# List 9510 - EXOPRO® PHX : Deep Feed, Ball Nose
# List 9590 - EXOPRO® PHX : 3 Flute, Long Neck, Ball Nose
# List 9581 - EXOPRO® PHX : Pencil-Neck, Deep-Feed, Ball Nose

## Side Milling

| Hardness | | | <38 HRC | | | | 38-53 HRC | | | | <53 HRC | | | | <55 HRC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Work Material | | | Hardened and Pre-hardened Steels | | | | | | | | | | | | | | | | |
| Cutting Speed | | | 60-400 SFM | | | | 60-310 SFM | | | | 105-250 SFM | | | | 62-410 SFM | | | | |
| R (mm) | L/D | Recom'd Cutting Angle | Speed (RPM) | Feed (in/min) | DOC (in) Aa | DOC (in) Ar | Speed (RPM) | Feed (in/min) | DOC (in) Aa | DOC (in) Ar | Speed (RPM) | Feed (in/min) | DOC (in) Aa | DOC (in) Ar | Speed (RPM) | Feed (in/min) | DOC (in) Aa | DOC (in) Ar | Clearance (in) |
| 0.5 | 6 | 0.3° | 18,000 | 39.4 | 0.0020 | 0.0063 | 18,000 | 35.4 | 0.0020 | 0.0063 | 18,000 | 11.0 | 0.0003 | 0.0012 | 18,000 | 47.2 | 0.0012 | 0.0012 | 0.0020 |
| | 10 | 0.3° | 16,000 | 31.5 | 0.0016 | 0.0063 | 16,000 | 31.5 | 0.0016 | 0.0063 | 16,000 | 4.7 | 0.0001 | 0.0118 | 16,000 | 39.4 | 0.0012 | 0.0012 | 0.0012 |
| | 15 | 0.3° | 8,000 | 16.5 | 0.0012 | 0.0063 | 8,000 | 16.5 | 0.0012 | 0.0063 | - | - | - | - | 8,000 | 19.7 | 0.0012 | 0.0012 | 0.0012 |
| | 20 | 0.3° | 6,000 | 11.8 | 0.0008 | 0.0047 | 6,000 | 11.8 | 0.0008 | 0.0047 | - | - | - | - | 6,000 | 15.0 | 0.0012 | 0.0012 | 0.0012 |
| | 25 | 0.3° | 6,000 | 5.1 | 0.0008 | 0.0031 | 6,000 | 5.1 | 0.0008 | 0.0031 | - | - | - | - | 6,000 | 13.8 | 0.0012 | 0.0012 | 0.0012 |
| | 30 | 0.3° | 6,000 | 3.5 | 0.0004 | 0.0020 | 6,000 | 3.5 | 0.0004 | 0.0020 | - | - | - | - | 6,000 | 9.8 | 0.0012 | 0.0012 | 0.0012 |
| 0.75 | 6 | 0.3° | 18,000 | 59.1 | 0.0039 | 0.0118 | 16,000 | 51.2 | 0.0039 | 0.0118 | 16,000 | 25.6 | 0.0028 | 0.0059 | 18,000 | 43.3 | 0.0016 | 0.0016 | 0.0020 |
| | 10 | 0.3° | 15,000 | 43.3 | 0.0024 | 0.0098 | 15,000 | 37.4 | 0.0024 | 0.0098 | 15,000 | 12.6 | 0.0004 | 0.0039 | 15,000 | 35.4 | 0.0016 | 0.0016 | 0.0012 |
| | 16 | 0.3° | 7,500 | 9.1 | 0.0008 | 0.0079 | 7,500 | 7.9 | 0.0008 | 0.0079 | 7,500 | 11.8 | 0.0003 | 0.0020 | 7,500 | 17.7 | 0.0016 | 0.0016 | 0.0012 |
| 1.0 | 6 | 0.3° | 18,000 | 63.0 | 0.0079 | 0.0236 | 15,000 | 55.1 | 0.0079 | 0.0157 | 12,000 | 23.6 | 0.0059 | 0.0059 | 15,000 | 708.7 | 0.0024 | 0.0020 | 0.0039 |
| | 10 | 0.3° | 12,000 | 49.2 | 0.0055 | 0.0157 | 12,000 | 43.3 | 0.0055 | 0.0157 | 12,000 | 23.6 | 0.0039 | 0.0020 | 12,000 | 59.1 | 0.0024 | 0.0020 | 0.0028 |
| | 15 | 0.3° | 7,800 | 32.3 | 0.0055 | 0.0157 | 7,800 | 30.7 | 0.0055 | 0.0157 | 7,800 | 17.7 | 0.0028 | 0.0020 | 7,800 | 38.6 | 0.0024 | 0.0020 | 0.0028 |
| | 20 | 0.3° | 6,200 | 25.6 | 0.0051 | 0.0157 | 6,200 | 23.6 | 0.0051 | 0.0118 | 6,200 | 13.4 | 0.0020 | 0.0020 | 6,200 | 23.6 | 0.0024 | 0.0020 | 0.0020 |
| | 25 | 0.3° | 4,700 | 19.7 | 0.0047 | 0.0118 | 4,700 | 19.7 | 0.0047 | 0.0118 | - | - | - | - | 4,700 | 17.7 | 0.0024 | 0.0020 | 0.0020 |
| | 30 | 0.3° | 3,500 | 15.7 | 0.0039 | 0.0118 | 3,500 | 15.7 | 0.0039 | 0.0118 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0020 |
| | 35 | 0.3° | 3,500 | 15.7 | 0.0028 | 0.0118 | 3,500 | 15.7 | 0.0028 | 0.0118 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0012 |
| | 40 | 0.3° | 3,500 | 11.8 | 0.0028 | 0.0098 | 3,500 | 11.8 | 0.0028 | 0.0098 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0012 |
| | 45 | 0.3° | 3,500 | 7.9 | 0.0028 | 0.0079 | 3,500 | 7.9 | 0.0028 | 0.0079 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0012 |
| | 50 | 0.3° | 3,500 | 5.9 | 0.0024 | 0.0039 | 3,500 | 5.9 | 0.0024 | 0.0039 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0012 |
| | 60 | 0.3° | 3,500 | 5.9 | 0.0020 | 0.0039 | 3,500 | 5.9 | 0.0020 | 0.0039 | - | - | - | - | 3,500 | 17.7 | 0.0024 | 0.0020 | 0.0012 |
| 1.5 | 10 | 0.3° | 12,000 | 74.8 | 0.0083 | 0.0197 | 8,000 | 47.2 | 0.0083 | 0.0197 | 8,000 | 27.6 | 0.0051 | 0.0039 | 11,000 | 80.7 | 0.0035 | 0.0031 | 0.0039 |
| | 15 | 0.3° | 10,000 | 61.0 | 0.0079 | 0.0197 | 8,000 | 47.2 | 0.0079 | 0.0197 | 8,000 | 21.7 | 0.0039 | 0.0039 | 10,000 | 74.8 | 0.0035 | 0.0031 | 0.0028 |
| | 20 | 0.3° | 7,500 | 45.3 | 0.0075 | 0.0197 | 7,200 | 43.3 | 0.0075 | 0.0197 | 7,200 | 18.9 | 0.0024 | 0.0028 | 7,500 | 55.1 | 0.0035 | 0.0031 | 0.0028 |
| | 25 | 0.3° | 4,800 | 29.5 | 0.0075 | 0.0197 | 4,600 | 27.6 | 0.0075 | 0.0197 | 4,600 | 12.6 | 0.0016 | 0.0020 | 4,800 | 35.4 | 0.0035 | 0.0031 | 0.0020 |
| | 30 | 0.3° | 4,000 | 24.8 | 0.0063 | 0.0157 | 3,400 | 19.7 | 0.0063 | 0.0157 | 3,400 | 9.4 | 0.0008 | 0.0012 | 3,800 | 28.3 | 0.0035 | 0.0031 | 0.0012 |
| | 40 | 0.3° | 2,800 | 17.3 | 0.0051 | 0.0157 | 2,600 | 15.7 | 0.0051 | 0.0157 | - | - | - | - | 2,600 | 19.7 | 0.0035 | 0.0031 | 0.0012 |
| | 50 | 0.3° | 2,200 | 13.8 | 0.0039 | 0.0157 | 2,200 | 11.8 | 0.0039 | 0.0157 | - | - | - | - | 2,200 | 15.7 | 0.0035 | 0.0031 | 0.0012 |
| | 60 | 0.3° | 2,200 | 13.8 | 0.0028 | 0.0157 | 2,200 | 11.8 | 0.0028 | 0.0157 | - | - | - | - | 2,200 | 15.7 | 0.0035 | 0.0031 | 0.0012 |
| 2.0 | 10 | 0.5° | 9,600 | 78.7 | 0.0118 | 0.0236 | 6,000 | 49.2 | 0.0118 | 0.0236 | 6,000 | 31.5 | 0.0059 | 0.0039 | 9,500 | 94.5 | 0.0047 | 0.0039 | 0.0039 |
| | 15 | 0.5° | 9,300 | 74.8 | 0.0106 | 0.0236 | 6,000 | 47.2 | 0.0106 | 0.0236 | 6,000 | 31.5 | 0.0047 | 0.0039 | 9,000 | 88.6 | 0.0047 | 0.0039 | 0.0039 |
| | 20 | 0.5° | 7,600 | 61.0 | 0.0098 | 0.0236 | 6,000 | 45.3 | 0.0098 | 0.0236 | 6,000 | 27.6 | 0.0039 | 0.0028 | 8,200 | 80.7 | 0.0047 | 0.0039 | 0.0039 |
| | 25 | 0.5° | 6,100 | 49.2 | 0.0091 | 0.0236 | 5,500 | 43.3 | 0.0091 | 0.0236 | 5,500 | 17.7 | 0.0020 | 0.0028 | 5,500 | 53.1 | 0.0047 | 0.0039 | 0.0028 |
| | 30 | 0.5° | 5,000 | 41.3 | 0.0079 | 0.0236 | 4,500 | 31.5 | 0.0079 | 0.0236 | 4,500 | 13.8 | 0.0012 | 0.0020 | 4,500 | 43.3 | 0.0047 | 0.0039 | 0.0028 |
| | 35 | 0.5° | 3,600 | 29.5 | 0.0063 | 0.0197 | 3,600 | 25.6 | 0.0063 | 0.0197 | 3,600 | 11.0 | 0.0004 | 0.0012 | 3,600 | 35.4 | 0.0047 | 0.0039 | 0.0020 |
| | 40 | 0.5° | 3,000 | 24.8 | 0.0047 | 0.0197 | 3,000 | 21.7 | 0.0047 | 0.0197 | 3,000 | 5.9 | 0.0003 | 0.0004 | 3,000 | 29.5 | 0.0047 | 0.0039 | 0.0020 |
| | 45 | 0.5° | 2,700 | 21.7 | 0.0039 | 0.0157 | 2,700 | 19.7 | 0.0039 | 0.0157 | - | - | - | - | 2,700 | 26.8 | 0.0047 | 0.0039 | 0.0012 |
| | 50 | 0.5° | 2,500 | 20.5 | 0.0039 | 0.0157 | 2,500 | 17.7 | 0.0039 | 0.0157 | - | - | - | - | 2,500 | 24.8 | 0.0047 | 0.0039 | 0.0012 |
| | 60 | 0.5° | 2,100 | 16.9 | 0.0031 | 0.0157 | 2,100 | 15.7 | 0.0031 | 0.0157 | - | - | - | - | 2,100 | 20.9 | 0.0047 | 0.0039 | 0.0012 |
| 2.5 | 10 | 0.5° | 7,700 | 74.8 | 0.0138 | 0.0315 | 4,800 | 43.3 | 0.0138 | 0.0315 | 4,800 | 35.4 | 0.0079 | 0.0039 | 7,700 | 94.5 | 0.0059 | 0.0472 | 0.0039 |
| | 15 | 0.5° | 7,700 | 74.8 | 0.0118 | 0.0315 | 4,800 | 39.4 | 0.0118 | 0.0315 | 4,800 | 33.5 | 0.0063 | 0.0039 | 6,100 | 74.8 | 0.0059 | 0.0472 | 0.0039 |
| | 20 | 0.5° | 7,700 | 70.9 | 0.0118 | 0.0315 | 4,800 | 37.4 | 0.0118 | 0.0315 | 4,800 | 27.6 | 0.0047 | 0.0028 | 6,100 | 74.8 | 0.0059 | 0.0472 | 0.0039 |
| | 25 | 0.5° | 5,100 | 51.2 | 0.0098 | 0.0315 | 4,800 | 35.4 | 0.0098 | 0.0315 | 4,800 | 25.6 | 0.0024 | 0.0020 | 5,100 | 63.0 | 0.0059 | 0.0472 | 0.0028 |
| | 30 | 0.5° | 5,100 | 47.2 | 0.0079 | 0.0236 | 4,800 | 33.5 | 0.0079 | 0.0236 | 4,800 | 19.7 | 0.0012 | 0.0020 | 5,100 | 63.0 | 0.0059 | 0.0472 | 0.0028 |
| | 35 | 0.5° | 4,400 | 43.3 | 0.0055 | 0.0236 | 4,400 | 29.5 | 0.0055 | 0.0236 | 4,400 | 15.7 | 0.0006 | 0.0012 | 4,400 | 53.1 | 0.0059 | 0.0472 | 0.0020 |
| | 40 | 0.5° | 3,100 | 29.5 | 0.0039 | 0.0236 | 3,100 | 25.6 | 0.0039 | 0.0236 | 3,100 | 10.2 | 0.0003 | 0.0012 | 3,100 | 37.4 | 0.0059 | 0.0472 | 0.0020 |

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. For 0.5R - 2.5R, the machining conditions are based on chucking the tool up to the base of the neck.
3. Highly rigid machines and tool holders should be used.
4. Tool vibrations should be kept at a minimum level for maximum accuracy.
5. In the case of linear machining, do not use the Ar value, instead refer to the Aa value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or decelleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high-precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.

CONTINUED

# List 9510 - EXOPRO® PHX : Deep Feed, Ball Nose (Continued)
# List 9590 - EXOPRO® PHX : 3 Flute, Long Neck, Ball Nose (Continued)
# List 9581 - EXOPRO® PHX : Pencil-Neck, Deep-Feed, Ball Nose (Continued)

## Side Milling

| Hardness | | | <38 HRC | | | | 38-53 HRC | | | | <53 HRC | | | | <55 HRC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Work Material | | | Hardened and Pre-hardened Steels | | | | | | | | | | | | | | | | |
| Cutting Speed | | | 60-400 SFM | | | | 60-310 SFM | | | | 105-250 SFM | | | | 62-410 SFM | | | | |
| R (mm) | L/D | Recom'd Cutting Angle | Speed (RPM) | Feed (in/min) | DOC (in) | | Speed (RPM) | Feed (in/min) | DOC (in) | | Speed (RPM) | Feed (in/min) | DOC (in) | | Speed (RPM) | Feed (in/min) | DOC (in) | | Clearance (in) |
| | | | | | Aa | Ar | | | Aa | Ar | | | Aa | Ar | | | Aa | Ar | |
| 3.0 | 24 | 0.5° | 6,400 | 74.8 | 0.0169 | 0.0472 | 4,000 | 47.2 | 0.0118 | 0.0394 | 4,000 | 35.4 | 0.0118 | 0.0039 | 6,500 | 57.1 | 0.0071 | 0.0063 | 0.0039 |
| | 30 | 0.5° | 5,100 | 59.1 | 0.0134 | 0.0472 | 4,000 | 45.3 | 0.0118 | 0.0394 | 4,000 | 35.4 | 0.0098 | 0.0039 | 5,100 | 76.8 | 0.0071 | 0.0063 | 0.0039 |
| | 36 | 0.5° | 4,200 | 49.2 | 0.0150 | 0.0472 | 4,000 | 43.3 | 0.0118 | 0.0394 | 4,000 | 29.5 | 0.0079 | 0.0028 | 4,200 | 62.2 | 0.0071 | 0.0063 | 0.0028 |
| | 42 | 0.5° | 3,700 | 41.3 | 0.0079 | 0.0354 | 3,700 | 39.4 | 0.0079 | 0.0394 | 3,700 | 19.7 | 0.0059 | 0.0020 | 3,700 | 55.1 | 0.0071 | 0.0063 | 0.0028 |
| | 48 | 0.5° | 3,600 | 29.5 | 0.0059 | 0.0354 | 2,600 | 27.6 | 0.0059 | 0.0315 | 2,600 | 15.7 | 0.0039 | 0.0012 | 2,600 | 38.6 | 0.0071 | 0.0063 | 0.0020 |
| | 54 | 0.5° | 2,100 | 24.8 | 0.0039 | 0.0315 | 2,100 | 23.6 | 0.0039 | 0.0315 | 2,100 | 9.4 | 0.0020 | 0.0012 | 2,100 | 31.5 | 0.0071 | 0.0063 | 0.0020 |
| | 66 | 0.5° | 1,900 | 21.7 | 0.0031 | 0.0276 | 1,900 | 19.7 | 0.0031 | 0.0276 | - | - | - | - | 1,900 | 27.6 | 0.0071 | 0.0063 | 0.0012 |
| | 80 | 0.5° | 1,700 | 17.7 | 0.0031 | 0.0236 | 1,700 | 15.7 | 0.0031 | 0.0236 | - | - | - | - | 1,700 | 25.6 | 0.0071 | 0.0063 | 0.0012 |
| 4.0 | 30 | 0.5° | 4,800 | 90.6 | 0.0177 | 0.0591 | 3,000 | 49.6 | 0.0118 | 0.0591 | 3,000 | 41.3 | 0.0118 | 0.0059 | 4,800 | 94.5 | 0.0094 | 0.0083 | 0.0039 |
| | 40 | 0.5° | 3,800 | 70.9 | 0.0150 | 0.0512 | 3,000 | 47.2 | 0.0118 | 0.0512 | 3,000 | 41.3 | 0.0118 | 0.0039 | 3,800 | 74.8 | 0.0094 | 0.0083 | 0.0039 |
| | 48 | 0.5° | 3,200 | 59.1 | 0.0110 | 0.0472 | 3,000 | 43.3 | 0.0098 | 0.0472 | 3,000 | 35.4 | 0.0098 | 0.0039 | 3,200 | 63.0 | 0.0094 | 0.0083 | 0.0028 |
| | 56 | 0.5° | 2,700 | 51.2 | 0.0079 | 0.0433 | 2,700 | 39.4 | 0.0079 | 0.0433 | 2,700 | 31.5 | 0.0079 | 0.0028 | 2,700 | 53.1 | 0.0094 | 0.0083 | 0.0028 |
| | 64 | 0.5° | 1,900 | 35.4 | 0.0079 | 0.0394 | 1,900 | 27.6 | 0.0067 | 0.0394 | 1,900 | 19.7 | 0.0067 | 0.0028 | 1,900 | 37.4 | 0.0094 | 0.0083 | 0.0020 |
| | 80 | 0.5° | 1,500 | 27.6 | 0.0059 | 0.0315 | 1,500 | 21.7 | 0.0055 | 0.0315 | - | - | - | - | 1,500 | 29.5 | 0.0094 | 0.0083 | 0.0012 |
| | 100 | 0.5° | 1,200 | 23.6 | 0.0059 | 0.0315 | 1,200 | 15.7 | 0.0039 | 0.0315 | - | - | - | - | 1,200 | 23.6 | 0.0094 | 0.0083 | 0.0012 |
| | 120 | 0.5° | 1,000 | 19.7 | 0.0039 | 0.0276 | 1,000 | 13.8 | 0.0028 | 0.0276 | - | - | - | - | 1,000 | 19.7 | 0.0094 | 0.0083 | 0.0012 |
| 5.0 | 35 | 0.5° | 3,800 | 90.6 | 0.0256 | 0.0709 | 2,400 | 39.4 | 0.0157 | 0.0630 | 2,400 | 33.5 | 0.0157 | 0.0059 | 3,800 | 94.5 | 0.0118 | 0.0106 | 0.0039 |
| | 50 | 0.5° | 3,100 | 74.8 | 0.0217 | 0.0709 | 2,400 | 39.4 | 0.0118 | 0.0630 | 2,400 | 33.5 | 0.0118 | 0.0059 | 3,100 | 76.8 | 0.0118 | 0.0106 | 0.0039 |
| | 60 | 0.5° | 2,500 | 59.1 | 0.0181 | 0.0630 | 2,400 | 39.4 | 0.0118 | 0.0591 | 2,400 | 33.5 | 0.0118 | 0.0039 | 2,500 | 61.0 | 0.0118 | 0.0106 | 0.0039 |
| | 70 | 0.5° | 2,200 | 51.2 | 0.0134 | 0.0630 | 2,200 | 35.4 | 0.0118 | 0.0591 | 2,200 | 31.5 | 0.0118 | 0.0039 | 2,200 | 53.1 | 0.0118 | 0.0106 | 0.0028 |
| | 80 | 0.5° | 1,500 | 31.5 | 0.0094 | 0.0630 | 1,500 | 23.6 | 0.0079 | 0.0591 | 1,500 | 23.6 | 0.0079 | 0.0028 | 1,500 | 37.4 | 0.0118 | 0.0106 | 0.0028 |
| | 100 | 0.5° | 1,200 | 23.6 | 0.0059 | 0.0591 | 1,200 | 19.7 | 0.0047 | 0.0591 | 1,200 | 19.7 | 0.0047 | 0.0028 | 1,200 | 29.5 | 0.0118 | 0.0106 | 0.0020 |
| | 120 | 0.5° | 1,050 | 19.7 | 0.0039 | 0.0512 | 1,000 | 15.7 | 0.0039 | 0.0512 | - | - | - | - | 1,050 | 25.6 | 0.0118 | 0.0106 | 0.0020 |
| | 140 | 0.5° | 850 | 15.7 | 0.0028 | 0.0512 | 800 | 13.8 | 0.0028 | 0.0512 | - | - | - | - | 850 | 19.7 | 0.0118 | 0.0106 | 0.0012 |
| | 160 | 0.5° | 700 | 12.6 | 0.0028 | 0.0394 | 700 | 11.8 | 0.0028 | 0.0394 | - | - | - | - | 700 | 17.7 | 0.0118 | 0.0106 | 0.0012 |
| 6.0 | 45 | 0.5° | 3,200 | 66.9 | 0.0315 | 0.0787 | 2,000 | 31.5 | 0.0315 | 0.0709 | 2,000 | 31.5 | 0.0236 | 0.0059 | 3,200 | 94.5 | 0.0142 | 0.0126 | 0.0059 |
| | 60 | 0.5° | 2,500 | 51.2 | 0.0256 | 0.0787 | 2,000 | 31.5 | 0.0256 | 0.0709 | 2,000 | 31.5 | 0.0197 | 0.0059 | 2,500 | 74.8 | 0.0142 | 0.0126 | 0.0059 |
| | 70 | 0.5° | 2,100 | 43.3 | 0.0224 | 0.0787 | 2,000 | 31.5 | 0.0224 | 0.0709 | 2,000 | 31.5 | 0.0197 | 0.0039 | 2,100 | 63.0 | 0.0142 | 0.0126 | 0.0039 |
| | 85 | 0.5° | 1,800 | 37.4 | 0.0165 | 0.0709 | 1,500 | 23.6 | 0.0165 | 0.0669 | 1,500 | 23.6 | 0.0157 | 0.0039 | 1,800 | 53.1 | 0.0142 | 0.0126 | 0.0039 |
| | 100 | 0.5° | 1,300 | 27.2 | 0.0118 | 0.0709 | 1,200 | 19.7 | 0.0118 | 0.0669 | 1,200 | 19.7 | 0.0118 | 0.0039 | 1,300 | 38.6 | 0.0142 | 0.0126 | 0.0039 |
| | 120 | 0.5° | 1,000 | 20.9 | 0.0098 | 0.0591 | 1,000 | 16.5 | 0.0098 | 0.0591 | - | - | - | - | 1,000 | 29.5 | 0.0142 | 0.0126 | 0.0020 |
| | 140 | 0.5° | 900 | 18.5 | 0.0079 | 0.0591 | 900 | 15.0 | 0.0079 | 0.0591 | - | - | - | - | 900 | 26.8 | 0.0142 | 0.0126 | 0.0020 |
| | 160 | 0.5° | 700 | 14.6 | 0.0059 | 0.0512 | 700 | 11.8 | 0.0059 | 0.0512 | - | - | - | - | 700 | 20.9 | 0.0142 | 0.0126 | 0.0020 |
| 8.0 | 55 | 0.5° | 2,400 | 63.0 | 0.0394 | 0.0866 | 1,500 | 23.6 | 0.0394 | 0.0709 | 1,500 | 23.6 | 0.0315 | 0.0059 | 2,400 | 94.5 | 0.0189 | 0.0157 | 0.0079 |
| | 80 | 0.5° | 1,900 | 49.2 | 0.0354 | 0.0866 | 1,500 | 23.6 | 0.0354 | 0.0709 | 1,500 | 23.6 | 0.0315 | 0.0059 | 1,900 | 74.8 | 0.0189 | 0.0157 | 0.0059 |
| | 90 | 0.5° | 1,600 | 41.3 | 0.0295 | 0.0866 | 1,500 | 23.6 | 0.0295 | 0.0709 | 1,500 | 23.6 | 0.0276 | 0.0039 | 1,600 | 63.0 | 0.0189 | 0.0157 | 0.0039 |
| | 105 | 0.5° | 1,400 | 35.4 | 0.0217 | 0.0787 | 1,400 | 22.4 | 0.0217 | 0.0669 | 1,400 | 22.4 | 0.0197 | 0.0028 | 1,400 | 55.1 | 0.0189 | 0.0157 | 0.0028 |
| | 120 | 0.5° | 1,000 | 25.6 | 0.0157 | 0.0787 | 1,000 | 16.5 | 0.0157 | 0.0669 | 1,000 | 16.5 | 0.0157 | 0.0020 | 1,000 | 39.4 | 0.0189 | 0.0157 | 0.0020 |
| 10.0 | 70 | 0.5° | 1,900 | 59.1 | 0.0472 | 0.1417 | 1,200 | 19.7 | 0.0472 | 0.0709 | 1,200 | 19.7 | 0.0315 | 0.0059 | 1,900 | 94.5 | 0.0236 | 0.0197 | 0.0079 |
| | 90 | 0.5° | 1,500 | 47.2 | 0.0433 | 0.1417 | 1,200 | 19.7 | 0.0433 | 0.0709 | 1,200 | 19.7 | 0.0315 | 0.0059 | 1,500 | 74.8 | 0.0236 | 0.0197 | 0.0059 |
| | 110 | 0.5° | 1,300 | 39.4 | 0.0354 | 0.1378 | 1,200 | 19.7 | 0.0354 | 0.0709 | 1,200 | 19.7 | 0.0315 | 0.0039 | 1,300 | 63.0 | 0.0236 | 0.0197 | 0.0039 |
| | 130 | 0.5° | 1,100 | 33.5 | 0.0276 | 0.1339 | 1,100 | 17.7 | 0.0276 | 0.0709 | 1,100 | 17.7 | 0.0276 | 0.0039 | 1,100 | 55.1 | 0.0236 | 0.0197 | 0.0028 |
| | 150 | 0.5° | 760 | 23.6 | 0.0197 | 0.1299 | 760 | 12.6 | 0.0197 | 0.0709 | 760 | 12.6 | 0.0197 | 0.0028 | 760 | 37.4 | 0.0236 | 0.0197 | 0.0020 |

1. The above mentioned conditions according to projection lengths are intended as general guidelines for reference only. Adjustments should be made based on actual milling conditions.
2. For 0.5R - 2.5R, the machining conditions are based on chucking the tool up to the base of the neck.
3. Highly rigid machines and tool holders should be used.
4. Tool vibrations should be kept at a minimum level for maximum accuracy.
5. In the case of linear machining, do not use the Ar value, instead refer to the Aa value.
6. More stable high-feed machining in the corners can be attained by setting an R insertion or decelleration on the CAM or machine side.
7. When cutting load fluctuates (in the corners, etc.) or when high-precision is required, be sure to control the rotational speed.
8. When cutting at greater than the recommended cutting angle, reduce the feed.