



PLUNGING* AND RAMPING*

| Material/ISO material | Hardness | Ramping depth* (a _p max.) | Ramping* max. angle in ° | Cutting speed (v _c) | fz (mm/z) with nom. Ø | | | | | |
|---|----------------------------------|---|--------------------------------|------------------------------------|-----------------------|-------|-------|-------|-------|-------|
| | | | | | 5.7 | 7.7 | 9.7 | 11.7 | 15.6 | 19.5 |
| Struct./free-cutting steels, unall. heat-treat./case hard. steels | up to 850 N/mm ² | 1xd | 45° | 270 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |
| P Free-cutting steels, unalloyed case hard. steels, nitr. steels | 850 - 1200 N/mm ² | 1xd | 45° | 240 | 0.015 | 0.020 | 0.035 | 0.040 | 0.045 | 0.050 |
| Alloyed heat-treatable, tool and high speed steels | 850 - 1400 N/mm ² | 1xd | 30° | 200 | 0.010 | 0.015 | 0.025 | 0.030 | 0.035 | 0.040 |
| M Stainless steel - easy to machine / sulphured | up to 750 N/mm ² | 1xd | 10° | 60 | 0.010 | 0.015 | 0.025 | 0.030 | 0.035 | 0.040 |
| Stainless steel - moderately difficult to machine | over 750 - 950 N/mm ² | 0.5xd | 5° | 50 | 0.010 | 0.015 | 0.020 | 0.025 | 0.030 | 0.035 |
| K Cast iron, grey cast iron, spher. graphite/malleable cast iron | over 240 HB 30 | 1xd | 45° | 150 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |
| N Aluminium, Al-wrought alloys, Al-alloys | up to 3% Si | 1xd | 30° | 180 | 0.015 | 0.020 | 0.035 | 0.040 | 0.045 | 0.050 |
| Aluminium-cast alloys | over 3% Si | 1xd | 45° | 140 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |
| S Titanium, Titanium alloys | up to 1400 N/mm ² | 0.5xd | 10° | 45 | 0.010 | 0.015 | 0.020 | 0.025 | 0.030 | 0.035 |

* peripheral cooling „Guhrojet“ recommended for optimal chip evacuation and tool life

SLOTING*

| Material/ISO material | Hardness | Cutting depth* (a _p) | Cutting width (a _e) | Cutting speed (v _c) | fz (mm/z) with nom. Ø | | | | | |
|---|----------------------------------|-------------------------------------|------------------------------------|------------------------------------|-----------------------|-------|-------|-------|-------|-------|
| | | | | | 5.7 | 7.7 | 9.7 | 11.7 | 15.6 | 19.5 |
| Struct./free-cutting steels, unall. heat-treat./case hard. steels | up to 850 N/mm ² | 1xd | 1xd | 270 | 0.025 | 0.035 | 0.050 | 0.060 | 0.080 | 0.100 |
| P Free-cutting steels, unalloyed case hard. steels, nitr. steels | 850 - 1200 N/mm ² | 1xd | 1xd | 240 | 0.025 | 0.035 | 0.050 | 0.060 | 0.080 | 0.100 |
| Alloyed heat-treatable, tool and high speed steels | 850 - 1400 N/mm ² | 1xd | 1xd | 200 | 0.025 | 0.030 | 0.045 | 0.050 | 0.070 | 0.085 |
| M Stainless steel - easy to machine / sulphured | up to 750 N/mm ² | 1xd | 1xd | 120 | 0.020 | 0.030 | 0.045 | 0.060 | 0.065 | 0.075 |
| Stainless steel - moderately difficult to machine | over 750 - 950 N/mm ² | 1xd | 1xd | 80 | 0.020 | 0.030 | 0.040 | 0.045 | 0.060 | 0.070 |
| K Cast iron, grey cast iron, spher. graphite/malleable cast iron | over 240 HB 30 | 1xd | 1xd | 160 | 0.025 | 0.035 | 0.050 | 0.060 | 0.080 | 0.100 |
| N Aluminium, Al-wrought alloys, Al-alloys | up to 3% Si | 1xd | 1xd | 500 | 0.030 | 0.040 | 0.065 | 0.080 | 0.095 | 0.110 |
| Aluminium-cast alloys | over 3% Si | 1xd | 1xd | 340 | 0.020 | 0.030 | 0.055 | 0.065 | 0.080 | 0.100 |
| S Titanium, Titanium alloys | up to 1400 N/mm ² | 1xd | 1xd | 60 | 0.020 | 0.030 | 0.040 | 0.045 | 0.060 | 0.070 |

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HPC-ROUGHING* AND HSC-FINISHING**

| Material/ISO material | Hardness | Cutting depth* (a _p) | Cutting width*** (a _e) | Cutting speed (v _c) | fz (mm/z) with nom. Ø | | | | | |
|---|----------------------------------|-------------------------------------|---------------------------------------|------------------------------------|-----------------------|-------|-------|-------|-------|-------|
| | | | | | 5.7 | 7.7 | 9.7 | 11.7 | 15.6 | 19.5 |
| Struct./free-cutting steels, unall. heat-treat./case hard. steels | up to 850 N/mm ² | 2xd | 0.4xd | 350 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| P Free-cutting steels, unalloyed case hard. steels, nitr. steels | 850 - 1200 N/mm ² | 2xd | 0.4xd | 290 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| Alloyed heat-treatable, tool and high speed steels | 850 - 1400 N/mm ² | 2xd | 0.3xd | 240 | 0.025 | 0.030 | 0.055 | 0.070 | 0.085 | 0.100 |
| M Stainless steel - easy to machine / sulphured | up to 750 N/mm ² | 2xd | 0.3xd | 140 | 0.025 | 0.035 | 0.055 | 0.065 | 0.080 | 0.090 |
| Stainless steel - moderately difficult to machine | over 750 - 950 N/mm ² | 2xd | 0.25xd | 120 | 0.020 | 0.030 | 0.045 | 0.050 | 0.065 | 0.075 |
| K Cast iron, grey cast iron, spher. graphite/malleable cast iron | over 240 HB 30 | 2xd | 0.4xd | 180 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| N Aluminium, Al-wrought alloys, Al-alloys | up to 3% Si | 2xd | 0.5xd | 600 | 0.040 | 0.060 | 0.080 | 0.100 | 0.120 | 0.150 |
| Aluminium-cast alloys | over 3% Si | 2xd | 0.4xd | 420 | 0.030 | 0.045 | 0.060 | 0.075 | 0.090 | 0.110 |
| S Titanium, Titanium alloys | up to 1400 N/mm ² | 2xd | 0.4xd | 120 | 0.020 | 0.030 | 0.045 | 0.050 | 0.065 | 0.075 |

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** for HSC machining the cutting speed can be increased by 50%, feed rate fz can be reduced depending on surface requirements.

*** for trochoidal milling and machining with a_e = 0.1-0.2xd the cutting speed v_c and the feed rate can be increased by 50 %.

DRILLING*

| Material/ISO material | Hardness | Drilling depth** (a _p max.) | Cutting speed (v _c) | fz (mm/z) with nom. Ø | | | | | |
|---|------------------------------|---|------------------------------------|-----------------------|-------|-------|-------|-------|-------|
| | | | | 5.7 | 7.7 | 9.7 | 11.7 | 15.6 | 19.5 |
| Struct./free-cutting steels, unall. heat-treat./case hard. steels | up to 850 N/mm ² | 2xd | 270 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |
| P Free-cutting steels, unalloyed case hard. steels, nitr. steels | 850 - 1200 N/mm ² | 2xd | 240 | 0.015 | 0.020 | 0.035 | 0.040 | 0.045 | 0.050 |
| Alloyed heat-treatable, tool and high speed steels | 850 - 1400 N/mm ² | 1xd | 200 | 0.010 | 0.015 | 0.025 | 0.030 | 0.035 | 0.040 |
| K Cast iron, grey cast iron, spher. graphite/malleable cast iron | over 240 HB 30 | 2xd | 150 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |
| N Aluminium, Al-wrought alloys, Al-alloys | up to 3% Si | 1xd | 180 | 0.015 | 0.020 | 0.035 | 0.040 | 0.045 | 0.050 |
| Aluminium-cast alloys | over 3% Si | 1xd | 140 | 0.020 | 0.030 | 0.040 | 0.045 | 0.050 | 0.060 |

* wood pecking recommended from drilling depth 1xd

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