



UMFANGSBEARBEITUNG

|   |                                                                           | VDI 3323  |  | VHM<br>Vc [m/min] | TiAlN<br>Vc [m/min] | ae<br>(mm) | ap<br>(mm) |
|---|---------------------------------------------------------------------------|-----------|--|-------------------|---------------------|------------|------------|
| P | Unlegierter Stahl, Automaten Stahl                                        | 1 - 5     |  |                   | 100                 | <0.30×ØD1  | <1×L1      |
|   | Niedrig legierter Stahl < 800 N/mm²                                       | 6 - 9     |  |                   | 80                  | <0.20×ØD1  | <1×L1      |
|   | Hochlegierter Stahl > 800 N/mm², ferritischer / martensitischer Edelstahl | 10 - 13   |  |                   | 55                  | <0.15×ØD1  | <1×L1      |
| M | Austenitischer rostfreier Stahl < 700 N/mm²                               | 14.1-14.2 |  |                   | 80                  | <0.15×ØD1  | <1×L1      |
|   | Nickelfreier rostfreier Stahl / DUPLEX > 700 N/mm2                        | 14.3-14.4 |  |                   | 55                  | <0.10×ØD1  | <1×L1      |
| K | Grauguss < 250 HB                                                         | 15 - 16   |  | 110               | 125                 | <0.40×ØD1  | <1×L1      |
|   | Duktiles Gusseisen, Temperguss > 250 HB                                   | 17 - 20   |  | 75                | 100                 | <0.30×ØD1  | <1×L1      |
| N | Alu-Knetlegierung < 12% Si                                                | 21 - 22   |  | 320               |                     | <0.45×ØD1  | <1×L1      |
|   | Alu-Gusslegierung >12% Si                                                 | 23 - 25   |  | 260               |                     | <0.35×ØD1  | <1×L1      |
|   | Kupferlegierung gute Zerspanbarkeit mit Pb                                | 26        |  | 160               |                     | <0.40×ØD1  | <1×L1      |
|   | Kupferlegierung schwere Zerspanbarkeit                                    | 27 - 28   |  | 140               |                     | <0.40×ØD1  | <1×L1      |
|   | Kunststoff, Holz                                                          | 29 - 30   |  | 210               |                     | <0.45×ØD1  | <1×L1      |
|   | Gold, Silber                                                              | -         |  | 180               |                     | <0.40×ØD1  | <1×L1      |
| S | Spezielle Nickel-Kobalt-Legierung                                         | 31 - 35   |  | 15                | 20                  | <0.05×ØD1  | <1×L1      |
|   | Titan, Titanlegierung                                                     | 36 - 37   |  | 60                | 70                  | <0.30×ØD1  | <1×L1      |

NUTBEARBEITUNG

|   |                                                                           | VDI 3323  |  | VHM<br>Vc [m/min] | TiAlN<br>Vc [m/min] | ae<br>(mm) | ap<br>(mm) |
|---|---------------------------------------------------------------------------|-----------|--|-------------------|---------------------|------------|------------|
| P | Unlegierter Stahl, Automaten Stahl                                        | 1 - 5     |  |                   | 70                  | 1×ØD1      | <0.50×ØD1  |
|   | Niedrig legierter Stahl < 800 N/mm²                                       | 6 - 9     |  |                   | 55                  | 1×ØD1      | <0.30×ØD1  |
|   | Hochlegierter Stahl > 800 N/mm², ferritischer / martensitischer Edelstahl | 10 - 13   |  |                   | 40                  | 1×ØD1      | <0.20×ØD1  |
| M | Austenitischer rostfreier Stahl < 700 N/mm²                               | 14.1-14.2 |  |                   | 55                  | 1×ØD1      | <0.20×ØD1  |
|   | Nickelfreier rostfreier Stahl / DUPLEX > 700 N/mm2                        | 14.3-14.4 |  |                   | 40                  | 1×ØD1      | <0.15×ØD1  |
| K | Grauguss < 250 HB                                                         | 15 - 16   |  | 90                | 100                 | 1×ØD1      | <0.50×ØD1  |
|   | Duktiles Gusseisen, Temperguss > 250 HB                                   | 17 - 20   |  | 60                | 70                  | 1×ØD1      | <0.35×ØD1  |
| N | Alu-Knetlegierung < 12% Si                                                | 21 - 22   |  | 230               |                     | 1×ØD1      | <1.00×ØD1  |
|   | Alu-Gusslegierung >12% Si                                                 | 23 - 25   |  | 190               |                     | 1×ØD1      | <0.80×ØD1  |
|   | Kupferlegierung gute Zerspanbarkeit mit Pb                                | 26        |  | 110               |                     | 1×ØD1      | <1.00×ØD1  |
|   | Kupferlegierung schwere Zerspanbarkeit                                    | 27 - 28   |  | 100               |                     | 1×ØD1      | <0.50×ØD1  |
|   | Kunststoff, Holz                                                          | 29 - 30   |  | 150               |                     | 1×ØD1      | <0.70×ØD1  |
|   | Gold, Silber                                                              | -         |  | 130               |                     | 1×ØD1      | <0.70×ØD1  |
| S | Spezielle Nickel-Kobalt-Legierung                                         | 31 - 35   |  | 10                | 15                  | 1×ØD1      | <1.00×ØD1  |
|   | Titan, Titanlegierung                                                     | 36 - 37   |  | 50                | 50                  | 1×ØD1      | <0.25×ØD1  |

$$n \text{ [U/min]} = \frac{Vc \text{ [m/min]} \times 1000}{\pi \times D_1 \text{ [mm]}}$$

$$Vf \text{ [mm/min]} = n \text{ [U/min]} \times f \text{ [mm]} \times Z$$

| Vorschub pro Zahn fz [mm]       |                                 |                                 |                                 |                                 |                                 |                                  |                                   |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| Ø D <sub>1</sub><br>0.10 - 0.30 | Ø D <sub>1</sub><br>0.35 - 0.60 | Ø D <sub>1</sub><br>0.65 - 1.00 | Ø D <sub>1</sub><br>1.05 - 2.00 | Ø D <sub>1</sub><br>2.10 - 3.00 | Ø D <sub>1</sub><br>3.50 - 6.00 | Ø D <sub>1</sub><br>6.50 - 10.00 | Ø D <sub>1</sub><br>12.00 - 20.00 |
| 0.0008 - 0.003                  | 0.004 - 0.006                   | 0.007 - 0.010                   | 0.011 - 0.020                   | 0.021 - 0.030                   | 0.036 - 0.060                   | 0.060 - 0.090                    | 0.100 - 0.140                     |
| 0.0007 - 0.002                  | 0.003 - 0.005                   | 0.006 - 0.009                   | 0.009 - 0.018                   | 0.019 - 0.027                   | 0.032 - 0.055                   | 0.050 - 0.080                    | 0.090 - 0.130                     |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.016                   | 0.017 - 0.024                   | 0.028 - 0.050                   | 0.050 - 0.070                    | 0.080 - 0.110                     |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.016                   | 0.017 - 0.024                   | 0.028 - 0.050                   | 0.050 - 0.070                    | 0.080 - 0.110                     |
| 0.0006 - 0.002                  | 0.002 - 0.004                   | 0.005 - 0.007                   | 0.007 - 0.014                   | 0.015 - 0.021                   | 0.024 - 0.040                   | 0.040 - 0.060                    | 0.070 - 0.100                     |
| 0.0010 - 0.003                  | 0.004 - 0.007                   | 0.008 - 0.012                   | 0.013 - 0.024                   | 0.025 - 0.036                   | 0.042 - 0.070                   | 0.070 - 0.110                    | 0.120 - 0.170                     |
| 0.0008 - 0.003                  | 0.004 - 0.006                   | 0.007 - 0.010                   | 0.011 - 0.020                   | 0.021 - 0.030                   | 0.036 - 0.060                   | 0.060 - 0.090                    | 0.100 - 0.140                     |
| 0.0012 - 0.004                  | 0.005 - 0.009                   | 0.010 - 0.015                   | 0.016 - 0.030                   | 0.032 - 0.045                   | 0.052 - 0.090                   | 0.090 - 0.140                    | 0.140 - 0.210                     |
| 0.0010 - 0.004                  | 0.005 - 0.008                   | 0.008 - 0.013                   | 0.014 - 0.026                   | 0.027 - 0.039                   | 0.046 - 0.080                   | 0.080 - 0.120                    | 0.120 - 0.180                     |
| 0.0012 - 0.004                  | 0.005 - 0.009                   | 0.010 - 0.015                   | 0.016 - 0.030                   | 0.032 - 0.045                   | 0.052 - 0.090                   | 0.090 - 0.140                    | 0.140 - 0.210                     |
| 0.0010 - 0.003                  | 0.004 - 0.007                   | 0.008 - 0.012                   | 0.013 - 0.024                   | 0.025 - 0.036                   | 0.042 - 0.070                   | 0.070 - 0.110                    | 0.120 - 0.170                     |
| 0.0012 - 0.004                  | 0.005 - 0.009                   | 0.010 - 0.015                   | 0.016 - 0.030                   | 0.032 - 0.045                   | 0.052 - 0.090                   | 0.090 - 0.140                    | 0.140 - 0.210                     |
| 0.0008 - 0.003                  | 0.004 - 0.006                   | 0.007 - 0.010                   | 0.011 - 0.020                   | 0.021 - 0.030                   | 0.036 - 0.060                   | 0.060 - 0.090                    | 0.100 - 0.140                     |
| 0.0004 - 0.001                  | 0.002 - 0.003                   | 0.003 - 0.005                   | 0.005 - 0.010                   | 0.011 - 0.015                   | 0.018 - 0.030                   | 0.030 - 0.050                    | 0.050 - 0.070                     |
| 0.0008 - 0.003                  | 0.004 - 0.006                   | 0.007 - 0.010                   | 0.011 - 0.020                   | 0.021 - 0.030                   | 0.036 - 0.060                   | 0.060 - 0.090                    | 0.100 - 0.140                     |

| Vorschub pro Zahn fz [mm]       |                                 |                                 |                                 |                                 |                                 |                                  |                                   |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| Ø D <sub>1</sub><br>0.10 - 0.30 | Ø D <sub>1</sub><br>0.35 - 0.60 | Ø D <sub>1</sub><br>0.65 - 1.00 | Ø D <sub>1</sub><br>1.05 - 2.00 | Ø D <sub>1</sub><br>2.10 - 3.00 | Ø D <sub>1</sub><br>3.50 - 6.00 | Ø D <sub>1</sub><br>6.50 - 10.00 | Ø D <sub>1</sub><br>12.00 - 20.00 |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.015                   | 0.016 - 0.023                   | 0.028 - 0.045                   | 0.050 - 0.070                    | 0.080 - 0.110                     |
| 0.0005 - 0.002                  | 0.002 - 0.004                   | 0.005 - 0.007                   | 0.007 - 0.014                   | 0.014 - 0.020                   | 0.024 - 0.040                   | 0.040 - 0.060                    | 0.070 - 0.100                     |
| 0.0005 - 0.002                  | 0.002 - 0.004                   | 0.004 - 0.006                   | 0.006 - 0.012                   | 0.013 - 0.018                   | 0.022 - 0.040                   | 0.040 - 0.050                    | 0.060 - 0.080                     |
| 0.0005 - 0.002                  | 0.002 - 0.004                   | 0.004 - 0.006                   | 0.006 - 0.012                   | 0.013 - 0.018                   | 0.022 - 0.040                   | 0.040 - 0.050                    | 0.060 - 0.080                     |
| 0.0005 - 0.002                  | 0.002 - 0.003                   | 0.004 - 0.005                   | 0.005 - 0.011                   | 0.011 - 0.016                   | 0.018 - 0.030                   | 0.030 - 0.050                    | 0.050 - 0.080                     |
| 0.0008 - 0.002                  | 0.003 - 0.005                   | 0.006 - 0.009                   | 0.010 - 0.018                   | 0.019 - 0.027                   | 0.032 - 0.055                   | 0.050 - 0.080                    | 0.090 - 0.130                     |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.015                   | 0.016 - 0.023                   | 0.028 - 0.045                   | 0.050 - 0.070                    | 0.080 - 0.110                     |
| 0.0009 - 0.003                  | 0.004 - 0.007                   | 0.008 - 0.011                   | 0.012 - 0.023                   | 0.024 - 0.034                   | 0.040 - 0.070                   | 0.070 - 0.110                    | 0.110 - 0.160                     |
| 0.0008 - 0.003                  | 0.004 - 0.006                   | 0.006 - 0.010                   | 0.011 - 0.020                   | 0.020 - 0.029                   | 0.034 - 0.060                   | 0.060 - 0.090                    | 0.090 - 0.140                     |
| 0.0009 - 0.003                  | 0.004 - 0.007                   | 0.008 - 0.011                   | 0.012 - 0.023                   | 0.024 - 0.034                   | 0.040 - 0.070                   | 0.070 - 0.110                    | 0.110 - 0.160                     |
| 0.0008 - 0.002                  | 0.003 - 0.005                   | 0.006 - 0.009                   | 0.010 - 0.018                   | 0.019 - 0.027                   | 0.032 - 0.055                   | 0.050 - 0.080                    | 0.090 - 0.130                     |
| 0.0009 - 0.003                  | 0.004 - 0.007                   | 0.008 - 0.011                   | 0.012 - 0.023                   | 0.024 - 0.034                   | 0.040 - 0.070                   | 0.070 - 0.110                    | 0.110 - 0.160                     |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.015                   | 0.016 - 0.023                   | 0.028 - 0.045                   | 0.050 - 0.070                    | 0.080 - 0.110                     |
| 0.0003 - 0.001                  | 0.002 - 0.002                   | 0.002 - 0.004                   | 0.004 - 0.008                   | 0.008 - 0.011                   | 0.014 - 0.025                   | 0.020 - 0.040                    | 0.040 - 0.050                     |
| 0.0006 - 0.002                  | 0.003 - 0.005                   | 0.005 - 0.008                   | 0.008 - 0.015                   | 0.016 - 0.023                   | 0.028 - 0.045                   | 0.050 - 0.070                    | 0.080 - 0.110                     |

Werte basieren auf der Verwendung von Schneidöl. Die Schnittparameter werden durch äußere Parameter sehr stark beeinflusst, insbesondere durch die Stabilität der Werkzeugspannung sowie der Werkstückgeometrie und der Aufspannsituation.