | 150                              | 0.75 <sup>*2</sup>                       | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4020-0300                       | 2                                 | 3                              | 11,000                                                                   | 460                              | 2                                        | 11,000                                                                  | 320                              | 2                                        | 12,200                                                                                            | 260                              | 2                                        | 9,350                                                                                                | 220                              | 2                                        | 9,350                                                       | 150                              | 0.6 <sup>*</sup>                         |
| 4020-0500                       |                                   | 5                              | 11,000                                                                   | 460                              | 2                                        | 11,000                                                                  | 320                              | 2                                        | 12,200                                                                                            | 260                              | 1                                        | 9,350                                                                                                | 220                              | 2                                        | 9,350                                                       | 150                              | 0.6 <sup>*</sup>                         |
| 4020-0600                       |                                   | 6                              | 11,000                                                                   | 440                              | 1 <sup>*</sup>                           | 11,000                                                                  | 310                              | 1 <sup>*</sup>                           | 12,000                                                                                            | 240                              | 0.5 <sup>*</sup>                         | 9,300                                                                                                | 200                              | 1 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4020-0800                       |                                   | 8                              | 11,000                                                                   | 400                              | 1 <sup>*</sup>                           | 11,000                                                                  | 290                              | 1 <sup>*</sup>                           | 11,600                                                                                            | 200                              | 0.5 <sup>*</sup>                         | 8,600                                                                                                | 160                              | 1 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4020-1000                       |                                   | 10                             | 11,000                                                                   | 400                              | 1 <sup>*</sup>                           | 11,000                                                                  | 290                              | 1 <sup>*</sup>                           | 11,600                                                                                            | 200                              | 0.5 <sup>*</sup>                         | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4025-0375                       | 2.5                               | 3.75                           | 9,500                                                                    | 540                              | 2.5                                      | 9,500                                                                   | 360                              | 2.5                                      | 11,000                                                                                            | 310                              | 2.5                                      | 8,300                                                                                                | 270                              | 2.5                                      | 8,300                                                       | 240                              | 0.75 <sup>*</sup>                        |
| 4025-0625                       |                                   | 6.25                           | 9,500                                                                    | 540                              | 2.5                                      | 9,500                                                                   | 360                              | 2.5                                      | 11,000                                                                                            | 310                              | 1.25                                     | 8,300                                                                                                | 270                              | 2.5                                      | 8,300                                                       | 240                              | 0.75 <sup>*</sup>                        |
| 4025-1000                       |                                   | 10                             | 9,500                                                                    | 480                              | 1.25 <sup>*</sup>                        | 9,500                                                                   | 330                              | 1.25 <sup>*</sup>                        | 10,400                                                                                            | 250                              | 0.625 <sup>*</sup>                       | 8,000                                                                                                | 210                              | 1.25 <sup>*2</sup>                       | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4030-0450                       | 3                                 | 4.5                            | 8,500                                                                    | 600                              | 3                                        | 8,500                                                                   | 400                              | 3                                        | 10,000                                                                                            | 360                              | 3                                        | 7,400                                                                                                | 320                              | 3                                        | 7,400                                                       | 360                              | 1.5                                      |
| 4030-0750                       |                                   | 7.5                            | 8,500                                                                    | 600                              | 3                                        | 8,500                                                                   | 400                              | 3                                        | 10,000                                                                                            | 360                              | 1.5                                      | 7,400                                                                                                | 320                              | 3                                        | 7,400                                                       | 360                              | 1.5                                      |
| 4030-0900                       |                                   | 9                              | 8,500                                                                    | 550                              | 3                                        | 8,500                                                                   | 360                              | 3                                        | 9,100                                                                                             | 310                              | 1.5                                      | 7,050                                                                                                | 270                              | 3                                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4030-1200                       |                                   | 12                             | 8,500                                                                    | 450                              | 1.5 <sup>*</sup>                         | 8,500                                                                   | 280                              | 1.5 <sup>*</sup>                         | 7,300                                                                                             | 210                              | 0.75 <sup>*</sup>                        | 6,350                                                                                                | 170                              | 1.5 <sup>*2</sup>                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4030-1500                       |                                   | 15                             | 8,500                                                                    | 450                              | 1.5 <sup>*</sup>                         | 8,500                                                                   | 280                              | 1.5 <sup>*</sup>                         | 7,300                                                                                             | 210                              | 0.75 <sup>*</sup>                        | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4035-0900                       | 3.5                               | 9                              | 7,800                                                                    | 620                              | 3.5                                      | 7,500                                                                   | 420                              | 3.5                                      | 8,600                                                                                             | 380                              | 1.75                                     | 6,500                                                                                                | 350                              | 3.5                                      | 6,500                                                       | 370                              | 1.75                                     |
| 4040-0600                       | 4                                 | 6                              | 7,200                                                                    | 650                              | 4                                        | 6,700                                                                   | 450                              | 4                                        | 7,500                                                                                             | 400                              | 4                                        | 5,900                                                                                                | 390                              | 4                                        | 5,900                                                       | 380                              | 2                                        |
| 4040-1000                       |                                   | 10                             | 7,200                                                                    | 650                              | 4                                        | 6,700                                                                   | 450                              | 4                                        | 7,500                                                                                             | 400                              | 2                                        | 5,900                                                                                                | 390                              | 4                                        | 5,900                                                       | 380                              | 2                                        |
| 4040-1200                       |                                   | 12                             | 7,200                                                                    | 580                              | 4                                        | 6,700                                                                   | 400                              | 4                                        | 6,600                                                                                             | 320                              | 2                                        | 5,500                                                                                                | 300                              | 4                                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4040-1600                       |                                   | 16                             | 7,200                                                                    | 440                              | 2 <sup>*</sup>                           | 6,700                                                                   | 300                              | 2 <sup>*</sup>                           | 4,800                                                                                             | 200                              | 1 <sup>*</sup>                           | 4,700                                                                                                | 160                              | 2 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4040-2000                       |                                   | 20                             | 7,200                                                                    | 440                              | 2 <sup>*</sup>                           | 6,700                                                                   | 300                              | 2 <sup>*</sup>                           | 4,800                                                                                             | 200                              | 1 <sup>*</sup>                           | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4045-1150                       | 4.5                               | 11.5                           | 6,550                                                                    | 670                              | 4.5                                      | 6,000                                                                   | 470                              | 4.5                                      | 6,300                                                                                             | 430                              | 2.25                                     | 5,300                                                                                                | 410                              | 4.5                                      | 5,300                                                       | 390                              | 2.25                                     |
| 4050-0750                       | 5                                 | 7.5                            | 6,000                                                                    | 700                              | 5                                        | 5,400                                                                   | 500                              | 5                                        | 5,400                                                                                             | 460                              | 5                                        | 4,800                                                                                                | 440                              | 5                                        | 4,800                                                       | 410                              | 2.5                                      |
| 4050-1250                       |                                   | 12.5                           | 6,000                                                                    | 700                              | 5                                        | 5,400                                                                   | 500                              | 5                                        | 5,400                                                                                             | 460                              | 2.5                                      | 4,800                                                                                                | 440                              | 5                                        | 4,800                                                       | 410                              | 2.5                                      |
| 4050-1500                       |                                   | 15                             | 6,000                                                                    | 600                              | 5                                        | 5,400                                                                   | 430                              | 5                                        | 4,600                                                                                             | 350                              | 2.5                                      | 4,400                                                                                                | 320                              | 5                                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4050-2000                       |                                   | 20                             | 6,000                                                                    | 400                              | 2.5 <sup>*</sup>                         | 5,400                                                                   | 290                              | 2.5 <sup>*</sup>                         | 3,000                                                                                             | 170                              | 1.25 <sup>*</sup>                        | 3,600                                                                                                | 160                              | 2.5 <sup>*2</sup>                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4050-2500                       |                                   | 25                             | 6,000                                                                    | 400                              | 2.5 <sup>*</sup>                         | 5,400                                                                   | 290                              | 2.5 <sup>*</sup>                         | 3,000                                                                                             | 170                              | 1.25 <sup>*</sup>                        | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4055-1400                       | 5.5                               | 14                             | 5,450                                                                    | 700                              | 5.5                                      | 4,900                                                                   | 500                              | 5.5                                      | 4,900                                                                                             | 460                              | 2.75                                     | 4,350                                                                                                | 440                              | 5.5                                      | 4,350                                                       | 420                              | 2.75                                     |
| 4060-0900                       | 6                                 | 9                              | 5,000                                                                    | 700                              | 6                                        | 4,500                                                                   | 500                              | 6                                        | 4,500                                                                                             | 460                              | 6                                        | 4,000                                                                                                | 520                              | 6                                        | 4,000                                                       | 440                              | 3                                        |
| 4060-1500                       |                                   | 15                             | 5,000                                                                    | 700                              | 6                                        | 4,500                                                                   | 500                              | 6                                        | 4,500                                                                                             | 460                              | 3                                        | 4,000                                                                                                | 440                              | 6                                        | 4,000                                                       | 440                              | 3                                        |
| 4060-1800                       |                                   | 18                             | 5,000                                                                    | 560                              | 6                                        | 4,500                                                                   | 410                              | 6                                        | 3,700                                                                                             | 320                              | 3                                        | 3,600                                                                                                | 290                              | 6                                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4060-2400                       |                                   | 24                             | 5,000                                                                    | 280                              | 3 <sup>*</sup>                           | 4,500                                                                   | 230                              | 3 <sup>*</sup>                           | 2,100                                                                                             | 150                              | 1.5 <sup>*</sup>                         | 2,800                                                                                                | 140                              | 3 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4060-3000                       |                                   | 30                             | 5,000                                                                    | 280                              | 3 <sup>*</sup>                           | 4,500                                                                   | 230                              | 3 <sup>*</sup>                           | 2,100                                                                                             | 150                              | 1.5 <sup>*</sup>                         | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 切込み深さ<br>Milling Amount<br>(mm) |                                   |                                | a <sub>p</sub> =1D<br>※a <sub>p</sub> =0.5D                              |                                  |                                          | a <sub>p</sub> =1D<br>※a <sub>p</sub> =0.5D                             |                                  |                                          | a <sub>p</sub> =0.5D<br>※a <sub>p</sub> =0.25D                                                    |                                  |                                          | a <sub>p</sub> =1D<br>※1 a <sub>p</sub> =0.8D<br>※2 a <sub>p</sub> =0.5D<br>※3 a <sub>p</sub> =6mmまで |                                  |                                          | a <sub>p</sub> =0.5D<br>※a <sub>p</sub> =0.3D               |                                  |                                          |

## 溝切削 Slotting

| 被削材<br>WORK MATERIAL            |                                   |                                | 炭素鋼<br>CARBON STEELS<br>S45C / S50C焼鈍材<br>Annealed Materials<br>(~225HB) |                                  |                                          | 合金鋼<br>ALLOY STEELS<br>SK / SCM焼鈍材<br>Annealed Materials<br>(225~325HB) |                                  |                                          | ステンレス鋼<br>STAINLESS STEELS<br>SUS304<br>注: 切削油の使用が必須です。<br>* Use water soluble or oil coolant. |                                  |                                          | プリハードン鋼<br>PREHARDENED STEELS<br>HPM / NAK<br>(30~45HRC)                                             |                                  |                                          | 焼入れ鋼<br>HARDENED STEELS<br>SKD / SKT / STAVAX<br>(45~55HRC) |                                  |                                          |
|---------------------------------|-----------------------------------|--------------------------------|--------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------------------------------------|----------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------------------------|----------------------------------|------------------------------------------|
| 型番<br>Model<br>Number           | 外径<br>Outside<br>Diameter<br>(mm) | 刃長<br>Length<br>of Cut<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                         | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                        | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                               | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )                                                     | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) | 回転速度<br>Spindle<br>Speed<br>(min <sup>-1</sup> )            | 送り速度<br>Feed<br>Rate<br>(mm/min) | a <sub>p</sub><br>Axial<br>Depth<br>(mm) |
| 4065-1650                       | 6.5                               | 16.5                           | 4,400                                                                    | 650                              | 6.5                                      | 3,950                                                                   | 450                              | 6.5                                      | 3,950                                                                                          | 420                              | 3.25                                     | 3,500                                                                                                | 420                              | 6.5                                      | 3,500                                                       | 400                              | 3.25                                     |
| 4070-1050                       | 7                                 | 10.5                           | 3,900                                                                    | 300                              | 7                                        | 3,550                                                                   | 200                              | 7                                        | 3,550                                                                                          | 200                              | 3.5                                      | 3,150                                                                                                | 190                              | 7                                        | 3,150                                                       | 190                              | 3.5                                      |
| 4070-1750                       |                                   | 17.5                           | 3,900                                                                    | 600                              | 7                                        | 3,550                                                                   | 400                              | 7                                        | 3,550                                                                                          | 390                              | 3.5                                      | 3,150                                                                                                | 410                              | 7                                        | 3,150                                                       | 380                              | 3.5                                      |
| 4075-1900                       | 7.5                               | 19                             | 3,500                                                                    | 550                              | 7.5                                      | 3,250                                                                   | 380                              | 7.5                                      | 3,250                                                                                          | 380                              | 3.75                                     | 2,850                                                                                                | 400                              | 7.5                                      | 2,850                                                       | 370                              | 3.75                                     |
| 4080-1200                       | 8                                 | 12                             | 3,000                                                                    | 500                              | 8                                        | 2,900                                                                   | 360                              | 8                                        | 2,900                                                                                          | 360                              | 8                                        | 2,500                                                                                                | 520                              | 6 <sup>*3</sup>                          | 2,500                                                       | 340                              | 4                                        |
| 4080-2000                       |                                   | 20                             | 3,000                                                                    | 500                              | 8                                        | 2,900                                                                   | 360                              | 8                                        | 2,900                                                                                          | 360                              | 4                                        | 2,500                                                                                                | 390                              | 8                                        | 2,500                                                       | 340                              | 4                                        |
| 4080-2400                       |                                   | 24                             | 2,800                                                                    | 330                              | 8                                        | 2,600                                                                   | 260                              | 8                                        | 2,600                                                                                          | 240                              | 4                                        | 2,350                                                                                                | 200                              | 8                                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4080-3200                       |                                   | 32                             | 2,400                                                                    | 230                              | 4 <sup>*2</sup>                          | 2,000                                                                   | 180                              | 4 <sup>*2</sup>                          | 2,000                                                                                          | 130                              | 2 <sup>*2</sup>                          | 2,050                                                                                                | 110                              | 4 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4080-4000                       |                                   | 40                             | 2,400                                                                    | 230                              | 4 <sup>*2</sup>                          | 2,000                                                                   | 180                              | 4 <sup>*2</sup>                          | 2,000                                                                                          | 130                              | 2 <sup>*2</sup>                          | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4085-2150                       | 8.5                               | 21.5                           | 2,550                                                                    | 450                              | 8.5                                      | 2,450                                                                   | 330                              | 8.5                                      | 2,450                                                                                          | 310                              | 4.25                                     | 2,150                                                                                                | 330                              | 8.5                                      | 2,150                                                       | 300                              | 4.25                                     |
| 4090-1350                       | 9                                 | 13.5                           | 2,250                                                                    | 210                              | 9                                        | 2,150                                                                   | 160                              | 9                                        | 2,150                                                                                          | 140                              | 4.5                                      | 1,950                                                                                                | 150                              | 9                                        | 1,950                                                       | 140                              | 4.5                                      |
| 4090-2250                       |                                   | 22.5                           | 2,250                                                                    | 420                              | 9                                        | 2,150                                                                   | 300                              | 9                                        | 2,150                                                                                          | 260                              | 4.5                                      | 1,950                                                                                                | 300                              | 9                                        | 1,950                                                       | 270                              | 4.5                                      |
| 4095-2400                       | 9.5                               | 24                             | 1,950                                                                    | 400                              | 9.5                                      | 1,900                                                                   | 300                              | 9.5                                      | 1,900                                                                                          | 250                              | 4.75                                     | 1,750                                                                                                | 270                              | 9.5                                      | 1,750                                                       | 270                              | 4.75                                     |
| 4100-1500                       | 10                                | 15                             | 1,600                                                                    | 380                              | 10                                       | 1,500                                                                   | 270                              | 10                                       | 1,500                                                                                          | 220                              | 10                                       | 1,500                                                                                                | 450                              | 6 <sup>*3</sup>                          | 1,500                                                       | 240                              | 5                                        |
| 4100-2500                       |                                   | 25                             | 1,600                                                                    | 380                              | 10                                       | 1,500                                                                   | 270                              | 10                                       | 1,500                                                                                          | 220                              | 5                                        | 1,500                                                                                                | 220                              | 10                                       | 1,500                                                       | 240                              | 5                                        |
| 4100-3000                       |                                   | 30                             | 1,500                                                                    | 250                              | 10                                       | 1,500                                                                   | 180                              | 10                                       | 1,500                                                                                          | 190                              | 5                                        | 1,500                                                                                                | 180                              | 8 <sup>*1</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4100-4000                       |                                   | 40                             | 1,300                                                                    | 180                              | 5 <sup>*2</sup>                          | 1,500                                                                   | 150                              | 5 <sup>*2</sup>                          | 1,500                                                                                          | 130                              | 2.5 <sup>*2</sup>                        | 1,200                                                                                                | 90                               | 5 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4100-5000                       |                                   | 50                             | 1,300                                                                    | 180                              | 5 <sup>*2</sup>                          | 1,500                                                                   | 150                              | 5 <sup>*2</sup>                          | 1,500                                                                                          | 130                              | 2.5 <sup>*2</sup>                        | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4110-1650                       | 11                                | 16.5                           | 1,400                                                                    | 170                              | 11                                       | 1,350                                                                   | 120                              | 11                                       | 1,350                                                                                          | 100                              | 5.5                                      | 1,250                                                                                                | 100                              | 11                                       | 1,350                                                       | 110                              | 5.5                                      |
| 4110-2750                       |                                   | 27.5                           | 1,400                                                                    | 340                              | 11                                       | 1,350                                                                   | 240                              | 11                                       | 1,350                                                                                          | 200                              | 5.5                                      | 1,250                                                                                                | 200                              | 11                                       | 1,350                                                       | 230                              | 5.5                                      |
| 4120-1800                       | 12                                | 18                             | 1,200                                                                    | 300                              | 12                                       | 1,200                                                                   | 210                              | 12                                       | 1,200                                                                                          | 180                              | 12                                       | 1,000                                                                                                | 420                              | 6 <sup>*3</sup>                          | 1,200                                                       | 220                              | 6                                        |
| 4120-3000                       |                                   | 30                             | 1,200                                                                    | 300                              | 12                                       | 1,200                                                                   | 210                              | 12                                       | 1,200                                                                                          | 180                              | 6                                        | 1,000                                                                                                | 180                              | 12                                       | 1,200                                                       | 220                              | 6                                        |
| 4120-3600                       |                                   | 36                             | 1,150                                                                    | 200                              | 12                                       | 1,150                                                                   | 140                              | 12                                       | 1,150                                                                                          | 150                              | 6                                        | 1,000                                                                                                | 140                              | 9.6 <sup>*1</sup>                        | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4120-4800                       |                                   | 48                             | 1,050                                                                    | 160                              | 6 <sup>*2</sup>                          | 1,050                                                                   | 120                              | 6 <sup>*2</sup>                          | 1,050                                                                                          | 100                              | 3 <sup>*2</sup>                          | 800                                                                                                  | 70                               | 6 <sup>*2</sup>                          | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4120-6000                       |                                   | 60                             | 1,050                                                                    | 160                              | 6 <sup>*2</sup>                          | 1,050                                                                   | 120                              | 6 <sup>*2</sup>                          | 1,050                                                                                          | 100                              | 3 <sup>*2</sup>                          | 不可N/A                                                                                                | 不可N/A                            | 不可N/A                                    | 不可N/A                                                       | 不可N/A                            | 不可N/A                                    |
| 4130-1950                       | 13                                | 19.5                           | 1,100                                                                    | 190                              | 13                                       | 1,100                                                                   | 90                               | 13                                       | 1,000                                                                                          | 80                               | 6.5                                      | 1,000                                                                                                | 80                               | 13                                       | 1,100                                                       | 90                               | 6.5                                      |
| 4160-4000                       | 16                                | 40                             | 1,000                                                                    | 400                              | 8 <sup>*2</sup>                          | 1,000                                                                   | 280                              | 8 <sup>*2</sup>                          | 720                                                                                            | 240                              | 4 <sup>*2</sup>                          | 1,000                                                                                                | 240                              | 8 <sup>*2</sup>                          | 1,000                                                       | 220                              | 4.8 <sup>*2</sup>                        |
| 切込み深さ<br>Milling Amount<br>(mm) |                                   |                                | a <sub>p</sub> =1D<br>※a <sub>p</sub> =0.5D                              |                                  |                                          | a <sub>p</sub> =1D<br>※a <sub>p</sub> =0.5D                             |                                  |                                          | a <sub>p</sub> =0.5D<br>※a <sub>p</sub> =0.25D                                                 |                                  |                                          | a <sub>p</sub> =1D<br>※1 a <sub>p</sub> =0.8D<br>※2 a <sub>p</sub> =0.5D<br>※3 a <sub>p</sub> =6mmまで |                                  |                                          | a <sub>p</sub> =0.5D<br>※a <sub>p</sub> =0.3D               |                                  |                                          |

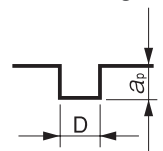
## 備考:

- ・ビビリが発生する場合は、回転速度と送り速度を同じ比率で下げてください。
- ・突き出し長が最短となるチャッキング状態（溝切り上がり付近、シャンクテーパ付近のチャッキング）を想定した条件表です。
- ・加工精度を要求される場合は、送り速度・切込み深さを減らしてください。
- ・水溶性・油性切削油、オイルミスト、エアブローのいずれにおいても安定した加工が可能です。
- ・ステンレス鋼と銅の加工には水溶性もしくは油性切削油を推奨致します。

## Note:

- ・ Decrease both spindle speed and feed rate proportionally in case of chattering.
- ・ These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the milling parameters.
- ・ Reduce the milling amount and feed rate in accordance with required milling precision.
- ・ Every coolant offers stable milling.
- ・ Recommend water soluble or oil coolant for Stainless Steels and Copper.

## 溝切削 Slotting



D : 外径 (mm)  
Outside Diameter



## エンドミル取扱上の注意

エンドミルをご使用いただく際には、切削条件の不適合、切りくずの巻き付きや堆積、工具の摩耗などにより発熱や発火、加工物の損傷など重大な事故を招くことがありますので、十分ご注意ください。超硬エンドミルは鋭利な刃物ですから、取扱に際しては十分ご注意ください。

- 切削に直接触れると怪我をすることがありますので、ケースから抜き取る際は十分ご注意ください。
- エンドミルを落とした場合、飛散した刃先で怪我をすることがありますので、取扱にご注意ください。
- 工具への衝撃的負荷や工具損傷により切削抵抗が急増し、工具が飛散することがありますので、安全カバーや保護めがね等の保護具をご使用ください。
- 切削条件表は切削条件の目安を示すものです。実際の加工では被削材の材質、加工形状、機械剛性、主軸などの加工環境により、加工条件の最適化が必要となる場合があります。
- 振れの小さい剛性の高い機械をご使用ください。小径工具（φ1以下）においては振れ管理値：5μm以下を推奨致します。
- 発火性の高い切削油の使用は避けてください。

### エンドミル再研磨時の注意

- 超硬合金の研磨塵が目に入らないよう必ず保護めがねを着用してください。研磨塵を吸い込まないよう必ずマスクを着用してください。



## Advisory for Safe Use of End Mills

Correct application and operation is strongly advised to avoid clogging, abrasion, etc., that could cause serious accidents or injuries. Ignition or sparks generated during milling could lead to fire or extreme damage to the work piece. End Mills are made with very sharp cutting edges and must be handled with extra care.

- Never touch the cutting edge with your bare hands, as this could cause serious injury. Special caution is required when opening the package.
- Dropping the tool could cause breakage or flying debris, leading to serious injury.
- During milling, unexpected impact or shock on the tool could cause breakage or flying debris. Ensure to use protective items such as safety glasses and a face guard.
- For best results, fine parameter adjustment may be required, depending on the materials; milling shape and strategy; machine rigidity and spindle capability.
- Use a machine that has high rigidity and generates a low level of vibration. Recommend setting the runout control value at 5μm or below for the small diameter tools φ1 or below.
- Do not use flammable cutting oils.

### Advisory for Regrinding End Mills

- Never regrind the tool without wearing safety glasses and a face guard.

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エンドミルの技術的なお問い合わせは下記まで



0120-60-2620

受付時間: 9:30~12:00, 13:00~16:30 (土曜、日曜、祝日、弊社休日を除く)

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Price & Specifications are subject to change without notice.