

UNION TOOL

# Tungsten Carbide End Mills UNIMAX Series

NEW

2025 年 11 月発売  
Launched November 2025

超硬エンドミル ユニマックスシリーズ

UTC0AT 2枚刃 ロングネックラジラスエンドミル  
UTC0AT 2 Flute Long Neck Radius End Mills

CLRS



生材〜40HRCの低中硬度材に最適  
Best for soft materials up to 40HRC

ネガティブフラット面で底面加工時の **鏡面性** アップ

Improved mirror surface finish when flat milling on negative flat surfaces



UNION TOOL CO.

# CLRS

NEW



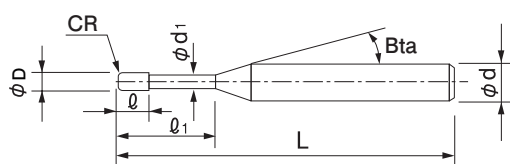
UTCOAT 2 枚刃 ロングネックラジアスエンドミル  
UTCOAT 2 Flute Long Neck Radius End Mills

φ0.2~φ6

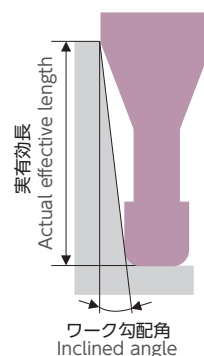


対応被削材表 (★●○の順に推奨) Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

| 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 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-Metallic<br>Materials) |
|                                         |                                           |                                             | ～ 50<br>HRC             | ～ 55<br>HRC | ～ 60<br>HRC | ～ 65<br>HRC | ～ 70<br>HRC |                 |                             |                    |             |                |                                     |                             |                                      |                             |                                                    |
| ●                                       | ●                                         | ●                                           | ●                       | ○           |             |             |             | ○               | ●                           |                    | ●           |                |                                     | ○                           | ○                                    |                             |                                                    |



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



特長 1 Feature 1

高精度

High precision

更なる高精度加工が可能に！

Even higher precision milling!

従来品 HLRS 標準タイプ

Conventional HLRS standard type

単位 Unit (mm)

| 外径<br>Outside<br>Diameter | 外径公差<br>Diameter<br>Tolerance | R 精度<br>Radius<br>Accuracy | シャンク径公差<br>Shank Diameter<br>Tolerance |
|---------------------------|-------------------------------|----------------------------|----------------------------------------|
| 0.2 ≤ D ≤ 6               | 0/-0.015                      | ± 0.005                    | 0/-0.005                               |

CLRS

単位 Unit (mm)

| 外径<br>Outside<br>Diameter | 外径公差<br>Diameter<br>Tolerance | R 精度<br>Radius<br>Accuracy | シャンク径公差<br>Shank Diameter<br>Tolerance |
|---------------------------|-------------------------------|----------------------------|----------------------------------------|
| 0.2 ≤ D ≤ 0.8             | 0/-0.008                      | ± 0.003                    | 0/-0.004<br>(h4 公差 tolerance)          |
| 1 ≤ D ≤ 6                 | 0/-0.01                       |                            |                                        |

特長 2 Feature 2

ネガティブフラット面

Negative flat surface

底面加工時の鏡面性が向上

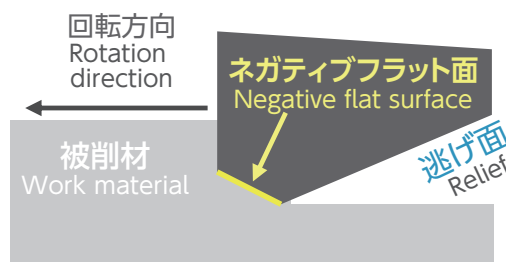
Improved mirror surface finish for flat milling

従来品

Conventional tool



CLRS



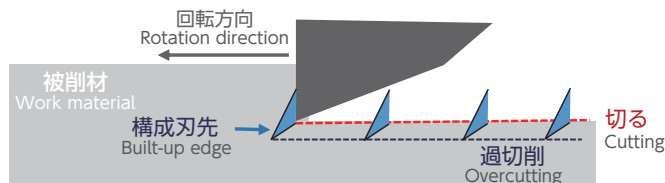
## Key points

### 底刃形状 ネガティブフラット面

Tip geometry Negative flat surface

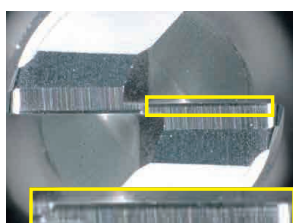
#### 従来品

Conventional tool



## CLRS

切刃に負の逃げ角  
Negative relief angle  
on cutting edge



フラットな底刃輪郭  
Flat tip outline



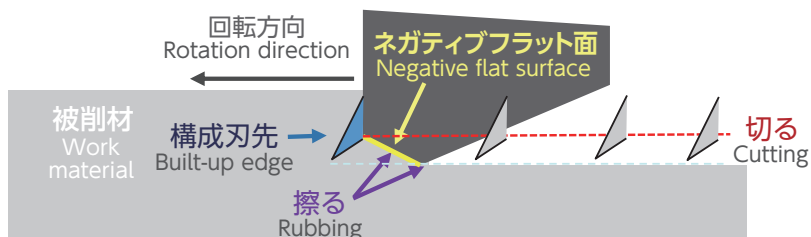
### 構成刃先によって発生する切削痕を ネガティブフラット面で擦って除去

Remove cutting marks caused by the built-up edge by rubbing them with a negative flat surface.

※ アプローチ時の傾斜角は 3° を推奨

※ An inclined angle of 3° is recommended when approaching.

※ SUS、チタン合金等、光沢が得られない被削材あり  
※ Some materials such as SUS and titanium alloys cannot be polished.



### 底面仕上げ 比較事例

φ6 × CR0.1 × EL12

Flat finishing comparison

PXA30(30HRC)

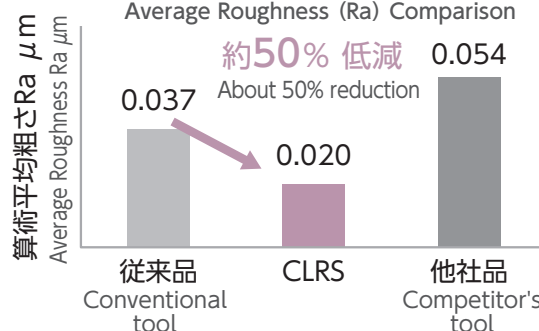


|                                |                         |
|--------------------------------|-------------------------|
| 回転速度<br>Spindle Speed          | 5,250 min <sup>-1</sup> |
| 送り速度<br>Feed Rate              | 3,600 mm/min            |
| a <sub>p</sub><br>Axial Depth  | 0.02 mm                 |
| a <sub>e</sub><br>Radial Depth | 0.15 mm                 |
| 加工時間<br>Cycle Time             | 7 min 50 s              |

Coolant : 水溶性切削油 Water Soluble

#### 算術平均粗さ Ra 比較

Average Roughness (Ra) Comparison

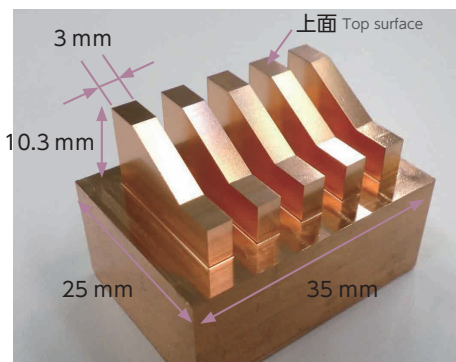


## 銅加工事例 鉄鋼用従来品との比較 φ3 × CR0.2 × EL12

Copper milling example

Comparison with conventional tools for steels

タフピッチ銅C1100 Tough Pitch Copper C1100



Coolant: 水溶性切削油 Water Soluble



| 工程<br>Process          | 回転速度<br>Spindle Speed<br>(min <sup>-1</sup> ) | 送り速度<br>Feed Rate<br>(mm/min) | $a_p$<br>(mm) | $a_e$<br>(mm) | 仕上げ代<br>Allowance<br>(mm) | 加工時間<br>Cycle Time<br>(min) |
|------------------------|-----------------------------------------------|-------------------------------|---------------|---------------|---------------------------|-----------------------------|
| 荒加工<br>Roughing        | 10,500                                        | 1,600<br>溝部 Groove 800        | 0.39          | 0.85          | 0.08                      | 21                          |
| 中仕上げ<br>Semi-finishing | 10,500                                        | 1,600                         | 0.03          | 0.15          | 0.03                      | 60                          |
| 仕上げ<br>Finishing       | 10,500                                        | 1,600                         | 0             | 0.15          | 0.03                      | 90                          |

Total 171 min

CLRS は鉄鋼用従来品に比べ表面粗さが小さい。ワーク上面のバリも小さく良好なエッジ  
CLRS has a smaller surface roughness than conventional tools for steels. Small burrs on the work surface and good edges.

### 特長 3 Feature 3

## UTCOAT による長寿命化

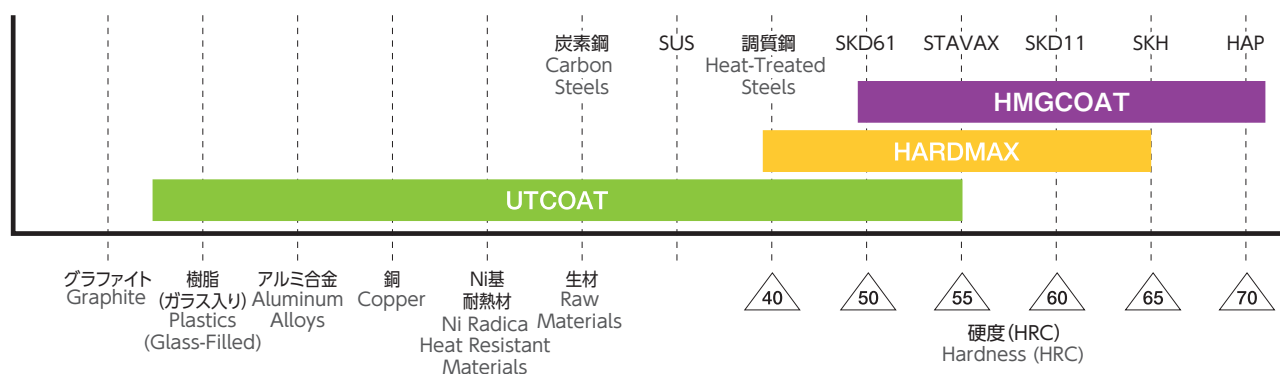
Long tool life with UTCOAT



潤滑性と靱性を高めた UTCOAT を採用  
低中硬度材の面粗さ向上及び長寿命化を実現

High lubricity and toughness.

Improved surface roughness of low to medium hardness materials and longer tool life.

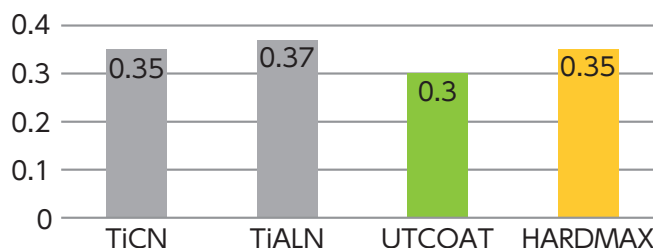
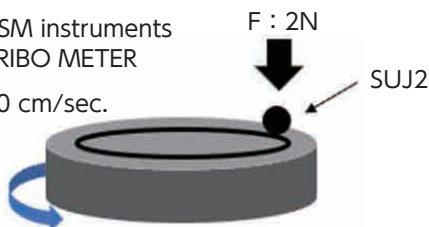


### コーティング被膜の摩擦係数

Friction coefficient of coating film

CSM instruments  
TRIBO METER

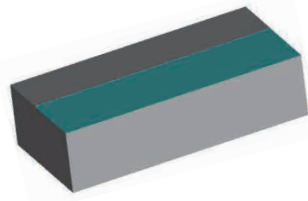
20 cm/sec.



荒加工 工具摩耗比較（平面加工）  
 $\phi 3 \times \text{CR0.2} \times \text{EL12}$

Roughing Tool wear comparison (Flat milling)

S50C

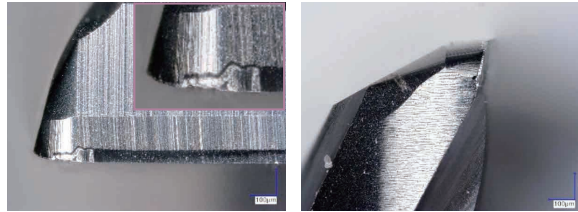


Work Size 200 × 105 mm

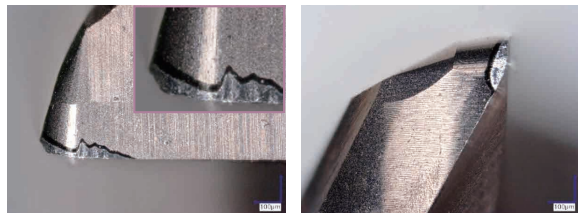
Coolant 水溶性切削油 Water Soluble

|                       |                          |
|-----------------------|--------------------------|
| 回転速度<br>Spindle Speed | 15,000 min <sup>-1</sup> |
| 送り速度<br>Feed Rate     | 1,600 mm/min             |
| $a_p$<br>Axial Depth  | 0.2 mm                   |
| $a_e$<br>Radial Depth | 0.8 mm                   |
| 加工時間<br>Cycle Time    | 26 min                   |

CLRS 逃げ面摩耗幅 0.058 mm  
 Relief wear width 0.058 mm



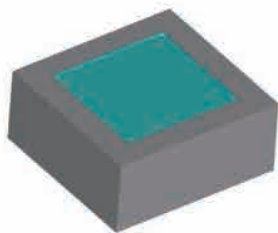
従来品 逃げ面摩耗幅 0.077 mm  
 Conventional tool Relief wear width 0.077 mm



荒加工 工具摩耗比較（ポケット加工）  
 $\phi 6 \times \text{CR0.1}$

Roughing Tool wear comparison (Pocket milling)

PXA30 (30HRC)

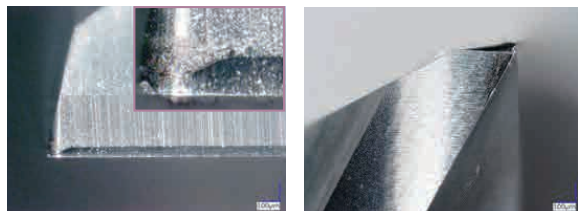


Work Size 80 × 80 × 2 mm

Coolant 水溶性切削油 Water Soluble

|                            |                         |
|----------------------------|-------------------------|
| 回転速度<br>Spindle Speed      | 4,500 min <sup>-1</sup> |
| 送り速度<br>Feed Rate          | 880 mm/min              |
| $a_p$<br>Axial Depth       | 0.4 mm                  |
| $a_e$<br>Radial Depth      | 1.26 mm                 |
| 工具突き出し長<br>Overhang Length | 32 mm                   |
| 加工時間<br>Cycle Time         | 27.5 min                |

CLRS 逃げ面摩耗幅 0.02 mm  
 Relief wear width 0.02 mm



従来品 逃げ面摩耗幅 0.03 mm  
 Conventional tool Relief wear width 0.03 mm



他社品 逃げ面摩耗幅 0.1 mm  
 Competitor's tool Relief wear width 0.1 mm



低中硬度材に最適な UTcoat を採用、長寿命化を実現

Longer tool life with UTcoat which is suitable for low to medium hardness materials.

荒加工 ステンレス鋼 工具摩耗比較 (側面加工)  
 $\phi 6 \times \text{CR0.1}$

Roughing Stainless steel Tool wear comparison (Side milling)  
 SUS304

|                            |                         |
|----------------------------|-------------------------|
| 回転速度<br>Spindle Speed      | 5,200 min <sup>-1</sup> |
| 送り速度<br>Feed Rate          | 1,000 mm/min            |
| $a_p$<br>Axial Depth       | 3 mm                    |
| $a_e$<br>Radial Depth      | 0.3 mm                  |
| 工具突き出し長<br>Overhang Length | 23 mm                   |
| 加工時間<br>Cycle Time         | 90 min                  |

Coolant : 水溶性切削油 Water Soluble

CLRS

従来品

Conventional tool

30 分後  
After 30 min



60 分後  
After 60 min



チップング大で中断  
Stopped due to large chipping

90 分後  
After 90 min



CLRS は従来工具の 3 倍以上の寿命で、継続使用可能

CLRS lasts more than three times longer than conventional tools and can be used continuously.

仕上げ加工 ステンレス鋼 寿命評価  
 $\phi 4 \times \text{CR0.1} \times \text{EL12}$

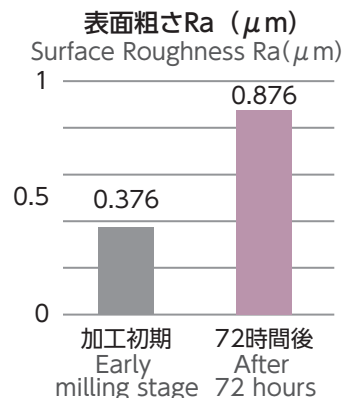
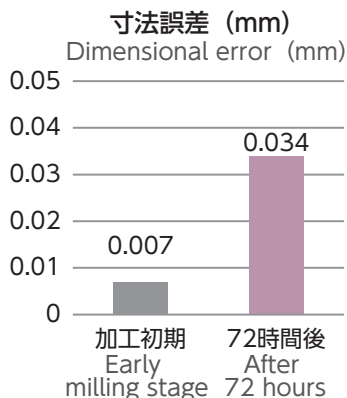
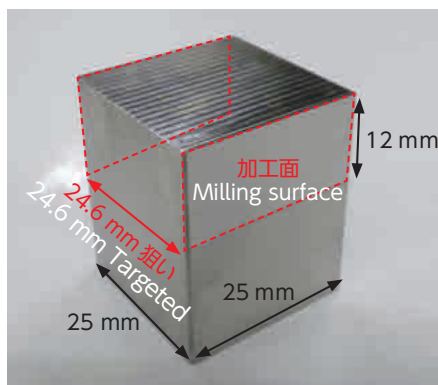
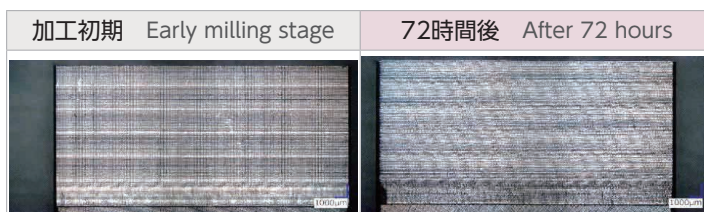
Finishing Stainless steel Tool life comparison

SUS304

|                       |                         |
|-----------------------|-------------------------|
| 回転速度<br>Spindle Speed | 4,000 min <sup>-1</sup> |
| 送り速度<br>Feed Rate     | 500 mm/min              |
| $a_p$<br>Axial Depth  | 2 mm                    |
| $a_e$<br>Radial Depth | 0.1 mm                  |
| 加工時間<br>Cycle Time    | 72 h                    |

Coolant : 水溶性切削油 Water Soluble

加工面写真 Milling surface photo



72 時間加工し、上面の目立ったバリや加工面の荒れは無く、継続加工可能

After milling 72 hours, there are no noticeable burrs or roughness on the surface and can be used continuously.

合計 187 型番 Total 187 models

単位 Unit (mm)

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |      |       |      |       |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|------|-------|------|-------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°   | 1°30' | 2°   | 3°    |
| CLRS 2002-002-005     | 0.2                             | R0.02                           | 0.5                                          | 0.2                         | 0.19                                      | 11°                                     | 50                           | 4                                | 9,400                                    | 0.63                                                     | 0.67 | 0.70  | 0.74 | 0.84  |
| CLRS 2002-002-010     |                                 |                                 | 1                                            |                             |                                           |                                         | 50                           | 4                                | 9,400                                    | 1.16                                                     | 1.22 | 1.28  | 1.35 | 1.52  |
| CLRS 2002-002-015     |                                 |                                 | 1.5                                          |                             |                                           |                                         | 50                           | 4                                | 9,400                                    | 1.67                                                     | 1.75 | 1.84  | 1.95 | 2.19  |
| CLRS 2002-005-005     |                                 | R0.05                           | 0.5                                          |                             |                                           |                                         | 50                           | 4                                | 9,400                                    | 0.63                                                     | 0.66 | 0.70  | 0.74 | 0.83  |
| CLRS 2002-005-010     |                                 |                                 | 1                                            |                             |                                           |                                         | 50                           | 4                                | 9,400                                    | 1.16                                                     | 1.21 | 1.28  | 1.35 | 1.51  |
| CLRS 2002-005-015     |                                 |                                 | 1.5                                          |                             |                                           |                                         | 50                           | 4                                | 9,400                                    | 1.67                                                     | 1.75 | 1.84  | 1.94 | 2.18  |
| CLRS 2003-002-010     | 0.3                             | R0.02                           | 1                                            | 0.3                         | 0.29                                      | 11°                                     | 50                           | 4                                | 9,200                                    | 1.16                                                     | 1.22 | 1.28  | 1.35 | 1.52  |
| CLRS 2003-002-020     |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 9,200                                    | 2.19                                                     | 2.30 | 2.42  | 2.56 | 2.87  |
| CLRS 2003-005-010     |                                 | R0.05                           | 1                                            |                             |                                           |                                         | 50                           | 4                                | 9,200                                    | 1.16                                                     | 1.21 | 1.28  | 1.35 | 1.51  |
| CLRS 2003-005-020     |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 9,200                                    | 2.19                                                     | 2.30 | 2.42  | 2.55 | 2.86  |
| CLRS 2004-002-010     | 0.4                             | R0.02                           | 1                                            | 0.4                         | 0.39                                      | 11°                                     | 50                           | 4                                | 6,600                                    | 1.16                                                     | 1.22 | 1.28  | 1.36 | 1.53  |
| CLRS 2004-002-020     |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 2.19                                                     | 2.30 | 2.42  | 2.56 | 2.88  |
| CLRS 2004-002-030     |                                 |                                 | 3                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 3.24                                                     | 3.40 | 3.58  | 3.78 | 4.25  |
| CLRS 2004-005-010     |                                 | R0.05                           | 1                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 1.16                                                     | 1.22 | 1.28  | 1.35 | 1.52  |
| CLRS 2004-005-020     |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 2.19                                                     | 2.30 | 2.42  | 2.55 | 2.87  |
| CLRS 2004-005-030     |                                 |                                 | 3                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 3.24                                                     | 3.40 | 3.58  | 3.77 | 4.24  |
| CLRS 2004-01-010      |                                 | R0.1                            | 1                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 1.16                                                     | 1.21 | 1.27  | 1.34 | 1.50  |
| CLRS 2004-01-020      |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 2.19                                                     | 2.29 | 2.41  | 2.54 | 2.85  |
| CLRS 2004-01-030      |                                 |                                 | 3                                            |                             |                                           |                                         | 50                           | 4                                | 6,600                                    | 3.24                                                     | 3.39 | 3.57  | 3.76 | 4.22  |
| CLRS 2005-005-010     | 0.5                             | R0.05                           | 1                                            | 0.5                         | 0.49                                      | 11°                                     | 50                           | 4                                | 5,400                                    | 1.16                                                     | 1.22 | 1.28  | 1.35 | 1.52  |
| CLRS 2005-005-020     |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.30 | 2.42  | 2.55 | 2.87  |
| CLRS 2005-005-030     |                                 |                                 | 3                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 3.24                                                     | 3.40 | 3.58  | 3.77 | 4.24  |
| CLRS 2005-005-050     |                                 |                                 | 5                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 5.33                                                     | 5.60 | 5.89  | 6.21 | 6.97  |
| CLRS 2005-01-010      |                                 | R0.1                            | 1                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 1.16                                                     | 1.21 | 1.27  | 1.34 | 1.50  |
| CLRS 2005-01-020      |                                 |                                 | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.29 | 2.41  | 2.54 | 2.85  |
| CLRS 2005-01-030      |                                 |                                 | 3                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 3.24                                                     | 3.39 | 3.57  | 3.76 | 4.22  |
| CLRS 2005-01-050      |                                 |                                 | 5                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 5.33                                                     | 5.59 | 5.88  | 6.20 | 6.96  |
| CLRS 2006-005-020     | 0.6                             | R0.05                           | 2                                            | 0.6                         | 0.59                                      | 11°                                     | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.30 | 2.42  | 2.55 | 2.87  |
| CLRS 2006-005-040     |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 4.29                                                     | 4.50 | 4.73  | 4.99 | 5.61  |
| CLRS 2006-005-060     |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 6.38                                                     | 6.69 | 7.04  | 7.43 | 8.34  |
| CLRS 2006-01-020      |                                 | R0.1                            | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.29 | 2.41  | 2.54 | 2.85  |
| CLRS 2006-01-040      |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 4.28                                                     | 4.49 | 4.72  | 4.98 | 5.59  |
| CLRS 2006-01-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 6.38                                                     | 6.69 | 7.03  | 7.42 | 8.33  |
| CLRS 2008-005-020     | 0.8                             | R0.05                           | 2                                            | 0.8                         | 0.79                                      | 11°                                     | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.30 | 2.42  | 2.55 | 2.87  |
| CLRS 2008-005-040     |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 4.29                                                     | 4.50 | 4.73  | 4.99 | 5.61  |
| CLRS 2008-005-060     |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 6.38                                                     | 6.69 | 7.04  | 7.43 | 8.34  |
| CLRS 2008-005-080     |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.47                                                     | 8.89 | 9.35  | 9.87 | 11.08 |
| CLRS 2008-01-020      |                                 | R0.1                            | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 2.19                                                     | 2.29 | 2.41  | 2.54 | 2.85  |
| CLRS 2008-01-040      |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 4.28                                                     | 4.49 | 4.72  | 4.98 | 5.59  |
| CLRS 2008-01-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 6.38                                                     | 6.69 | 7.03  | 7.42 | 8.33  |
| CLRS 2008-01-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.47                                                     | 8.89 | 9.35  | 9.86 | 11.06 |
| CLRS 2008-02-020      |                                 | R0.2                            | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 2.18                                                     | 2.29 | 2.40  | 2.52 | 2.81  |
| CLRS 2008-02-040      |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,400                                    | 4.28                                                     | 4.48 | 4.71  | 4.96 | 5.55  |
| CLRS 2008-02-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 6.37                                                     | 6.68 | 7.02  | 7.40 | 8.29  |
| CLRS 2008-02-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.47                                                     | 8.88 | 9.33  | 9.83 | 11.03 |

UTCOAT 2 枚刃 ロングネックラジアスエンドミル  
UTCOAT 2 Flute Long Neck Radius End Mills

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |       |       |       |       |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|-------|-------|-------|-------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°    | 1°30′ | 2°    | 3°    |
| CLRS 2010-005-020     | 1                               | R0.05                           | 2                                            | 1                           | 0.98                                      | 11°                                     | 50                           | 4                                | 5,200                                    | 2.20                                                     | 2.31  | 2.43  | 2.56  | 2.88  |
| CLRS 2010-005-040     |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,200                                    | 4.30                                                     | 4.51  | 4.74  | 5.00  | 5.62  |
| CLRS 2010-005-060     |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 6.39                                                     | 6.71  | 7.05  | 7.44  | 8.36  |
| CLRS 2010-005-080     |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 8.48                                                     | 8.90  | 9.37  | 9.88  | 11.10 |
| CLRS 2010-005-100     |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 10.58                                                    | 11.10 | 11.68 | 12.32 | 13.83 |
| CLRS 2010-01-020      |                                 | R0.1                            | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,200                                    | 2.20                                                     | 2.31  | 2.42  | 2.55  | 2.86  |
| CLRS 2010-01-040      |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,200                                    | 4.29                                                     | 4.50  | 4.74  | 4.99  | 5.60  |
| CLRS 2010-01-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 6.39                                                     | 6.70  | 7.05  | 7.43  | 8.34  |
| CLRS 2010-01-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 8.48                                                     | 8.90  | 9.36  | 9.87  | 11.08 |
| CLRS 2010-01-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 10.58                                                    | 11.10 | 11.67 | 12.31 | 13.82 |
| CLRS 2010-02-020      |                                 | R0.2                            | 2                                            |                             |                                           |                                         | 50                           | 4                                | 5,200                                    | 2.20                                                     | 2.30  | 2.41  | 2.53  | 2.83  |
| CLRS 2010-02-040      |                                 |                                 | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,200                                    | 4.29                                                     | 4.49  | 4.72  | 4.97  | 5.57  |
| CLRS 2010-02-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 6.38                                                     | 6.69  | 7.03  | 7.41  | 8.30  |
| CLRS 2010-02-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 8.48                                                     | 8.89  | 9.34  | 9.85  | 11.04 |
| CLRS 2010-02-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 5,800                                    | 10.57                                                    | 11.09 | 11.65 | 12.28 | 13.78 |
| CLRS 2015-005-040     | 1.5                             | R0.05                           | 4                                            | 1.5                         | 1.47                                      | 11°                                     | 50                           | 4                                | 5,500                                    | 4.25                                                     | 4.46  | 4.69  | 4.95  | 5.56  |
| CLRS 2015-005-060     |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 6.34                                                     | 6.66  | 7.00  | 7.39  | 8.30  |
| CLRS 2015-005-080     |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 8.44                                                     | 8.85  | 9.31  | 9.82  | 11.04 |
| CLRS 2015-01-040      |                                 | R0.1                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 4.25                                                     | 4.45  | 4.68  | 4.94  | 5.54  |
| CLRS 2015-01-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 6.34                                                     | 6.65  | 6.99  | 7.38  | 8.28  |
| CLRS 2015-01-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 8.43                                                     | 8.85  | 9.31  | 9.81  | 11.02 |
| CLRS 2015-01-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 12.62                                                    | 13.24 | 13.93 | 14.69 | 16.49 |
| CLRS 2015-02-040      |                                 | R0.2                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 4.24                                                     | 4.44  | 4.67  | 4.92  | 5.50  |
| CLRS 2015-02-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 6.34                                                     | 6.64  | 6.98  | 7.35  | 8.24  |
| CLRS 2015-02-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 8.43                                                     | 8.84  | 9.29  | 9.79  | 10.98 |
| CLRS 2015-02-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 12.62                                                    | 13.23 | 13.91 | 14.67 | 16.46 |
| CLRS 2015-03-040      |                                 | R0.3                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 4.24                                                     | 4.43  | 4.65  | 4.89  | 5.47  |
| CLRS 2015-03-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 6.33                                                     | 6.63  | 6.96  | 7.33  | 8.21  |
| CLRS 2015-03-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 8.43                                                     | 8.83  | 9.28  | 9.77  | 10.95 |
| CLRS 2015-03-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 12.61                                                    | 13.22 | 13.90 | 14.65 | 16.42 |
| CLRS 2015-05-040      |                                 | R0.5                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 4.23                                                     | 4.42  | 4.62  | 4.85  | 5.40  |
| CLRS 2015-05-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,500                                    | 6.32                                                     | 6.61  | 6.93  | 7.29  | 8.14  |
| CLRS 2015-05-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 8.42                                                     | 8.81  | 9.24  | 9.73  | 10.87 |
| CLRS 2015-05-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 5,900                                    | 12.60                                                    | 13.20 | 13.87 | 14.60 | 16.35 |

UTCOAT 2 枚刃 ロングネックラジウスエンドミル  
 UTCOAT 2 Flute Long Neck Radius End Mills

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |       |       |       |                         |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|-------|-------|-------|-------------------------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°    | 1°30′ | 2°    | 3°                      |
| CLRS 2020-005-040     | 2                               | R0.05                           | 4                                            | 2                           | 1.98                                      | 11°                                     | 50                           | 4                                | 5,600                                    | 4.22                                                     | 4.43  | 4.66  | 4.92  | 5.52                    |
| CLRS 2020-005-060     |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 6.32                                                     | 6.63  | 6.97  | 7.35  | 8.26                    |
| CLRS 2020-005-080     |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.41                                                     | 8.83  | 9.28  | 9.79  | 11.00                   |
| CLRS 2020-005-100     |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 10.50                                                    | 11.02 | 11.60 | 12.23 | 13.74                   |
| CLRS 2020-01-040      |                                 | R0.1                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 4.22                                                     | 4.43  | 4.65  | 4.91  | 5.51                    |
| CLRS 2020-01-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 6.31                                                     | 6.62  | 6.96  | 7.34  | 8.24                    |
| CLRS 2020-01-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.41                                                     | 8.82  | 9.28  | 9.78  | 10.98                   |
| CLRS 2020-01-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 10.50                                                    | 11.02 | 11.59 | 12.22 | 13.72                   |
| CLRS 2020-01-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 12.60                                                    | 13.22 | 13.90 | 14.66 | 16.46                   |
| CLRS 2020-01-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 4                                | 6,000                                    | 16.78                                                    | 17.61 | 18.52 | 19.53 | 干渉なし<br>No Interference |
| CLRS 2020-02-040      |                                 | R0.2                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 4.22                                                     | 4.42  | 4.64  | 4.88  | 5.47                    |
| CLRS 2020-02-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 6.31                                                     | 6.61  | 6.95  | 7.32  | 8.21                    |
| CLRS 2020-02-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.40                                                     | 8.81  | 9.26  | 9.76  | 10.95                   |
| CLRS 2020-02-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 10.50                                                    | 11.01 | 11.57 | 12.20 | 13.68                   |
| CLRS 2020-02-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 12.59                                                    | 13.21 | 13.88 | 14.64 | 16.42                   |
| CLRS 2020-02-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 4                                | 6,000                                    | 16.78                                                    | 17.60 | 18.51 | 19.51 | 干渉なし<br>No Interference |
| CLRS 2020-03-040      |                                 | R0.3                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 4.21                                                     | 4.41  | 4.62  | 4.86  | 5.43                    |
| CLRS 2020-03-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 6.30                                                     | 6.60  | 6.93  | 7.30  | 8.17                    |
| CLRS 2020-03-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.40                                                     | 8.80  | 9.25  | 9.74  | 10.91                   |
| CLRS 2020-03-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 10.49                                                    | 11.00 | 11.56 | 12.18 | 13.65                   |
| CLRS 2020-03-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 12.59                                                    | 13.20 | 13.87 | 14.61 | 16.39                   |
| CLRS 2020-03-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 4                                | 6,000                                    | 16.77                                                    | 17.59 | 18.49 | 19.49 | 干渉なし<br>No Interference |
| CLRS 2020-05-040      |                                 | R0.5                            | 4                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 4.20                                                     | 4.39  | 4.59  | 4.82  | 5.36                    |
| CLRS 2020-05-060      |                                 |                                 | 6                                            |                             |                                           |                                         | 50                           | 4                                | 5,600                                    | 6.30                                                     | 6.58  | 6.90  | 7.26  | 8.10                    |
| CLRS 2020-05-080      |                                 |                                 | 8                                            |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 8.39                                                     | 8.78  | 9.21  | 9.70  | 10.84                   |
| CLRS 2020-05-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 10.48                                                    | 10.98 | 11.53 | 12.13 | 13.58                   |
| CLRS 2020-05-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 50                           | 4                                | 6,000                                    | 12.58                                                    | 13.18 | 13.84 | 14.57 | 16.31                   |
| CLRS 2020-05-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 4                                | 6,000                                    | 16.77                                                    | 17.57 | 18.46 | 19.45 | 干渉なし<br>No Interference |

UTCOAT 2 枚刃 ロングネックラジアスエンドミル  
 UTCOAT 2 Flute Long Neck Radius End Mills

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |       |       |       |                         |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|-------|-------|-------|-------------------------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°    | 1°30′ | 2°    | 3°                      |
| CLRS 2030-01-060      | 3                               | R0.1                            | 6                                            | 3                           | 2.95                                      | 11°                                     | 50                           | 6                                | 6,000                                    | 6.39                                                     | 6.71  | 7.05  | 7.44  | 8.35                    |
| CLRS 2030-01-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 6                                | 7,000                                    | 10.58                                                    | 11.10 | 11.68 | 12.31 | 13.83                   |
| CLRS 2030-01-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 12.68                                                    | 13.30 | 13.99 | 14.75 | 16.56                   |
| CLRS 2030-01-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 16.86                                                    | 17.69 | 18.61 | 19.63 | 22.04                   |
| CLRS 2030-01-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 21.05                                                    | 22.09 | 23.23 | 24.50 | 27.52                   |
| CLRS 2030-01-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 9,800                                    | 26.29                                                    | 27.58 | 29.01 | 30.60 | 干渉なし<br>No Interference |
| CLRS 2030-02-060      |                                 | R0.2                            | 6                                            |                             |                                           |                                         | 50                           | 6                                | 6,000                                    | 6.39                                                     | 6.70  | 7.04  | 7.42  | 8.31                    |
| CLRS 2030-02-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 6                                | 7,000                                    | 10.58                                                    | 11.09 | 11.66 | 12.29 | 13.79                   |
| CLRS 2030-02-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 12.67                                                    | 13.29 | 13.97 | 14.73 | 16.53                   |
| CLRS 2030-02-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 16.86                                                    | 17.68 | 18.60 | 19.61 | 22.00                   |
| CLRS 2030-02-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 21.05                                                    | 22.08 | 23.22 | 24.48 | 27.48                   |
| CLRS 2030-02-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 9,800                                    | 26.28                                                    | 27.57 | 29.00 | 30.58 | 干渉なし<br>No Interference |
| CLRS 2030-03-060      |                                 | R0.3                            | 6                                            |                             |                                           |                                         | 50                           | 6                                | 6,000                                    | 6.39                                                     | 6.69  | 7.02  | 7.40  | 8.28                    |
| CLRS 2030-03-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 6                                | 7,000                                    | 10.57                                                    | 11.08 | 11.65 | 12.27 | 13.75                   |
| CLRS 2030-03-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 12.67                                                    | 13.28 | 13.96 | 14.71 | 16.49                   |
| CLRS 2030-03-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 16.86                                                    | 17.68 | 18.58 | 19.59 | 21.97                   |
| CLRS 2030-03-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 21.04                                                    | 22.07 | 23.20 | 24.46 | 27.45                   |
| CLRS 2030-03-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 9,800                                    | 26.28                                                    | 27.56 | 28.98 | 30.56 | 干渉なし<br>No Interference |
| CLRS 2030-05-060      |                                 | R0.5                            | 6                                            |                             |                                           |                                         | 50                           | 6                                | 6,000                                    | 6.38                                                     | 6.67  | 6.99  | 7.35  | 8.21                    |
| CLRS 2030-05-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 6                                | 7,000                                    | 10.56                                                    | 11.06 | 11.62 | 12.23 | 13.68                   |
| CLRS 2030-05-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 12.66                                                    | 13.26 | 13.93 | 14.67 | 16.42                   |
| CLRS 2030-05-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 16.85                                                    | 17.66 | 18.55 | 19.54 | 21.90                   |
| CLRS 2030-05-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 21.03                                                    | 22.05 | 23.17 | 24.42 | 27.37                   |
| CLRS 2030-05-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 9,800                                    | 26.27                                                    | 27.54 | 28.95 | 30.51 | 干渉なし<br>No Interference |
| CLRS 2030-10-060      |                                 | R1                              | 6                                            |                             |                                           |                                         | 50                           | 6                                | 6,000                                    | 6.35                                                     | 6.62  | 6.92  | 7.24  | 8.03                    |
| CLRS 2030-10-100      |                                 |                                 | 10                                           |                             |                                           |                                         | 50                           | 6                                | 7,000                                    | 10.54                                                    | 11.01 | 11.54 | 12.12 | 13.50                   |
| CLRS 2030-10-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 12.63                                                    | 13.21 | 13.85 | 14.56 | 16.24                   |
| CLRS 2030-10-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 16.82                                                    | 17.61 | 18.47 | 19.43 | 21.72                   |
| CLRS 2030-10-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 60                           | 6                                | 8,800                                    | 21.01                                                    | 22.00 | 23.10 | 24.31 | 27.19                   |
| CLRS 2030-10-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 9,800                                    | 26.25                                                    | 27.49 | 28.87 | 30.41 | 干渉なし<br>No Interference |

UTCOAT 2 枚刃 ロングネックラジアスエンドミル  
UTCOAT 2 Flute Long Neck Radius End Mills

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |       |       |                         |                         |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|-------|-------|-------------------------|-------------------------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°    | 1°30' | 2°                      | 3°                      |
| CLRS 2040-01-080      | 4                               | R0.1                            | 8                                            | 4                           | 3.96                                      | 11°                                     | 60                           | 6                                | 7,800                                    | 8.48                                                     | 8.90  | 9.36  | 9.87                    | 11.08                   |
| CLRS 2040-01-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 8,000                                    | 12.67                                                    | 13.29 | 13.98 | 14.74                   | 16.55                   |
| CLRS 2040-01-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 9,400                                    | 16.86                                                    | 17.69 | 18.60 | 19.62                   | 干渉なし<br>No Interference |
| CLRS 2040-01-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 21.04                                                    | 22.08 | 23.22 | 24.49                   | 干渉なし<br>No Interference |
| CLRS 2040-01-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 26.28                                                    | 27.57 | 29.00 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-01-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 10,100                                   | 31.51                                                    | 33.07 | 34.78 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-02-080      |                                 | R0.2                            | 8                                            |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 8.48                                                     | 8.89  | 9.34  | 9.85                    | 11.04                   |
| CLRS 2040-02-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 8,000                                    | 12.66                                                    | 13.28 | 13.96 | 14.72                   | 16.52                   |
| CLRS 2040-02-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 9,400                                    | 16.85                                                    | 17.68 | 18.59 | 19.60                   | 干渉なし<br>No Interference |
| CLRS 2040-02-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 21.04                                                    | 22.07 | 23.21 | 24.47                   | 干渉なし<br>No Interference |
| CLRS 2040-02-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 26.28                                                    | 27.56 | 28.99 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-02-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 10,100                                   | 31.51                                                    | 33.06 | 34.77 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-03-080      |                                 | R0.3                            | 8                                            |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 8.47                                                     | 8.88  | 9.33  | 9.82                    | 11.01                   |
| CLRS 2040-03-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 8,000                                    | 12.66                                                    | 13.27 | 13.95 | 14.70                   | 16.48                   |
| CLRS 2040-03-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 9,400                                    | 16.85                                                    | 17.67 | 18.57 | 19.58                   | 干渉なし<br>No Interference |
| CLRS 2040-03-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 21.04                                                    | 22.06 | 23.19 | 24.45                   | 干渉なし<br>No Interference |
| CLRS 2040-03-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 26.27                                                    | 27.55 | 28.97 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-03-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 10,100                                   | 31.51                                                    | 33.05 | 34.75 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-05-080      |                                 | R0.5                            | 8                                            |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 8.46                                                     | 8.86  | 9.30  | 9.78                    | 10.93                   |
| CLRS 2040-05-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 8,000                                    | 12.65                                                    | 13.25 | 13.92 | 14.66                   | 16.41                   |
| CLRS 2040-05-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 9,400                                    | 16.84                                                    | 17.65 | 18.54 | 19.53                   | 干渉なし<br>No Interference |
| CLRS 2040-05-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 21.03                                                    | 22.04 | 23.16 | 24.41                   | 干渉なし<br>No Interference |
| CLRS 2040-05-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 26.26                                                    | 27.53 | 28.94 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-05-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 10,100                                   | 31.50                                                    | 33.03 | 34.72 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-10-080      |                                 | R1                              | 8                                            |                             |                                           |                                         | 60                           | 6                                | 7,800                                    | 8.44                                                     | 8.81  | 9.22  | 9.67                    | 10.75                   |
| CLRS 2040-10-120      |                                 |                                 | 12                                           |                             |                                           |                                         | 60                           | 6                                | 8,000                                    | 12.63                                                    | 13.20 | 13.84 | 14.55                   | 16.23                   |
| CLRS 2040-10-160      |                                 |                                 | 16                                           |                             |                                           |                                         | 60                           | 6                                | 9,400                                    | 16.81                                                    | 17.60 | 18.46 | 19.43                   | 干渉なし<br>No Interference |
| CLRS 2040-10-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 21.00                                                    | 21.99 | 23.09 | 24.30                   | 干渉なし<br>No Interference |
| CLRS 2040-10-250      |                                 |                                 | 25                                           |                             |                                           |                                         | 70                           | 6                                | 10,100                                   | 26.24                                                    | 27.49 | 28.86 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2040-10-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 10,100                                   | 31.47                                                    | 32.98 | 34.64 | 干渉なし<br>No Interference | 干渉なし<br>No Interference |

UTCOAT 2 枚刃 ロングネックラジアスエンドミル  
UTCOAT 2 Flute Long Neck Radius End Mills

| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>φD | コーナ半径<br>Corner<br>Radius<br>CR | 有効長<br>Effective<br>Length<br>ℓ <sub>1</sub> | 刃長<br>Length<br>of Cut<br>ℓ | 首径<br>Neck<br>Diameter<br>φd <sub>1</sub> | 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 | 希望小売価格<br>Suggested<br>Retail Price<br>¥ | ワーク勾配角に対する実有効長<br>Effective Length by<br>Inclined Angles |                         |                         |                         |                         |
|-----------------------|---------------------------------|---------------------------------|----------------------------------------------|-----------------------------|-------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|------------------------------------------|----------------------------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                       |                                 |                                 |                                              |                             |                                           |                                         |                              |                                  |                                          | 30°                                                      | 1°                      | 1°30′                   | 2°                      | 3°                      |
| CLRS 2060-01-150      | 6                               | R0.1                            | 15                                           | 6                           | 5.86                                      | —                                       | 60                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-01-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-01-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 15,200                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-01-400      |                                 |                                 | 40                                           |                             |                                           |                                         | 90                           | 6                                | 18,000                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-02-150      |                                 | R0.2                            | 15                                           |                             |                                           |                                         | 60                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-02-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-02-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 15,200                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-02-400      |                                 |                                 | 40                                           |                             |                                           |                                         | 90                           | 6                                | 18,000                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-03-150      |                                 | R0.3                            | 15                                           |                             |                                           |                                         | 60                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-03-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-03-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 15,200                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-03-400      |                                 |                                 | 40                                           |                             |                                           |                                         | 90                           | 6                                | 18,000                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-05-150      |                                 | R0.5                            | 15                                           |                             |                                           |                                         | 60                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-05-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-05-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 15,200                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-05-400      |                                 |                                 | 40                                           |                             |                                           |                                         | 90                           | 6                                | 18,000                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-10-150      |                                 | R1                              | 15                                           |                             |                                           |                                         | 60                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-10-200      |                                 |                                 | 20                                           |                             |                                           |                                         | 70                           | 6                                | 12,900                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-10-300      |                                 |                                 | 30                                           |                             |                                           |                                         | 80                           | 6                                | 15,200                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |
| CLRS 2060-10-400      |                                 |                                 | 40                                           |                             |                                           |                                         | 90                           | 6                                | 18,000                                   | 干渉なし<br>No Interference                                  | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference | 干渉なし<br>No Interference |

## CLRS 切削条件表 Milling Conditions for CLRS (2 Flutes)

## 等高線加工条件 Z-Level Milling

| 被削材<br>WORK MATERIAL  |                                   |                                    | 銅 / アルミ合金<br>COPPER / ALUMINUM ALLOYS<br>C1100 / A5052 / A7075 |                                  |                                          |                                           | 炭素鋼 / 合金鋼 / プリハードン鋼 / チタン合金<br>CARBON STEELS / ALLOY STEELS /<br>PREHARDENED STEELS / TITANIUM ALLOYS<br>S50C / SCM / SUS / PXA30 / NAK / Ti-6Al-4V<br>(~40HRC) |                                  |                                          |                                           | 焼入れ鋼<br>HARDENED STEELS<br>STAVAX / SKD61<br>(~55HRC) |                                  |                                          |                                           |
|-----------------------|-----------------------------------|------------------------------------|----------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|-------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 有効長<br>Effective<br>Length<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) |
| 2002                  | 0.2                               | 0.5                                | 40,000                                                         | 230                              | 0.027                                    | 0.02                                      | 40,000                                                                                                                                                          | 240                              | 0.006                                    | 0.02                                      | 40,000                                                | 240                              | 0.005                                    | 0.02                                      |
|                       |                                   | 1                                  | 40,000                                                         | 200                              | 0.027                                    | 0.02                                      | 40,000                                                                                                                                                          | 200                              | 0.006                                    | 0.02                                      | 35,000                                                | 150                              | 0.004                                    | 0.02                                      |
|                       |                                   | 1.5                                | 40,000                                                         | 180                              | 0.017                                    | 0.01                                      | 40,000                                                                                                                                                          | 180                              | 0.005                                    | 0.01                                      | 27,000                                                | 100                              | 0.003                                    | 0.01                                      |
| 2003                  | 0.3                               | 1                                  | 40,000                                                         | 500                              | 0.03                                     | 0.02                                      | 40,000                                                                                                                                                          | 500                              | 0.007                                    | 0.02                                      | 35,000                                                | 350                              | 0.005                                    | 0.02                                      |
|                       |                                   | 2                                  | 40,000                                                         | 400                              | 0.03                                     | 0.02                                      | 40,000                                                                                                                                                          | 400                              | 0.007                                    | 0.02                                      | 33,200                                                | 250                              | 0.005                                    | 0.015                                     |
| 2004                  | 0.4                               | 1                                  | 40,000                                                         | 610                              | 0.048                                    | 0.063                                     | 40,000                                                                                                                                                          | 510                              | 0.013                                    | 0.072                                     | 40,000                                                | 370                              | 0.011                                    | 0.072                                     |
|                       |                                   | 2                                  | 40,000                                                         | 580                              | 0.042                                    | 0.054                                     | 40,000                                                                                                                                                          | 450                              | 0.011                                    | 0.045                                     | 32,300                                                | 290                              | 0.009                                    | 0.045                                     |
|                       |                                   | 3                                  | 33,900                                                         | 460                              | 0.027                                    | 0.054                                     | 33,900                                                                                                                                                          | 390                              | 0.008                                    | 0.027                                     | 27,100                                                | 280                              | 0.007                                    | 0.027                                     |
| 2005                  | 0.5                               | 1                                  | 40,000                                                         | 1,370                            | 0.081                                    | 0.117                                     | 40,000                                                                                                                                                          | 1,140                            | 0.034                                    | 0.122                                     | 40,000                                                | 860                              | 0.03                                     | 0.122                                     |
|                       |                                   | 2                                  | 39,900                                                         | 1,000                            | 0.075                                    | 0.108                                     | 39,900                                                                                                                                                          | 830                              | 0.029                                    | 0.117                                     | 32,500                                                | 630                              | 0.026                                    | 0.117                                     |
|                       |                                   | 3                                  | 31,900                                                         | 770                              | 0.057                                    | 0.09                                      | 31,900                                                                                                                                                          | 640                              | 0.023                                    | 0.113                                     | 26,000                                                | 480                              | 0.02                                     | 0.113                                     |
|                       |                                   | 5                                  | 26,400                                                         | 570                              | 0.027                                    | 0.045                                     | 26,400                                                                                                                                                          | 470                              | 0.011                                    | 0.099                                     | 21,500                                                | 360                              | 0.01                                     | 0.099                                     |
| 2006                  | 0.6                               | 2                                  | 28,600                                                         | 610                              | 0.114                                    | 0.162                                     | 28,600                                                                                                                                                          | 510                              | 0.01                                     | 0.219                                     | 23,700                                                | 390                              | 0.01                                     | 0.219                                     |
|                       |                                   | 4                                  | 20,400                                                         | 400                              | 0.063                                    | 0.108                                     | 20,400                                                                                                                                                          | 330                              | 0.005                                    | 0.104                                     | 16,800                                                | 250                              | 0.005                                    | 0.104                                     |
|                       |                                   | 6                                  | 16,800                                                         | 300                              | 0.036                                    | 0.045                                     | 16,800                                                                                                                                                          | 250                              | 0.003                                    | 0.099                                     | 13,900                                                | 190                              | 0.003                                    | 0.099                                     |
| 2008                  | 0.8                               | 2                                  | 22,000                                                         | 600                              | 0.14                                     | 0.22                                      | 22,000                                                                                                                                                          | 500                              | 0.016                                    | 0.117                                     | 19,000                                                | 400                              | 0.017                                    | 0.12                                      |
|                       |                                   | 4                                  | 17,500                                                         | 540                              | 0.132                                    | 0.198                                     | 17,500                                                                                                                                                          | 450                              | 0.014                                    | 0.117                                     | 15,000                                                | 360                              | 0.015                                    | 0.117                                     |
|                       |                                   | 6                                  | 14,600                                                         | 410                              | 0.075                                    | 0.144                                     | 14,600                                                                                                                                                          | 340                              | 0.008                                    | 0.117                                     | 12,500                                                | 270                              | 0.008                                    | 0.108                                     |
|                       |                                   | 8                                  | 12,800                                                         | 310                              | 0.03                                     | 0.1                                       | 12,800                                                                                                                                                          | 270                              | 0.008                                    | 0.117                                     | 11,000                                                | 185                              | 0.004                                    | 0.09                                      |
| 2010                  | 1                                 | 2                                  | 17,600                                                         | 1,100                            | 0.21                                     | 0.45                                      | 17,600                                                                                                                                                          | 920                              | 0.035                                    | 0.27                                      | 15,300                                                | 750                              | 0.04                                     | 0.27                                      |
|                       |                                   | 4                                  | 13,800                                                         | 980                              | 0.201                                    | 0.405                                     | 13,800                                                                                                                                                          | 820                              | 0.03                                     | 0.27                                      | 12,000                                                | 670                              | 0.035                                    | 0.27                                      |
|                       |                                   | 6                                  | 11,300                                                         | 790                              | 0.117                                    | 0.387                                     | 11,300                                                                                                                                                          | 650                              | 0.021                                    | 0.216                                     | 9,800                                                 | 540                              | 0.024                                    | 0.216                                     |
|                       |                                   | 8                                  | 9,800                                                          | 590                              | 0.072                                    | 0.36                                      | 9,800                                                                                                                                                           | 490                              | 0.016                                    | 0.189                                     | 8,500                                                 | 400                              | 0.018                                    | 0.189                                     |
|                       |                                   | 10                                 | 8,800                                                          | 390                              | 0.048                                    | 0.315                                     | 8,800                                                                                                                                                           | 320                              | 0.011                                    | 0.126                                     | 7,600                                                 | 270                              | 0.013                                    | 0.126                                     |
| 2015                  | 1.5                               | 4                                  | 13,200                                                         | 1,310                            | 0.3                                      | 0.675                                     | 13,200                                                                                                                                                          | 1,090                            | 0.06                                     | 0.45                                      | 12,000                                                | 950                              | 0.06                                     | 0.45                                      |
|                       |                                   | 6                                  | 10,600                                                         | 1,240                            | 0.282                                    | 0.63                                      | 10,600                                                                                                                                                          | 1,030                            | 0.055                                    | 0.405                                     | 9,700                                                 | 900                              | 0.055                                    | 0.405                                     |
|                       |                                   | 8                                  | 9,300                                                          | 1,050                            | 0.204                                    | 0.612                                     | 9,300                                                                                                                                                           | 870                              | 0.045                                    | 0.315                                     | 8,500                                                 | 760                              | 0.045                                    | 0.315                                     |
|                       |                                   | 12                                 | 7,800                                                          | 800                              | 0.114                                    | 0.54                                      | 7,800                                                                                                                                                           | 670                              | 0.038                                    | 0.27                                      | 7,100                                                 | 580                              | 0.038                                    | 0.27                                      |
| 2020                  | 2                                 | 4                                  | 15,300                                                         | 1,500                            | 0.33                                     | 0.9                                       | 15,300                                                                                                                                                          | 1,250                            | 0.065                                    | 0.9                                       | 14,300                                                | 1,130                            | 0.065                                    | 0.9                                       |
|                       |                                   | 6                                  | 12,800                                                         | 1,220                            | 0.321                                    | 0.855                                     | 12,800                                                                                                                                                          | 1,020                            | 0.06                                     | 0.81                                      | 12,000                                                | 930                              | 0.06                                     | 0.81                                      |
|                       |                                   | 8                                  | 11,200                                                         | 1,120                            | 0.267                                    | 0.81                                      | 11,200                                                                                                                                                          | 930                              | 0.055                                    | 0.72                                      | 10,400                                                | 850                              | 0.055                                    | 0.72                                      |
|                       |                                   | 10                                 | 10,000                                                         | 1,050                            | 0.225                                    | 0.765                                     | 10,000                                                                                                                                                          | 870                              | 0.047                                    | 0.585                                     | 9,300                                                 | 790                              | 0.047                                    | 0.585                                     |
|                       |                                   | 12                                 | 9,100                                                          | 980                              | 0.186                                    | 0.72                                      | 9,100                                                                                                                                                           | 820                              | 0.044                                    | 0.45                                      | 8,500                                                 | 740                              | 0.044                                    | 0.45                                      |
|                       |                                   | 16                                 | 7,800                                                          | 830                              | 0.132                                    | 0.702                                     | 7,800                                                                                                                                                           | 690                              | 0.039                                    | 0.315                                     | 7,300                                                 | 630                              | 0.039                                    | 0.315                                     |
| 2030                  | 3                                 | 6                                  | 14,000                                                         | 2,700                            | 0.5                                      | 0.9                                       | 14,000                                                                                                                                                          | 1,510                            | 0.15                                     | 0.72                                      | 13,300                                                | 1,140                            | 0.15                                     | 0.72                                      |
|                       |                                   | 10                                 | 11,800                                                         | 1,700                            | 0.4                                      | 0.88                                      | 11,800                                                                                                                                                          | 1,200                            | 0.135                                    | 0.77                                      | 11,500                                                | 930                              | 0.125                                    | 0.69                                      |
|                       |                                   | 12                                 | 10,500                                                         | 1,600                            | 0.39                                     | 0.85                                      | 10,500                                                                                                                                                          | 1,150                            | 0.105                                    | 0.67                                      | 10,000                                                | 890                              | 0.105                                    | 0.67                                      |
|                       |                                   | 16                                 | 9,200                                                          | 1,160                            | 0.321                                    | 0.81                                      | 9,200                                                                                                                                                           | 960                              | 0.081                                    | 0.63                                      | 8,800                                                 | 730                              | 0.081                                    | 0.63                                      |
|                       |                                   | 20                                 | 8,400                                                          | 1,050                            | 0.26                                     | 0.78                                      | 8,400                                                                                                                                                           | 880                              | 0.073                                    | 0.58                                      | 7,900                                                 | 680                              | 0.073                                    | 0.58                                      |
|                       |                                   | 25                                 | 7,500                                                          | 980                              | 0.18                                     | 0.72                                      | 7,500                                                                                                                                                           | 820                              | 0.065                                    | 0.495                                     | 7,100                                                 | 620                              | 0.065                                    | 0.495                                     |
| 2040                  | 4                                 | 8                                  | 10,200                                                         | 1,340                            | 0.42                                     | 1.62                                      | 10,200                                                                                                                                                          | 1,110                            | 0.095                                    | 1.35                                      | 8,500                                                 | 970                              | 0.095                                    | 1.35                                      |
|                       |                                   | 12                                 | 8,900                                                          | 1,300                            | 0.41                                     | 1.56                                      | 8,900                                                                                                                                                           | 1,080                            | 0.083                                    | 1.15                                      | 7,600                                                 | 950                              | 0.083                                    | 1.15                                      |
|                       |                                   | 16                                 | 7,900                                                          | 1,250                            | 0.4                                      | 1.5                                       | 7,900                                                                                                                                                           | 1,030                            | 0.065                                    | 1                                         | 6,600                                                 | 910                              | 0.065                                    | 1                                         |
|                       |                                   | 20                                 | 6,900                                                          | 1,190                            | 0.384                                    | 1.44                                      | 6,900                                                                                                                                                           | 990                              | 0.054                                    | 0.9                                       | 5,800                                                 | 860                              | 0.054                                    | 0.9                                       |
|                       |                                   | 25                                 | 6,200                                                          | 1,100                            | 0.31                                     | 1.38                                      | 6,200                                                                                                                                                           | 900                              | 0.043                                    | 0.8                                       | 5,200                                                 | 770                              | 0.043                                    | 0.8                                       |
|                       |                                   | 30                                 | 5,500                                                          | 860                              | 0.189                                    | 1.26                                      | 5,500                                                                                                                                                           | 720                              | 0.027                                    | 0.648                                     | 4,600                                                 | 630                              | 0.027                                    | 0.648                                     |
| 2060                  | 6                                 | 15                                 | 6,900                                                          | 1,570                            | 0.59                                     | 2.18                                      | 6,900                                                                                                                                                           | 1,400                            | 0.48                                     | 1.33                                      | 4,100                                                 | 1,180                            | 0.19                                     | 1.35                                      |
|                       |                                   | 20                                 | 5,800                                                          | 1,350                            | 0.58                                     | 2.12                                      | 5,800                                                                                                                                                           | 1,180                            | 0.46                                     | 1.31                                      | 3,500                                                 | 1,000                            | 0.18                                     | 1.31                                      |
|                       |                                   | 30                                 | 4,500                                                          | 1,060                            | 0.546                                    | 1.98                                      | 4,500                                                                                                                                                           | 880                              | 0.396                                    | 1.26                                      | 2,600                                                 | 740                              | 0.158                                    | 1.26                                      |
|                       |                                   | 40                                 | 3,900                                                          | 880                              | 0.416                                    | 1.86                                      | 3,900                                                                                                                                                           | 730                              | 0.301                                    | 1.17                                      | 2,200                                                 | 610                              | 0.12                                     | 1.17                                      |

# CLRS 切削条件表 Milling Conditions for CLRS (2 Flutes)

## 側面加工条件 Side Milling

| 被削材<br>WORK MATERIAL |                             |                              | 銅 / アルミ合金<br>COPPER / ALUMINUM ALLOYS<br>C1100 / A5052 / A7075 |                            |                                    |                                     | 炭素鋼 / ステンレス鋼<br>CARBON STEELS / STAINLESS STEELS<br>S50C / SUS |                            |                                    |                                     | 合金鋼 / プリハードン鋼 / 焼入れ鋼<br>ALLOY STEELS / PREHARDENED STEELS / HARDENED STEELS<br>SCM / PXA30 / NAK / STAVAX (30~55HRC) |                            |                                    |                                     | チタン合金<br>TITANIUM ALLOYS<br>Ti-6Al-4V      |                            |                                    |                                     |
|----------------------|-----------------------------|------------------------------|----------------------------------------------------------------|----------------------------|------------------------------------|-------------------------------------|----------------------------------------------------------------|----------------------------|------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------|-------------------------------------|--------------------------------------------|----------------------------|------------------------------------|-------------------------------------|
| 型番<br>Model Number   | 外径<br>Outside Diameter (mm) | 有効長<br>Effective Length (mm) | 回転速度<br>Spindle Speed (min <sup>-1</sup> )                     | 送り速度<br>Feed Rate (mm/min) | a <sub>p</sub><br>Axial Depth (mm) | a <sub>e</sub><br>Radial Depth (mm) | 回転速度<br>Spindle Speed (min <sup>-1</sup> )                     | 送り速度<br>Feed Rate (mm/min) | a <sub>p</sub><br>Axial Depth (mm) | a <sub>e</sub><br>Radial Depth (mm) | 回転速度<br>Spindle Speed (min <sup>-1</sup> )                                                                           | 送り速度<br>Feed Rate (mm/min) | a <sub>p</sub><br>Axial Depth (mm) | a <sub>e</sub><br>Radial Depth (mm) | 回転速度<br>Spindle Speed (min <sup>-1</sup> ) | 送り速度<br>Feed Rate (mm/min) | a <sub>p</sub><br>Axial Depth (mm) | a <sub>e</sub><br>Radial Depth (mm) |
| 2002                 | 0.2                         | 0.5                          | 40,000                                                         | 170                        | 0.1                                | 0.01                                | 40,000                                                         | 170                        | 0.1                                | 0.01                                | 40,000                                                                                                               | 120                        | 0.1                                | 0.01                                | 40,000                                     | 85                         | 0.1                                | 0.01                                |
|                      |                             | 1                            | 40,000                                                         | 170                        | 0.1                                | 0.005                               | 40,000                                                         | 170                        | 0.1                                | 0.005                               | 40,000                                                                                                               | 120                        | 0.1                                | 0.005                               | 40,000                                     | 85                         | 0.1                                | 0.005                               |
|                      |                             | 1.5                          | 40,000                                                         | 130                        | 0.1                                | 0.003                               | 40,000                                                         | 130                        | 0.1                                | 0.003                               | 40,000                                                                                                               | 60                         | 0.1                                | 0.003                               | 40,000                                     | 25                         | 0.1                                | 0.003                               |
| 2003                 | 0.3                         | 1                            | 40,000                                                         | 290                        | 0.15                               | 0.015                               | 40,000                                                         | 290                        | 0.15                               | 0.015                               | 40,000                                                                                                               | 260                        | 0.15                               | 0.015                               | 40,000                                     | 230                        | 0.15                               | 0.015                               |
|                      |                             | 2                            | 40,000                                                         | 220                        | 0.15                               | 0.005                               | 40,000                                                         | 220                        | 0.15                               | 0.005                               | 40,000                                                                                                               | 120                        | 0.15                               | 0.005                               | 40,000                                     | 60                         | 0.15                               | 0.005                               |
| 2004                 | 0.4                         | 1                            | 40,000                                                         | 400                        | 0.2                                | 0.02                                | 40,000                                                         | 400                        | 0.2                                | 0.02                                | 40,000                                                                                                               | 400                        | 0.2                                | 0.02                                | 40,000                                     | 400                        | 0.2                                | 0.02                                |
|                      |                             | 2                            | 40,000                                                         | 340                        | 0.2                                | 0.013                               | 40,000                                                         | 340                        | 0.2                                | 0.013                               | 40,000                                                                                                               | 230                        | 0.2                                | 0.013                               | 40,000                                     | 170                        | 0.2                                | 0.013                               |
|                      |                             | 3                            | 40,000                                                         | 270                        | 0.2                                | 0.006                               | 40,000                                                         | 270                        | 0.2                                | 0.006                               | 40,000                                                                                                               | 130                        | 0.2                                | 0.006                               | 40,000                                     | 50                         | 0.2                                | 0.006                               |
| 2005                 | 0.5                         | 1                            | 40,000                                                         | 520                        | 0.25                               | 0.025                               | 40,000                                                         | 520                        | 0.25                               | 0.025                               | 40,000                                                                                                               | 400                        | 0.25                               | 0.025                               | 40,000                                     | 520                        | 0.25                               | 0.025                               |
|                      |                             | 2                            | 40,000                                                         | 520                        | 0.25                               | 0.015                               | 40,000                                                         | 520                        | 0.25                               | 0.015                               | 40,000                                                                                                               | 370                        | 0.25                               | 0.015                               | 40,000                                     | 310                        | 0.25                               | 0.015                               |
|                      |                             | 3                            | 40,000                                                         | 390                        | 0.25                               | 0.008                               | 40,000                                                         | 390                        | 0.25                               | 0.008                               | 40,000                                                                                                               | 230                        | 0.25                               | 0.008                               | 40,000                                     | 130                        | 0.25                               | 0.008                               |
|                      |                             | 5                            | 40,000                                                         | 250                        | 0.25                               | 0.008                               | 40,000                                                         | 250                        | 0.25                               | 0.008                               | 40,000                                                                                                               | 120                        | 0.25                               | 0.008                               | 40,000                                     | 60                         | 0.25                               | 0.008                               |
| 2006                 | 0.6                         | 2                            | 40,000                                                         | 570                        | 0.3                                | 0.03                                | 40,000                                                         | 570                        | 0.3                                | 0.03                                | 33,000                                                                                                               | 400                        | 0.3                                | 0.03                                | 40,000                                     | 470                        | 0.3                                | 0.03                                |
|                      |                             | 4                            | 40,000                                                         | 440                        | 0.3                                | 0.01                                | 40,000                                                         | 440                        | 0.3                                | 0.01                                | 33,000                                                                                                               | 190                        | 0.3                                | 0.01                                | 40,000                                     | 120                        | 0.3                                | 0.01                                |
|                      |                             | 6                            | 40,000                                                         | 300                        | 0.3                                | 0.01                                | 40,000                                                         | 300                        | 0.3                                | 0.01                                | 33,000                                                                                                               | 120                        | 0.3                                | 0.01                                | 40,000                                     | 75                         | 0.3                                | 0.01                                |
| 2008                 | 0.8                         | 2                            | 40,000                                                         | 800                        | 0.4                                | 0.04                                | 40,000                                                         | 800                        | 0.4                                | 0.04                                | 25,000                                                                                                               | 400                        | 0.4                                | 0.04                                | 40,000                                     | 800                        | 0.4                                | 0.04                                |
|                      |                             | 4                            | 40,000                                                         | 680                        | 0.4                                | 0.025                               | 40,000                                                         | 670                        | 0.4                                | 0.025                               | 25,000                                                                                                               | 290                        | 0.4                                | 0.025                               | 40,000                                     | 340                        | 0.4                                | 0.025                               |
|                      |                             | 6                            | 40,000                                                         | 540                        | 0.4                                | 0.013                               | 40,000                                                         | 540                        | 0.4                                | 0.013                               | 25,000                                                                                                               | 160                        | 0.4                                | 0.013                               | 40,000                                     | 100                        | 0.4                                | 0.013                               |
|                      |                             | 8                            | 40,000                                                         | 400                        | 0.4                                | 0.013                               | 40,000                                                         | 400                        | 0.4                                | 0.013                               | 25,000                                                                                                               | 120                        | 0.4                                | 0.013                               | 40,000                                     | 90                         | 0.4                                | 0.013                               |
| 2010                 | 1                           | 2                            | 30,000                                                         | 800                        | 0.5                                | 0.05                                | 30,000                                                         | 800                        | 0.5                                | 0.05                                | 20,000                                                                                                               | 400                        | 0.5                                | 0.05                                | 30,000                                     | 800                        | 0.5                                | 0.05                                |
|                      |                             | 4                            | 30,000                                                         | 680                        | 0.5                                | 0.03                                | 30,000                                                         | 680                        | 0.5                                | 0.03                                | 20,000                                                                                                               | 370                        | 0.5                                | 0.03                                | 30,000                                     | 470                        | 0.5                                | 0.03                                |
|                      |                             | 6                            | 30,000                                                         | 590                        | 0.5                                | 0.015                               | 30,000                                                         | 590                        | 0.5                                | 0.015                               | 20,000                                                                                                               | 230                        | 0.5                                | 0.015                               | 30,000                                     | 200                        | 0.5                                | 0.015                               |
|                      |                             | 8                            | 30,000                                                         | 480                        | 0.5                                | 0.015                               | 30,000                                                         | 480                        | 0.5                                | 0.015                               | 20,000                                                                                                               | 150                        | 0.5                                | 0.015                               | 30,000                                     | 80                         | 0.5                                | 0.015                               |
|                      |                             | 10                           | 30,000                                                         | 380                        | 0.5                                | 0.015                               | 30,000                                                         | 400                        | 0.5                                | 0.015                               | 20,000                                                                                                               | 100                        | 0.5                                | 0.015                               | 30,000                                     | 100                        | 0.5                                | 0.015                               |
| 2015                 | 1.5                         | 4                            | 30,000                                                         | 1,120                      | 0.75                               | 0.075                               | 21,000                                                         | 790                        | 0.75                               | 0.075                               | 14,000                                                                                                               | 510                        | 0.75                               | 0.075                               | 21,000                                     | 760                        | 0.75                               | 0.075                               |
|                      |                             | 6                            | 30,000                                                         | 1,020                      | 0.75                               | 0.05                                | 21,000                                                         | 720                        | 0.75                               | 0.05                                | 14,000                                                                                                               | 390                        | 0.75                               | 0.05                                | 21,000                                     | 490                        | 0.75                               | 0.05                                |
|                      |                             | 8                            | 30,000                                                         | 920                        | 0.75                               | 0.05                                | 21,000                                                         | 650                        | 0.75                               | 0.05                                | 14,000                                                                                                               | 280                        | 0.75                               | 0.05                                | 21,000                                     | 290                        | 0.75                               | 0.05                                |
|                      |                             | 12                           | 30,000                                                         | 720                        | 0.75                               | 0.025                               | 21,000                                                         | 510                        | 0.75                               | 0.025                               | 14,000                                                                                                               | 150                        | 0.75                               | 0.025                               | 21,000                                     | 80                         | 0.75                               | 0.025                               |
| 2020                 | 2                           | 4                            | 30,000                                                         | 1,580                      | 1                                  | 0.1                                 | 15,750                                                         | 800                        | 1                                  | 0.1                                 | 11,000                                                                                                               | 620                        | 1                                  | 0.1                                 | 15,750                                     | 800                        | 1                                  | 0.1                                 |
|                      |                             | 6                            | 30,000                                                         | 1,480                      | 1                                  | 0.1                                 | 15,750                                                         | 780                        | 1                                  | 0.1                                 | 11,000                                                                                                               | 500                        | 1                                  | 0.1                                 | 15,750                                     | 690                        | 1                                  | 0.1                                 |
|                      |                             | 8                            | 30,000                                                         | 1,370                      | 1                                  | 0.06                                | 15,750                                                         | 720                        | 1                                  | 0.06                                | 11,000                                                                                                               | 410                        | 1                                  | 0.06                                | 15,750                                     | 490                        | 1                                  | 0.06                                |
|                      |                             | 10                           | 30,000                                                         | 1,270                      | 1                                  | 0.06                                | 15,750                                                         | 670                        | 1                                  | 0.06                                | 11,000                                                                                                               | 320                        | 1                                  | 0.06                                | 15,750                                     | 340                        | 1                                  | 0.06                                |
|                      |                             | 12                           | 30,000                                                         | 1,180                      | 1                                  | 0.03                                | 15,750                                                         | 620                        | 1                                  | 0.03                                | 11,000                                                                                                               | 250                        | 1                                  | 0.03                                | 15,750                                     | 210                        | 1                                  | 0.03                                |
|                      |                             | 16                           | 30,000                                                         | 970                        | 1                                  | 0.03                                | 15,750                                                         | 510                        | 1                                  | 0.03                                | 11,000                                                                                                               | 160                        | 1                                  | 0.03                                | 15,750                                     | 80                         | 1                                  | 0.03                                |
| 2030                 | 3                           | 6                            | 21,000                                                         | 1,600                      | 1.5                                | 0.15                                | 10,500                                                         | 800                        | 1.5                                | 0.15                                | 8,100                                                                                                                | 690                        | 1.5                                | 0.15                                | 10,500                                     | 800                        | 1.5                                | 0.15                                |
|                      |                             | 10                           | 21,000                                                         | 1,520                      | 1.5                                | 0.15                                | 10,500                                                         | 760                        | 1.5                                | 0.15                                | 8,100                                                                                                                | 520                        | 1.5                                | 0.15                                | 10,500                                     | 620                        | 1.5                                | 0.15                                |
|                      |                             | 12                           | 21,000                                                         | 1,440                      | 1.5                                | 0.1                                 | 10,500                                                         | 720                        | 1.5                                | 0.1                                 | 8,100                                                                                                                | 450                        | 1.5                                | 0.1                                 | 10,500                                     | 490                        | 1.5                                | 0.1                                 |
|                      |                             | 16                           | 21,000                                                         | 1,300                      | 1.5                                | 0.1                                 | 10,500                                                         | 650                        | 1.5                                | 0.1                                 | 8,100                                                                                                                | 330                        | 1.5                                | 0.1                                 | 10,500                                     | 290                        | 1.5                                | 0.1                                 |
|                      |                             | 20                           | 21,000                                                         | 1,160                      | 1.5                                | 0.05                                | 10,500                                                         | 580                        | 1.5                                | 0.05                                | 8,100                                                                                                                | 230                        | 1.5                                | 0.05                                | 10,500                                     | 150                        | 1.5                                | 0.05                                |
|                      |                             | 25                           | 21,000                                                         | 980                        | 1.5                                | 0.05                                | 10,500                                                         | 490                        | 1.5                                | 0.05                                | 8,100                                                                                                                | 160                        | 1.5                                | 0.05                                | 10,500                                     | 75                         | 1.5                                | 0.05                                |
| 2040                 | 4                           | 8                            | 15,600                                                         | 1,600                      | 2                                  | 0.2                                 | 7,800                                                          | 800                        | 2                                  | 0.2                                 | 6,700                                                                                                                | 770                        | 2                                  | 0.2                                 | 7,800                                      | 800                        | 2                                  | 0.2                                 |
|                      |                             | 12                           | 15,600                                                         | 1,560                      | 2                                  | 0.2                                 | 7,800                                                          | 780                        | 2                                  | 0.2                                 | 6,700                                                                                                                | 620                        | 2                                  | 0.2                                 | 7,800                                      | 690                        | 2                                  | 0.2                                 |
|                      |                             | 16                           | 15,600                                                         | 1,440                      | 2                                  | 0.13                                | 7,800                                                          | 720                        | 2                                  | 0.13                                | 6,700                                                                                                                | 500                        | 2                                  | 0.13                                | 7,800                                      | 490                        | 2                                  | 0.13                                |
|                      |                             | 20                           | 15,600                                                         | 1,340                      | 2                                  | 0.13                                | 7,800                                                          | 670                        | 2                                  | 0.13                                | 6,700                                                                                                                | 390                        | 2                                  | 0.13                                | 7,800                                      | 340                        | 2                                  | 0.13                                |
|                      |                             | 25                           | 15,600                                                         | 1,200                      | 2                                  | 0.06                                | 7,800                                                          | 600                        | 2                                  | 0.06                                | 6,700                                                                                                                | 290                        | 2                                  | 0.06                                | 7,800                                      | 190                        | 2                                  | 0.06                                |
|                      |                             | 30                           | 15,600                                                         | 1,080                      | 2                                  | 0.06                                | 7,800                                                          | 540                        | 2                                  | 0.06                                | 6,700                                                                                                                | 220                        | 2                                  | 0.06                                | 7,800                                      | 100                        | 2                                  | 0.06                                |
| 2060                 | 6                           | 15                           | 10,500                                                         | 1,600                      | 3                                  | 0.3                                 | 5,250                                                          | 800                        | 3                                  | 0.3                                 | 5,250                                                                                                                | 800                        | 3                                  | 0.3                                 | 5,250                                      | 800                        | 3                                  | 0.3                                 |
|                      |                             | 20                           | 10,500                                                         | 1,500                      | 3                                  | 0.3                                 | 5,250                                                          | 760                        | 3                                  | 0.3                                 | 5,250                                                                                                                | 700                        | 3                                  | 0.3                                 | 5,250                                      | 620                        | 3                                  | 0.3                                 |
|                      |                             | 30                           | 10,500                                                         | 1,400                      | 3                                  | 0.2                                 | 5,250                                                          | 680                        | 3                                  | 0.2                                 | 5,250                                                                                                                | 480                        | 3                                  | 0.2                                 | 5,250                                      | 350                        | 3                                  | 0.2                                 |
|                      |                             | 40                           | 10,500                                                         | 1,200                      | 3                                  | 0.15                                | 5,250                                                          | 600                        | 3                                  | 0.15                                | 5,250                                                                                                                | 300                        | 3                                  | 0.15                                | 5,250                                      | 150                        | 3                                  | 0.15                                |

## CLRS 切削条件表 Milling Conditions for CLRS (2 Flutes)

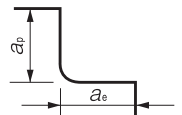
## 底面仕上げ加工条件 Flat Finishing

| 被削材<br>WORK MATERIAL  |                                   |                                    | 銅 / アルミ合金/炭素鋼 / 合金鋼 /<br>プリハードン鋼<br>COPPER / ALUMINUM ALLOYS / CARBON STEELS<br>/ ALLOY STEELS / PREHARDENED STEELS |                                  |                                          |                                           | 焼入れ鋼<br>HARDENED STEELS                          |                                  |                                          |                                           | ステンレス鋼<br>STAINLESS STEELS                       |                                  |                                          |                                           | チタン合金<br>TITANIUM ALLOYS                         |                                  |                                          |                                           |
|-----------------------|-----------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|--------------------------------------------------|----------------------------------|------------------------------------------|-------------------------------------------|
|                       |                                   |                                    | C1100 / A5052 / A7075 / S50C /<br>SCM / PXA30 / NAK (~40HRC)                                                        |                                  |                                          |                                           | STAVAX / SKD61<br>(~55HRC)                       |                                  |                                          |                                           | SUS                                              |                                  |                                          |                                           | Ti-6Al-4V                                        |                                  |                                          |                                           |
| 型番<br>Model<br>Number | 外径<br>Outside<br>Diameter<br>(mm) | 有効長<br>Effective<br>Length<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) | 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) |
| 2002                  | 0.2                               | 0.5                                | 40,000                                                                                                              | 400                              | 0.004                                    | 0.01                                      | 40,000                                           | 200                              | 0.004                                    | 0.01                                      | 40,000                                           | 400                              | 0.004                                    | 0.01                                      | 40,000                                           | 400                              | 0.004                                    | 0.02                                      |
|                       |                                   | 1                                  | 40,000                                                                                                              | 300                              | 0.004                                    | 0.01                                      | 40,000                                           | 150                              | 0.002                                    | 0.01                                      | 40,000                                           | 300                              | 0.004                                    | 0.01                                      | 40,000                                           | 300                              | 0.004                                    | 0.02                                      |
|                       |                                   | 1.5                                | 40,000                                                                                                              | 150                              | 0.003                                    | 0.01                                      | 40,000                                           | 80                               | 0.002                                    | 0.007                                     | 40,000                                           | 150                              | 0.003                                    | 0.01                                      | 40,000                                           | 150                              | 0.004                                    | 0.02                                      |
| 2003                  | 0.3                               | 1                                  | 40,000                                                                                                              | 500                              | 0.005                                    | 0.015                                     | 40,000                                           | 250                              | 0.003                                    | 0.015                                     | 40,000                                           | 500                              | 0.005                                    | 0.015                                     | 40,000                                           | 600                              | 0.005                                    | 0.03                                      |
|                       |                                   | 2                                  | 40,000                                                                                                              | 300                              | 0.005                                    | 0.015                                     | 40,000                                           | 100                              | 0.003                                    | 0.015                                     | 40,000                                           | 300                              | 0.005                                    | 0.015                                     | 40,000                                           | 300                              | 0.005                                    | 0.03                                      |
| 2004                  | 0.4                               | 1                                  | 40,000                                                                                                              | 850                              | 0.006                                    | 0.02                                      | 40,000                                           | 425                              | 0.006                                    | 0.02                                      | 40,000                                           | 850                              | 0.006                                    | 0.02                                      | 40,000                                           | 850                              | 0.006                                    | 0.05                                      |
|                       |                                   | 2                                  | 40,000                                                                                                              | 700                              | 0.006                                    | 0.02                                      | 40,000                                           | 350                              | 0.006                                    | 0.02                                      | 40,000                                           | 700                              | 0.006                                    | 0.02                                      | 40,000                                           | 700                              | 0.006                                    | 0.05                                      |
|                       |                                   | 3                                  | 40,000                                                                                                              | 400                              | 0.006                                    | 0.02                                      | 40,000                                           | 170                              | 0.006                                    | 0.02                                      | 40,000                                           | 400                              | 0.006                                    | 0.02                                      | 40,000                                           | 400                              | 0.006                                    | 0.05                                      |
| 2005                  | 0.5                               | 1                                  | 40,000                                                                                                              | 1,000                            | 0.007                                    | 0.025                                     | 40,000                                           | 500                              | 0.007                                    | 0.025                                     | 40,000                                           | 1,000                            | 0.007                                    | 0.025                                     | 40,000                                           | 1,000                            | 0.007                                    | 0.07                                      |
|                       |                                   | 2                                  | 40,000                                                                                                              | 1,000                            | 0.007                                    | 0.025                                     | 40,000                                           | 500                              | 0.007                                    | 0.025                                     | 40,000                                           | 1,000                            | 0.007                                    | 0.025                                     | 40,000                                           | 1,000                            | 0.007                                    | 0.07                                      |
|                       |                                   | 3                                  | 40,000                                                                                                              | 500                              | 0.007                                    | 0.025                                     | 40,000                                           | 250                              | 0.007                                    | 0.025                                     | 40,000                                           | 500                              | 0.007                                    | 0.025                                     | 40,000                                           | 500                              | 0.007                                    | 0.07                                      |
|                       |                                   | 5                                  | 40,000                                                                                                              | 250                              | 0.007                                    | 0.025                                     | 40,000                                           | 125                              | 0.007                                    | 0.025                                     | 40,000                                           | 250                              | 0.007                                    | 0.025                                     | 40,000                                           | 250                              | 0.007                                    | 0.07                                      |
| 2006                  | 0.6                               | 2                                  | 40,000                                                                                                              | 1,250                            | 0.008                                    | 0.03                                      | 40,000                                           | 625                              | 0.008                                    | 0.03                                      | 40,000                                           | 1,250                            | 0.008                                    | 0.03                                      | 40,000                                           | 1,250                            | 0.008                                    | 0.09                                      |
|                       |                                   | 4                                  | 40,000                                                                                                              | 600                              | 0.008                                    | 0.03                                      | 40,000                                           | 300                              | 0.005                                    | 0.03                                      | 40,000                                           | 600                              | 0.008                                    | 0.03                                      | 40,000                                           | 600                              | 0.008                                    | 0.09                                      |
|                       |                                   | 6                                  | 40,000                                                                                                              | 250                              | 0.008                                    | 0.03                                      | 40,000                                           | 150                              | 0.005                                    | 0.03                                      | 40,000                                           | 250                              | 0.008                                    | 0.03                                      | 40,000                                           | 300                              | 0.008                                    | 0.09                                      |
| 2008                  | 0.8                               | 2                                  | 37,500                                                                                                              | 1,600                            | 0.01                                     | 0.04                                      | 37,500                                           | 800                              | 0.01                                     | 0.04                                      | 37,500                                           | 1,600                            | 0.01                                     | 0.04                                      | 37,500                                           | 1,600                            | 0.01                                     | 0.14                                      |
|                       |                                   | 4                                  | 37,500                                                                                                              | 1,200                            | 0.01                                     | 0.04                                      | 37,500                                           | 600                              | 0.01                                     | 0.04                                      | 37,500                                           | 1,200                            | 0.01                                     | 0.04                                      | 37,500                                           | 1,200                            | 0.01                                     | 0.14                                      |
|                       |                                   | 6                                  | 37,500                                                                                                              | 650                              | 0.01                                     | 0.04                                      | 37,500                                           | 250                              | 0.01                                     | 0.04                                      | 37,500                                           | 650                              | 0.01                                     | 0.04                                      | 37,500                                           | 800                              | 0.01                                     | 0.14                                      |
|                       |                                   | 8                                  | 37,500                                                                                                              | 400                              | 0.01                                     | 0.04                                      | 37,500                                           | 130                              | 0.007                                    | 0.03                                      | 37,500                                           | 400                              | 0.01                                     | 0.04                                      | 37,500                                           | 400                              | 0.01                                     | 0.14                                      |
| 2010                  | 1                                 | 2                                  | 30,000                                                                                                              | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.2                                       |
|                       |                                   | 4                                  | 30,000                                                                                                              | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,600                            | 0.015                                    | 0.2                                       |
|                       |                                   | 6                                  | 30,000                                                                                                              | 1,200                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,200                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,200                            | 0.015                                    | 0.05                                      | 30,000                                           | 1,200                            | 0.015                                    | 0.2                                       |
|                       |                                   | 8                                  | 30,000                                                                                                              | 800                              | 0.015                                    | 0.05                                      | 30,000                                           | 800                              | 0.015                                    | 0.05                                      | 30,000                                           | 800                              | 0.015                                    | 0.05                                      | 30,000                                           | 800                              | 0.015                                    | 0.2                                       |
|                       |                                   | 10                                 | 30,000                                                                                                              | 400                              | 0.015                                    | 0.05                                      | 30,000                                           | 300                              | 0.01                                     | 0.05                                      | 30,000                                           | 400                              | 0.015                                    | 0.05                                      | 30,000                                           | 400                              | 0.015                                    | 0.2                                       |
| 2015                  | 1.5                               | 4                                  | 20,000                                                                                                              | 1,600                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,600                            | 0.02                                     | 0.075                                     | 19,000                                           | 1,600                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,600                            | 0.02                                     | 0.3                                       |
|                       |                                   | 6                                  | 20,000                                                                                                              | 1,600                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,600                            | 0.02                                     | 0.075                                     | 19,000                                           | 1,600                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,600                            | 0.02                                     | 0.3                                       |
|                       |                                   | 8                                  | 20,000                                                                                                              | 1,200                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,200                            | 0.02                                     | 0.075                                     | 19,000                                           | 1,200                            | 0.02                                     | 0.075                                     | 20,000                                           | 1,200                            | 0.02                                     | 0.3                                       |
|                       |                                   | 12                                 | 20,000                                                                                                              | 800                              | 0.02                                     | 0.075                                     | 20,000                                           | 800                              | 0.02                                     | 0.075                                     | 19,000                                           | 800                              | 0.02                                     | 0.075                                     | 20,000                                           | 800                              | 0.02                                     | 0.3                                       |
| 2020                  | 2                                 | 4                                  | 15,000                                                                                                              | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.1                                       | 13,500                                           | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.4                                       |
|                       |                                   | 6                                  | 15,000                                                                                                              | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.1                                       | 13,500                                           | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.4                                       |
|                       |                                   | 8                                  | 15,000                                                                                                              | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.1                                       | 13,500                                           | 1,600                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,600                            | 0.025                                    | 0.4                                       |
|                       |                                   | 10                                 | 15,000                                                                                                              | 1,400                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,400                            | 0.025                                    | 0.1                                       | 13,500                                           | 1,400                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,400                            | 0.025                                    | 0.4                                       |
|                       |                                   | 12                                 | 15,000                                                                                                              | 1,200                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,200                            | 0.025                                    | 0.1                                       | 13,500                                           | 1,200                            | 0.025                                    | 0.1                                       | 15,000                                           | 1,200                            | 0.025                                    | 0.4                                       |
|                       |                                   | 16                                 | 15,000                                                                                                              | 800                              | 0.025                                    | 0.1                                       | 15,000                                           | 800                              | 0.025                                    | 0.1                                       | 13,500                                           | 800                              | 0.025                                    | 0.1                                       | 15,000                                           | 800                              | 0.025                                    | 0.4                                       |
| 2030                  | 3                                 | 6                                  | 10,500                                                                                                              | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.15                                      | 8,100                                            | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 10                                 | 10,500                                                                                                              | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.15                                      | 8,100                                            | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 12                                 | 10,500                                                                                                              | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.15                                      | 8,100                                            | 1,600                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 16                                 | 10,500                                                                                                              | 1,200                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,200                            | 0.03                                     | 0.15                                      | 8,100                                            | 1,200                            | 0.03                                     | 0.15                                      | 10,500                                           | 1,200                            | 0.03                                     | 0.6                                       |
|                       |                                   | 20                                 | 10,500                                                                                                              | 800                              | 0.03                                     | 0.15                                      | 10,500                                           | 800                              | 0.03                                     | 0.15                                      | 8,100                                            | 800                              | 0.03                                     | 0.15                                      | 10,500                                           | 800                              | 0.03                                     | 0.6                                       |
|                       |                                   | 25                                 | 10,500                                                                                                              | 400                              | 0.03                                     | 0.15                                      | 10,500                                           | 400                              | 0.03                                     | 0.15                                      | 8,100                                            | 400                              | 0.03                                     | 0.15                                      | 10,500                                           | 400                              | 0.03                                     | 0.6                                       |
| 2040                  | 4                                 | 8                                  | 7,900                                                                                                               | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.15                                      | 5,400                                            | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 12                                 | 7,900                                                                                                               | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.15                                      | 5,400                                            | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 16                                 | 7,900                                                                                                               | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.15                                      | 5,400                                            | 1,600                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 20                                 | 7,900                                                                                                               | 1,200                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,200                            | 0.03                                     | 0.15                                      | 5,400                                            | 1,200                            | 0.03                                     | 0.15                                      | 7,900                                            | 1,200                            | 0.03                                     | 0.6                                       |
|                       |                                   | 25                                 | 7,900                                                                                                               | 800                              | 0.03                                     | 0.15                                      | 7,900                                            | 800                              | 0.03                                     | 0.15                                      | 5,400                                            | 800                              | 0.03                                     | 0.15                                      | 7,900                                            | 800                              | 0.03                                     | 0.6                                       |
|                       |                                   | 30                                 | 7,900                                                                                                               | 400                              | 0.03                                     | 0.15                                      | 7,900                                            | 400                              | 0.03                                     | 0.15                                      | 5,400                                            | 400                              | 0.03                                     | 0.15                                      | 7,900                                            | 400                              | 0.03                                     | 0.6                                       |
| 2060                  | 6                                 | 15                                 | 5,250                                                                                                               | 1,600                            | 0.03                                     | 0.15                                      | 5,250                                            | 1,600                            | 0.03                                     | 0.15                                      | 2,625                                            | 1,600                            | 0.03                                     | 0.15                                      | 5,250                                            | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 20                                 | 5,250                                                                                                               | 1,600                            | 0.03                                     | 0.15                                      | 5,250                                            | 1,600                            | 0.03                                     | 0.15                                      | 2,625                                            | 1,600                            | 0.03                                     | 0.15                                      | 5,250                                            | 1,600                            | 0.03                                     | 0.6                                       |
|                       |                                   | 30                                 | 5,250                                                                                                               | 800                              | 0.03                                     | 0.15                                      | 5,250                                            | 800                              | 0.03                                     | 0.15                                      | 2,625                                            | 800                              | 0.03                                     | 0.15                                      | 5,250                                            | 800                              | 0.03                                     | 0.6                                       |
|                       |                                   | 40                                 | 5,250                                                                                                               | 400                              | 0.03                                     | 0.15                                      | 5,250                                            | 400                              | 0.03                                     | 0.15                                      | 2,625                                            | 400                              | 0.03                                     | 0.15                                      | 5,250                                            | 400                              | 0.03                                     | 0.6                                       |

- 備考:
- ・機械の回転速度が足りない場合は、回転速度と送り速度を下げてください。
  - ・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。
  - ・ステンレス鋼と超耐熱合金の加工には油性切削油を推奨致します。
  - ・銅の加工には湿式のクーラントを推奨致します。

Note:

- ・Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- ・Every coolant offers stable milling.
- ・Recommend oil coolant for Stainless Steels and Heat Resistant Alloys.
- ・Recommend wet coolant for Copper.





## 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.