

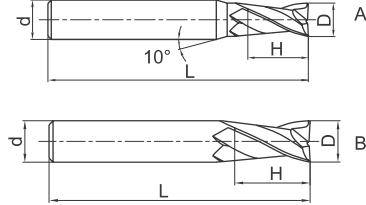
# Milling · Fräsen

Solid Carbide end mills · Vollhartmetallschaftfräser

2-flute flattened end mills with straight shank and long cutting edge  
2-Schneiden Eckfräser mit langer Schneide und Zylinderschaft



## PM-2EL



| Type<br>Typ  | Dimension (mm)<br>Abmessungen |    |    |     | Teeth<br>Zähne<br>Z | Geometry<br>Ausführung | Grade<br>Sorte<br>KMG 405 |
|--------------|-------------------------------|----|----|-----|---------------------|------------------------|---------------------------|
|              | D                             | d  | H  | L   |                     |                        |                           |
| PM-2EL-D3.0  | 3.0                           | 6  | 12 | 75  | 2                   | A                      | ●                         |
| PM-2EL-D4.0  | 4.0                           | 6  | 15 | 75  | 2                   | A                      | ●                         |
| PM-2EL-D5.0  | 5.0                           | 6  | 20 | 75  | 2                   | A                      | ●                         |
| PM-2EL-D6.0  | 6.0                           | 6  | 20 | 75  | 2                   | B                      | ●                         |
| PM-2EL-D8.0  | 8.0                           | 8  | 25 | 100 | 2                   | B                      | ●                         |
| PM-2EL-D10.0 | 10.0                          | 10 | 30 | 100 | 2                   | B                      | ●                         |
| PM-2EL-D12.0 | 12.0                          | 12 | 35 | 100 | 2                   | B                      | ●                         |
| PM-2EL-D14.0 | 14.0                          | 14 | 40 | 100 | 2                   | B                      | ●                         |
| PM-2EL-D16.0 | 16.0                          | 16 | 50 | 150 | 2                   | B                      | ●                         |
| PM-2EL-D20.0 | 20.0                          | 20 | 55 | 150 | 2                   | B                      | ●                         |

## Material Overview · Material Übersicht

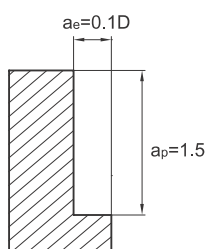
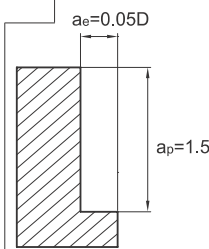
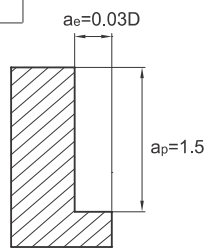
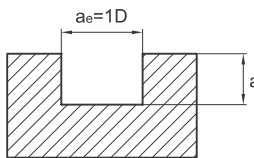
✓ = Very suitable · Sehr empfohlen  
✓ = Suitable · Empfohlen

| Workpiece material<br>Werkstückstoff |                                   |                                                      |        |                                      |        |                                             |                                                       |                               |                              |                                |                                          |
|--------------------------------------|-----------------------------------|------------------------------------------------------|--------|--------------------------------------|--------|---------------------------------------------|-------------------------------------------------------|-------------------------------|------------------------------|--------------------------------|------------------------------------------|
| Carbon steel<br>Kohlenstoff<br>Stahl | Alloy steel<br>Legierter<br>Stahl | Quenched and<br>tempered steel ·<br>Vergüteter Stahl |        | Hardened steel ·<br>Gehärteter Stahl |        | Stainless<br>steel ·<br>Rostfreier<br>Stahl | Cast iron,<br>Nodular<br>cast iron<br>Grauguss<br>GGG | Copper<br>alloy<br>Kupfer Leg | Aluminum<br>alloy<br>Alu Leg | Titanium<br>alloy<br>Titan Leg | Heat resist<br>alloy<br>warmfeste<br>Leg |
|                                      |                                   | ~40HRC                                               | ~50HRC | ~55HRC                               | ~68HRC |                                             |                                                       |                               |                              |                                |                                          |
| ✓                                    | ✓                                 | ✓                                                    | ✓      | ✓                                    |        | ✓                                           | ✓                                                     |                               |                              | ✓                              | ✓                                        |

● Ex Stock / ab Lager ○ On demand / auf Anfrage

### Recommended cutting data · Empfohlene Schnittdaten

#### PM-2E | PM-2EL

| Workpiece material<br>Werkstück-material | Cast iron,<br>Carbon steel, Alloy steel<br>Kohlenstoffstahl<br>Leg. Stahl<br>~30HRC                                                                                                                                          |                              | Stainless steel<br>Rostfreier Stahl          |                              | Pre-hardened steel,<br>Quenched and tempered steel<br>Vergüteter Stahl<br>~40HRC |                                                                                       | Pre-hardened steel,<br>Quenched and tempered steel<br>Vergüteter Stahl<br>~50HRC |                              | Hardened steel<br>Gehärteter Stahl<br>~55HRC |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------|------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------|----------------------------------------------|------------------------------|-------|---------|------|----------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--------------|-------------|---|----|---------|------|------|------|
| Diameter Ø<br>Durchmesse<br>(mm)         | Rotating<br>Drehzahl<br>(min <sup>-1</sup> )                                                                                                                                                                                 | Feed<br>Vorschub<br>(mm/min) | Rotating<br>Drehzahl<br>(min <sup>-1</sup> ) | Feed<br>Vorschub<br>(mm/min) | Rotating<br>Drehzahl<br>(min <sup>-1</sup> )                                     | Feed<br>Vorschub<br>(mm/min)                                                          | Rotating<br>Drehzahl<br>(min <sup>-1</sup> )                                     | Feed<br>Vorschub<br>(mm/min) | Rotating<br>Drehzahl<br>(min <sup>-1</sup> ) | Feed<br>Vorschub<br>(mm/min) |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 1                                        | 20000                                                                                                                                                                                                                        | 200                          | 20000                                        | 60                           | 20000                                                                            | 165                                                                                   | 20000                                                                            | 120                          | 20000                                        | 90                           |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 2                                        | 15000                                                                                                                                                                                                                        | 320                          | 11150                                        | 85                           | 15000                                                                            | 285                                                                                   | 13000                                                                            | 180                          | 11140                                        | 130                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 3                                        | 14000                                                                                                                                                                                                                        | 545                          | 7500                                         | 120                          | 10600                                                                            | 420                                                                                   | 8500                                                                             | 330                          | 7430                                         | 240                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 4                                        | 10800                                                                                                                                                                                                                        | 560                          | 5500                                         | 135                          | 8000                                                                             | 425                                                                                   | 6500                                                                             | 335                          | 5570                                         | 245                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 5                                        | 8200                                                                                                                                                                                                                         | 585                          | 4500                                         | 135                          | 6400                                                                             | 445                                                                                   | 5000                                                                             | 355                          | 4460                                         | 260                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 6                                        | 7000                                                                                                                                                                                                                         | 600                          | 3700                                         | 140                          | 5300                                                                             | 465                                                                                   | 4200                                                                             | 360                          | 3710                                         | 260                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 8                                        | 5200                                                                                                                                                                                                                         | 595                          | 2800                                         | 140                          | 4000                                                                             | 455                                                                                   | 3200                                                                             | 365                          | 2785                                         | 270                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 10                                       | 4200                                                                                                                                                                                                                         | 585                          | 2200                                         | 140                          | 3200                                                                             | 445                                                                                   | 2500                                                                             | 350                          | 2230                                         | 250                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 12                                       | 3500                                                                                                                                                                                                                         | 585                          | 1850                                         | 140                          | 2650                                                                             | 445                                                                                   | 2100                                                                             | 350                          | 1855                                         | 250                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 14                                       | 3000                                                                                                                                                                                                                         | 545                          | 1600                                         | 135                          | 2300                                                                             | 420                                                                                   | 1800                                                                             | 330                          | 1590                                         | 240                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 16                                       | 2600                                                                                                                                                                                                                         | 545                          | 1400                                         | 120                          | 2000                                                                             | 420                                                                                   | 1600                                                                             | 330                          | 1390                                         | 240                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 18                                       | 2300                                                                                                                                                                                                                         | 535                          | 1250                                         | 120                          | 1800                                                                             | 415                                                                                   | 1400                                                                             | 325                          | 1240                                         | 235                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| 20                                       | 2050                                                                                                                                                                                                                         | 535                          | 1100                                         | 120                          | 1600                                                                             | 415                                                                                   | 1250                                                                             | 325                          | 1115                                         | 235                          |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Max. cutting depth<br>max Schnitttiefe   |                                                                                                                                           |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
|                                          |                                                                                                                                          |                              |                                              |                              |                                                                                  |  |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
|                                          |                                                                                                                                           |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
|                                          | <table><tr><th>Milling slot</th><th>Nutenfräsen</th></tr><tr><th>Ø</th><th>Ap</th></tr><tr><td>Ø1≤D&lt;Ø3</td><td>0.15D</td></tr><tr><td>Ø3≤D&lt;Ø6</td><td>0.3D</td></tr><tr><td>Ø6≤D&lt;Ø20</td><td>0.5D</td></tr></table> |                              |                                              |                              |                                                                                  | Milling slot                                                                          | Nutenfräsen                                                                      | Ø                            | Ap                                           | Ø1≤D<Ø3                      | 0.15D | Ø3≤D<Ø6 | 0.3D | Ø6≤D<Ø20 | 0.5D | <table><tr><th>Milling slot</th><th>Nutenfräsen</th></tr><tr><th>Ø</th><th>Ap</th></tr><tr><td>Ø1≤D&lt;Ø3</td><td>0.1D</td></tr><tr><td>Ø3≤D</td><td>0.2D</td></tr></table> |  |  |  |  | Milling slot | Nutenfräsen | Ø | Ap | Ø1≤D<Ø3 | 0.1D | Ø3≤D | 0.2D |
| Milling slot                             | Nutenfräsen                                                                                                                                                                                                                  |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø                                        | Ap                                                                                                                                                                                                                           |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø1≤D<Ø3                                  | 0.15D                                                                                                                                                                                                                        |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø3≤D<Ø6                                  | 0.3D                                                                                                                                                                                                                         |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø6≤D<Ø20                                 | 0.5D                                                                                                                                                                                                                         |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Milling slot                             | Nutenfräsen                                                                                                                                                                                                                  |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø                                        | Ap                                                                                                                                                                                                                           |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø1≤D<Ø3                                  | 0.1D                                                                                                                                                                                                                         |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
| Ø3≤D                                     | 0.2D                                                                                                                                                                                                                         |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |
|                                          |                                                                                                                                                                                                                              |                              |                                              |                              |                                                                                  |                                                                                       |                                                                                  |                              |                                              |                              |       |         |      |          |      |                                                                                                                                                                             |  |  |  |  |              |             |   |    |         |      |      |      |

- The above table shows the standard value of side milling. When slot milling, of rotating speed 50%~70% and feed rate like mentioned above 40%~60%.
- Please select high precise machine and tool holder.
- Please use air blow or cutting liquid with high mist retardant property.
- Down milling is recommended in side milling.
- Vibration and unusual noise may be generated if the machine rigidity and workpiece fixture stability is low, please reduce the rotating speed and feed rate like mentioned above.
- Make overhang as short as possible if no interference.

- Die obige Tabelle zeigt Standard Werte für das Eckfräsen. Bei Nutenfräsen, Schnittgeschwindigkeit auf 50-70% und den Vorschub auf 40-60% reduzieren.
- Bitte präzise Maschinen und Werkzeughalter verwenden.
- Bitte Luftkühlung oder Schneidflüssigkeit benutzen.
- Empfohlene Fräsmethode: Gleichlaufräsen.
- Bei Vibrationen oder unüblichen Geräuschen reduzieren Sie die Schnittdaten (wie oben empfohlen) entsprechend.
- Werkzeugauskragung so kurz wie möglich wählen.