

CARBIDE, 2 FLUTE LONG LENGTH

● **VOLLHARTMETALL, 2 SCHNEIDEN LANG**  
● **Fraise carbure, 2 dents, longue**  
● **2 TAGLIENTI, SERIE LUNGA**

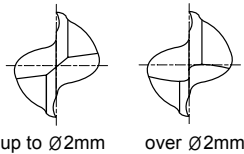
- ▶ Suitable for dry milling applications at high temperatures.

▶ Excellent high-performance end mills.

▶ 2 flute design for slotting.
- ▶ Für die Trockenbearbeitung.

▶ Hervorragendes Preis - Leistungsverhältnis.

▶ 2 Schneiden zum Nutenfräsen.



up to Ø2mm      over Ø2mm

CARBIDE

DIN 6527

2











P.603

Unit : mm

| EDP No.  | Mill Diameter | Shank Diameter | Length of Cut | Overall Length |
|----------|---------------|----------------|---------------|----------------|
| G9445901 | 2.0           | ● 3            | 6             | 38             |
| G9445028 | 2.8           | 6              | 7             | 57             |
| G9445030 | 3.0           | 6              | 7             | 57             |
| G9445035 | 3.5           | 6              | 7             | 57             |
| G9445038 | 3.8           | 6              | 8             | 57             |
| G9445040 | 4.0           | 6              | 8             | 57             |
| G9445045 | 4.5           | 6              | 8             | 57             |
| G9445048 | 4.8           | 6              | 10            | 57             |
| G9445050 | 5.0           | 6              | 10            | 57             |
| G9445957 | 5.8           | 6              | 10            | 57             |
| G9445060 | 6.0           | 6              | 10            | 57             |
| G9445967 | 6.8           | 8              | 13            | 63             |
| G9445070 | 7.0           | 8              | 13            | 63             |
| G9445977 | 7.8           | 8              | 16            | 63             |
| G9445080 | 8.0           | 8              | 16            | 63             |
| G9445087 | 8.7           | 10             | 16            | 72             |
| G9445090 | 9.0           | 10             | 16            | 72             |
| G9445097 | 9.7           | 10             | 19            | 72             |
| G9445100 | 10.0          | 10             | 19            | 72             |
| G9445117 | 11.7          | 12             | 22            | 83             |
| G9445120 | 12.0          | 12             | 22            | 83             |
| G9445137 | 13.7          | 14             | 22            | 83             |
| G9445140 | 14.0          | 14             | 22            | 83             |

● with plain shank

▶ NEXT PAGE

| Mill Dia.<br>Tolerance(mm) | Shank Dia.<br>Tolerance |
|----------------------------|-------------------------|
| 0 ~ - 0.03                 | h5                      |

◎ : Excellent    ○ : Good

| ISO                  | P                      |     |                        |     |                                           |                 |                        |     |     |                                    | M                           |                 |     |     | K              |                 |                   |                |                     |                   |     |                    |  |
|----------------------|------------------------|-----|------------------------|-----|-------------------------------------------|-----------------|------------------------|-----|-----|------------------------------------|-----------------------------|-----------------|-----|-----|----------------|-----------------|-------------------|----------------|---------------------|-------------------|-----|--------------------|--|
| Material Description | Non-alloy steel        |     |                        |     |                                           | Low alloy steel |                        |     |     | High alloyed steel, and tool steel |                             | Stainless steel |     |     | Grey cast iron |                 | Nodular cast iron |                | Malleable cast iron |                   |     |                    |  |
| VDI 3323             | 1                      | 2   | 3                      | 4   | 5                                         | 6               | 7                      | 8   | 9   | 10                                 | 11                          | 12              | 13  | 14  | 15             | 16              | 17                | 18             | 19                  | 20                |     |                    |  |
| HRc                  |                        | 13  | 25                     | 28  | 32                                        | 10              | 29                     | 32  | 38  | 15                                 | 35                          | 15              | 23  | 10  | 10             | 26              | 3                 | 25             |                     | 21                |     |                    |  |
| HB                   | 125                    | 190 | 250                    | 270 | 300                                       | 180             | 275                    | 300 | 350 | 200                                | 325                         | 200             | 240 | 180 | 180            | 260             | 160               | 250            | 130                 | 230               |     |                    |  |
| Recommend            | ◎                      | ◎   | ◎                      | ◎   | ◎                                         | ◎               | ◎                      | ◎   | ◎   | ◎                                  | ◎                           | ○               | ○   | ○   | ○              | ○               | ○                 | ○              | ○                   | ○                 |     |                    |  |
| ISO                  | N                      |     |                        |     |                                           |                 |                        |     |     |                                    | S                           |                 |     |     |                |                 |                   | H              |                     |                   |     |                    |  |
| Material Description | Aluminum-wrought alloy |     | Aluminum-cast, alloyed |     | Copper and Copper Alloys (Bronze / Brass) |                 | Non Metallic Materials |     |     |                                    | Heat Resistant Super Alloys |                 |     |     |                | Titanium Alloys |                   | Hardened steel |                     | Chilled Cast Iron |     | Hardened Cast Iron |  |
| VDI 3323             | 21                     | 22  | 23                     | 24  | 25                                        | 26              | 27                     | 28  | 29  | 30                                 | 31                          | 32              | 33  | 34  | 35             | 36              | 37                | 38             | 39                  | 40                | 41  |                    |  |
| HRc                  |                        |     |                        |     |                                           |                 |                        |     |     |                                    | 15                          | 30              | 25  | 38  | 34             |                 |                   | 55             | 60                  | 42                | 55  |                    |  |
| HB                   | 60                     | 100 | 75                     | 90  | 130                                       | 110             | 90                     | 100 |     |                                    | 200                         | 280             | 250 | 350 | 320            | 400 Rm          | 1050 Rm           | 550            | 630                 | 400               | 550 |                    |  |
| Recommend            | ○                      | ○   | ○                      | ○   | ○                                         | ○               | ○                      | ○   | ○   |                                    | ○                           | ○               | ○   | ○   | ○              | ○               | ○                 | ○              | ○                   | ○                 | ○   |                    |  |

# CARBIDE, 2 FLUTE LONG LENGTH

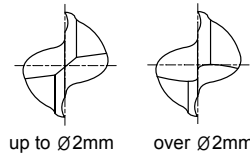
● **VOLLHARTMETALL, 2 SCHNEIDEN LANG**

● **Fraise carbure, 2 dents, longue**

● **2 TAGLIENTI, SERIE LUNGA**

- ▶ Suitable for dry milling applications at high temperatures.
- ▶ Excellent high-performance end mills.
- ▶ 2 flute design for slotting.

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- ▶ Hervorragendes Preis - Leistungsverhältnis.
- ▶ 2 Schneiden zum Nutenfräsen.



Unit : mm

| EDP No.         | Mill Diameter | Shank Diameter | Length of Cut | Overall Length |
|-----------------|---------------|----------------|---------------|----------------|
| <b>G9445157</b> | <b>15.7</b>   | <b>16</b>      | <b>26</b>     | <b>92</b>      |
| <b>G9445160</b> | <b>16.0</b>   | <b>16</b>      | <b>26</b>     | <b>92</b>      |
| <b>G9445177</b> | <b>17.7</b>   | <b>18</b>      | <b>26</b>     | <b>92</b>      |
| <b>G9445180</b> | <b>18.0</b>   | <b>18</b>      | <b>26</b>     | <b>92</b>      |
| <b>G9445197</b> | <b>19.7</b>   | <b>20</b>      | <b>32</b>     | <b>104</b>     |
| <b>G9445200</b> | <b>20.0</b>   | <b>20</b>      | <b>32</b>     | <b>104</b>     |

| Mill Dia.<br>Tolerance(mm) | Shank Dia.<br>Tolerance |
|----------------------------|-------------------------|
| 0 ~ - 0.03                 | h5                      |

◎ : Excellent   ○ : Good

| ISO                  | P                      |     |                        |     |                                           |                 |     |                        |     |                             | M                                  |     |                 |     | K               |                |                |                   |                   |                     |                    |
|----------------------|------------------------|-----|------------------------|-----|-------------------------------------------|-----------------|-----|------------------------|-----|-----------------------------|------------------------------------|-----|-----------------|-----|-----------------|----------------|----------------|-------------------|-------------------|---------------------|--------------------|
| Material Description | Non-alloy steel        |     |                        |     |                                           | Low alloy steel |     |                        |     |                             | High alloyed steel, and tool steel |     | Stainless steel |     |                 | Grey cast iron |                | Nodular cast iron |                   | Malleable cast iron |                    |
| VDI 3323             | 1                      | 2   | 3                      | 4   | 5                                         | 6               | 7   | 8                      | 9   | 10                          | 11                                 | 12  | 13              | 14  | 15              | 16             | 17             | 18                | 19                | 20                  |                    |
| HRC                  |                        | 13  | 25                     | 28  | 32                                        | 10              | 29  | 32                     | 38  | 15                          | 35                                 | 15  | 23              | 10  | 10              | 26             | 3              | 25                |                   | 21                  |                    |
| HB                   | 125                    | 190 | 250                    | 270 | 300                                       | 180             | 275 | 300                    | 350 | 200                         | 325                                | 200 | 240             | 180 | 180             | 260            | 160            | 250               | 130               | 230                 |                    |
| Recommend            | ◎                      | ◎   | ◎                      | ◎   | ◎                                         | ◎               | ◎   | ◎                      | ◎   | ◎                           | ◎                                  | ○   | ○               | ○   | ○               | ○              | ○              | ○                 | ○                 | ○                   |                    |
| ISO                  | N                      |     |                        |     |                                           |                 |     |                        |     |                             | S                                  |     |                 |     |                 |                | H              |                   |                   |                     |                    |
| Material Description | Aluminum-wrought alloy |     | Aluminum-cast, alloyed |     | Copper and Copper Alloys (Bronze / Brass) |                 |     | Non Metallic Materials |     | Heat Resistant Super Alloys |                                    |     |                 |     | Titanium Alloys |                | Hardened steel |                   | Chilled Cast Iron |                     | Hardened Cast Iron |
| VDI 3323             | 21                     | 22  | 23                     | 24  | 25                                        | 26              | 27  | 28                     | 29  | 30                          | 31                                 | 32  | 33              | 34  | 35              | 36             | 37             | 38                | 39                | 40                  | 41                 |
| HRC                  |                        |     |                        |     |                                           |                 |     |                        |     |                             | 15                                 | 30  | 25              | 38  | 34              |                |                | 55                | 60                | 42                  | 55                 |
| HB                   | 60                     | 100 | 75                     | 90  | 130                                       | 110             | 90  | 100                    |     |                             | 200                                | 280 | 250             | 350 | 320             | 400 Rm         | 1050 Rm        | 550               | 630               | 400                 | 550                |
| Recommend            | ○                      | ○   | ○                      | ○   | ○                                         | ○               | ○   | ○                      | ○   | ○                           | ○                                  | ○   | ○               | ○   | ○               | ○              | ○              | ○                 | ○                 | ○                   | ○                  |

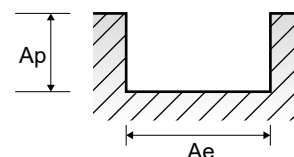
**G9424, G9G44, G9A68, G9444, G9527, G9445, G9G45, G9452 SERIES**

**2 FLUTE - SLOTTING**

Vc = m/min.  
fz = mm/tooth  
RPM = rev./min.  
FEED = mm/min.

| ISO         | VDI 3323                           | Material Description                                       | Ae                        | Ap                        | Parameter | Mill Diameter (Ø) |       |       |       |       |       |       |       |       |       |       |       |       |  |
|-------------|------------------------------------|------------------------------------------------------------|---------------------------|---------------------------|-----------|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
|             |                                    |                                                            |                           |                           |           | 1.0               | 1.5   | 2.0   | 3.0   | 4.0   | 5.0   | 6.0   | 8.0   | 10.0  | 12.0  | 14.0  | 16.0  | 20.0  |  |
| P           | 1-4                                | Non-alloy steel                                            | 1.0D<br>(Up to Ø3 : 0.2D) | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 45                | 45    | 50    | 55    | 65    | 70    | 70    | 70    | 70    | 70    | 75    | 75    | 70    |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.008 | 0.01  | 0.015 | 0.025 | 0.031 | 0.039 | 0.057 | 0.064 | 0.065 | 0.063 | 0.062 | 0.063 |  |
|             |                                    |                                                            |                           |                           | RPM       | 14324             | 9549  | 7958  | 5836  | 5173  | 4456  | 3714  | 2785  | 2228  | 1857  | 1705  | 1492  | 1114  |  |
|             |                                    |                                                            |                           |                           | FEED      | 115               | 153   | 159   | 175   | 259   | 276   | 290   | 318   | 285   | 241   | 215   | 185   | 140   |  |
|             | 5                                  |                                                            | 1.0D<br>(Up to Ø3 : 0.2D) | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 25                | 25    | 30    | 35    | 40    | 40    | 45    | 45    | 40    | 45    | 45    | 50    | 45    |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.008 | 0.01  | 0.016 | 0.025 | 0.031 | 0.041 | 0.05  | 0.05  | 0.048 | 0.048 | 0.05  | 0.05  |  |
|             |                                    |                                                            |                           |                           | RPM       | 7958              | 5305  | 4775  | 3714  | 3183  | 2546  | 2387  | 1790  | 1273  | 1194  | 1023  | 995   | 716   |  |
|             |                                    |                                                            |                           |                           | FEED      | 64                | 85    | 95    | 119   | 159   | 158   | 196   | 179   | 127   | 115   | 98    | 99    | 72    |  |
|             | 6-7                                | Low alloy steel                                            | 1.0D<br>(Up to Ø3 : 0.2D) | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 45                | 45    | 50    | 55    | 65    | 70    | 70    | 70    | 70    | 70    | 75    | 75    | 70    |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.008 | 0.01  | 0.015 | 0.025 | 0.031 | 0.039 | 0.057 | 0.064 | 0.065 | 0.063 | 0.062 | 0.063 |  |
|             |                                    |                                                            |                           |                           | RPM       | 14324             | 9549  | 7958  | 5836  | 5173  | 4456  | 3714  | 2785  | 2228  | 1857  | 1705  | 1492  | 1114  |  |
|             |                                    |                                                            |                           |                           | FEED      | 115               | 153   | 159   | 175   | 259   | 276   | 290   | 318   | 285   | 241   | 215   | 185   | 140   |  |
|             | 8-9                                |                                                            | 1.0D<br>(Up to Ø3 : 0.2D) | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 25                | 25    | 30    | 35    | 40    | 40    | 45    | 45    | 40    | 45    | 45    | 50    | 45    |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.008 | 0.01  | 0.016 | 0.025 | 0.031 | 0.041 | 0.05  | 0.05  | 0.048 | 0.048 | 0.05  | 0.05  |  |
| RPM         |                                    |                                                            |                           |                           | 7958      | 5305              | 4775  | 3714  | 3183  | 2546  | 2387  | 1790  | 1273  | 1194  | 1023  | 995   | 716   |       |  |
| FEED        |                                    |                                                            |                           |                           | 64        | 85                | 95    | 119   | 159   | 158   | 196   | 179   | 127   | 115   | 98    | 99    | 72    |       |  |
| 10          | High alloyed steel, and tool steel | 1.0D<br>(Up to Ø3 : 0.2D)                                  | 0.5D<br>(Up to Ø3 : 0.2D) | Vc                        | 45        | 45                | 50    | 55    | 65    | 70    | 70    | 70    | 70    | 70    | 75    | 75    | 70    |       |  |
|             |                                    |                                                            |                           | fz                        | 0.004     | 0.008             | 0.01  | 0.015 | 0.025 | 0.031 | 0.039 | 0.057 | 0.064 | 0.065 | 0.063 | 0.062 | 0.063 |       |  |
|             |                                    |                                                            |                           | RPM                       | 14324     | 9549              | 7958  | 5836  | 5173  | 4456  | 3714  | 2785  | 2228  | 1857  | 1705  | 1492  | 1114  |       |  |
|             |                                    |                                                            |                           | FEED                      | 115       | 153               | 159   | 175   | 259   | 276   | 290   | 318   | 285   | 241   | 215   | 185   | 140   |       |  |
| 11.1 - 11.2 |                                    | 1.0D<br>(Up to Ø3 : 0.2D)                                  | 0.5D<br>(Up to Ø3 : 0.2D) | Vc                        | 25        | 25                | 30    | 35    | 40    | 40    | 45    | 45    | 40    | 45    | 45    | 50    | 45    |       |  |
|             |                                    |                                                            |                           | fz                        | 0.004     | 0.008             | 0.01  | 0.016 | 0.025 | 0.031 | 0.041 | 0.05  | 0.05  | 0.048 | 0.048 | 0.05  | 0.05  |       |  |
|             |                                    |                                                            |                           | RPM                       | 7958      | 5305              | 4775  | 3714  | 3183  | 2546  | 2387  | 1790  | 1273  | 1194  | 1023  | 995   | 716   |       |  |
|             |                                    |                                                            |                           | FEED                      | 64        | 85                | 95    | 119   | 159   | 158   | 196   | 179   | 127   | 115   | 98    | 99    | 72    |       |  |
| M           | 14.1                               | Stainless steel                                            | 1.0D<br>(Up to Ø3 : 0.2D) | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 20                | 25    | 25    | 30    | 35    | 35    | 35    | 35    | 35    | 35    | 35    | 35    |       |  |
|             |                                    |                                                            |                           |                           | fz        | 0.003             | 0.007 | 0.009 | 0.016 | 0.025 | 0.031 | 0.04  | 0.053 | 0.059 | 0.058 | 0.059 | 0.068 | 0.064 |  |
|             |                                    |                                                            |                           |                           | RPM       | 6366              | 5305  | 3979  | 3183  | 2785  | 2228  | 1857  | 1393  | 1114  | 928   | 796   | 696   | 557   |  |
|             |                                    |                                                            |                           |                           | FEED      | 38                | 74    | 72    | 102   | 139   | 138   | 149   | 148   | 131   | 108   | 94    | 95    | 71    |  |
| K           | 15-20                              | Grey cast iron<br>Nodular cast iron<br>Malleable cast iron | 1.0D                      | 1.0D                      | Vc        | 60                | 55    | 60    | 55    | 60    | 55    | 55    | 55    | 60    | 55    | 55    | 55    |       |  |
|             |                                    |                                                            |                           |                           | fz        | 0.005             | 0.008 | 0.012 | 0.018 | 0.024 | 0.03  | 0.043 | 0.063 | 0.077 | 0.102 | 0.119 | 0.145 | 0.189 |  |
|             |                                    |                                                            |                           |                           | RPM       | 19099             | 11671 | 9549  | 5836  | 4775  | 3501  | 2918  | 2188  | 1910  | 1459  | 1251  | 1094  | 875   |  |
|             |                                    |                                                            |                           |                           | FEED      | 191               | 187   | 229   | 210   | 229   | 210   | 251   | 276   | 294   | 298   | 298   | 317   | 331   |  |
| N           | 21~22                              | Aluminum-wrought alloy                                     | 1.0D                      | 1.0D                      | Vc        | 140               | 130   | 140   | 145   | 140   | 145   | 145   | 145   | 145   | 140   | 145   | 145   | 140   |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.007 | 0.01  | 0.015 | 0.021 | 0.025 | 0.032 | 0.043 | 0.053 | 0.065 | 0.073 | 0.085 | 0.11  |  |
|             |                                    |                                                            |                           |                           | RPM       | 44563             | 27587 | 22282 | 15385 | 11141 | 9231  | 7692  | 5769  | 4615  | 3714  | 3297  | 2885  | 2228  |  |
|             |                                    |                                                            |                           |                           | FEED      | 357               | 386   | 446   | 462   | 468   | 462   | 492   | 496   | 489   | 483   | 481   | 490   | 490   |  |
|             | 23~25                              | Aluminum-cast, alloyed                                     | 1.0D                      | 1.0D                      | Vc        | 140               | 130   | 140   | 145   | 140   | 145   | 145   | 145   | 145   | 140   | 145   | 145   | 140   |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.007 | 0.01  | 0.015 | 0.021 | 0.025 | 0.032 | 0.043 | 0.053 | 0.065 | 0.073 | 0.085 | 0.11  |  |
|             |                                    |                                                            |                           |                           | RPM       | 44563             | 27587 | 22282 | 15385 | 11141 | 9231  | 7692  | 5769  | 4615  | 3714  | 3297  | 2885  | 2228  |  |
|             |                                    |                                                            |                           |                           | FEED      | 357               | 386   | 446   | 462   | 468   | 462   | 492   | 496   | 489   | 483   | 481   | 490   | 490   |  |
|             | 26-28                              | Copper and Copper Alloys (Bronze / Brass)                  | 1.0D                      | 1.0D                      | Vc        | 80                | 95    | 105   | 105   | 110   | 105   | 105   | 110   | 105   | 105   | 105   | 110   | 105   |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.007 | 0.01  | 0.015 | 0.019 | 0.025 | 0.033 | 0.043 | 0.055 | 0.066 | 0.078 | 0.085 | 0.11  |  |
|             |                                    |                                                            |                           |                           | RPM       | 25465             | 20160 | 16711 | 11141 | 8754  | 6685  | 5570  | 4377  | 3342  | 2785  | 2387  | 2188  | 1671  |  |
|             |                                    |                                                            |                           |                           | FEED      | 204               | 282   | 334   | 334   | 333   | 334   | 368   | 376   | 368   | 368   | 372   | 372   | 368   |  |
|             | 29.1                               | Non Metallic Materials                                     | 1.0D                      | 1.0D                      | Vc        | 80                | 95    | 105   | 105   | 110   | 105   | 105   | 110   | 105   | 105   | 105   | 110   | 105   |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.007 | 0.01  | 0.015 | 0.019 | 0.025 | 0.033 | 0.043 | 0.055 | 0.066 | 0.078 | 0.085 | 0.11  |  |
|             |                                    |                                                            |                           |                           | RPM       | 25465             | 20160 | 16711 | 11141 | 8754  | 6685  | 5570  | 4377  | 3342  | 2785  | 2387  | 2188  | 1671  |  |
|             |                                    |                                                            |                           |                           | FEED      | 204               | 282   | 334   | 334   | 333   | 334   | 368   | 376   | 368   | 368   | 372   | 372   | 368   |  |
| H           | 40                                 | Chilled Cast Iron                                          | 1.0D                      | 0.5D<br>(Up to Ø3 : 0.2D) | Vc        | 25                | 25    | 30    | 35    | 40    | 40    | 45    | 45    | 40    | 45    | 45    | 50    | 45    |  |
|             |                                    |                                                            |                           |                           | fz        | 0.004             | 0.008 | 0.01  | 0.016 | 0.025 | 0.031 | 0.041 | 0.05  | 0.05  | 0.048 | 0.048 | 0.05  | 0.05  |  |
|             |                                    |                                                            |                           |                           | RPM       | 7958              | 5305  | 4775  | 3714  | 3183  | 2546  | 2387  | 1790  | 1273  | 1194  | 1023  | 995   | 716   |  |
|             |                                    |                                                            |                           |                           | FEED      | 64                | 85    | 95    | 119   | 159   | 158   | 196   | 179   | 127   | 115   | 98    | 99    | 72    |  |

※ The FEED, in long & extra long types, should be reduced by around 50%





## MILLING TOOLS

**SOLID CARBIDE**  
**K-2**  
**END MILLS**

General Purpose with Coating  
Conventional or High Speed Milling, Wet or Dry Cutting



Please visit  
[globalyg1.com/mat](http://globalyg1.com/mat)  
for material search

◎ : Excellent   ○ : Good

Recommended cutting conditions : P 597

| ISO | VDI 3323 | Material Description                      | Composition / Structure / Heat Treatment       |                     | HB      | HRc                                                                                   |    |    |    |    |
|-----|----------|-------------------------------------------|------------------------------------------------|---------------------|---------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| P   | 1        | Non-alloy steel                           | About 0.15% C                                  | Annealed            | 125     |                                                                                       |    |    |    |    |
|     | 2        |                                           | About 0.45% C                                  | Annealed            | 190     | 13                                                                                    |    |    |    |    |
|     | 3        |                                           | About 0.45% C                                  | Quenched & Tempered | 250     | 25                                                                                    |    |    |    |    |
|     | 4        |                                           | About 0.75% C                                  | Annealed            | 270     | 28                                                                                    |    |    |    |    |
|     | 5        |                                           | About 0.75% C                                  | Quenched & Tempered | 300     | 32                                                                                    |   |   |   |   |
|     | 6        | Low alloy steel                           |                                                | Annealed            | 180     | 10                                                                                    |  |  |  |  |
|     | 7        |                                           |                                                | Quenched & Tempered | 275     | 29                                                                                    |  |  |  |  |
|     | 8        |                                           |                                                | Quenched & Tempered | 300     | 32                                                                                    |  |  |  |  |
|     | 9        |                                           |                                                | Quenched & Tempered | 350     | 38                                                                                    |  |  |  |  |
|     | 10       | High alloyed steel, and tool steel        |                                                | Annealed            | 200     | 15                                                                                    |  |  |  |  |
| 11  |          |                                           | Quenched & Tempered                            | 325                 | 35      |  |  |  |  |                                                                                       |
| M   | 12       | Stainless steel                           | Ferritic / Martensitic                         | Annealed            | 200     | 15                                                                                    |  |  |  |  |
|     | 13       |                                           | Martensitic                                    | Quenched & Tempered | 240     | 23                                                                                    |  |  |  |  |
|     | 14       |                                           | Austenitic                                     |                     | 180     | 10                                                                                    |  |  |  |  |
| K   | 15       | Grey cast iron                            | Pearlitic / ferritic                           |                     | 180     | 10                                                                                    |  |  |  |  |
|     | 16       |                                           | Pearlitic (Martensitic)                        |                     | 260     | 26                                                                                    |  |  |  |  |
|     | 17       | Nodular cast iron                         | Ferritic                                       |                     | 160     | 3                                                                                     |  |  |  |  |
|     | 18       |                                           | Pearlitic                                      |                     | 250     | 25                                                                                    |  |  |  |  |
|     | 19       | Malleable cast iron                       | Ferritic                                       |                     | 130     |                                                                                       |  |  |  |  |
|     | 20       |                                           | Pearlitic                                      |                     | 230     | 21                                                                                    |  |  |  |  |
| N   | 21       | Aluminum-wrought alloy                    | Not Curable                                    |                     | 60      |                                                                                       |  |  |  |  |
|     | 22       |                                           | Curable Hardened                               |                     | 100     |                                                                                       |  |  |  |  |
|     | 23       | Aluminum-cast, alloyed                    | ≤ 12% Si, Not Curable                          |                     | 75      |                                                                                       |  |  |  |  |
|     | 24       |                                           | ≤ 12% Si, Curable Hardened                     |                     | 90      |                                                                                       |  |  |  |  |
|     | 25       |                                           | > 12% Si, Not Curable                          |                     | 130     |                                                                                       |  |  |  |  |
|     | 26       | Copper and Copper Alloys (Bronze / Brass) | Cutting Alloys, PB>1%                          |                     | 110     |                                                                                       |  |  |  |  |
|     | 27       |                                           | CuZn, CuSnZn (Brass)                           |                     | 90      |                                                                                       |  |  |  |  |
|     | 28       |                                           | CuSn, lead-free copper and electrolytic copper |                     | 100     |                                                                                       |  |  |  |  |
|     | 29       | Non Metallic Materials                    | Duroplastic, Fiber Reinforced Plastic          |                     |         |                                                                                       |  |  |  |  |
|     | 30       |                                           | Rubber, Wood, etc.                             |                     |         |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
| S   | 31       | Heat Resistant Super Alloys               | Fe Based                                       | Annealed            | 200     | 15                                                                                    |  |  |  |  |
|     | 32       |                                           |                                                | Cured               | 280     | 30                                                                                    |  |  |  |  |
|     | 33       |                                           |                                                | Annealed            | 250     | 25                                                                                    |  |  |  |  |
|     | 34       |                                           | Ni or Co Based                                 | Cured               | 350     | 38                                                                                    |  |  |  |  |
|     | 35       |                                           |                                                | Cast                | 320     | 34                                                                                    |  |  |  |  |
|     | 36       | Titanium Alloys                           | Pure Titanium                                  |                     | 400 Rm  |                                                                                       |  |  |  |  |
|     | 37       |                                           | Alpha + Beta Alloys                            | Hardened            | 1050 Rm |                                                                                       |  |  |  |  |
| H   | 38       | Hardened steel                            |                                                | Hardened            | 550     | 55                                                                                    |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|     | 39       |                                           |                                                | Hardened            | 630     | 60                                                                                    |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|     | 40       | Chilled Cast Iron                         |                                                | Cast                | 400     | 42                                                                                    |  |  |  |  |
|     | 41       | Hardened Cast Iron                        |                                                | Hardened            | 550     | 55                                                                                    |                                                                                       |                                                                                       |                                                                                       |                                                                                       |