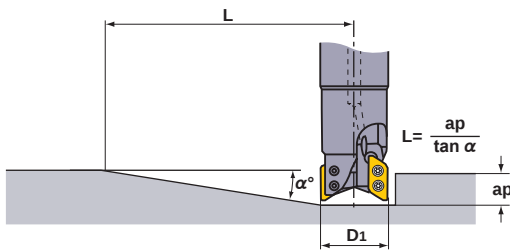


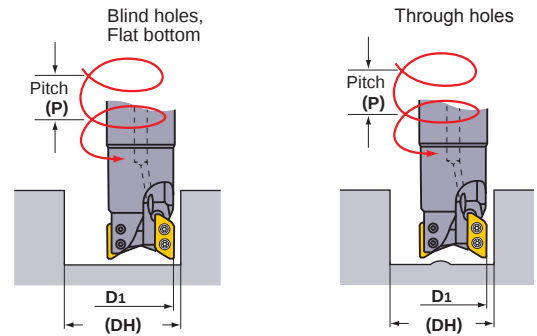
# ROTATING TOOLS

## RAMPING/HELICAL MILLING

### RAMPING



### HELICAL MILLING



## RAMPING/HELICAL CUTTING

| Holder Type | Diameter<br>D1<br>(mm) | Insert<br>Corner Radius<br>Re<br>(mm) | Ramping                                    |                                     | Helical Milling (Blind Hole, Flat Bottom)   |                                    |                                             |                                    | Helical Milling                             |                                    |
|-------------|------------------------|---------------------------------------|--------------------------------------------|-------------------------------------|---------------------------------------------|------------------------------------|---------------------------------------------|------------------------------------|---------------------------------------------|------------------------------------|
|             |                        |                                       | Maximum<br>Ramping Angle<br>$\alpha^\circ$ | Minimum<br>Distance<br>L<br>(mm) ★1 | Maximum Hole<br>Diameter<br>DH max.<br>(mm) | Maximum<br>Pitch<br>P max.<br>(mm) | Minimum<br>Hole Diameter<br>DH min.<br>(mm) | Maximum<br>Pitch<br>P max.<br>(mm) | Minimum<br>Hole Diameter<br>DH min.<br>(mm) | Maximum<br>Pitch<br>P max.<br>(mm) |
| A type      | 20                     | 0.4—1.2                               | 20.7                                       | 42                                  | 37.1 ★2                                     | 14                                 | 36.1                                        | 14                                 | 22                                          | 2                                  |
|             |                        | 1.6—2.4                               | 19.9                                       | 43                                  | 34.7 ★3                                     | 13                                 | 34.6                                        | 13                                 | 22                                          | 2                                  |
|             |                        | 3.0—3.2                               | 18.9                                       | 46                                  | 33.1 ★4                                     | 12                                 | 33.3                                        | 12                                 | 22                                          | 1                                  |
|             | 25                     | 0.4—1.2                               | 23.1                                       | 37                                  | 47.1 ★2                                     | 14                                 | 46                                          | 14                                 | 32                                          | 8                                  |
|             |                        | 1.6—2.4                               | 22.0                                       | 39                                  | 44.7 ★3                                     | 13                                 | 44.4                                        | 13                                 | 32                                          | 8                                  |
|             |                        | 3.0—3.2                               | 18.7                                       | 46                                  | 43.1 ★4                                     | 12                                 | 43                                          | 12                                 | 32                                          | 7                                  |
|             | 28                     | 0.4—1.2                               | 19.2                                       | 45                                  | 53.1 ★2                                     | 14                                 | 52                                          | 14                                 | 36                                          | 8                                  |
|             |                        | 1.6—2.4                               | 18.5                                       | 47                                  | 50.7 ★3                                     | 13                                 | 50.4                                        | 13                                 | 36                                          | 8                                  |
|             |                        | 3.0—3.2                               | 16.7                                       | 52                                  | 49.1 ★4                                     | 12                                 | 48.9                                        | 12                                 | 36                                          | 7                                  |
|             | 32                     | 0.4—1.2                               | 15.4                                       | 57                                  | 61.1 ★2                                     | 14                                 | 59.9                                        | 14                                 | 46                                          | 11                                 |
|             |                        | 1.6—2.4                               | 14.7                                       | 60                                  | 58.7 ★3                                     | 13                                 | 58.3                                        | 13                                 | 46                                          | 11                                 |
|             |                        | 3.0—3.2                               | 13.8                                       | 64                                  | 57.1 ★4                                     | 12                                 | 56.8                                        | 12                                 | 46                                          | 10                                 |
|             | 35                     | 0.4—1.2                               | 13.4                                       | 66                                  | 67.1 ★2                                     | 14                                 | 65.8                                        | 14                                 | 50                                          | 11                                 |
|             |                        | 1.6—2.4                               | 12.7                                       | 69                                  | 64.7 ★3                                     | 13                                 | 64.3                                        | 13                                 | 50                                          | 10                                 |
|             |                        | 3.0—3.2                               | 11.8                                       | 75                                  | 63.1 ★4                                     | 12                                 | 62.8                                        | 12                                 | 50                                          | 9                                  |
|             | 40                     | 0.4—1.2                               | 11.1                                       | 80                                  | 76.7 ★2                                     | 14                                 | 75.9                                        | 14                                 | 62                                          | 13                                 |
|             |                        | 1.6—2.4                               | 10.4                                       | 85                                  | 74.3 ★3                                     | 13                                 | 74.2                                        | 13                                 | 62                                          | 12                                 |
|             |                        | 3.0—3.2                               | 9.7                                        | 91                                  | 72.7 ★4                                     | 12                                 | 72.7                                        | 12                                 | 62                                          | 11                                 |
|             | 50                     | 0.4—1.2                               | 8.2                                        | 108                                 | 96.7 ★2                                     | 14                                 | 95.6                                        | 14                                 | 81                                          | 14                                 |
|             |                        | 1.6—2.4                               | 7.6                                        | 117                                 | 94.3 ★3                                     | 13                                 | 94                                          | 13                                 | 81                                          | 13                                 |
|             |                        | 3.0—3.2                               | 6.9                                        | 129                                 | 92.7 ★4                                     | 12                                 | 92.4                                        | 12                                 | 81                                          | 11                                 |
|             | 63                     | 0.4—1.2                               | 6.1                                        | 146                                 | 122.7 ★2                                    | 14                                 | 121.6                                       | 14                                 | 107                                         | 14                                 |
|             |                        | 1.6—2.4                               | 5.6                                        | 159                                 | 120.3 ★3                                    | 13                                 | 119.9                                       | 13                                 | 107                                         | 13                                 |
|             |                        | 3.0—3.2                               | 5.2                                        | 171                                 | 118.7 ★4                                    | 12                                 | 118.4                                       | 12                                 | 107                                         | 12                                 |
|             | 80                     | 0.4—1.2                               | 4.6                                        | 193                                 | 156.7 ★2                                    | 14                                 | 155.6                                       | 14                                 | 141                                         | 14                                 |
|             |                        | 1.6—2.4                               | 4.2                                        | 212                                 | 154.3 ★3                                    | 13                                 | 153.9                                       | 13                                 | 141                                         | 13                                 |
|             |                        | 3.0—3.2                               | 3.8                                        | 234                                 | 152.7 ★4                                    | 12                                 | 152.4                                       | 12                                 | 141                                         | 12                                 |
|             | 100                    | 0.4—1.2                               | 3.5                                        | 254                                 | 196.7 ★2                                    | 14                                 | 195.5                                       | 14                                 | 181                                         | 14                                 |
|             |                        | 1.6—2.4                               | 3.2                                        | 278                                 | 194.3 ★3                                    | 13                                 | 193.9                                       | 13                                 | 181                                         | 13                                 |
|             |                        | 3.0—3.2                               | 2.9                                        | 306                                 | 192.7 ★4                                    | 12                                 | 192.3                                       | 12                                 | 181                                         | 12                                 |
|             | 125                    | 0.4—1.2                               | 2.7                                        | 329                                 | 246.7 ★2                                    | 14                                 | 245.5                                       | 14                                 | 231                                         | 14                                 |
|             |                        | 1.6—2.4                               | 2.5                                        | 356                                 | 244.3 ★3                                    | 13                                 | 243.8                                       | 13                                 | 231                                         | 13                                 |
|             |                        | 3.0—3.2                               | 2.3                                        | 386                                 | 242.7 ★4                                    | 12                                 | 242.3                                       | 12                                 | 231                                         | 12                                 |

(Note) The recommended ramping feed is 0.05mm/tooth or under.

★1) Using the maximum ramping angle, the distance to reach the maximum depth of cut is as follows:

$L = (\text{maximum depth of cut } ap / \tan \alpha)$ . Maximum depth of cut A type is 15.5mm, B type is 14.8mm.

★2) Corner radius of 1.2mm. For other corner radii, use the following formula.  $\{(\text{cutting edge diameter } D1) - (\text{corner radius } Re) - 0.25\} \times 2$

★3) Corner radius of 2.4mm. For other corner radii, use the following formula.  $\{(\text{cutting edge diameter } D1) - (\text{corner radius } Re) - 0.25\} \times 2$

★4) Corner radius of 3.2mm. For other corner radii, use the following formula.  $\{(\text{cutting edge diameter } D1) - (\text{corner radius } Re) - 0.25\} \times 2$