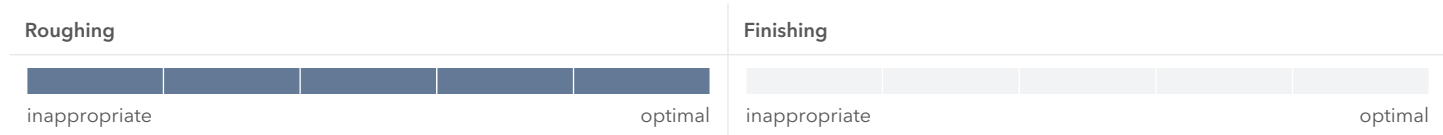
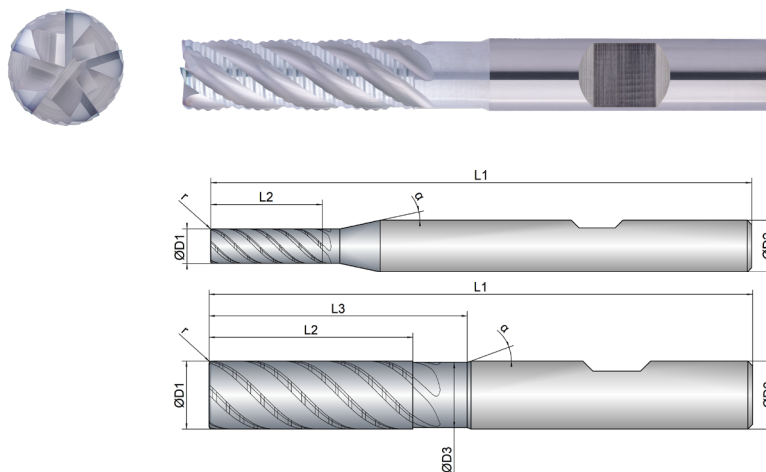


|           |                     |
|-----------|---------------------|
| Cooling   |                     |
| Tolerance | e8                  |
| Coating   | AlphaFerro Platin X |

|             |     |     |  |     |
|-------------|-----|-----|--|-----|
| Strategy    | ETC | HPC |  |     |
| Application |     |     |  |     |
| Features    | HB  | ≠   |  | 3xD |
|             |     |     |  |     |






- Optimized roughing teeth for soft cut and small chips
  - Ascending reinforced tool core for maximum stability
  - Variable helical pitch and unequal tooth pitch for smooth running
- 
- For roughing, up to 2xD full slot
  - For process reliable, helical immersion
- 
- Extreme material removal at the highest performance
  - Also ideally designed for trochoidal milling



| EXPK1-M02-0154 | D1<br><br>mm<br>ø | D3<br><br>mm<br>ø | L2<br><br>mm | L3<br><br>mm | L1<br><br>mm | D2<br><br>mm<br>ø | z<br><br># | r<br><br>mm | <br>° | α<br><br>° |
|----------------|-------------------|-------------------|--------------|--------------|--------------|-------------------|------------|-------------|-------|------------|
| 4              | 4.0               | 0.0               | 13.0         | 0.0          | 63.0         | 6.0               | 5          | 0.10        | 45    | 12         |
| 6              | 6.0               | 5.6               | 18.0         | 24.0         | 63.0         | 6.0               | 5          | 0.20        | 45    | 20         |
| 8              | 8.0               | 7.6               | 24.0         | 30.0         | 70.0         | 8.0               | 5          | 0.20        | 45    | 20         |
| 10             | 10.0              | 9.6               | 30.0         | 38.0         | 80.0         | 10.0              | 5          | 0.32        | 45    | 20         |
| 12             | 12.0              | 11.4              | 36.0         | 46.0         | 93.0         | 12.0              | 5          | 0.32        | 45    | 20         |
| 16             | 16.0              | 15.4              | 48.0         | 58.0         | 110.0        | 16.0              | 5          | 0.32        | 45    | 20         |
| 20             | 20.0              | 19.4              | 60.0         | 74.0         | 125.0        | 20.0              | 5          | 0.50        | 45    | 20         |









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|          | Material                        | Strength (N/mm <sup>2</sup> ) | Full Slot   | Side Milling  | ETC  | Materialgroup Factor fz / a | Materialgroup Factor ae ETC |
|----------|---------------------------------|-------------------------------|---|---|--|-----------------------------|-----------------------------|
|          |                                 |                               |  |  |  |                             |                             |
| <b>P</b> | STEEL                           |                               | Vc = m/min  | Vc = m/min  | Vc = m/min   |                             |                             |
| 1.1      | unalloyed                       | <500                          | 205   | 205   | 313  | 1                           | 1                           |
| 1.2-1.5  | unalloyed                       | <1100                         | 170   | 170   | 258  | 0.9                         | 0.8                         |
| 2.1-2.2  | low-alloyed                     | <950                          | 160   | 160   | 236  | 0.9                         | 0.8                         |
| 2.3-2.4  | low-alloyed                     | <1300                         | 135   | 135   | 162  | 0.8                         | 0.75                        |
| 3.1-3.2  | high-alloyed                    | <1100                         | 150   | 150   | 177  | 0.8                         | 0.7                         |
| 3.3      | high-alloyed                    | <1400                         | 125   | 125   | 156  | 0.7                         | 0.68                        |
| <b>K</b> | CASTINGS                        |                               | Vc = m/min  | Vc = m/min  | Vc = m/min   |                             |                             |
| 1.1-1.2  | Grey cast iron                  | <1000                         | 190   | 190   | 212  | 0.9                         | 0.8                         |
| 2.1-2.2  | Modular cast iron               | <850                          | 150   | 150   | 167  | 0.8                         | 0.75                        |
| 3.1-3.2  | Malleable cast iron             | <800                          | 125   | 125   | 154  | 0.8                         | 0.75                        |
| <b>M</b> | STAINLESS STEEL                 |                               | Vc = m/min  | Vc = m/min  | Vc = m/min   |                             |                             |
| 1.1      | ferritic/martensitic            | <850                          |   | 70  | 136  | 0.9                         | 0.6                         |
| 2.1      | austenitic                      | <650                          |   | 55  | 114  | 0.8                         | 0.45                        |
| 2.2      | austenitic                      | <750                          |   | 45  | 99   | 0.75                        | 0.4                         |
| 3.1      | DUPLEX STEEL   super austenitic | <1100                         |   |   |  |                             |                             |







**ADVICE |** The values marked in turquoise are side applications!  
 All fz/a values in the table for material group 1.1, consider factors for the other groups!  
 When helical, ramping and drilling use fz 50 % of the full slot.  
 The specified values represent starting values for a solid clamping situation.  
 To determine the hmax values, please use the provided calculator.

**Material P 1.1**

| D1<br> | L2<br> | Immersion Angle<br> | Full Slot<br> |               |               | Side Milling<br> |                 |         | ETC<br> |         |         |           |
|---|---|--|--|---------------|---------------|---|-----------------|---------|--|---------|---------|-----------|
|   |   |  | fz (mm/Z)  | ae = 1xD (mm) | ap = 1xD (mm) | fz (mm/Z)   | ae = 0.3xD (mm) | ap (mm) | fz (mm/Z)  | ae (mm) | ap (mm) | hmax (mm) |
| 4   | 13  | 0.8°   | 0.015  | 4             | 4             | 0.022   | 1.2             | L2max   | 0.038  | 0.7     | L2max   | 0.0289    |
| 6   | 18  | 1°   | 0.025  | 6             | 6             | 0.035   | 1.8             | L2max   | 0.062  | 1.1     | L2max   | 0.048     |
| 8   | 24  | 1°   | 0.035  | 8             | 8             | 0.05  | 2.4             | L2max   | 0.086  | 1.4     | L2max   | 0.0654    |
| 10  | 30  | 1.2°   | 0.055  | 10            | 10            | 0.075   | 3               | L2max   | 0.102  | 1.8     | L2max   | 0.0784    |
| 12  | 36  | 1.2°   | 0.06   | 12            | 12            | 0.085   | 3.6             | L2max   | 0.125  | 2.1     | L2max   | 0.095     |
| 16  | 48  | 1.5°   | 0.065  | 16            | 16            | 0.09  | 4.8             | L2max   | 0.142  | 2.8     | L2max   | 0.108     |
| 20  | 60  | 2°   | 0.075  | 20            | 20            | 0.11  | 6               | L2max   | 0.166  | 3.5     | L2max   | 0.126     |

# EXPLANATION


























## APPLICATIONS

|   |   |  |   |
|---|---|--|---|
|  Multipass milling |  Trimming          |  Deburring                      |  Engraving |
|  Corner rounding   |  Full slot milling |  Forward and backward deburring |   |






## COOLINGS

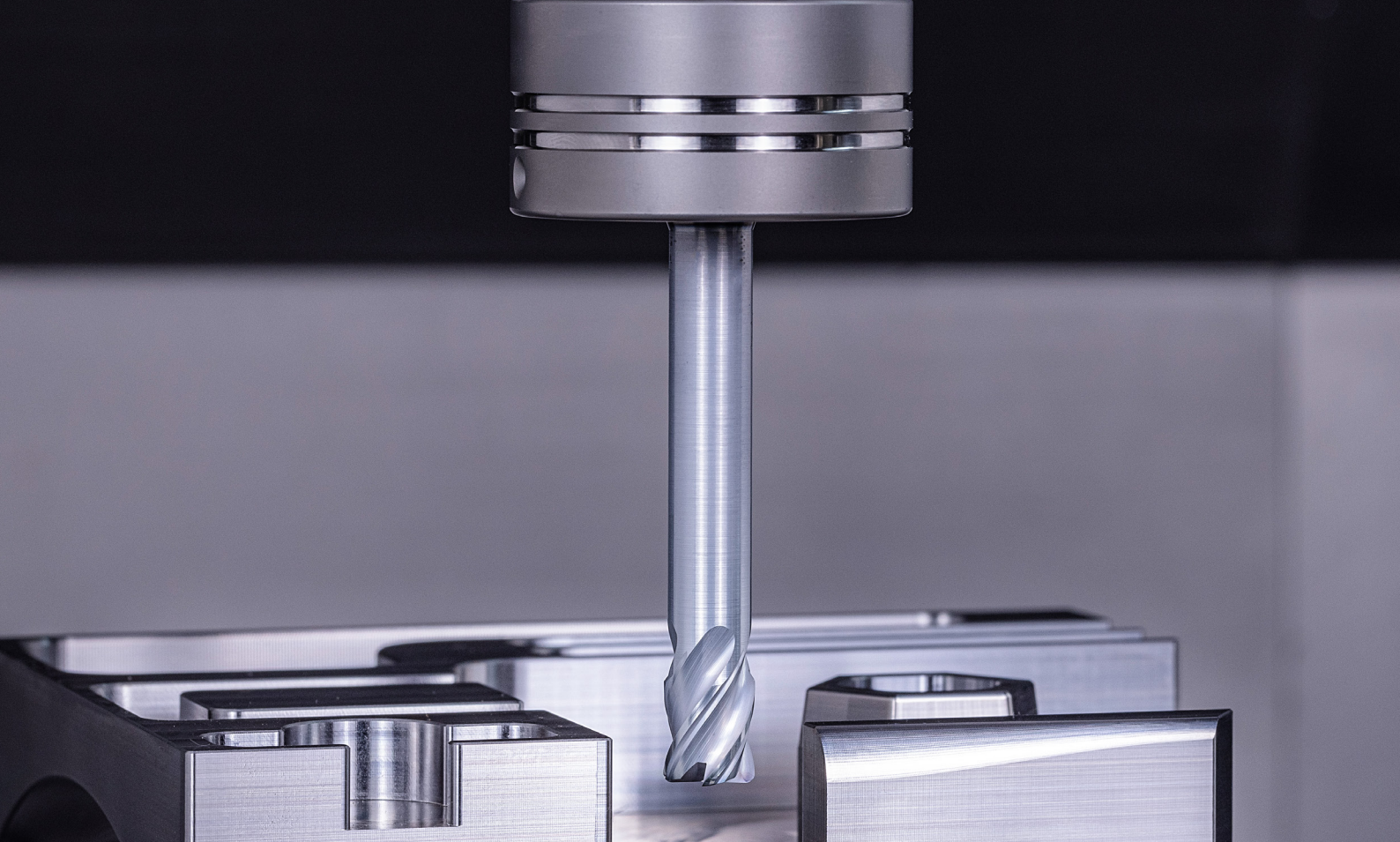
|  |   |   |   |
|--|---|---|---|
|  Air-cooling                  |  Dry machining |  Oil cooling |  Cooling Lubricant |
|  Minimum quantity lubrication |   |   |   |

## FEATURES

















|   |   |   |   |
|---|---|---|---|
|  0,5xD                   |  1xD                       |  1,5xD                 |  2xD                 |
|  2,5xD                   |  3xD                       |  3,5xD                 |  4xD                 |
|  5xD                     |  Center cutting            |  Non-center cutting    |  Without Weldon      |
|  With Weldon             |  Internal cooling          |  Dynamic helical pitch |  Chip breaker        |
|  Unequal tooth pitch     |  Roughing teeth            |  Helical immersion     |  Feed directions x,y |
|  Feed directions x, y, z |  Feed directions x, y, (z) |  Corner radius         |  Corner bevel        |
|  Sharp edged             |   |   |   |

## STRATEGY

|   |  |  |  |
|---|--|--|--|
|  Extended Trochoidal Cutting |  High Performance Cutting |  High Speed Cutting |  Multi Task Cutting |
|  Universal Machining         |  |  |  |



## PROPERTIES

|  |  |  |   |
|--|--|--|---|
|  Cutting diameter   |  Small cutting diameter |  Large cutting diameter |  Undercut diameter |
|  Cutting length     |  Total bevel length     |  Undercut length        |  Total length      |
|  Shank diameter     |  Number of teeth        |  Corner radius          |  Corner bevel      |
|  Programming radius |  Maximum cutting depth  |  Helical angle          |  Alpha angle       |

## APPLICATION TABLE

The values given in the application table are only guidelines. These values are largely dependent on the machining situation and application.

## FIGURES

All technical drawings and photographs are given as an example. The product may deviate from the original in terms of colour and dimensions.

**P 1.1** **STEEL | unalloyed <500 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI   | Sweden   SIS | Spain   UNE  | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|---------------|--------------|--------------|-------------|------------|
| 1.0498         | ST42.8        |             |                |                    |               |              |              | STPT 42     |            |
| 1.0044         | ST442         |             | E28-2          | 4360-43 B          | Fe 430 BFN    | 1412         | AE 275-B     | SM 41 B     | 570 Gr. 40 |
| 1.0420         | GS38          | GE 200      | 230-400M       |                    |               | 1306         |              |             |            |
| 1.0446         | GS45          | GE 230      | E23-45M        | A1                 |               | 1305         | F.221        | SC 450      |            |
| 1.0136         | St42-3        |             |                |                    |               |              |              |             |            |
| 1.0254         | St37.0        | P235T1      |                |                    |               |              |              | STPG 38     |            |
| 1.1120         | GS20Mn5       |             |                |                    |               |              |              | SMnC 420    |            |
| 1.1121         | Ck10          | 2 C 10      | XC 10          | 040 A 10           | C 10          | 1265         | C 10 k       | S 10 C      | 1010       |
| 1.1131         | GS15Mn5       |             |                |                    |               |              |              |             |            |
| 1.1151         | Ck22          | 2 C 22      | XC 25          | 050 A 20           | C 20          |              | C 25 k       | S 22 C      | 1023       |
| 1.5523         | 19MnB4        |             |                | 170 H 20           |               |              | 20 Mn B 4 DF | SWRCHB      |            |
| 1.8961         | WTS1373       |             |                |                    | Fe 360 D FF   |              |              | SMA 50 A    |            |
| 1.0035         | ST33          |             | A 33           |                    | FE 320        |              |              | SS 330      |            |
| 1.0037         | ST37-2        |             |                |                    |               |              |              | STKR 400    |            |
| 1.0710         | 15S10         |             |                |                    |               |              |              |             |            |
| 1.0715         | 95Mn28        | 11 SMn 28   | S 250          | 230 M 07           | CF 9 SMn 28   | 1912         | 11 SMn 28    | SUM 22      | 1213       |
| 1.0718         | 95MnPb28      | 11 SMnPb28  | S 250 Pb       |                    | CF 9SMnPb 28  | 1914         | 11 SMnPb 28  | SUM 22 L    | 12 L 13    |
| 1.0721         | 10S20         | 10 S 20     | 10 F 1         | 210 M 15           | CF 10 S 20    |              | 10 S 20      |             | 1108       |
| 1.0722         | 10SPb20       | 10 SPb 20   | 10 Pb F 2      |                    | CF 10 SPb 20  |              | 10 SPb 20    |             | 11 L 08    |
| 1.0736         | 95Mn36        |             | S300           | 240 M 07           | CF 9 SMn 36   |              | 12 SMn 35    | SUM 25      | 1215       |
| 1.0737         | 95MnPb36      |             | S 300 Pb       |                    | CF 9 SMnPb 36 | 1926         | 12 SMnPb 35  |             | 12 L 14    |

**P 1.2** **STEEL | unalloyed <700 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI   |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|--------------|
| 1.0553         | S244J0        | S355J0      | E 36-3         | En 50 C            | Fe 510 C FN |              |             | SM 520 M    | S355J0       |
| 1.0581         | ST52.4        |             |                |                    |             |              |             | STS 49      |              |
| 1.1140         | C15R          | C15R        | C15R           | C15R               |             |              | C 16 k-1    |             |              |
| 1.1141         | Ck15          | 2 C 15      | XC 15          | 080 M 15           | C 15        | 1370         | C 16 k      | S 15 C      | 1015         |
| 1.1190         | S355G15       |             |                |                    |             |              |             |             |              |
| 1.0116         | ST373         |             | E 24-3         | 4360-40 C          | Fe 37-3     | 1312         | A 360 C     |             | A 570 Gr. 36 |
| 1.0144         | ST443         |             | E 28-3         | 4360-43 C          | Fe 430 D FF | 1414         | AE 275-D    | SM 41 B     | A 573 Gr. 70 |
| 1.0401         | C15           |             | CC12           | 080 M 15           | C 15        | 1350         | F.111       | S 15 C      | 1015         |
| 1.0402         | C22           | 1 C 22      | CC 22          | 070 M 20           | C 22        |              | C 22 k      | SFVC 1      |              |
| 1.0406         | C25           | 1 C 25      | CC 25          | 070 M 26           | C 25        |              | C 25 k      | S 22 C      | 1025         |
| 1.0461         | STE255        |             |                |                    |             |              |             |             |              |
| 1.0482         | 19Mn5         |             | A 52 CP        | 224-460            |             |              |             | SG 37       |              |
| 1.0486         | STE285        |             |                |                    | FE E 285 KG |              | AE 285 KG   | SM 41 A     |              |
| 1.0501         | C35           | 1 C 35      | CC 35          | 060 A 35           | C 35        | 1550         | F.113       | S 35 C      | 1035         |
| 1.0503         | C45           | 1 C 45      | CC 45          | 080 M 46           | C 45        | 1650         | C 45 k      | S 45 C      | 1045         |
| 1.0505         | STE315        |             |                |                    |             |              |             | SM 50 A     |              |
| 1.0511         | C40           | 1 C 40      |                | 080 M 40           |             |              | F.114.A     | S 40 C      | 1040         |
| 1.0528         | C30           | 1 C 30      | CC 32          | 080 M 30           | C30         |              |             | SUP 7       | 1030         |
| 1.0540         | C50           | 1 C 50      |                | 080 M 50           |             | 1674         |             | S 50 C      | 1050         |
| 1.0552         | GS52          | GE 260      |                |                    |             |              |             |             |              |
| 1.0558         | GS60          | GE 300      | 320-560M       | A3                 | C 45        | 1606         |             |             |              |
| 1.0562         | STE355        |             | E 355 R/FP     |                    | Fe E 355 KG | 2132         | AE 355 KG   | SM 50 YB    | A 633 Gr. C  |
| 1.0711         | 9520          |             |                | 220 M 07           | CF 9 S 22   |              |             | G 11120     | 1212         |
| 1.0970         | 38Si7         |             | 41 S 7         |                    |             |              |             |             |              |
| 1.1106         | ESTE355       |             |                | P 355 NL 2         |             |              |             | STK 500     |              |
| 1.1127         | 36Mn6         |             |                | 212 M 36           |             |              |             | SMn 443     | 1141         |
| 1.1133         | 20Mn5         |             |                | 120 M 19           | G 22 Mn3    |              | 20 Mn 6     | SMn 420     | 1022         |
| 1.1169         | 20Mn6         |             |                |                    |             |              |             |             |              |
| 1.1520         | C70W1         |             |                |                    | C 70 KU     |              |             |             |              |
| 1.5637         | 10Ni14        |             |                | 503                | 18 Ni 14 KT |              |             |             | A 350-LF 5   |
| 1.8962         | 9CrNiCuP324   |             |                | WR 50 A            |             |              |             | SPA-H       |              |
| 1.0726         | 35S20         | 35 S 20     | 35 MF 4        | 212 M 36           |             | 1957         | F.210G      |             | 1140         |
| 1.0760         | 38SMn28       | 38SMn28     | 38SMn28        | 38SMn28            |             |              | 38SMn28     |             |              |
| 1.1158         | Ck25          | 2 C 25      | XC 25          | 070 M 26           | C 25        |              | C 25 k      | S 25 C      | 1025         |
| 1.1178         | Ck30          | 2 C 30      | XC 32          | 080 M 30           | C30         |              |             | S 30 C      | 1030         |
| 1.1181         | Ck35          | 2 C 35      | XC 38 H1       | 080 M 36           | C35         | 1572         | C 35 k      | S 35 C      | 1034         |
| 1.1183         | Cf35          |             | XC 38 TS       | 060 A 35           | C35         | 1572         |             | S 35 C      | 1035         |
| 1.1191         | Ck45          | 2 C 45      | XC 42          | 080 M 46           | C40         |              | C45 k       | S 45 C      | 1045         |
| 1.1206         | Ck50          | 2 C 50      |                | 080 M 50           | C50         | 1674         |             | S 50 C      | 1050         |
| 1.1730         | C45W          | C 45 U      | Y3 42          |                    |             |              |             |             |              |
| 1.5423         | 16Mo5         |             |                | 1503-245-420       | 16 Mo 5     |              | 16 Mo 5     | SBC 690     | 4520         |

**P 1.3** **STEEL** | unalloyed <850 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN   | France   AFNOR | Great Britain   BS | Italy   UNI     | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI            |
|----------------|---------------|---------------|----------------|--------------------|-----------------|--------------|-------------|-------------|-----------------------|
| 1.1165         | GS30Mn5       |               | 35 M 5         | 120 M 36           |                 | 1330         | 30 Mn 5     | SMn 433 H   | 1330                  |
| 1.1525         | C80W1         | C 80 U        | Y1 90          |                    | C 80 KU         | 1880         | F.513       |             | W 108                 |
| 1.1545         | C105W1        | C 105 U       | Y1 105         | BW 1A              | C 100 KU        | 1880         | F.515       |             | W 110                 |
| 1.1620         | C70W2         | C 70 U        |                |                    |                 |              |             |             |                       |
| 1.1625         | C80W2         |               | Y1 80          | BW 1B              | C 80 KU         |              | C 80        | SKC 3       | W 1                   |
| 1.1645         | C105W2        |               |                |                    |                 |              | C 102       | SK 3        |                       |
| 1.1663         | C125W         | C 120 U       | Y2 120         |                    | C 120 KU        |              | C 120       | SK 2        | W 112                 |
| 1.1673         | C135W         |               | Y2 140         |                    | C 140 KU        |              |             | SK 1        |                       |
| 1.1740         | C60W          |               | Y3 55          |                    |                 |              |             | SK 7        |                       |
| 1.1820         | C55W          |               |                |                    |                 |              |             |             |                       |
| 1.1830         | C85W          | C 90 U        | Y3 90          |                    |                 |              |             | SK 5        | 1084                  |
| 1.1744         | C67W          |               | Y1 70          |                    |                 |              | F.512       |             | A-6                   |
| 1.1750         | C75W          |               |                | BW 1A              |                 |              |             |             | W 1                   |
| 1.5404         | 21MoV53       |               |                |                    |                 |              |             |             |                       |
| 1.5406         | 17MoV84       |               |                |                    |                 |              |             |             |                       |
| 1.5633         | 24Ni8         | G 9 Ni 10     | 22 N 8         |                    | G 9 Ni 10       |              |             | SCPL 21     |                       |
| 1.6311         | 20MnMoNi45    | 20 MnMoNi 4 5 |                |                    |                 |              |             | SQV 2 B     |                       |
| 1.7242         | 16CrMo4       | 18 CrMo 4     | 15 CD 3.5      |                    | 18 CrMo 4       |              | 18 CrMo 4   | SCM 418 H   |                       |
| 1.7258         | 24CrMo4       |               |                |                    |                 |              |             | SCM 822 H   |                       |
| 1.7259         | 26CrMo7       |               |                |                    |                 |              |             |             |                       |
| 1.7273         | 24CrMo10      |               |                |                    |                 |              |             |             |                       |
| 1.7337         | 16CrMo44      |               |                |                    | A18 CrMo 4 5 KW |              |             |             | A-387 Gr. 12<br>Cl. 2 |
| 1.7350         | 22CrMo44      |               |                |                    |                 |              |             |             |                       |
| 1.7362         | 12CrMo195     | X 12 CrMo 5   | Z 10 CD 5.05   | 3606-625           | 16 CrMo 20 5    |              |             | SCMV 6      |                       |
| 1.7709         | 21CrMoV57     | 21 CrMoV 5 7  | 20 CDV 5.07    |                    |                 |              |             |             |                       |
| 1.7766         | 17CrMoV10     |               |                |                    |                 |              |             |             |                       |
| 1.7779         | 20CrMoV135    |               |                |                    |                 |              |             |             |                       |

**P 1.4** **STEEL** | unalloyed <950 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| 1.0062         | ST601         |             |                |                    |             |              |             |             |            |
| 1.0532         | ST522         | S 390 G 1 S |                |                    |             |              |             |             |            |
| 1.0535         | C55           | 1 C 55      | C 55           | 070 M 55           | C 55        | 1655         |             | C 55        | 1055       |
| 1.0570         | ST523         | S 355 J2 F3 | E 36-3         | 4360-50 B          | Fe 510 B    | 2132         | A 510 C     | SM 50 YB    |            |
| 1.0728         | 60S20         | 60 S 20     | 60 MF 4        |                    |             |              |             |             | 1151       |
| 1.1203         | Ck55          | 2 C 55      | XC 55 H1       | 070 M 55           | C 55        | 1655         | C 55 k      | S 55 C      | 1055       |
| 1.7276         | 10CrMo11      |             | 12 CD 10       |                    |             |              |             |             |            |
| 1.7281         | 16CrMo93      |             | 20 CD 8        |                    |             |              |             |             |            |

**P 1.5** **STEEL** | unalloyed <1100 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| 1.0070         | ST702         |             | A 70-2         |                    | Fe 70-2     |              | A 690-2     |             |            |
| 1.0601         | C60           | 1 C 60      | AF 70 C 55     | 080 A 62           | C 60        |              |             | S 60 C-CSP  | 1060       |
| 1.1221         | Ck60          | 2 C 60      | XC 60          | 060 A 62           | C 60        | 1678         |             | S 58 C      | 1060       |
| 1.1223         | Cm60          | 3 C 60      | C 60 R         | 080 A 67           | C 60 R      |              |             |             |            |
| 1.0603         | C67W          |             |                |                    |             |              |             |             |            |

**P 2.1** **STEEL | low alloyed <750 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN     | France   AFNOR | Great Britain   BS | Italy   UNI   | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-----------------|----------------|--------------------|---------------|--------------|-------------|-------------|------------|
| 1.0961         | 60SiCr7       | 60 SiCr 8       | 60 SC 7        | 250 A 61           | 60 SiCr 8     |              | 60 SiCr 8   | SUP 7       | 9262       |
| 1.2101         | 62SiMnCr4     |                 |                |                    |               |              |             |             |            |
| 1.2162         | 21MnCr5       | 21 MnCr 5       | 20 NC 5        |                    |               |              |             | SCR 420 H   |            |
| 1.2208         | 31CrV3        |                 |                |                    |               |              |             |             |            |
| 1.2210         | 115CrV3       | 107 CrV 3 KU    | 100 C 3        |                    | 107 CrV 3 KU  |              | F.520.L     |             | L2         |
| 1.2235         | 80CrV2        |                 |                |                    |               |              | F.520.J     |             |            |
| 1.2241         | 51CrV4        | 51 CRMnV 4      |                |                    | 51 CrMnV 4 KU |              |             |             | S6         |
| 1.2307         | 29CrMoV9      |                 |                |                    |               |              |             |             |            |
| 1.2323         | 48CrMoV67     |                 | 45 CDV 6       |                    |               |              |             |             |            |
| 1.2382         | GX155CrVMo121 |                 |                |                    |               |              |             |             |            |
| 1.2414         | 120W4         |                 |                |                    |               |              | F.532       |             |            |
| 1.2542         | 45WCrV7       | 45 WCrV 8       |                | BS 1               | 45 WCrV 8 KU  | 2710         | 45 WCrSi 8  |             | S1         |
| 1.2552         | 80WCrV8       |                 |                |                    |               |              | 60 WCrSi 8  |             |            |
| 1.2726         | 26NiCrMoV5    |                 |                |                    |               |              |             |             |            |
| 1.2737         | 28NiCrV5      |                 |                |                    |               |              |             |             |            |
| 1.2738         | 40CrMnNiMo864 | 40CrMnNiMo8-6-4 |                |                    |               |              |             |             |            |
| 1.2826         | 60MnSi4       |                 | 60 MSC 4       |                    |               |              |             |             |            |
| 1.2838         | 145V33        |                 |                |                    |               |              |             |             |            |
| 1.2842         | 90MnCrV8      | 90 MnV 8        | 90 MV 8        | BO 2               | 90 MnVCr 8 KU |              |             |             | O 2        |
| 1.5752         | 14NiCr14      | 13 NiCr 12      | 16 NC 12       | 655 M 13           | 16 NiCr 11    |              |             | SNC 815 H   | E3310      |
| 1.5919         | 15CrNi6       | 14 CrNi 6       | 16 NC 6        | S 107              | 16 CrNi 4     |              |             | SNCM 420    |            |
| 1.7003         | 38Cr2         | 38 Cr 2 KD      | 38 C 2         | 120 M 36           | 38 Cr 3       |              | 38 Cr 3     | SMn 438     | 50 B40     |
| 1.7012         | 13Cr2         |                 |                |                    |               |              |             |             |            |
| 1.7045         | 42Cr4         | 40 NiCrMo 3     | 42 C 4 TS      | 530 A 40           | 41 Cr 4       | 2245         | 42 Cr 4     | SCr 440     | 5140       |
| 1.7103         | 67SiCr5       | 67 SiCr 5       |                |                    | 67 SiCr 5     |              |             |             |            |
| 1.7131         | 16MnCr5       | 16 MnCr 5 KD    | 16 MC 5        | 527 M 17           | 16 MnCr 5     | 2173         | 16 MnCr 5   | SCR 415     | 5115       |
| 1.7271         | 23CrMoB33     |                 |                |                    |               |              |             |             |            |
| 1.7715         | 14MoV63       | 14 MoV 6-3      |                | 1503-660-440       |               |              | 13 MoCrV 6  |             |            |
| 1.8907         | STES500       |                 |                |                    |               |              |             | SM 58       |            |
| 1.8911         | ESTE380       |                 |                |                    |               |              |             |             |            |

**P 2.2** **STEEL | low alloyed <950 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI   | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|---------------|--------------|-------------|-------------|------------|
| 1.0902         | 46Si7         |             | 45 S7          |                    |               |              | 46 Si 7     |             |            |
| 1.0906         | 65Si7         |             |                | 250 A 61           |               |              |             |             |            |
| 1.0985         | QSTE500N      |             |                |                    |               |              |             |             |            |
| 1.1157         | 40Mn4         |             | 35 M 5         | 150 M 36           |               |              |             |             | 1039       |
| 1.1167         | 36Mn5         |             | 40 M 5         | 150 M 36           |               | 2120         | 36 Mn 5     |             | 1335       |
| 1.1170         | 28Mn6         | 28 Mn 6     | 35 M 5         | 150 M 17           | C 28 Mn       |              | 36 Mn 6     | SCMn 1      | 1330       |
| 1.1199         | 49MnV53       |             |                | 280 M 01           |               |              |             |             |            |
| 1.2002         | 125Cr1        |             | Y2 120 C       |                    |               |              |             |             |            |
| 1.2003         | 75Cr1         |             | 35 M 5         | 150 M 36           |               |              |             |             |            |
| 1.2004         | 85Cr1         |             | Y1 100 C 2     |                    |               |              |             |             |            |
| 1.2008         | 140Cr3        |             | Y2 140 C       |                    |               |              |             | SKS 8       |            |
| 1.2056         | 90Cr3         |             |                |                    |               |              |             |             |            |
| 1.2057         | 105Cr4        |             |                |                    |               |              | F.120.J     | SKC 11      |            |
| 1.2108         | 90CrSi5       | P 280 GH    |                |                    | C 100 KU      | 2092         |             | SFVC 2A     |            |
| 1.2109         | 125CrSi5      |             |                |                    |               |              |             |             |            |
| 1.2127         | 105MnCr4      |             |                |                    | 100 CrMn 4 KU |              |             | SUJ 3       |            |
| 1.2206         | 140CrV1       |             | 130 C 3        |                    |               |              |             |             | O 6        |
| 1.2242         | 59CrV4        |             |                |                    |               |              |             |             |            |
| 1.2243         | 61CrSiV5      |             |                |                    |               |              |             |             |            |
| 1.2249         | 45SiCrV6      |             |                |                    |               |              |             |             |            |
| 1.2303         | 100CrMo5      |             |                |                    |               |              | F.520.F     |             | L 7        |
| 1.2312         | 40CrMnMoS86   |             | 40 CMD 8       |                    |               |              |             |             |            |
| 1.2519         | 110WCrV5      |             |                |                    |               |              | 102 WCrV 5  |             |            |
| 1.2562         | 142WV13       |             |                |                    |               |              |             |             |            |
| 1.2740         | 28NiCrMoV10   |             |                |                    |               |              |             |             |            |
| 1.2743         | 60NiCrMoV124  |             |                |                    |               |              |             |             |            |

### P 2.2 STEEL | low alloyed <950 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| 1.2747         | 28NiMo17      |             |                |                    |             |              |             |             |            |
| 1.2766         | 35NiCrMo16    |             |                |                    |             |              |             |             |            |
| 1.2851         | 34CrAl6       |             |                |                    |             |              |             |             |            |
| 1.3501         | 100Cr2        |             | 100 C 2        |                    |             |              |             |             | E 50100    |
| 1.3503         | 105Cr4        |             |                |                    |             |              |             |             | E51100     |
| 1.3505         | 100Cr6        | 100 Cr 6    | 100 C 6        | 535 A 99           | 100 Cr 6    | 2258         | 100 Cr 6    | SUJ 2       | E52100     |
| 1.3520         | 100CrMn6      | 100 Cr Mn 6 | 100 CM 6       |                    |             |              | 100 CrMn 6  |             |            |

### P 2.3 STEEL | low alloyed <1100 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN  | France   AFNOR | Great Britain   BS | Italy   UNI    | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|--------------|----------------|--------------------|----------------|--------------|-------------|-------------|------------|
| 1.2419         | 105WCr6       | 105 WCr 5    | 105 WC 13      |                    | 107 WcR 5 KU   | 2140         | 105 WCr 5   | SKS 31      |            |
| 1.2511         | 80WCrV3       |              |                |                    |                |              |             |             |            |
| 1.2515         | 100WV4        |              |                |                    |                |              |             | SKS 21      |            |
| 1.3561         | 44Cr2         | 46 Cr 1 KD   | 44 Cr 2        |                    |                |              |             |             | 5046       |
| 1.3563         | 43CrMo4       |              | 43 CrMo 4      |                    |                |              |             |             | 4142       |
| 1.3565         | 48CrMo4       |              |                |                    |                |              |             |             |            |
| 1.5023         | 38Si7         |              |                |                    |                |              |             |             |            |
| 1.5025         | 51Si7         | 50 Si 7      |                |                    | 48 Si 7        | 2090         |             |             | 9259 H     |
| 1.5029         | 71Si7         |              |                |                    |                |              |             |             |            |
| 1.5085         | 51Mn7         |              |                |                    |                |              |             |             |            |
| 1.5094         | 38MnS6        | 38 MnS 6     |                |                    |                |              |             |             |            |
| 1.5131         | 50MnSi4       |              |                |                    |                |              |             |             |            |
| 1.5141         | 53MnSi4       |              |                |                    |                |              |             |             |            |
| 1.5142         | 60MnSi5       |              |                |                    |                |              |             |             |            |
| 1.5213         | 15MnV5        |              |                |                    |                |              |             |             |            |
| 1.5217         | 20MnV6        |              |                |                    |                |              |             |             |            |
| 1.5223         | 42MnV7        |              |                |                    |                |              |             |             |            |
| 1.5225         | 51MnV7        |              |                |                    |                |              |             |             |            |
| 1.5231         | 38MnSiVS5     |              |                |                    |                |              |             |             |            |
| 1.5232         | 27MnSiVS6     |              |                |                    |                |              |             |             |            |
| 1.5233         | 44MnSiVS6     |              |                |                    |                |              |             |             |            |
| 1.5403         | 17MnMoV64     |              |                | 1501-261           |                |              |             | SBV 3       |            |
| 1.5526         | 30MnB4        |              |                |                    |                |              |             |             |            |
| 1.5710         | 36NiCr6       |              | 30 NC 6        | 640 A 35           |                |              |             | SNC 236     | 3135       |
| 1.5736         | 36NiCr10      |              | 30 NC 11       |                    | 35 NiCr 9      |              |             | SNC 631 H   | 3435       |
| 1.5755         | 31NiCr14      |              | 18 NC 13       | 653 M 31           |                |              |             | SNC 836     |            |
| 1.6225         | 11NiMn54      |              |                |                    |                |              |             |             |            |
| 1.6310         | 20MnMoNi55    |              | 18 MND 5       |                    |                |              |             |             |            |
| 1.6368         | 15NiCuMoNb5   |              |                | 3604-591           |                |              |             | SBV 2       |            |
| 1.6511         | 36CrNiMo4     | 36 CrNiMo 4  | 40 NCD 3       | 816 M 40           | 38 NiCrMo 4 KB |              | 35 NiCrMo 4 |             | 9840       |
| 1.6582         | 34CrNiMo6     | 34 CrNiMo 6  | 35 NCD 6       | 817 M 40           | 35 NiCrMo 6 KB | 2541         | 40 NiCrMo 7 | SNCM 447    | 4340       |
| 1.6946         | 30CrMoNiV511  |              |                |                    |                |              |             |             |            |
| 1.6948         | 26NiCrMoV115  |              |                |                    |                |              |             |             |            |
| 1.6971         | 79Ni1         |              |                |                    |                |              |             |             |            |
| 1.6972         | 83Ni1         |              |                |                    |                |              |             |             |            |
| 1.7038         | 37CrS4        | 37 CrS 4     |                |                    |                |              |             | SUP 11      | 50 B50 H   |
| 1.7214         | 25CrMo4       |              |                |                    | 25 CrMo 4 F    |              |             |             |            |
| 1.7389         | GX12CrMo101   |              |                |                    |                |              |             |             |            |
| 1.7561         | 42CrV6        |              |                |                    |                |              |             |             |            |
| 1.7701         | 51CrMoV4      |              | 51 CDV 4       |                    | 51 CrMoV 4     |              |             |             |            |
| 1.7707         | 30CrMoV9      |              |                |                    |                |              |             |             |            |
| 1.7711         | 40CrMoV47     | 40 CrMoV 4 6 | 42 CDV 4       | 1506-670-860       |                |              |             | SNB 21-1-5  |            |
| 1.7725         | G530CrMoV64   |              |                |                    |                |              |             |             |            |
| 1.7733         | 24CrMoV55     |              | 20 CDV 6       |                    | 24 CrMoV 5 5   |              |             |             |            |
| 1.7735         | 14CrMoV69     |              |                |                    |                |              |             |             |            |
| 1.7741         | 42CrMoV73     |              |                |                    |                |              |             |             |            |



**P 2.3 STEEL | low alloyed <1100 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN     | France   AFNOR | Great Britain   BS | Italy   UNI   | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-----------------|----------------|--------------------|---------------|--------------|-------------|-------------|------------|
| 1.7755         | GS45CrMoV104  |                 |                |                    |               |              |             |             |            |
| 1.7756         | GS36CrMoV104  | G 36 CrMoV 10 4 |                |                    |               |              |             |             |            |
| 1.8070         | 21CrMoV511    |                 |                |                    | 21 CrMoV 5 11 |              |             |             |            |
| 1.8159         | 50CrV4        | 51 CrV 4        | 50 CV 4        | 735 A 50           | 50 CrV 4      | 2230         | 51 CrV 4    | SUP 10      | 6150       |
| 1.8212         | 21CrVMoW12    |                 |                |                    |               |              |             |             |            |
| 1.8521         | 15CrMoV59     |                 |                |                    |               |              |             |             |            |
| 1.8509         | 41CrAlMo7     | 41 CrAlMo 7     | 40 CAD 6. 12   | 905 M 39           | 41 CrAlMo 7   | 2940         | 41 CrAlMo 7 | SACM 645    | E 71400    |
| 1.8515         | 31CrMo12      | 31 CrMo 12      | 30 CD 12       | 722 M 24           | 31 CrMo 12    | 2240         | 31 CrMo 12  |             |            |
| 1.8523         | 39CrMoV139    | 39 CrMoV 13 9   |                | 897 M 39           | 36 CrMoV 10   |              |             |             |            |
| 1.8550         | 34CrAlNi7     | 34 CrAlMo 5     |                |                    |               |              |             |             |            |
| 1.8827         | S460M         | S 460 M         | E 460          | S 460 M            | S460M         |              | S460M       |             |            |

**P 2.4 STEEL | low alloyed <1300 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI  | Sweden   SIS | Spain   UNE  | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|--------------|--------------|--------------|-------------|------------|
| 1.1273         | 90Mn4         |             |                | 060 A 96           |              |              |              | SUP 4       | 1090       |
| 1.2311         | 40CrMnMo7     |             |                | BP 20              | 35 CrMo 8 KU |              |              |             | P 20       |
| 1.2710         | 45NiCr6       |             |                |                    |              |              |              |             |            |
| 1.2762         | 75CrMoNiW67   |             |                |                    |              |              |              |             |            |
| 1.5864         | 35NiCr18      |             |                |                    |              |              |              |             |            |
| 1.6587         | 17CrNiMo6     | 17 CrNiMo 7 | 18 NCD 6       | 820 A 16           | 18 NiCrMo 7  | 2523         | 14 NiCrMo 13 | SNCM 815    |            |
| 1.7222         | 42CrMoPb4     |             |                |                    |              |              |              |             |            |
| 1.7225         | 42CrMo4.M4S   | 42 CrMo 4   | 42 CD 4        | 708 A 42           | 42 CrMo 4    | 2244         |              | SCM 440 H   | 4140       |
| 1.7227         | 42CrMoS4      | 42 CrMoS 4  | 42 CD          | 708 H 42           | 42 CrMoS 4   | 2244         | 40 CrMo 4    |             |            |
| 1.7238         | 49CrMo4       |             |                |                    |              |              |              |             |            |

**P 3.1 STEEL | high alloyed <800 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN       | France   AFNOR | Great Britain   BS | Italy   UNI         | Sweden   SIS | Spain   UNE   | Japan   JIS | USA   AISI |
|----------------|---------------|-------------------|----------------|--------------------|---------------------|--------------|---------------|-------------|------------|
| 1.2362         | X63CrMoV51    |                   |                |                    |                     |              |               |             |            |
| 1.2363         | X100CrMoV51   | X 100 CrMoV 5 1   | Z 100 CDV 5    | BA 2               | X 100 CrMoV 5 1 KU  | 2260         | X 100 CrMoV 5 | SKD 12      | A 2        |
| 1.2367         | X38CrMoV53    |                   | Z 38 CDV 5 3   |                    |                     |              |               |             |            |
| 1.2376         | X96CrMoV12    |                   |                |                    |                     |              |               |             |            |
| 1.2379         | X155CrVMo121  | X 153 CrMoV 12    | Z 160 CDV 12   | BD 2               | X 155 CrVMo 12 1 KU | 2310         |               | SKD 11      | D 2        |
| 1.2453         | X130W5        |                   |                |                    |                     |              |               |             |            |
| 1.2564         | X30WCrV41     | 30 WCrV 15 1      |                |                    |                     |              | F.527         |             |            |
| 1.2567         | X30WCrV53     | X 30 WCrV 5 3     | Z 32 WCV 5     |                    | X 30 WCrV 5 3 KU    |              |               | SKD 4       |            |
| 1.2606         | X37CrMoW51    |                   | Z 35 CWDV 5    | BH 12              | X 35 CrMoW 05 KU    |              | F.537         | SKD 62      | H 12       |
| 1.2631         | X50CrMoW911   |                   |                |                    |                     |              |               |             |            |
| 1.2786         | X13NiCrSi3615 | X 13 CrNiSi 36 15 | Z 35 NCS 37-18 |                    |                     |              |               |             |            |
| 1.2889         | X45CoCrMoV553 |                   |                |                    |                     |              |               |             |            |

### P 3.2 STEEL | high alloyed <1100 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN    | France   AFNOR        | Great Britain   BS | Italy   UNI              | Sweden   SIS | Spain   UNE    | Japan   JIS | USA   AISI |
|----------------|---------------|----------------|-----------------------|--------------------|--------------------------|--------------|----------------|-------------|------------|
| 1.2083         | X42Cr13       | X 42 Cr 13     | Z 40 C 14             |                    | X 41 Cr 13 KU            | 2314         |                | SUS 420 J2  | 420        |
| 1.2316         | X36CrMo17     | X 36 CrMo 17   | X38CrMo 16 1          |                    | X 38 CrMo 16 1 KU        |              | X 38 CrMo 16   |             | D-4        |
| 1.2343         | X38CrMoVH1    | X 38 CrMoV 5 1 | Z 38 CDV 5            | BH 11              | X 37 CrMoV 5 1 KU        |              | X 37 CrMoV 5   | SKD 6       | H 11       |
| 1.2344         | X40CrMoV51    | X 40 CrMoV 5 1 | Z 40 CDV 5            | BH 13              | X 40 CrMoV 5 1 1 KU 2242 |              | X 40 CrMoV 5   | SKD 61      | H 13       |
| 1.2436         | X210CrW12     | X 210 CrW 12   | Z 210 CW1 2           |                    | X 215 CrW 12 1 KU 2312   |              | X 210 CrW 12   | SKD 2       |            |
| 1.2581         | X30WCrV93     | X 30 WCrV 9 3  | Z 30 WCV 9            | BH 21              | X 30 WCrV 9 3 KU         |              | X 30 WCrV 9    | SKD 5       | H 21       |
| 1.2601         | X165CrMoV12   | X 165 CrMoV 12 |                       |                    | X 165 CrMoW 12 KU 2310   |              | X 160 CrMoV 12 |             |            |
| 1.2622         | X60WCrMoV94   |                |                       |                    |                          |              |                |             |            |
| 1.2678         | X45CrCoVW555  |                |                       |                    |                          |              |                |             | H 19       |
| 1.2731         | X50NiCrVW1313 |                |                       |                    |                          |              |                |             |            |
| 1.2764         | X19NiCrMo4    |                |                       |                    |                          |              |                |             |            |
| 1.2767         | X45NiCrMo4    | 40 NiCrMo 4    | Y 35 NCD 16           |                    | 42 NiCrMo 15 7 KU        |              |                |             | A 9        |
| 1.2779         | X6NiCrTi2615  |                |                       | S 66286            |                          |              |                |             | 660        |
| 1.2787         | X23CrNi17     | HS 6-5-2       | Z 85 WDCV 06 05 04 02 | BM 2               | HS 6 5 2 2               | 2722         |                | SKH 9       |            |
| 1.3302         | S1214         | HS 12 1 4      |                       |                    | X 150 WV 1305 KU         |              |                |             | A 7        |
| 1.3318         | S1212         | HS 02.01.12    |                       |                    |                          |              |                |             |            |
| 1.3401         | X120Mn12      | X 120 Mn 12    | Z 120 M 12            | BW 10              | X G 120 Mn 12            | 2183         | AM-X 120 Mn 12 | SCMnH 1     | A 128      |
| 1.3543         | X102CrMo17    | X 102 CrMo 17  | X100CrMo17            |                    | X 105 CrMo 17            |              | X 100 CrMo 17  |             |            |
| 1.3549         | X89CrMoV81    |                |                       |                    |                          |              |                |             |            |
| 1.3551         | 80MoCrV4216   |                | 80 DCV 40             | T 11350            | X 80 MoCrV 4 4           |              | 80 MoCrV 40-16 |             | M 50       |

### P 3.3 STEEL | high alloyed <1400 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN  | Europe   EN | France   AFNOR        | Great Britain   BS | Italy   UNI  | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|----------------|-------------|-----------------------|--------------------|--------------|--------------|-------------|-------------|------------|
| 1.2709         | X3NiCoMoTi1895 |             |                       |                    |              |              |             |             |            |
| 1.2790         | 725NiCrMoV54   |             |                       |                    |              |              |             |             |            |
| 1.2888         | X20CoCrWMo109  |             |                       |                    |              |              |             |             |            |
| 1.3202         | S12145         | HS12-1-5-5  |                       | BT 15              | HS 12-1-5-5  |              | 12-1-5-5    |             | T 15       |
| 1.3207         | S104310        | HS10-4-3-10 | Z130WKCDV10-10-04-04  | BT 42              | HS 10-4-3-10 |              | 10-4-3-10   | SKH 57      | M 44       |
| 1.3243         | S6525          | HS6-5-2-5   | KCV 06-05-05-04-02    |                    | HS 6-5-2-5   | 2723         | 6-5-2-5     | SKH 55      | M 35       |
| 1.3246         | S7425          | HS1-8-1     | Z110 WKCDV 07-05-04   | T 11341            | HS 7-4-2-5   |              | 7-4-2-5     |             | M 41       |
| 1.3247         | S21018         | HS2-9-1-8   | Z110 DKCWV 09-08-04   | BM 42              | HS 2-9-1-8   |              | 2-10-1-8    |             | M 42       |
| 1.3249         | S2928          |             |                       | BM 34              |              |              | 2-9-2-8     |             |            |
| 1.3255         | S18125         | HS18-1-1-4  | Z80 WKCV 18-05-04-01  | BT 4               | HS 18-1-1-5  |              | 18-1-1-5    | SKH 3       | T 4        |
| 1.3257         | S181215        |             |                       |                    |              |              |             |             |            |
| 1.3265         | S181210        | HS18-0-1-10 |                       | BT 5               | HS 18-0-1-10 |              | 18-0-2-10   | SKH 4A      | T 5        |
| 1.3342         | SC652          | HS6-5-2     | Z90 WDCV 06-05-04-02  |                    | HSC 6-5-3    |              |             |             | M 3        |
| 1.3343         | S652           | HS6-5-3     | Z85 WDCV 06-05-04-02  | BM 2               | HS 6-5-2     | 2722         | 6-5-2       | SKH 51      | M2         |
| 1.3344         | S653           |             | Z120 WDCV 06-05-04-03 |                    |              |              | 6-5-3       | SKH 52      | M 3 Cl.2   |
| 1.3346         | S291           | HS1-8-1     | Z85 DCWV 08-04-02-01  | BM 1               | HS 1-8-1     |              |             |             | M1         |
| 1.3348         | S292           | HS2-9-2     | Z100 DCWV 09-04-02-02 |                    | HS 2-9-2     | 2782         | 2-9-2       |             | M 7        |
| 1.3355         | S1801          | HS18-0-1    | Z80 WCV 18-04-01      | BT 1               | HS 18-0-1    |              | 18-0-1      | SKH 2       | T 1        |

**K 1.1 GREY CAST IRON <600 N/mm<sup>2</sup> (180 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.6010</b>  | GG10          | GJL-100     | FGL 100        | Grade 100          | G 10        | 0110-00      | FG 10       | FC 100      | A48-20 B   |
| <b>0.6012</b>  | GG150 HB      | GJL-HB 170  |                |                    |             |              |             |             |            |
| <b>0.6015</b>  | GG15          | GJL-150     | FGL 150        | Grade 150          | G 15        | 0115-00      | FG 15       | FC 150      | A48-25 B   |
| <b>0.6017</b>  | GG170 HB      | GJL-HB 205  |                |                    |             |              |             |             |            |

**K 1.2 GREY CAST IRON <1000 N/mm<sup>2</sup> (300 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.6020</b>  | GG20          | GJL-200     | FGL 200        | Grade 220          | G 20        | 0120-00      | FG 20       | FC 200      | A48-30 B   |
| <b>0.6022</b>  | GG190 HB      | GJL-HB 230  |                |                    |             |              |             |             |            |
| <b>0.6025</b>  | GG25          | GJL-250     | FGL 250        | Grade 260          | G 25        | 0125-00      | FG 25       | FC 250      | A48-40 B   |
| <b>0.6027</b>  | GG220 HB      | GJL-HB 250  | FGL 250        |                    |             |              |             |             |            |
| <b>0.6030</b>  | GG30          | GJL-300     | FGL 300        | Grade 300          | G 30        | 0130-00      | FG 30       | FC 300      | A48-45 B   |
| <b>0.6032</b>  | GG240 HB      | GJL-HB 275  |                |                    |             |              |             |             |            |
| <b>0.6035</b>  | GG35          | GJL-350     | FGL 350        | Grade 350          | G 35        | 0135-00      | FG 35       | FC 350      | A48-50 B   |
| <b>0.6037</b>  | GG260 HB      | GJL-HB 275  |                |                    |             |              |             |             |            |
| <b>0.6040</b>  | GG40          | GJL-400     | FGL 400        | Grade 400          |             | 0140-00      |             |             | A48-60 B   |

**K 2.1 CASTINGS | MODULAR CAST IRON <650 N/mm<sup>2</sup> (200 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.7033</b>  | GGG353        |             |                |                    |             | 0717-15      |             |             |            |
| <b>0.7040</b>  | GGG40         | GJS-400-15  | FGS 400-12     | FGS 420/12         | GS 400-12   | 0717-02      |             | FCD 400     | 60-40-18   |
| <b>0.7043</b>  | GGG403        | GJS-400-18  | FGS 370-17     | FGS 370/17         | GSO 42/15   | 0717-15      |             | FCD 370     |            |
| <b>0.7050</b>  | GGG50         | GJS-500-7   | FGS 500-7      | FGS 500/7          | GS 500/7    | 0727-02      |             | FCD 500     | 65-45-12   |

**K 2.2 CASTINGS | MODULAR CAST IRON <850 N/mm<sup>2</sup> (250 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.7060</b>  | GGG60         | GJS-600-3   | FGS 600-3      | SNG 600/3          | GS 600/3    | 0732-03      |             | FCD 600     | 80-55-06   |
| <b>0.7070</b>  | GGG70         | GJS-700-2   | FGS 700-2      | SNG 700/2          | GS 700-2    | 0737-01      |             | FCD 700     | 100-70-03  |
| <b>0.7080</b>  | GGG80         | GJS-800-2   | FGS 800-2      | SNG 800/2          | GS 800-2    |              |             | FCD 800     |            |

**K 3.1 CASTINGS | MALLEABLE CAST IRON <440 N/mm<sup>2</sup> (130 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.8038</b>  | GTWS3818      | GJMW-360-12 | MB 300-12      | W 38-12            | W38-12      | 5922         |             |             |            |
| <b>0.8040</b>  | GTW4005       | GJMW-400-5  | MB 400-5       | W 40-05            | GMB 40      |              |             | FCMW 370    |            |
| <b>0.8045</b>  | GTW4507       | GJMW-450-7  | MB 450-7       | W 40-07            | GMB 45      |              |             | FCMWP 440   |            |
| <b>0.8055</b>  | GTW55         |             |                |                    | GMB 55      |              |             |             |            |
| <b>0.8065</b>  | GTW65         |             |                |                    | GMB 65      |              |             |             |            |
| <b>0.8135</b>  | GTS3510       | GJMB-350-10 | MN 350-10      | B 340/12           |             | 0815         |             | FCMP 330    | 32510      |
| <b>0.8145</b>  | GTS4506       | GJMB-450-6  | MP 45-06       | P 440/7            |             | 0852         |             | FCMP 440 c3 | 40010      |

**K 3.2 CASTINGS | MALLEABLE CAST IRON <800 N/mm<sup>2</sup> (230 HB)**

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|-------------|--------------|-------------|-------------|------------|
| <b>0.8035</b>  | GTW3504       | GJMW-350-4  |                |                    |             |              |             | FCMW 330 c1 |            |
| <b>0.8155</b>  | GTS5504       | GJMB-550-4  | MP 50-5        | P 510/4            |             | 0854         |             | FCMP 490    | 50005      |
| <b>0.8165</b>  | GTS6502       | GJMB-650-2  | MP 60-3        | P 570/3            |             | 0858         |             | FCMP 540    | 70003      |
| <b>0.8170</b>  | GTS7002       | GJMB-700-2  | Mn 700-2       | P 690/2            | GMN 70      | 0862         |             | FCMP 690    | 90001      |

**M 1.1 STAINLESS STEEL | ferritic/martensitic <850 N/mm<sup>2</sup>**

| Materialnumber | Germany   DIN | Europe   EN        | France   AFNOR     | Great Britain   BS | Italy   UNI        | Sweden   SIS | Spain   UNE  | Japan   JIS | USA   AISI |
|----------------|---------------|--------------------|--------------------|--------------------|--------------------|--------------|--------------|-------------|------------|
| <b>1.4000</b>  | X6Cr13        | X 6 Cr 13          | Z 6 C 13           | 403 S 17           | X 6 Cr 13          | 2301         | X 6 Cr 13    | SUS 403     | 403        |
| <b>1.4002</b>  | X6CrAl13      | X 6 CrAl 13        | Z 6 CA 13          | 405 S 17           | X 6 CrAl 13        | 2302         | X 6 CrAl 13  | SUS 405     | 405        |
| <b>1.4003</b>  | X2CrNi12      | X2CrNi12           | CLC 4003           |                    | F 12N              |              |              |             |            |
| <b>1.4005</b>  | X12CrS13      | X 12 CrS 13        | Z 12 CF 13         | 416 S 21           | X 12 CrS 13        | 2380         | X12 CrS 13   | SUS 416     | 416        |
| <b>1.4006</b>  | X10Cr13       | X 12 Cr 13 KD      | Z 12 C 13          | 410 S 21           | X 12 Cr 13         | 2302         | X 12 Cr 13   | SUS 410     | 410        |
| <b>1.4008</b>  | GX8CrNi13     | GX 7 CrNiMo 12 1   | Z 12 CN 13 M       | 410 C 21           | GX 12 Cr 13        |              |              | SCS 1       | 414        |
| <b>1.4016</b>  | X6Cr17        | X 8 Cr 17          | Z 8 C 17           | 430 S 15           | X 8 Cr 17 KD       | 2320         | X 8 Cr 17    | SUS 430     | 430        |
| <b>1.4017</b>  | X6CrNi171     | X 6 CrNi 17 1      | F 17 N             |                    | X 6 CrNi 17 1      |              |              |             |            |
| <b>1.4021</b>  | X20Cr13       | X 20 Cr 13         | Z 20 C 13          | 420 S 37           | X 20 Cr 13         | 2303         | X 20 Cr 13   | SUS 420 J1  | 420        |
| <b>1.4024</b>  | X15Cr13       | X 15 Cr 13         | Z 12 C 13 M        | 420 S 29           | X 12 Cr 13         |              |              | SUS 410 J1  |            |
| <b>1.4027</b>  | GX20Cr14      |                    | Z 20 C 13 M        | 420 C 29           |                    |              |              | SCS 2       |            |
| <b>1.4028</b>  | X30Cr13       | X 30 Cr 13         | Z 30 Cr 13         | 420 S 45           | X 30 Cr 13         | 2304         | X 30 Cr 13   | SUS 420 J2  | 420        |
| <b>1.4031</b>  | X40Cr13       | X 40 Cr 13         | Z 40 C 14          |                    | X 40 Cr 14         | 2304         | X 40 Cr 13   | SUS 420     | 420        |
| <b>1.4034</b>  | X45Cr13       | X 45 Cr 13         | Z 40 C 14          | 420 S 45           | X 40 Cr 14         |              | X 46 Cr 13   |             | 420        |
| <b>1.4057</b>  | X19CrNi172    | X 19 CrNi 17 2     | Z 15 CN 16.02      | 431 S 29           | X 16 CrNi 16       | 2321         | X 15 CrNi 16 | SUS 431     | 431        |
| <b>1.4059</b>  | GX22CrNi17    |                    | Z 20 CN 17.2 M     | ANC 2              |                    |              |              |             |            |
| <b>1.4085</b>  | GX70Cr29      |                    |                    |                    |                    |              |              |             |            |
| <b>1.4086</b>  | GX120Cr29     |                    |                    | 425 C 11           |                    |              |              |             |            |
| <b>1.4104</b>  | X12CrMoS17    | X 14 CrMoS 17      | Z 10 CF 17         | 441 S 29           | X 10 CrS 17        | 2383         | X 10 CrS 17  | SUS 430 F   | 430 F      |
| <b>1.4105</b>  | X4CrMoS18     | X 6 CRMoS 17       | Z 6 CDF 18-02      |                    |                    |              |              | SUS 430 F   | 430        |
| <b>1.4106</b>  | X10CrMo13     |                    |                    |                    |                    |              |              |             |            |
| <b>1.4107</b>  | GX8CrNi12     | GX 8 CrNi 12       | GX 8 CrNi 12       |                    | GX 8 CrNi 12       |              |              |             |            |
| <b>1.4108</b>  | X100CrMo13    |                    |                    |                    |                    |              |              |             |            |
| <b>1.4109</b>  | X65CrMo14     | X 70 CrMo 15       | Z 70 CD 14         |                    |                    |              |              | SUS 440 A   | 440 A      |
| <b>1.4110</b>  | X55CrMo14     |                    | Z 50 CD 13         |                    |                    |              |              |             |            |
| <b>1.4111</b>  | X110CrMoV15   |                    | Z 4 CN b 17        |                    | X 6 CrNb 17        |              |              | SUS 430 LX  |            |
| <b>1.4112</b>  | X90CrMoV18    | X 90 CrMoV 18      | Z 3 CT 1 2         | 409 S 1 9          | X 6 Cr Ti 1 2      |              |              | SUS 440 B   | 440 B      |
| <b>1.4113</b>  | X6CrMo171     | X 8 CrMo 17        | Z 8 CD 17.02       | 434 S 17           | X 8 CrMo 17        | 2325         |              | SUS 434     | 434        |
| <b>1.4115</b>  | X20CrMo171    |                    |                    |                    |                    |              |              |             |            |
| <b>1.4116</b>  | X45CrMoV15    | X 50 CrMoV 15      | Z 50 CD 15         |                    | X50 CrMoV 15       |              | X 46 CrMo 16 |             |            |
| <b>1.4117</b>  | X38CrMoV15    |                    |                    |                    |                    |              |              |             |            |
| <b>1.4119</b>  | X15CrMo13     |                    |                    |                    |                    |              |              |             |            |
| <b>1.4120</b>  | X20CrMo13     |                    | Z 20 CD 14         |                    |                    |              |              |             |            |
| <b>1.4122</b>  | X35CrMo17     | X 39 CrMo 17 1     | X39CrMo17-1        |                    | X 35 CrMo 17       |              |              |             |            |
| <b>1.4123</b>  | X15TN         |                    |                    |                    |                    |              |              |             |            |
| <b>1.4125</b>  | X105CrMo17    | X 105 CrMo 17      | Z 100 CD 17        |                    | X 105 CrMo 17      |              |              | SUS 440 C   | 440 C      |
| <b>1.4136</b>  | GX70CrMo292   |                    | Z 60 CD 29.2 M     |                    |                    |              |              |             |            |
| <b>1.4138</b>  | GX120CrMo292  |                    |                    |                    |                    |              |              |             |            |
| <b>1.4313</b>  | X5CrNi134     | X 3 CrNiMo 13 4    | Z 4 CDN 13.4       | 425 C 11           | X 3 CrNiMo 13 4    | 2385         |              | SCS 5       | CA 6-NM    |
| <b>1.4317</b>  | GX4CrNi134    | GX 4 CrNi 13 4     | GX 4 CrNi 13 4     |                    | GX 4 CrNi 13 4     |              |              |             |            |
| <b>1.4351</b>  | X3CrNi134     | X 3 CrNi 14 04 KE  |                    |                    |                    |              |              |             |            |
| <b>1.4405</b>  | GX5CrNiMo165  | GX 4 CrNiMo 16 5 1 | GX 4 CrNiMo 16 5 1 |                    | GX 4 CrNiMo 16 5 1 |              |              |             |            |
| <b>1.4502</b>  | X8CrTi18      | X 6 Cr 18 KE       |                    |                    |                    |              |              |             |            |
| <b>1.4510</b>  | X6CrTi17      | X 8 CrTi 17        | Z 8 CT 17          |                    | X 6 CrTi 17        |              | X 8 CrTi 17  | SUS 430 LX  | 430 Ti     |
| <b>1.4511</b>  | X6CrNb17      | X 3 CrNb 17        | Z 8 CNb 17         |                    | X 6 CrNb 17        |              |              | SUS 430 LX  | 430 Nb     |
| <b>1.4512</b>  | X6CrTi12      | X 5 CrTi 12        | Z 6 CT 12          | 409 S 19           | X 6 CrTi12         |              |              | SUH 409     | 409        |

**M 1.1** STAINLESS STEEL | ferritic/martensitic <850 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN      | France   AFNOR   | Great Britain   BS | Italy   UNI      | Sweden   SIS | Spain   UNE      | Japan   JIS | USA   AISI |
|----------------|---------------|------------------|------------------|--------------------|------------------|--------------|------------------|-------------|------------|
| 1.4523         | X8CrMoTi17    | X 2 CrMoTiS 18 2 | X 2 CrMoTiS 18 2 |                    |                  |              |                  |             |            |
| 1.4528         | X105CrCoMo182 |                  |                  |                    |                  |              |                  |             |            |
| 1.4535         | X90CrCoMoV17  |                  |                  |                    |                  |              |                  |             |            |
| 1.4543         | X3CrNiCuTi29  |                  |                  |                    | X 6 CrNiNB 18 11 |              |                  |             |            |
| 1.4704         | X45SiCr4      | 45SiCr16-11      |                  |                    |                  |              |                  |             | HNV 2      |
| 1.4710         | GX30CrSi6     | GX 30 CrSi 6     |                  |                    |                  |              |                  |             |            |
| 1.4712         | X10CrSi6      |                  | K 51255          |                    |                  |              |                  |             |            |
| 1.4713         | X10CrAlSi7    | X 10 CrAlSi 7    |                  |                    |                  |              |                  |             |            |
| 1.4718         | X45CrSi93     | X 45 CrSi 8      | Z 45 CS 9        | 401 S 45           | X 45 CrSi 8      |              | F.3220           | SUH 1       | HNV 3      |
| 1.4722         | X10CrSi13     |                  |                  |                    |                  |              | X 10 CrSi 13     |             |            |
| 1.4724         | X10CrAl13     | X 10 CrAl 13     | Z 10 C 13        | BH 12              | X 10 CrAl 12     |              | X 10 CrAl 13     | SUS 405     | H-12       |
| 1.4725         | X8CrAl144     | CrAl 14 4        | K 91670          |                    |                  |              |                  |             |            |
| 1.4729         | GX40CrSi13    |                  |                  |                    | GX 35 Cr 13      |              |                  | SCH 1       |            |
| 1.4740         | GX40CrSi17    |                  |                  |                    | GX 35 Cr 17      |              |                  |             |            |
| 1.4742         | X10CrAl18     |                  | Z 10 CAS 18      | 403 S 15           | X 8 Cr 17        |              | X 10 CrAl 18     | SUH 21      | 430        |
| 1.4745         | GX40CrSi23    |                  |                  |                    |                  |              |                  |             |            |
| 1.4747         | X80CrNiSi20   | X 80 CrNiSi 20   | Z 80 CSN 20.02   | 433 S 65           | X 80 CrSiNi 20   |              | X 80 CrSiNi20-02 | SUH 4       | HNV 6      |
| 1.4762         | X10CrAl24     | X 10 CrAl 24     | Z 10 CAS 24      |                    | X 16 Cr 26       | 2322         | X 10 CrAl 24     | SUH 442     | 446        |
| 1.4767         | X8CrAl205     | CrAl 20 5        |                  |                    |                  |              |                  |             |            |
| 1.4773         | X8Cr30        |                  |                  |                    |                  |              |                  |             |            |
| 1.4776         | GX40CrSi29    |                  |                  | 452 C 11           | GX 35 Cr 28      |              |                  | SCH 2       |            |

**M 2.1** STAINLESS STEEL | austenitic <650 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN    | Europe   EN            | France   AFNOR               | Great Britain   BS | Italy   UNI         | Sweden   SIS | Spain   UNE         | Japan   JIS | USA   AISI |
|----------------|------------------|------------------------|------------------------------|--------------------|---------------------|--------------|---------------------|-------------|------------|
| 1.4300         | X12CrNi188       |                        |                              | 302                |                     |              |                     |             |            |
| 1.4301         | X5CrNi1810       | X 6 CrNi 18 10 KD      | Z 6 CN 18.09                 | 304 S 15           | X 5 CrNi 18 10      | 2332         | X 5 CrNi 18 11      | SUS 304     | 304 H      |
| 1.4302         | X5CrNi199        | X 6 CrNi 20 10 KE      |                              | 308 S 96           |                     |              |                     |             |            |
| 1.4303         | X5CrNi1812       | X 8 CrNi 18 12 KD      | Z 8 CN 17.07                 | 305 S 19           | X 8 CrNi 19 10      |              | X 8 CrNi 18 12      | SUS 305     | 308        |
| 1.4305         | X10CrNiS189      | X 8 CrNiS 19 9         | Z 8 CNF 18.09                | 303 S 31           | X 8 CrNiS 18 9      | 2346         | F.310.C             | SUS 303     | 303        |
| 1.4307         | X2CrNi189        | X 2 CrNi 18 9          | CLC 18.9.L                   | 304 S 11           | X 2 CrNi 18 9       |              |                     | SUS 304 L   | 304 L      |
| 1.4308         | GX6CrNi189       | X 2 CrNi 18 7          | Z 6 CN 18.10 M               | 304 C 15           | GX 5 CrNi 19 10     | 2333         |                     | SCS 13      | CF-8       |
| 1.4310         | X12CrNi177       | X 12 CrNi 17 7         | Z 12 CN 17.07                | 301 S 21           | X 12 CrNi 17 07     |              | X 12 CrNi 17 07     | SUS 301     | 301        |
| 1.4311         | X2CrNi1810       | X 2 CrNiN 18 10        | Z 8 CN 18.12                 | 304 S 62           | X 8 CrNi 19 10      | 2371         | X 8 CrNi 18 12      | SUS 304 LN  | 304 LN     |
| 1.4312         | GX10CrNi188      |                        | Z 10 CN 18.9 M               | 302 C 25           |                     |              |                     | SCS 12      |            |
| 1.4318         | X 2 CrNiN 18 7   | X 2 CrNiN 18 7         | 18-7L                        |                    | 18-7L               |              |                     |             |            |
| 1.4319         | X3CrNi178        |                        |                              | 302 S 26           | X 10 CrNi 18 09     |              |                     | SUS 302     |            |
| 1.4350         | X5CrNi189        |                        | Z 6 CN 18.09                 | 304 S 31           | X 5 CrNi 18 10      |              |                     |             | 304        |
| 1.4401         | X5CrNiMo17122    | X 6 CrNiMo 17 12 2 KD  | Z 6 CND 17.11                | 316 S 16           | X 5 CrNiMo 17 12    | 2347         | X 5 CrNiMo 17 12    | SUS 316     | 316        |
| 1.4404         | X2CrNiMo17132    | GX 3 CrNiMo 17 12 2 KD | Z 3 CND 19.10 M              | 316 S 12           | GX 2 CrNiMo 19 11   | 2348         | X 2 CrNiMo          | SUS 316 L   | 316 L      |
| 1.4406         | X2CrNiMoN17122   | X 3 CrNiMoN 17 12 2    | Z 2 CND 17.12 Az             | 316 S 61           | X 2 CrNiMoN 17 12   |              |                     | SUS 316 LN  | 316 LN     |
| 1.4407         | GX 5 CrNiMo 13 4 | GX 5 CrNiMo 13 4       | J 91550                      |                    |                     |              |                     |             | A757       |
| 1.4408         | GX6CrNiMo1810    | GX 5 CrNiMo 19 11 2    | GX 5 CrNiMo 19 11 2 316 C 16 |                    | GX 5 CrNiMo 19 11 2 | 2343         | X 7 CrNiMo 20 10    | SCS 14      | CF-8M      |
| 1.4435         | X2CrNiMo18143    | X 2 CrNiMo 18 16       | Z 2 CDN 17.13                | 316 S 11           | X 2 CrNiMo 17 13    | 2353         |                     | SUS 16      | 316 L      |
| 1.4436         | X5CrNiMo17133    | X 6 CrNiMo 18 13 3 KD  | Z 6 CND 17.12                | 316 S 16           | X 5 CrNiMo 17 13    | 2343         | X 6 CrNiMo 17 12 03 | SUS 316     | 316        |
| 1.4438         | X2CrNiMo18164    | X 3 CrNiMo 18 16 4     | Z 2 CND 19.15                | 317 S 12           | X 2 CrNiMo 18 15    | 2367         |                     | SUS 317 L   | 317 L      |
| 1.4440         | X2CrNiMo18165    |                        |                              |                    |                     |              |                     |             |            |
| 1.4442         | X2CrNiMo18154    |                        | X 3 CrNiMoN 18 14            |                    |                     |              |                     |             |            |

**M 2.2** STAINLESS STEEL | austenitic <750 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN    | Europe   EN            | France   AFNOR      | Great Britain   BS | Italy   UNI         | Sweden   SIS | Spain   UNE           | Japan   JIS | USA   AISI |
|----------------|------------------|------------------------|---------------------|--------------------|---------------------|--------------|-----------------------|-------------|------------|
| 1.4429         | X2CrNiMoN17133   | X 3 CrNiMoN 17 12 2    | Z 2 CND 17.13 Az    | 316 S 62           | X 2 CrNiMoN 17 13   | 2375         |                       | SUS 316 LN  | 316 LN     |
| 1.4432         | X2CrNiMo17123    | X 2 CrNiMo 17 12 2     | Z 3 CND 17 13 30    | 316 S 13           | X 2 CrNiMo 17 12 3  |              |                       | SUS 316L    | 316 L      |
| 1.4434         | X2CrNiMoN18124   |                        | CLC 18.12.4.LN      |                    | X 2 CrNiMoN 18 12 4 |              |                       |             | 317 LN     |
| 1.4439         | X2CrNiMoN17135   | X 3 CrNiMo 17 13 5     | Z 3 CnD 18.14-05 Az |                    |                     |              |                       |             |            |
| 1.4465         | X1CrNiMoN25252   |                        |                     |                    |                     |              |                       |             |            |
| 1.4505         | X5NiCrMoCuNb2018 |                        |                     |                    |                     |              |                       |             |            |
| 1.4506         | X5NiCrMoCuTi2018 |                        |                     |                    |                     |              |                       |             |            |
| 1.4529         | X1NiCrMoCuN25206 |                        |                     |                    |                     |              |                       |             |            |
| 1.4536         | GX2NiCrMoCuN2520 | GX 2 CrNiMoCuN 25 20 6 |                     |                    |                     |              |                       |             |            |
| 1.4539         | X1NiCrMoCuN25205 | X 1 NiCrMoCu 25 20 5   | Z 1 NCDU 25.20      | 904 S 13           |                     | 2662         |                       |             |            |
| 1.4541         | X6CrNiTi1810     | X 6 CrNiTi 18 10       | Z 6 CNT 18.10       | 321 S 12           | X 6 CrNiTi 18 11    | 2337         | X 7 CrNiTi 18 11      | SUS 321     | 321        |
| 1.4542         | X5CrNiCuNb164    | X 5 CrNiCuNb 16 4      | Z 7 CNU 17.04       |                    | X 5 CrNiCuNb 16 4   |              |                       | SUS 630     | 630        |
| 1.4550         | X6CrNiNb1810     | X 6 CrNiNb 18 10       | Z 6 CNNb 18.10      | 347 S 17           | X 6 CrNiNb 18 11    | 2338         | X 6 CrNiNb 18 11      | SUS 347     | 347        |
| 1.4551         | X5CrNiNb199      | X 5 CrNiNb 20 10 KE    | Z 6 CNNb 20-10      |                    |                     |              |                       | SUS 347 Y   |            |
| 1.4552         | GX5CrNiNb189     | GX 5 CrNiNb 19 11      | Z 4 CNNb 19.10 M    | 347 C 17           | GX 5 CrNiNb 19 11   |              |                       | SCS 21      |            |
| 1.4571         | X6CrNiMoTi17122  | X 6 CrNiMoTi 17 12 2   | Z 6 CNDT 17.12      | 320 S 31           | X 6 CrNiMoTi 17 12  | 2350         | X 6 CrNiMoTi 17 12 03 | SUS 316 Ti  | 316 Ti     |
| 1.4573         | X10CrNiMoTi812   |                        |                     | 320 S 33           | X 6 CrNiMoTi 17 13  |              |                       | SUS 316 Ti  | 316 Ti     |
| 1.4575         | X2CrNiMoNb2842   |                        |                     |                    |                     |              |                       |             |            |
| 1.4577         | X3CrNiMoTi2525   |                        |                     |                    |                     |              |                       |             |            |
| 1.4580         | X6CrNiMoNb17122  | X 6 CrNiMoNb 17 12 2   | Z 6 CNDNb 17.12     | 318 S 17           | X 6 CrNiMo 17 12 2  |              |                       |             | 316 Cb     |
| 1.4581         | GX5CrNiMoNb1810  | GX 5 CrNiMoNb 19 11 2  | Z 4 CNDNb 18.12 M   | 318 C 17           | GX 6 CrNiMoNb 20 11 |              |                       | SCS 22      |            |
| 1.4582         | X4CrNiMoNb257    |                        |                     |                    |                     |              |                       | SCS 22      |            |
| 1.4583         | X10CrNiMoNb1812  |                        |                     |                    | X 6 CrNiMoNb 17 13  |              |                       |             | 318        |
| 1.4585         | GX7CrNiMoNb257   |                        |                     |                    |                     |              |                       |             |            |
| 1.4586         | X5CrNiMoCuNb2218 |                        |                     |                    |                     |              |                       |             |            |
| 1.4821         | X20CrNiSi254     | X 20 CrNiSi 25 4       | Z 20 CNS 25.04      |                    |                     | 2322         |                       |             |            |
| 1.4822         | GX40CrNi245      |                        | J 92605             | J 92605            |                     |              |                       |             |            |
| 1.4823         | GX40CrNiSi274    |                        |                     |                    |                     |              |                       |             |            |
| 1.4825         | GX25CrNiSi189    |                        |                     | 302 C 35           | GX 16 CrNi 20 10    |              |                       |             |            |
| 1.4826         | GX40CrNiSi229    |                        |                     |                    |                     |              |                       | SCH 12      |            |
| 1.4828         | X15CrNiSi2012    | X 15 CrNiSi 20 12      | Z 15 CNS 20.12      | 309 S 24           | X 16 CrNiSi 20 12   |              | X 15 CrNiSi 20 12     | SUH 309     | 309        |
| 1.4833         | X7CrNi2314       | X 12 CrNi 23 13        | Z 15 CN 24.13       | 309 S 24           | X 6 Cni 23 14       |              |                       | SUS 309 S   | 309 S      |
| 1.4837         | GX40CrNiSi2512   |                        |                     | 309 C 30           | GX 35 CrNi 25 12    |              |                       | SCS 17      |            |
| 1.4841         | X15CrNiSi2520    | X 15 CrNiSi 25 20      | Z 15 CNS 25.20      | 314 S 25           | X 16 CrNiSi 25 20   |              | X 15 CrNiSi 25 20     | SUH 310     | 310        |
| 1.4845         | X12CrNi2521      | X 8 CrNi 25 21         | Z 12 CN 25.20       | 310 S 24           | X 6 CrNi 25 20      | 2361         | F.331                 | SUS 310 S   | 310 S      |
| 1.4848         | GX40CrNiSi2520   |                        |                     | 310 C 40           | GX 40 CrNi 26 20    |              | X 40 CrNi 25 20       | SCH 21      | HK         |
| 1.4861         | X10NiCr3220      |                        |                     |                    |                     |              |                       |             |            |
| 1.4866         | X33CrNiMnN238    | X 33 CrNiMnN 23 8      | X 33 CrNiMnN 23 8   |                    |                     |              |                       |             |            |
| 1.4871         | X53CrMnNiN219    |                        | Z 52 CMN 21.09      | 349 S 54           | X 53 CrMnNiN 21 9   |              | X 53 CrMnNiN 21-09    | SUH 35      | EV 8       |
| 1.4873         | X45CrNiW189      | X 45 CrNiW 18 9        | Z 35 CNWS 14.14     | 331 S 40           | X 45 CrNiW 18 9     |              | X 45 CrNiSiW 18-09    | SUH 31      |            |
| 1.4878         | X12CrNiTi189     | X 10 CrNiTi 18 10      | Z 6 CNT 18.12       | 321 S 20           | X 6 CrNiTi 18.11    | 2337         | X 6 CrNiTi 18 11      | SUS 321     | 321        |
| 1.4881         | X70CrMnNiN216    |                        |                     |                    | X 70 CrMnNiN 21 6   |              |                       |             | EV 11      |
| 1.4882         | X50CrMnNiNbN219  | X 50 CrMnNiNbN 21 9    | Z 50 CMNNb 21.09    |                    |                     |              |                       |             |            |
| 1.4919         | X6CrNiMo1713     | X 6 CrNiMo 17 12 2     | Z 6 CND 17.13 B     | 316 S 51           |                     |              |                       |             | 316 H      |
| 1.4948         | X6CrNi1811       | X 6 CrNi 18 10         | Z 6 CN 18.09        | 304 S 51           | X 5 CrNi 18 10 KW   | 2333         |                       |             |            |
| 1.4949         | X3CrNi1811       |                        |                     |                    | X 2 CrNiN 18 11     |              |                       |             |            |
| 1.4961         | X8CrNiNb1613     |                        |                     | 347 S 51           |                     |              | X 7 CrNiNb 16 13      |             |            |
| 1.4981         | X8CrNiMoNb1616   |                        |                     |                    |                     |              | X 7 CrNiMo 16 16      |             |            |

**M 3.1** **DUPLEX STEEL | SUPER AUSTENITIC** | super austenitic <1100 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN    | Europe   EN           | France   AFNOR    | Great Britain   BS | Italy   UNI        | Sweden   SIS | Spain   UNE      | Japan   JIS | USA   AISI |
|----------------|------------------|-----------------------|-------------------|--------------------|--------------------|--------------|------------------|-------------|------------|
| 1.4162         | X2CrMnNiN2252    | X 2 CrMnNiN 22 5 2    |                   |                    | X2CrMnNiN21-5-1    |              | S32101           | LDX 2101    | S321 01    |
| 1.4362         | X2CrNiN234       | X 2 CrNiN 23 4        | Z 3 CN 23 04 AZ   |                    |                    | 2327         |                  |             | S323 04    |
| 1.4410         | X2CrNiMoN2574    | X 2 CrNiMoN 25 7 4    | Z 5 CND 20.10 M   |                    | X 2 CrNiMoN 25 7 4 |              |                  | SCS 14 A    | S327 50    |
| 1.4460         | X4CrNiMo2752     | X 3 CrNiMo 27 5 2     | X 2 CrNiMo 25 7 3 |                    | X 3 CrNiMo 27 5 2  | 2324         | X 8 CrNiMo 27 05 | SUS 329 J1  | S325 50    |
| 1.4462         | X2CrNiMoN2253    | X 2 CrNiMoN 22 5 3    | Z 3 CND 22.05 AZ  | 318 S 13           | X 2 CrNiMoN 22 5 3 | 2377         |                  | SUS 329 J3L | S318 03    |
| 1.4465         | X1CrNiMoN25252   | X 1 CrNiMoN 25 25 2   | Z 1 CND 25.22 AZ  |                    |                    |              |                  |             | S310 50    |
| 1.4501         | X2CrNiMoCuWN2574 | X 2 CrNiMoCuWN 25 7 4 | Z 3 CND 25.06 AZ  |                    |                    |              |                  | SM 25 Cr    | S327 60    |
| 1.4507         | X2CrNiMoCuN2563  | X 2 CrNiMoCuN 25 6 3  | Z 3 CNDU 25.06 AZ |                    |                    |              |                  | QSA 2505    | S325 20    |
| 1.4534         | 13-8 PH          | X 3 CrNiMoAl 13 8 2   | Z 4 CNDAT 13.09   |                    |                    |              |                  |             | S138 00    |
| 1.4542         | 17-4 PH          | X 5 CrNiCuNb 16 4     | Z 7 CNU 17 04     |                    |                    |              |                  | SUS 630     | 630        |
| 1.4545         | 15-5 PH          | X 5 CrNiCu 15 5       | Z 6 CNU 15 05     |                    |                    |              |                  |             | XM-12      |
| 1.4548         | 17-4 PH          | X5CrNiCuNb1744        | X 5 CrNiCuNb 16 4 |                    |                    |              |                  | SUS 630     | S174 00    |
| 1.4568         | 17-7 PH          | X 7 CrNiAl 17 7       | Z 9 CNA 17 07     | 301 S 81           | X 7 CrNiAl 17 7    | 2388         | X 7 CrNiAl 17 7  | SUS 631     | S177 00    |

## Technical formulas

Calculate cutting speed (m/min)

$$V_c = \frac{D \cdot \pi \cdot n}{1000}$$

Calculate rotational speed (rpm)

$$n = \frac{V_c \cdot 1000}{D \cdot \pi}$$

Calculate feed rate (mm/min)

$$V_f = n \cdot z \cdot f_z$$

Calculate feed per tooth (mm/number of teeth)

$$f_z = \frac{V_f}{n \cdot z}$$

Calculate chip removal rate (cm<sup>3</sup>/min)

$$Q = \frac{a_p \cdot a_e \cdot V_f}{1000}$$

Calculate average chip thickness (mm)

$$h_m = f_z \cdot \frac{\sqrt{a_e}}{D}$$

### Explanation of terms

|                      |                           |                         |
|----------------------|---------------------------|-------------------------|
| <b>V<sub>c</sub></b> | Cutting speed             | in m/min                |
| <b>n</b>             | Rotational speed          | in rpm                  |
| <b>V<sub>f</sub></b> | Feed rate                 | in mm/min               |
| <b>F<sub>z</sub></b> | Feed per tooth            | in mm/number of teeth   |
| <b>z</b>             | Number of teeth (cutting) |                         |
| <b>a<sub>p</sub></b> | Depth of cut              | in mm                   |
| <b>a<sub>e</sub></b> | Width of cut              | in mm                   |
| <b>h<sub>m</sub></b> | Average chip thickness    | in mm                   |
| <b>Q</b>             | Chip removal rate         | in cm <sup>3</sup> /min |
| <b>D</b>             | Diameter of tool          | in mm                   |

# EXPLANATION OF CUTTING DATA

## EXAMPLE FOR SIDE MILLING OF 1.3561 WITH Ø10:

**P 2.3** STEEL | low alloyed <1100 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN | Europe   EN | France   AFNOR | Great Britain   BS | Italy   UNI  | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|---------------|-------------|----------------|--------------------|--------------|--------------|-------------|-------------|------------|
| 1.2419         | 105WCr6       | 105 WCr 5   | 105 WC 13      |                    | 107 WcR 5 KU | 2140         | 105 WCr 5   | SKS 31      |            |
| 1.2511         | 80WCv3        |             |                |                    |              |              |             |             |            |
| 1.2515         | 100WV4        |             |                |                    |              |              |             | SKS 21      |            |
| 1.3561         | 44Cr2         | 46 Cr 1 KD  | 44 Cr 2        |                    |              |              |             |             | 5046       |
| 1.3563         | 43CrMo4       |             | 43 CrMo 4      |                    |              |              |             |             | 4142       |

THE MATERIAL KEY WITH DETAILED BREAKDOWN OF MATERIALS BY MATERIAL GROUP CAN BE FOUND AT THE END OF THE CATALOGUE.

| P       | Material                        | Strength (N/mm <sup>2</sup> ) | Side Milling | Finishing  | ETC        | Materialgroup Factor fz / a | Materialgroup Factor ae ETC |
|---------|---------------------------------|-------------------------------|--------------|------------|------------|-----------------------------|-----------------------------|
|         |                                 |                               | Vc = m/min   | Vc = m/min | Vc = m/min |                             |                             |
| 1.1     | unalloyed                       | <500                          | 240          | 260        | 380        | 1                           | 1                           |
| 1.2-1.5 | unalloyed                       | <1100                         | 200          | 220        | 316        | 0.9                         | 0.8                         |
| 2.1-2.2 | low-alloyed                     | <950                          | 190          | 210        | 290        | 0.9                         | 0.8                         |
| 2.3-2.4 | low-alloyed                     | <1300                         | 160          | 180        | 203        | 0.8                         | 0.75                        |
| 3.1-3.2 | high-alloyed                    | <1100                         | 180          | 190        | 220        | 0.8                         | 0.7                         |
| 3.3     | high-alloyed                    | <1400                         | 150          | 160        | 196        | 0.7                         | 0.68                        |
| K       | CASTINGS                        |                               | Vc = m/min   | Vc = m/min | Vc = m/min |                             |                             |
| 1.1-1.2 | Grey cast iron                  | <1000                         | 220          | 230        | 262        | 0.9                         | 0.8                         |
| 2.1-2.2 | Modular cast iron               | <850                          | 180          | 190        | 208        | 0.8                         | 0.75                        |
| 3.1-3.2 | Malleable cast iron             | <800                          | 160          | 170        | 193        | 0.8                         | 0.75                        |
| M       | STAINLESS STEEL                 |                               | Vc = m/min   | Vc = m/min | Vc = m/min |                             |                             |
| 1.1     | ferritic/martensitic            | <850                          | 90           | 95         | 172        | 0.9                         | 0.6                         |
| 2.1     | austenitic                      | <650                          | 75           | 80         | 146        | 0.8                         | 0.45                        |
| 2.2     | austenitic                      | <750                          | 70           | 75         | 128        | 0.75                        | 0.4                         |
| 3.1     | DUPLIX STEEL   super austenitic | <1100                         |              |            |            |                             |                             |

OVERVIEW OF THE DIFFERENT MATERIAL GROUPS FOR THIS TOOL INCLUDING FACTORS

### Material P 1.1

| D1 | L2 | Immersion Angle | Side Milling |                 |         | Finishing |         |         | ETC       |         |         |           |
|----|----|-----------------|--------------|-----------------|---------|-----------|---------|---------|-----------|---------|---------|-----------|
|    |    |                 | fz (mm/Z)    | ae = 0.3xD (mm) | ap (mm) | fz (mm/Z) | ae (mm) | ap (mm) | fz (mm/Z) | ae (mm) | ap (mm) | hmax (mm) |
| 6  | 13 | 1°              | 0.045        | 1.8             | L2max   | 0.02      | 0.2     | L2max   | 0.072     | 1.3     | L2max   | 0.0593    |
| 8  | 19 | 1°              | 0.06         | 2.4             | L2max   | 0.025     | 0.2     | L2max   | 0.096     | 1.5     | L2max   | 0.0749    |
| 10 | 22 | 1.2°            | 0.07         | 3               | L2max   | 0.03      | 0.2     | L2max   | 0.112     | 1.8     | L2max   | 0.0861    |
| 12 | 26 | 1.2°            | 0.08         | 3.6             | L2max   | 0.035     | 0.2     | L2max   | 0.136     | 2.1     | L2max   | 0.1034    |
| 16 | 32 | 1.5°            | 0.09         | 4.8             | L2max   | 0.04      | 0.2     | L2max   | 0.152     | 2.6     | L2max   | 0.1121    |
| 20 | 41 | 2°              | 0.11         | 6               | L2max   | 0.045     | 0.2     | L2max   | 0.176     | 2.9     | L2max   | 0.1239    |

ALL DATA GIVEN HERE IS FOR THE FIRST GROUP P1.1 IN THE MATERIAL GROUP OVERVIEW

### DETERMINATION OF CUTTING DATA:

From the material key results: **material group P2.3**

Vc= 160 m/min (as indicated in the table)

fz= 0.07 mm/Z (as indicated in the table) x Factor fz 0.8 = fz **0.056 mm/Z**





VIDEO EXPLANATION

## EXAMPLE FOR ETC OF 1.3207 WITH Ø10:

### P 3.3 STEEL | high alloyed <1400 N/mm<sup>2</sup>

| Materialnumber | Germany   DIN  | Europe   EN | France   AFNOR       | Great Britain   BS | Italy   UNI  | Sweden   SIS | Spain   UNE | Japan   JIS | USA   AISI |
|----------------|----------------|-------------|----------------------|--------------------|--------------|--------------|-------------|-------------|------------|
| 1.2709         | X3NiCoMoTi1895 |             |                      |                    |              |              |             |             |            |
| 1.2790         | 72SiNiCrMoV54  |             |                      |                    |              |              |             |             |            |
| 1.2888         | X20CoCrWMo109  |             |                      |                    |              |              |             |             |            |
| 1.3202         | S12145         | HS12-1-5-5  |                      | BT 15              | HS 12-1-5-5  |              | 12-1-5-5    |             | T 15       |
| 1.3207         | S104310        | HS10-4-3-10 | Z130WKCDV10-10-04-04 | BT 42              | HS 10-4-3-10 |              | 10-4-3-10   | SKH 57      | M 44       |

THE MATERIAL KEY WITH DETAILED BREAKDOWN OF MATERIALS BY MATERIAL GROUP CAN BE FOUND AT THE END OF THE CATALOGUE.

| P                      | Material                        | Strength (N/mm <sup>2</sup> ) | Side Milling | Finishing  | ETC        | Materialgroup Factor fz / a | Materialgroup Factor ae ETC |
|------------------------|---------------------------------|-------------------------------|--------------|------------|------------|-----------------------------|-----------------------------|
|                        |                                 |                               | Vc = m/min   | Vc = m/min | Vc = m/min |                             |                             |
| <b>STEEL</b>           |                                 |                               |              |            |            |                             |                             |
| 1.1                    | unalloyed                       | <500                          | 240          | 260        | 380        | 1                           | 1                           |
| 1.2-1.5                | unalloyed                       | <1100                         | 200          | 220        | 316        | 0.9                         | 0.8                         |
| 2.1-2.2                | low-alloyed                     | <950                          | 190          | 210        | 290        | 0.9                         | 0.8                         |
| 2.3-2.4                | low-alloyed                     | <1300                         | 160          | 180        | 203        | 0.8                         | 0.75                        |
| 3.1-3.2                | high-alloyed                    | <1100                         | 180          | 190        | 220        | 0.8                         | 0.7                         |
| 3.3                    | high-alloyed                    | <1400                         | 150          | 160        | 196        | 0.7                         | 0.68                        |
| <b>CASTINGS</b>        |                                 |                               |              |            |            |                             |                             |
| 1.1-1.2                | Grey cast iron                  | <1000                         | 220          | 230        | 262        | 0.9                         | 0.8                         |
| 2.1-2.2                | Modular cast iron               | <850                          | 180          | 190        | 208        | 0.8                         | 0.75                        |
| 3.1-3.2                | Malleable cast iron             | <800                          | 160          | 170        | 193        | 0.8                         | 0.75                        |
| <b>STAINLESS STEEL</b> |                                 |                               |              |            |            |                             |                             |
| 1.1                    | ferritic/martensitic            | <850                          | 90           | 95         | 172        | 0.9                         | 0.6                         |
| 2.1                    | austenitic                      | <650                          | 75           | 80         | 146        | 0.8                         | 0.45                        |
| 2.2                    | austenitic                      | <750                          | 70           | 75         | 128        | 0.75                        | 0.4                         |
| 3.1                    | DUPLIX STEEL   super austenitic | <1100                         |              |            |            |                             |                             |

OVERVIEW OF THE DIFFERENT MATERIAL GROUPS FOR THIS TOOL INCLUDING FACTORS

#### Material P 1.1

| D1 | L2 | Immersion Angle | Side Milling |                 |         | Finishing |         |         | ETC       |         |         |           |
|----|----|-----------------|--------------|-----------------|---------|-----------|---------|---------|-----------|---------|---------|-----------|
|    |    |                 | fz (mm/Z)    | ae = 0.3xD (mm) | ap (mm) | fz (mm/Z) | ae (mm) | ap (mm) | fz (mm/Z) | ae (mm) | ap (mm) | hmax (mm) |
| 6  | 13 | 1°              | 0.045        | 1.8             | L2max   | 0.02      | 0.2     | L2max   | 0.072     | 1.3     | L2max   | 0.0593    |
| 8  | 19 | 1°              | 0.06         | 2.4             | L2max   | 0.025     | 0.2     | L2max   | 0.096     | 1.5     | L2max   | 0.0749    |
| 10 | 22 | 1.2°            | 0.07         | 3               | L2max   | 0.03      | 0.2     | L2max   | 0.112     | 1.8     | L2max   | 0.0861    |
| 12 | 26 | 1.2°            | 0.08         | 3.6             | L2max   | 0.035     | 0.2     | L2max   | 0.136     | 2.1     | L2max   | 0.1034    |
| 16 | 32 | 1.5°            | 0.09         | 4.8             | L2max   | 0.04      | 0.2     | L2max   | 0.152     | 2.6     | L2max   | 0.1121    |
| 20 | 41 | 2°              | 0.11         | 6               | L2max   | 0.045     | 0.2     | L2max   | 0.176     | 2.9     | L2max   | 0.1239    |

ALL DATA GIVEN HERE IS FOR THE FIRST GROUP P1.1 IN THE MATERIAL GROUP OVERVIEW

#### DETERMINATION OF CUTTING DATA:

From the material key results: **material group P3.3**

Vc= 196 m/min (as indicated in the table)

fz= 0.112 mm/Z (as indicated in the table) x Factor fz 0.7 = **fz 0.0784 mm/Z**

ae= 1.8 mm (as indicated in the table) x Factor ae 0.68 = **1.224 mm ae**