

# Recommended Cutting Conditions

## Machining data for MTECBF, MTECM, MTECK

| ISO | Material                                                           | Condition                     | Tensile strength<br>(N/mm <sup>2</sup> ) | Hardness<br>HB | Material<br>No. | Cutting<br>speed<br>Vc(m/min) | Feed (mm/tooth) for diameter (mm) |      |      |      |      |      |      |
|-----|--------------------------------------------------------------------|-------------------------------|------------------------------------------|----------------|-----------------|-------------------------------|-----------------------------------|------|------|------|------|------|------|
|     |                                                                    |                               |                                          |                |                 | TT9030                        | Ø1.5                              | Ø2   | Ø3   | Ø4   | Ø5   | Ø6   | Ø7   |
| P   | Non-alloy steel, cast steel, free cutting steel                    | <0.25%C Annealed              | 420                                      | 125            | 1               | 70-120                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | >=0.25%C Annealed             | 650                                      | 190            | 2               | 65-115                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | <0.55%C Quenched and tempered | 850                                      | 250            | 3               | 60-110                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | >=0.55%C Annealed             | 750                                      | 220            | 4               | 70-90                         | 0.04                              | 0.05 | 0.06 | 0.08 | 0.09 | 0.1  | 0.12 |
|     |                                                                    | Quenched and tempered         | 1000                                     | 300            | 5               | 60-85                         | 0.04                              | 0.05 | 0.06 | 0.08 | 0.09 | 0.1  | 0.12 |
|     | Low alloy steel and cast steel (Less than 5% of alloying elements) | Annealed                      | 600                                      | 200            | 6               | 60-80                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    | Quenched and tempered         | 930                                      | 275            | 7               | 60-75                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    |                               | 1000                                     | 300            | 8               | 55-75                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    |                               | 1200                                     | 350            | 9               | 55-70                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     | High alloy steel, cast steel and tool steel                        | Annealed                      | 680                                      | 200            | 10              | 50-65                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    | Quenched and tempered         | 1100                                     | 325            | 11              | 50-63                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
| M   | Stainless steel and cast steel                                     | Ferritic / martensitic        | 680                                      | 200            | 12              | 50-60                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    | Martensitic                   | 820                                      | 240            | 13              | 50-70                         | 0.04                              | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 |
|     |                                                                    | Austenitic                    | 600                                      | 180            | 14              | 60-90                         | 0.03                              | 0.03 | 0.04 | 0.05 | 0.06 | 0.06 | 0.07 |
| K   | Gray cast iron (GG)                                                | Ferritic                      |                                          | 160            | 15              | 60-80                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Pearlitic                     |                                          | 250            | 16              | 60-75                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     | Cast iron nodular (GGG)                                            | Ferritic                      |                                          | 180            | 17              | 50-70                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Pearlitic                     |                                          | 260            | 18              | 40-65                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     | Malleable cast iron                                                | Ferritic                      |                                          | 130            | 19              | 50-70                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Pearlitic                     |                                          | 230            | 20              | 40-65                         | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
| N   | Aluminum - Wrought alloy                                           | Not cureable                  |                                          | 60             | 21              | 150                           | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Cured                         |                                          | 100            | 22              | 110-                          | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     | Aluminum- <=12% Si cast, alloyed                                   | Not cureable                  |                                          | 75             | 23              | 120-                          | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Cured                         |                                          | 90             | 24              | 120-                          | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | >12% Si High temp.            |                                          | 130            | 25              | 80-110                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     | Copper alloys                                                      | >1% Pb Free cutting           |                                          | 110            | 26              | 85-120                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Brass                         |                                          | 90             | 27              | 85-120                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     |                                                                    | Electrolitic copper           |                                          | 100            | 28              | 70-100                        | 0.05                              | 0.05 | 0.07 | 0.09 | 0.11 | 0.13 | 0.14 |
|     | Non-metallic                                                       | Duroplastics, fiber plastics  |                                          |                | 29              | 120-                          | 0.1                               | 0.11 | 0.12 | 0.14 | 0.16 | 0.18 | 0.19 |
|     |                                                                    | Hard rubber                   |                                          |                | 30              | 120-                          | 0.1                               | 0.11 | 0.12 | 0.14 | 0.16 | 0.18 | 0.19 |
| S   | High temp. alloys                                                  | Fe based Annealed             |                                          | 200            | 31              | 40-60                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     |                                                                    | Cured                         |                                          | 280            | 32              | 30-50                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     |                                                                    | Ni or Co based Annealed       |                                          | 250            | 33              | 25-40                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     |                                                                    | Cured                         |                                          | 350            | 34              | 20-35                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     |                                                                    | Cast                          |                                          | 320            | 35              | 20-40                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     | Titanium, Ti alloys                                                | Pure                          | Rm 400                                   |                | 36              | 30-45                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
|     |                                                                    | Alpha+beta alloys cured       | Rm 1050                                  |                | 37              | 30-40                         | 0.03                              | 0.03 | 0.04 | 0.04 | 0.05 | 0.06 | 0.06 |
| H   | Hardened steel                                                     | Hardened                      |                                          | 55HRC          | 38              |                               |                                   |      |      |      |      |      |      |
|     |                                                                    | Hardened                      |                                          | 60HRC          | 39              |                               |                                   |      |      |      |      |      |      |
|     | Chilled cast iron                                                  | Cast                          |                                          | 400            | 40              |                               |                                   |      |      |      |      |      |      |
|     | Cast iron nodular                                                  | Hardened                      |                                          | 55HRC          | 41              |                               |                                   |      |      |      |      |      |      |

■ Steel
 ■ Stainless steel
 ■ Cast iron
 ■ Nonferrous
 ■ High temp. alloys
 ■ Hardened steel

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## Machining data for MTECBF, MTECM, MTECK

| ISO | Material                                                           | Condition                     | Tensile strength<br>(N/mm <sup>2</sup> ) | Hardness<br>HB | Material<br>No. | Cutting<br>speed<br>Vc(m/min) | Feed (mm/tooth) for diameter (mm) |      |      |      |      |      |
|-----|--------------------------------------------------------------------|-------------------------------|------------------------------------------|----------------|-----------------|-------------------------------|-----------------------------------|------|------|------|------|------|
|     |                                                                    |                               |                                          |                |                 | TT9030                        | Ø8                                | Ø9   | Ø10  | Ø12  | Ø14  | Ø15  |
| P   | Non-alloy steel, cast steel, free cutting steel                    | <0.25%C Annealed              | 420                                      | 125            | 1               | 70-120                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | >=0.25%C Annealed             | 650                                      | 190            | 2               | 65-115                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | <0.55%C Quenched and tempered | 850                                      | 250            | 3               | 60-110                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | >=0.55%C Annealed             | 750                                      | 220            | 4               | 70-90                         | 0.13                              | 0.14 | 0.14 | 0.16 | 0.17 | 0.18 |
|     |                                                                    | Quenched and tempered         | 1000                                     | 300            | 5               | 60-85                         | 0.13                              | 0.14 | 0.14 | 0.16 | 0.17 | 0.18 |
|     | Low alloy steel and cast steel (Less than 5% of alloying elements) | Annealed                      | 600                                      | 200            | 6               | 60-80                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    | Quenched and tempered         | 930                                      | 275            | 7               | 60-75                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    |                               | 1000                                     | 300            | 8               | 55-75                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    |                               | 1200                                     | 350            | 9               | 55-70                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     | High alloy steel, cast steel and tool steel                        | Annealed                      | 680                                      | 200            | 10              | 50-65                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    | Quenched and tempered         | 1100                                     | 325            | 11              | 50-63                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
| M   | Stainless steel and cast steel                                     | Ferritic / martensitic        | 680                                      | 200            | 12              | 50-60                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    | Martensitic                   | 820                                      | 240            | 13              | 50-70                         | 0.08                              | 0.09 | 0.1  | 0.12 | 0.13 | 0.14 |
|     |                                                                    | Austenitic                    | 600                                      | 180            | 14              | 60-90                         | 0.08                              | 0.09 | 0.1  | 0.11 | 0.12 | 0.13 |
| K   | Gray cast iron (GG)                                                | Ferritic                      |                                          | 160            | 15              | 60-80                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | Pearlitic                     |                                          | 250            | 16              | 60-75                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     | Cast iron nodular (GGG)                                            | Ferritic                      |                                          | 180            | 17              | 50-70                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | Pearlitic                     |                                          | 260            | 18              | 40-65                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     | Malleable cast iron                                                | Ferritic                      |                                          | 130            | 19              | 50-70                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | Pearlitic                     |                                          | 230            | 20              | 40-65                         | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
| N   | Aluminum - Wrought alloy                                           | Not cureable                  |                                          | 60             | 21              | 150                           | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | Cured                         |                                          | 100            | 22              | 110-                          | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
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|     |                                                                    | Cured                         |                                          | 90             | 24              | 120-                          | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | >12% Si High temp.            |                                          | 130            | 25              | 80-110                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
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|     |                                                                    | Brass                         |                                          | 90             | 27              | 85-120                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     |                                                                    | Electrolitic copper           |                                          | 100            | 28              | 70-100                        | 0.15                              | 0.16 | 0.16 | 0.17 | 0.18 | 0.18 |
|     | Non-metallic                                                       | Duroplastics, fiber plastics  |                                          |                | 29              | 120-                          | 0.19                              | 0.19 | 0.19 | 0.19 | 0.2  | 0.2  |
|     |                                                                    | Hard rubber                   |                                          |                | 30              | 120-                          | 0.19                              | 0.19 | 0.19 | 0.19 | 0.2  | 0.2  |
| S   | High temp. alloys                                                  | Fe based Annealed             |                                          | 200            | 31              | 40-60                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     |                                                                    | Cured                         |                                          | 280            | 32              | 30-50                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     |                                                                    | Ni or Co based Annealed       |                                          | 250            | 33              | 25-40                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     |                                                                    | Cured                         |                                          | 350            | 34              | 20-35                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     | Titanium, Ti alloys                                                | Cast                          |                                          | 320            | 35              | 20-40                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     |                                                                    | Pure                          | Rm 400                                   |                | 36              | 30-45                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
|     |                                                                    | Alpha+beta alloys cured       | Rm 1050                                  |                | 37              | 30-40                         | 0.06                              | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |
| H   | Hardened steel                                                     | Hardened                      |                                          | 55HRC          | 38              |                               |                                   |      |      |      |      |      |
|     |                                                                    | Hardened                      |                                          | 60HRC          | 39              |                               |                                   |      |      |      |      |      |
|     | Chilled cast iron                                                  | Cast                          |                                          | 400            | 40              |                               |                                   |      |      |      |      |      |
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