

## 切削条件参考表 Recommended Conditions

## 粗加工 Roughing

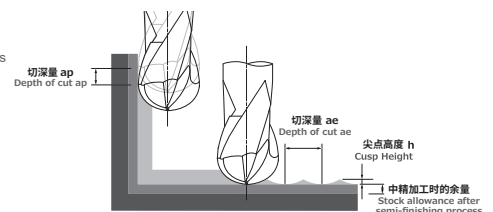
| 加工材料<br>Work Material |                            |                        | 高硬度钢<br>Hardened Steels<br>STAVAX·HPM38·M333 (相当于52HRC)<br>As the same as 52HRC |              |                         |                     |                   |                       |                                   |
|-----------------------|----------------------------|------------------------|---------------------------------------------------------------------------------|--------------|-------------------------|---------------------|-------------------|-----------------------|-----------------------------------|
| R球头半径<br>Radius       | 颈长<br>Under Neck<br>Length | L(颈长)/<br>D(外径)<br>L/D | 主轴转速<br>Spindle Speed                                                           | 进给速度<br>Feed | 每刃进给量<br>Feed per Tooth | 切深量<br>Depth of Cut |                   | 余量<br>Stock allowance | 切屑排出量<br>Material removal<br>rate |
|                       |                            |                        | min <sup>-1</sup>                                                               | mm/min       | mm/t                    | a <sub>p</sub> mm   | a <sub>e</sub> mm | mm                    | mm <sup>3</sup> /min              |
| R0.05                 | 0.2                        | 2                      | 40,000                                                                          | 100          | 0.001                   | 0.003               | 0.008             | 0.005                 | 0.002                             |
|                       | 0.3                        | 3                      | 40,000                                                                          | 100          | 0.001                   | 0.003               | 0.008             | 0.005                 | 0.002                             |
|                       | 0.4                        | 4                      | 40,000                                                                          | 80           | 0.001                   | 0.002               | 0.006             | 0.004                 | 0.001                             |
|                       | 0.5                        | 5                      | 40,000                                                                          | 60           | 0.001                   | 0.002               | 0.005             | 0.004                 | 0.001                             |
| R0.075                | 0.3                        | 2                      | 40,000                                                                          | 200          | 0.003                   | 0.006               | 0.014             | 0.007                 | 0.017                             |
|                       | 0.4                        | 2.7                    | 40,000                                                                          | 200          | 0.003                   | 0.006               | 0.014             | 0.007                 | 0.017                             |
|                       | 0.5                        | 3.3                    | 40,000                                                                          | 180          | 0.002                   | 0.005               | 0.012             | 0.006                 | 0.011                             |
|                       | 0.6                        | 4                      | 40,000                                                                          | 150          | 0.002                   | 0.004               | 0.010             | 0.005                 | 0.006                             |
|                       | 0.75                       | 5                      | 40,000                                                                          | 120          | 0.002                   | 0.003               | 0.008             | 0.004                 | 0.003                             |
| R0.1                  | 1                          | 6.7                    | 40,000                                                                          | 90           | 0.001                   | 0.003               | 0.006             | 0.004                 | 0.002                             |
|                       | 0.3                        | 1.5                    | 40,000                                                                          | 300          | 0.004                   | 0.008               | 0.020             | 0.009                 | 0.048                             |
|                       | 0.4                        | 2                      | 40,000                                                                          | 300          | 0.004                   | 0.008               | 0.020             | 0.009                 | 0.048                             |
|                       | 0.5                        | 2.5                    | 40,000                                                                          | 300          | 0.004                   | 0.008               | 0.020             | 0.009                 | 0.048                             |
|                       | 0.6                        | 3                      | 40,000                                                                          | 300          | 0.004                   | 0.008               | 0.020             | 0.009                 | 0.048                             |
|                       | 0.75                       | 3.8                    | 40,000                                                                          | 240          | 0.003                   | 0.007               | 0.016             | 0.007                 | 0.027                             |
|                       | 1                          | 5                      | 40,000                                                                          | 180          | 0.002                   | 0.005               | 0.012             | 0.005                 | 0.011                             |
|                       | 1.25                       | 6.3                    | 40,000                                                                          | 140          | 0.002                   | 0.004               | 0.010             | 0.004                 | 0.006                             |
| R0.15                 | 1.5                        | 7.5                    | 40,000                                                                          | 120          | 0.002                   | 0.003               | 0.008             | 0.004                 | 0.003                             |
|                       | 2                          | 10                     | 40,000                                                                          | 90           | 0.001                   | 0.002               | 0.006             | 0.004                 | 0.001                             |
|                       | 0.5                        | 1.7                    | 40,000                                                                          | 600          | 0.008                   | 0.014               | 0.036             | 0.013                 | 0.30                              |
|                       | 0.6                        | 2                      | 40,000                                                                          | 600          | 0.008                   | 0.014               | 0.036             | 0.013                 | 0.30                              |
|                       | 0.75                       | 2.5                    | 40,000                                                                          | 600          | 0.008                   | 0.014               | 0.036             | 0.013                 | 0.30                              |
|                       | 1                          | 3.3                    | 40,000                                                                          | 540          | 0.007                   | 0.013               | 0.032             | 0.012                 | 0.23                              |
|                       | 1.25                       | 4.2                    | 40,000                                                                          | 430          | 0.005                   | 0.010               | 0.026             | 0.009                 | 0.11                              |
|                       | 1.5                        | 5                      | 40,000                                                                          | 360          | 0.005                   | 0.009               | 0.022             | 0.008                 | 0.07                              |
| R0.2                  | 2                          | 6.7                    | 40,000                                                                          | 270          | 0.003                   | 0.007               | 0.016             | 0.006                 | 0.03                              |
|                       | 2.5                        | 8.3                    | 40,000                                                                          | 220          | 0.003                   | 0.005               | 0.013             | 0.005                 | 0.01                              |
|                       | 3                          | 10                     | 40,000                                                                          | 180          | 0.002                   | 0.004               | 0.011             | 0.004                 | 0.01                              |
|                       | 0.5                        | 1.3                    | 40,000                                                                          | 900          | 0.011                   | 0.022               | 0.056             | 0.015                 | 1.11                              |
|                       | 0.8                        | 2                      | 40,000                                                                          | 900          | 0.011                   | 0.022               | 0.056             | 0.015                 | 1.11                              |
|                       | 1                          | 2.5                    | 40,000                                                                          | 900          | 0.011                   | 0.022               | 0.056             | 0.015                 | 1.11                              |
|                       | 1.5                        | 3.8                    | 40,000                                                                          | 720          | 0.009                   | 0.018               | 0.044             | 0.012                 | 0.57                              |
|                       | 2                          | 5                      | 40,000                                                                          | 540          | 0.007                   | 0.013               | 0.033             | 0.009                 | 0.23                              |
| R0.25                 | 2.5                        | 6.3                    | 40,000                                                                          | 430          | 0.005                   | 0.011               | 0.027             | 0.007                 | 0.13                              |
|                       | 3                          | 7.5                    | 40,000                                                                          | 360          | 0.005                   | 0.009               | 0.022             | 0.006                 | 0.07                              |
|                       | 4                          | 10                     | 40,000                                                                          | 270          | 0.003                   | 0.007               | 0.017             | 0.005                 | 0.03                              |
|                       | 1                          | 2                      | 40,000                                                                          | 1,300        | 0.016                   | 0.031               | 0.079             | 0.020                 | 3.18                              |
|                       | 1.5                        | 3                      | 40,000                                                                          | 1,300        | 0.016                   | 0.031               | 0.079             | 0.020                 | 3.18                              |
|                       | 2                          | 4                      | 40,000                                                                          | 980          | 0.012                   | 0.024               | 0.059             | 0.015                 | 1.39                              |
|                       | 2.5                        | 5                      | 40,000                                                                          | 780          | 0.010                   | 0.019               | 0.047             | 0.012                 | 0.70                              |
|                       | 3                          | 6                      | 40,000                                                                          | 650          | 0.008                   | 0.016               | 0.039             | 0.010                 | 0.41                              |
| R0.3                  | 4                          | 8                      | 40,000                                                                          | 490          | 0.006                   | 0.012               | 0.030             | 0.008                 | 0.18                              |
|                       | 5                          | 10                     | 40,000                                                                          | 390          | 0.005                   | 0.009               | 0.024             | 0.006                 | 0.08                              |
|                       | 1                          | 1.7                    | 40,000                                                                          | 1,700        | 0.021                   | 0.042               | 0.106             | 0.023                 | 7.57                              |
|                       | 1.5                        | 2.5                    | 40,000                                                                          | 1,700        | 0.021                   | 0.042               | 0.106             | 0.023                 | 7.57                              |
|                       | 2                          | 3.3                    | 40,000                                                                          | 1,530        | 0.019                   | 0.038               | 0.095             | 0.021                 | 5.52                              |
|                       | 2.5                        | 4.2                    | 40,000                                                                          | 1,220        | 0.015                   | 0.030               | 0.076             | 0.017                 | 2.78                              |
|                       | 3                          | 5.0                    | 40,000                                                                          | 1,020        | 0.013                   | 0.025               | 0.063             | 0.014                 | 1.61                              |
|                       | 4                          | 6.7                    | 40,000                                                                          | 770          | 0.010                   | 0.019               | 0.048             | 0.010                 | 0.70                              |
|                       | 5                          | 8.3                    | 40,000                                                                          | 610          | 0.008                   | 0.015               | 0.038             | 0.008                 | 0.35                              |
|                       | 6                          | 10                     | 37,000                                                                          | 510          | 0.007                   | 0.013               | 0.032             | 0.007                 | 0.21                              |

| 加工材料<br>Work Material |                         |                        | 高硬度钢<br>Hardened Steels<br>STAVAX·HPM38·M333 (相当于52HRC)<br>As the same as 52HRC |              |                         |                     |       |                       |                                |
|-----------------------|-------------------------|------------------------|---------------------------------------------------------------------------------|--------------|-------------------------|---------------------|-------|-----------------------|--------------------------------|
| R球头半径<br>Radius       | 颈长<br>Under Neck Length | L(颈长)/<br>D(外径)<br>L/D | 主轴转速<br>Spindle Speed                                                           | 进给速度<br>Feed | 每刃进给量<br>Feed per Tooth | 切深量<br>Depth of Cut |       | 余量<br>Stock allowance | 切屑排出量<br>Material removal rate |
|                       |                         |                        | min <sup>-1</sup>                                                               | mm/min       | mm/t                    | ap mm               | ae mm | mm                    | mm <sup>3</sup> /min           |
| R0.4                  | 1                       | 1.3                    | 40,000                                                                          | 2,700        | 0.034                   | 0.068               | 0.170 | 0.029                 | 31.21                          |
|                       | 2                       | 2.5                    | 40,000                                                                          | 2,700        | 0.034                   | 0.068               | 0.170 | 0.029                 | 31.21                          |
|                       | 3                       | 3.8                    | 37,400                                                                          | 2,160        | 0.029                   | 0.054               | 0.136 | 0.023                 | 15.86                          |
|                       | 4                       | 5                      | 34,300                                                                          | 1,620        | 0.024                   | 0.041               | 0.102 | 0.017                 | 6.77                           |
|                       | 5                       | 6.3                    | 32,100                                                                          | 1,300        | 0.020                   | 0.033               | 0.082 | 0.014                 | 3.52                           |
|                       | 6                       | 7.5                    | 30,400                                                                          | 1,080        | 0.018                   | 0.027               | 0.068 | 0.012                 | 1.98                           |
| R0.5                  | 8                       | 10                     | 27,900                                                                          | 810          | 0.015                   | 0.020               | 0.051 | 0.009                 | 0.83                           |
|                       | 2                       | 2                      | 31,800                                                                          | 2,900        | 0.046                   | 0.100               | 0.250 | 0.040                 | 72.50                          |
|                       | 3                       | 3                      | 31,800                                                                          | 2,900        | 0.046                   | 0.100               | 0.250 | 0.040                 | 72.50                          |
|                       | 4                       | 4                      | 29,200                                                                          | 2,175        | 0.037                   | 0.075               | 0.188 | 0.030                 | 30.67                          |
|                       | 5                       | 5                      | 27,300                                                                          | 1,740        | 0.032                   | 0.060               | 0.150 | 0.024                 | 15.66                          |
|                       | 6                       | 6                      | 25,800                                                                          | 1,450        | 0.028                   | 0.050               | 0.125 | 0.020                 | 9.06                           |
| R0.75                 | 8                       | 8                      | 23,700                                                                          | 1,088        | 0.023                   | 0.038               | 0.094 | 0.015                 | 3.88                           |
|                       | 10                      | 10                     | 22,200                                                                          | 870          | 0.020                   | 0.030               | 0.075 | 0.012                 | 1.96                           |
|                       | 3                       | 2                      | 21,200                                                                          | 2,900        | 0.068                   | 0.150               | 0.375 | 0.056                 | 163.13                         |
|                       | 4                       | 2.7                    | 21,200                                                                          | 2,900        | 0.068                   | 0.150               | 0.375 | 0.056                 | 163.13                         |
|                       | 6                       | 4.0                    | 19,400                                                                          | 2,180        | 0.056                   | 0.113               | 0.281 | 0.042                 | 69.22                          |
|                       | 8                       | 5.3                    | 17,800                                                                          | 1,630        | 0.046                   | 0.084               | 0.211 | 0.032                 | 28.89                          |
| R1                    | 10                      | 6.7                    | 16,700                                                                          | 1,310        | 0.039                   | 0.068               | 0.169 | 0.025                 | 15.05                          |
|                       | 12                      | 8                      | 15,800                                                                          | 1,090        | 0.034                   | 0.056               | 0.141 | 0.021                 | 8.61                           |
|                       | 14                      | 9.3                    | 15,100                                                                          | 930          | 0.031                   | 0.048               | 0.121 | 0.018                 | 5.40                           |
|                       | 16                      | 10.7                   | 14,500                                                                          | 820          | 0.028                   | 0.042               | 0.105 | 0.016                 | 3.62                           |
|                       | 3                       | 1.5                    | 15,900                                                                          | 2,900        | 0.091                   | 0.200               | 0.500 | 0.068                 | 290.00                         |
|                       | 4                       | 2                      | 15,900                                                                          | 2,900        | 0.091                   | 0.200               | 0.500 | 0.068                 | 290.00                         |
| R1                    | 6                       | 3                      | 15,900                                                                          | 2,900        | 0.091                   | 0.200               | 0.500 | 0.068                 | 290.00                         |
|                       | 8                       | 4                      | 14,600                                                                          | 2,180        | 0.075                   | 0.150               | 0.375 | 0.051                 | 122.63                         |
|                       | 10                      | 5                      | 13,600                                                                          | 1,740        | 0.064                   | 0.120               | 0.300 | 0.041                 | 62.64                          |
|                       | 12                      | 6                      | 12,900                                                                          | 1,450        | 0.056                   | 0.100               | 0.250 | 0.034                 | 36.25                          |
|                       | 14                      | 7                      | 12,300                                                                          | 1,240        | 0.050                   | 0.086               | 0.214 | 0.029                 | 22.82                          |
|                       | 16                      | 8                      | 11,800                                                                          | 1,090        | 0.046                   | 0.075               | 0.188 | 0.026                 | 15.37                          |
| R1                    | 18                      | 9                      | 11,400                                                                          | 970          | 0.043                   | 0.067               | 0.167 | 0.023                 | 10.85                          |
|                       | 20                      | 10                     | 11,100                                                                          | 870          | 0.039                   | 0.060               | 0.150 | 0.020                 | 7.83                           |

备注  
Notes

- ※1 切深量的ap表示为轴向切深量, ae表示步距量。  
 ※2 请根据机床刚性和工件的夹持状态等调整切削参数。  
 ※3 发生振刀等情况时, 请根据需要调整切深参数。  
 ※4 R角等切削阻力大的部位, 请特别注意参数设定和刀路轨迹等。  
 ※5 进行高效率加工时, 请以相同比率提升主轴转速和进给速度。  
 ※6 当机床的最高主轴转速低于以上参考值时, 请以相同比率调整主轴转速和进给速度。  
 ※7 请尽量缩短刀具的伸出量。  
 ※8 建议使用油雾冷却方式, 但是不水溶性切削液、水溶性切削液、吹气方式也可使用。  
 ※9 中精加工和精加工的余量为参考值, 请根据前一工序的加工状态和要求精度进行调整。  
 ※10 中精加工、精加工的每刃进给量ap、ae是根据尖点高度的参考值为设定条件。  
 尖点高度为参考值, 请根据要求精度进行调整。

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.  
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.  
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.  
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.  
 ※5 In case high-efficient machining, increase spindle speed and feed rate at the same rate.  
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.  
 ※7 Length of tool overhang must be as short as possible.  
 ※8 Oil mist coolant is recommended. Water-insoluble, water-soluble, and air blow can also be used.  
 ※9 The stock allowances of semi-finishing and finishing are guide values, please adjust them according to the machining condition of the previous process and the required accuracy.  
 ※10 Feed per tooth, ap and ae of semi-finishing and finishing are set as reference values for the cusp height. The cusp height is a guideline, please adjust it according to the required accuracy.



## 切削条件参考表 Recommended Conditions

中精加工 Semi-Finishing

精加工 Finishing

| 加工材料<br>Work Material |                            |                        | 高硬度钢<br>Hardened Steels<br>STAVAX·HPM38·M333 (相当于52HRC)<br>As the same as 52HRC |              |                            |                        |                          |                        |                          |              |                            |                        |                          |                        |
|-----------------------|----------------------------|------------------------|---------------------------------------------------------------------------------|--------------|----------------------------|------------------------|--------------------------|------------------------|--------------------------|--------------|----------------------------|------------------------|--------------------------|------------------------|
| R球头半径<br>Radius       | 颈长<br>Under Neck<br>Length | L(颈长)/<br>D(外径)<br>L/D | 中精加工 Semi-Finishing                                                             |              |                            |                        |                          |                        | 精加工 Finishing            |              |                            |                        |                          |                        |
|                       |                            |                        | 主轴转速<br>Spindle<br>Speed                                                        | 进给速度<br>Feed | 每刃进给量<br>Feed per<br>Tooth | 切深量<br>Depth of<br>Cut | 余量<br>Stock<br>allowance | 尖点高度<br>Cusp<br>Height | 主轴转速<br>Spindle<br>Speed | 进给速度<br>Feed | 每刃进给量<br>Feed per<br>Tooth | 切深量<br>Depth of<br>Cut | 余量<br>Stock<br>allowance | 尖点高度<br>Cusp<br>Height |
|                       |                            |                        | min <sup>-1</sup>                                                               | mm/min       | min <sup>-1</sup>          | ap mm<br>或<br>ae mm    | mm/t                     | μm                     | min <sup>-1</sup>        | mm/min       | min <sup>-1</sup>          | ap mm<br>或<br>ae mm    | mm                       | μm                     |
| R0.05                 | 0.2                        | 2                      | 40,000                                                                          | 270          | 0.003                      | 0.003                  | 0.002                    | 0.02                   | 40,000                   | 160          | 0.002                      | 0.002                  | 0                        | 0.01                   |
|                       | 0.3                        | 3                      | 40,000                                                                          | 270          | 0.003                      | 0.003                  | 0.002                    | 0.02                   | 40,000                   | 160          | 0.002                      | 0.002                  | 0                        | 0.01                   |
|                       | 0.4                        | 4                      | 40,000                                                                          | 270          | 0.003                      | 0.003                  | 0.002                    | 0.02                   | 40,000                   | 160          | 0.002                      | 0.002                  | 0                        | 0.01                   |
|                       | 0.5                        | 5                      | 40,000                                                                          | 270          | 0.003                      | 0.003                  | 0.002                    | 0.02                   | 40,000                   | 160          | 0.002                      | 0.002                  | 0                        | 0.01                   |
| R0.075                | 0.3                        | 2                      | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.003                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
|                       | 0.4                        | 2.7                    | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.003                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
|                       | 0.5                        | 3.3                    | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.003                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
|                       | 0.6                        | 4                      | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.003                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
|                       | 0.75                       | 5                      | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.002                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
|                       | 1                          | 6.7                    | 40,000                                                                          | 390          | 0.005                      | 0.005                  | 0.002                    | 0.04                   | 40,000                   | 270          | 0.003                      | 0.003                  | 0                        | 0.02                   |
| R0.1                  | 0.3                        | 1.5                    | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.004                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 0.4                        | 2                      | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.004                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 0.5                        | 2.5                    | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.004                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 0.6                        | 3                      | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.004                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 0.75                       | 3.8                    | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.003                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 1                          | 5                      | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.002                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 1.25                       | 6.3                    | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.002                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 1.5                        | 7.5                    | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.002                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 2                          | 10                     | 40,000                                                                          | 450          | 0.006                      | 0.006                  | 0.002                    | 0.04                   | 40,000                   | 320          | 0.004                      | 0.004                  | 0                        | 0.02                   |
|                       | 0.5                        | 1.7                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.006                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
| R0.15                 | 0.6                        | 2                      | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.006                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 0.75                       | 2.5                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.006                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 1                          | 3.3                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.005                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 1.25                       | 4.2                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.004                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 1.5                        | 5                      | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.004                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 2                          | 6.7                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.003                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 2.5                        | 8.3                    | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.002                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 3                          | 10                     | 40,000                                                                          | 610          | 0.008                      | 0.008                  | 0.002                    | 0.05                   | 40,000                   | 480          | 0.006                      | 0.006                  | 0                        | 0.03                   |
|                       | 0.5                        | 1.3                    | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.007                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 0.8                        | 2                      | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.007                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
| R0.2                  | 1                          | 2.5                    | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.007                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 1.5                        | 3.8                    | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.006                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 2                          | 5                      | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.004                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 2.5                        | 6.3                    | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.003                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 3                          | 7.5                    | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.003                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 4                          | 10                     | 40,000                                                                          | 780          | 0.010                      | 0.010                  | 0.002                    | 0.06                   | 40,000                   | 560          | 0.007                      | 0.007                  | 0                        | 0.03                   |
|                       | 1                          | 2                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.009                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 1.5                        | 3                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.009                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
| R0.25                 | 2                          | 4                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.007                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 2.5                        | 5                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.005                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 3                          | 6                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.004                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 4                          | 8                      | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.003                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 5                          | 10                     | 40,000                                                                          | 1,010        | 0.013                      | 0.013                  | 0.003                    | 0.08                   | 40,000                   | 710          | 0.009                      | 0.009                  | 0                        | 0.04                   |
|                       | 1                          | 1.7                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.010                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |
| R0.3                  | 1.5                        | 2.5                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.010                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |
|                       | 2                          | 3.3                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.009                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |
|                       | 2.5                        | 4.2                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.007                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |
|                       | 3                          | 5.0                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.006                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |
|                       | 4                          | 6.7                    | 40,000                                                                          | 1,170        | 0.015                      | 0.015                  | 0.004                    | 0.09                   | 40,000                   | 780          | 0.010                      | 0.010                  | 0                        | 0.04                   |

| 加工材料<br>Work Material |                         |                          | 高硬度钢<br>Hardened Steels<br>STAVAX·HPM38·M333 (相当于52HRC)<br>As the same as 52HRC |              |                         |                     |                       |                     |                       |              |                         |                     |                       |                     |
|-----------------------|-------------------------|--------------------------|---------------------------------------------------------------------------------|--------------|-------------------------|---------------------|-----------------------|---------------------|-----------------------|--------------|-------------------------|---------------------|-----------------------|---------------------|
| R球头半径<br>Radius       | 颈长<br>Under Neck Length | L (颈长)/<br>D (外径)<br>L/D | 中精加工 Semi-Finishing                                                             |              |                         |                     |                       |                     | 精加工 Finishing         |              |                         |                     |                       |                     |
|                       |                         |                          | 主轴转速<br>Spindle Speed                                                           | 进给速度<br>Feed | 每刃进给量<br>Feed per Tooth | 切深量<br>Depth of Cut | 余量<br>Stock allowance | 尖点高度<br>Cusp Height | 主轴转速<br>Spindle Speed | 进给速度<br>Feed | 每刃进给量<br>Feed per Tooth | 切深量<br>Depth of Cut | 余量<br>Stock allowance | 尖点高度<br>Cusp Height |
|                       |                         |                          | min <sup>-1</sup>                                                               | mm/min       | min <sup>-1</sup>       | ap mm<br>或<br>ae mm | mm/t                  | μm                  | min <sup>-1</sup>     | mm/min       | min <sup>-1</sup>       | ap mm<br>或<br>ae mm | mm                    | μm                  |
| R0.3                  | 5                       | 8.3                      | 40,000                                                                          | 1,170        | 0.015                   | 0.015               | 0.004                 | 0.09                | 40,000                | 780          | 0.010                   | 0.010               | 0                     | 0.04                |
|                       | 6                       | 10                       | 37,000                                                                          | 1,080        | 0.015                   | 0.015               | 0.003                 | 0.09                | 37,000                | 720          | 0.010                   | 0.010               | 0                     | 0.04                |
| R0.4                  | 1                       | 1.3                      | 40,000                                                                          | 1,430        | 0.018                   | 0.018               | 0.013                 | 0.10                | 40,000                | 1,010        | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 2                       | 2.5                      | 40,000                                                                          | 1,430        | 0.018                   | 0.018               | 0.013                 | 0.10                | 40,000                | 1,010        | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 3                       | 3.8                      | 37,400                                                                          | 1,330        | 0.018                   | 0.018               | 0.010                 | 0.10                | 37,400                | 940          | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 4                       | 5                        | 34,300                                                                          | 1,220        | 0.018                   | 0.018               | 0.008                 | 0.10                | 34,300                | 860          | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 5                       | 6.3                      | 32,100                                                                          | 1,140        | 0.018                   | 0.018               | 0.006                 | 0.10                | 32,100                | 810          | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 6                       | 7.5                      | 30,400                                                                          | 1,080        | 0.018                   | 0.018               | 0.005                 | 0.10                | 30,400                | 760          | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 8                       | 10                       | 27,900                                                                          | 990          | 0.018                   | 0.018               | 0.004                 | 0.10                | 27,900                | 700          | 0.013                   | 0.013               | 0                     | 0.05                |
|                       | 10                      | 10                       | 22,200                                                                          | 1,080        | 0.024                   | 0.024               | 0.005                 | 0.14                | 22,200                | 740          | 0.017                   | 0.017               | 0                     | 0.07                |
| R0.5                  | 2                       | 2                        | 31,800                                                                          | 1,550        | 0.024                   | 0.024               | 0.017                 | 0.14                | 31,800                | 1,060        | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 3                       | 3                        | 31,800                                                                          | 1,550        | 0.024                   | 0.024               | 0.017                 | 0.14                | 31,800                | 1,060        | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 4                       | 4                        | 29,200                                                                          | 1,430        | 0.024                   | 0.024               | 0.013                 | 0.14                | 29,200                | 970          | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 5                       | 5                        | 27,300                                                                          | 1,330        | 0.024                   | 0.024               | 0.010                 | 0.14                | 27,300                | 910          | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 6                       | 6                        | 25,800                                                                          | 1,260        | 0.024                   | 0.024               | 0.008                 | 0.14                | 25,800                | 860          | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 8                       | 8                        | 23,700                                                                          | 1,160        | 0.024                   | 0.024               | 0.006                 | 0.14                | 23,700                | 790          | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 10                      | 10                       | 22,200                                                                          | 1,080        | 0.024                   | 0.024               | 0.005                 | 0.14                | 22,200                | 740          | 0.017                   | 0.017               | 0                     | 0.07                |
|                       | 12                      | 12                       | 20,900                                                                          | 1,000        | 0.024                   | 0.024               | 0.004                 | 0.14                | 20,900                | 680          | 0.017                   | 0.017               | 0                     | 0.07                |
| R0.75                 | 3                       | 2                        | 21,200                                                                          | 1,350        | 0.032                   | 0.032               | 0.022                 | 0.17                | 21,200                | 920          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 4                       | 2.7                      | 21,200                                                                          | 1,350        | 0.032                   | 0.032               | 0.022                 | 0.17                | 21,200                | 920          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 6                       | 4.0                      | 19,400                                                                          | 1,230        | 0.032                   | 0.032               | 0.016                 | 0.17                | 19,400                | 850          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 8                       | 5.3                      | 17,800                                                                          | 1,130        | 0.032                   | 0.032               | 0.012                 | 0.17                | 17,800                | 770          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 10                      | 6.7                      | 16,700                                                                          | 1,060        | 0.032                   | 0.032               | 0.010                 | 0.17                | 16,700                | 730          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 12                      | 8                        | 15,800                                                                          | 1,000        | 0.032                   | 0.032               | 0.008                 | 0.17                | 15,800                | 690          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 14                      | 9.3                      | 15,100                                                                          | 960          | 0.032                   | 0.032               | 0.007                 | 0.17                | 15,100                | 660          | 0.022                   | 0.022               | 0                     | 0.08                |
|                       | 16                      | 10.7                     | 14,500                                                                          | 920          | 0.032                   | 0.032               | 0.006                 | 0.17                | 14,500                | 630          | 0.022                   | 0.022               | 0                     | 0.08                |
| R1                    | 3                       | 1.5                      | 15,900                                                                          | 1,270        | 0.040                   | 0.040               | 0.028                 | 0.2                 | 15,900                | 890          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 4                       | 2                        | 15,900                                                                          | 1,270        | 0.040                   | 0.040               | 0.028                 | 0.2                 | 15,900                | 890          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 6                       | 3                        | 15,900                                                                          | 1,270        | 0.040                   | 0.040               | 0.028                 | 0.2                 | 15,900                | 890          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 8                       | 4                        | 14,600                                                                          | 1,160        | 0.040                   | 0.040               | 0.021                 | 0.2                 | 14,600                | 820          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 10                      | 5                        | 13,600                                                                          | 1,080        | 0.040                   | 0.040               | 0.017                 | 0.2                 | 13,600                | 760          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 12                      | 6                        | 12,900                                                                          | 1,030        | 0.040                   | 0.040               | 0.014                 | 0.2                 | 12,900                | 720          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 14                      | 7                        | 12,300                                                                          | 980          | 0.040                   | 0.040               | 0.012                 | 0.2                 | 12,300                | 690          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 16                      | 8                        | 11,800                                                                          | 940          | 0.040                   | 0.040               | 0.011                 | 0.2                 | 11,800                | 660          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 18                      | 9                        | 11,400                                                                          | 910          | 0.040                   | 0.040               | 0.009                 | 0.2                 | 11,400                | 640          | 0.028                   | 0.028               | 0                     | 0.1                 |
|                       | 20                      | 10                       | 11,100                                                                          | 880          | 0.040                   | 0.040               | 0.008                 | 0.2                 | 11,100                | 620          | 0.028                   | 0.028               | 0                     | 0.1                 |

备注  
Notes

- ※1 切深量的ap表示为轴向切深量，ae表示步距量。
- ※2 请根据机床刚性和工件的夹持状态等调整切削参数。
- ※3 发生振刀等情况时，请根据需要调整切深参数。
- ※4 R角等切削阻力大的部位，请特别注意参数设定和刀路轨迹等。
- ※5 进行高效率加工时，请以相同比率提升主轴转速和进给速度。
- ※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
- ※7 请尽量缩短刀具的伸出量。
- ※8 建议使用油雾冷却方式，但是不水溶性切削液、水溶性切削液、吹气方式也可使用。
- ※9 中精加工和精加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
- ※10 中精加工、精加工的每刃进给量ap、ae是根据尖点高度的参考值为设定条件。

尖点高度为参考值，请根据要求精度进行调整。

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
- ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
- ※3 In case of chattering etc., please adjust cutting conditions if necessary.
- ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
- ※5 In case high-efficient machining, increase spindle speed and feed rate at the same rate.
- ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
- ※7 Length of tool overhang must be as short as possible.
- ※8 Oil mist coolant is recommended. Water-insoluble, water-soluble, and air blow can also be used.
- ※9 The stock allowances of semi-finishing and finishing are guide values, please adjust them according to the machining condition of the previous process and the required accuracy.
- ※10 Feed per tooth, ap and ae of semi-finishing and finishing are set as reference values for the cusp height. The cusp height is a guideline, please adjust it according to the required accuracy.

