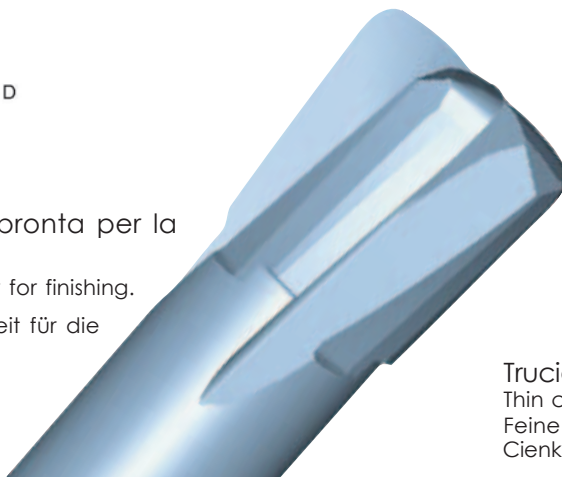


Superficie semi-finita, pronta per la finitura.

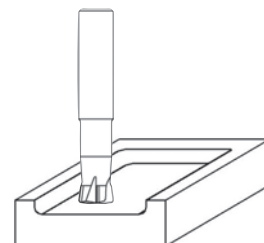
Semi-finished surface, ready for finishing.

Halfertige Oberfläche, bereit für die Fertigbearbeitung.

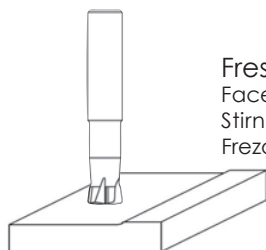
Powierzchnia po obróbce średnio dokładnej przygotowana pod obróbkę wykończeniową.



Fresatura di tasca  
Pocketing  
Taschenfräsen  
Wybieranie "kieszoni".

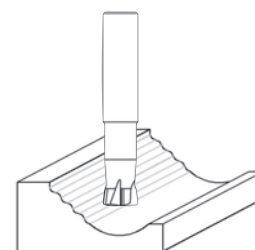


Trucioli sottili, minore sforzo di taglio  
Thin chips, less cutting forces.  
Feine Späne, geringere Schnittkräfte  
Cienki wiór, mniejsze siły skrawania.



Fresatura frontale  
Face Milling  
Stirnfräsen  
Frezowanie czółowe.

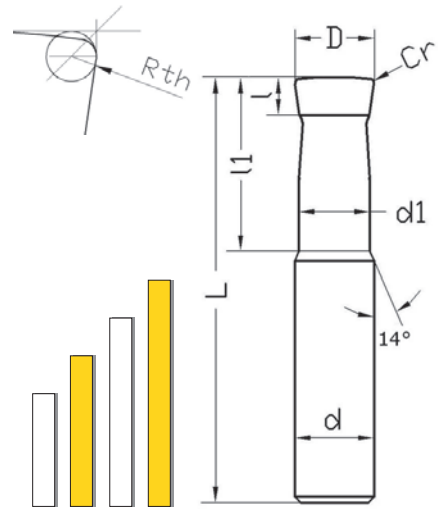
Fresatura a copiare  
3D copy milling  
Kopierfräsen  
Kopowanie 3D.



| HRC < 52 |       |        |         |       |        |         |       |        |         | HRC < 56 |        |         |       |        |         |       |        |        |  |  |
|----------|-------|--------|---------|-------|--------|---------|-------|--------|---------|----------|--------|---------|-------|--------|---------|-------|--------|--------|--|--|
| HMC 04W  |       |        | HMC 08W |       |        | HMC 09W |       |        | HMC 04w |          |        | HMC 08w |       |        | HMC 09w |       |        |        |  |  |
|          |       |        |         |       |        |         |       |        |         |          |        |         |       |        |         |       |        |        |  |  |
| m/min    |       |        | Vc 150  |       |        | Vc 150  |       |        | Vc 150  |          |        | Vc 120  |       |        | Vc 120  |       |        | Vc 120 |  |  |
| D        | fz    | F      | n       | fz    | F      | n       | fz    | F      | n       | fz       | F      | n       | fz    | F      | n       | fz    | F      | n      |  |  |
| mm       | mm/z  | mm/min | min     | mm/z  | mm/min | min     | mm/z  | mm/min | min     | mm/z     | mm/min | min     | mm/z  | mm/min | min     | mm/z  | mm/min | min    |  |  |
| 4,0      | 0,202 | 4800   | 11900   | 0,305 | 14500  | 11900   | 0,183 | 8700   | 11900   | 0,147    | 2800   | 9500    | 0,200 | 7600   | 9500    | 0,120 | 4560   | 9500   |  |  |
| 6,0      | 0,200 | 3200   | 8000    | 0,394 | 12600  | 8000    | 0,236 | 7560   | 8000    | 0,148    | 1900   | 6400    | 0,195 | 5000   | 6400    | 0,117 | 3000   | 6400   |  |  |
| 8,0      | 0,200 | 2400   | 6000    | 0,396 | 9500   | 6000    | 0,238 | 5700   | 6000    | 0,146    | 1400   | 4800    | 0,198 | 3800   | 4800    | 0,119 | 2280   | 4800   |  |  |
| 10,0     | 0,198 | 1900   | 4800    | 0,401 | 7700   | 4800    | 0,241 | 4620   | 4800    | 0,151    | 1150   | 3800    | 0,204 | 3100   | 3800    | 0,122 | 1860   | 3800   |  |  |
| 12,0     | 0,200 | 1600   | 4000    | 0,400 | 6400   | 4000    | 0,240 | 3840   | 4000    | 0,148    | 950    | 3200    | 0,195 | 2500   | 3200    | 0,117 | 1500   | 3200   |  |  |
| 16,0     | 0,200 | 1200   | 3000    | 0,400 | 4800   | 3000    | 0,240 | 2880   | 3000    | 0,146    | 700    | 2400    | 0,198 | 1900   | 2400    |       |        |        |  |  |

| HRC < 60 |       |        |         |       |        |         |       |        |        |  |  |  |  |  |
|----------|-------|--------|---------|-------|--------|---------|-------|--------|--------|--|--|--|--|--|
| HMC 04w  |       |        | HMC 08w |       |        | HMC 09w |       |        |        |  |  |  |  |  |
|          |       |        |         |       |        |         |       |        |        |  |  |  |  |  |
| m/min    |       |        | Vc 100  |       |        | Vc 100  |       |        | Vc 100 |  |  |  |  |  |
| D        | fz    | F      | n       | fz    | F      | n       | fz    | F      | n      |  |  |  |  |  |
| mm       | mm/z  | mm/min | min     | mm/z  | mm/min | min     | mm/z  | mm/min | min    |  |  |  |  |  |
| 4,0      | 0,103 | 1650   | 8000    | 0,097 | 3100   | 8000    | 0,058 | 1860   | 8000   |  |  |  |  |  |
| 6,0      | 0,099 | 1050   | 5300    | 0,099 | 2100   | 5300    | 0,059 | 1260   | 5300   |  |  |  |  |  |
| 8,0      | 0,100 | 800    | 4000    | 0,100 | 1600   | 4000    | 0,060 | 960    | 4000   |  |  |  |  |  |
| 10,0     | 0,102 | 650    | 3200    | 0,102 | 1300   | 3200    | 0,061 | 780    | 3200   |  |  |  |  |  |
| 12,0     | 0,100 | 550    | 2600    | 0,100 | 1100   | 2600    | 0,063 | 660    | 2600   |  |  |  |  |  |
| 16,0     | 0,100 | 400    | 2000    | 0,100 | 800    | 2000    |       |        |        |  |  |  |  |  |



### 04w

Frese per elevati avanzamenti

- Ultra Fine
- 
- Silmax Norm
- $\lambda 0^\circ$
- 
- Cr



### 08w 09w

Frese per elevati avanzamenti

- Ultra Fine
- 
- Silmax Norm
- $\lambda 0^\circ$
- 
- Cr



HRC

|     |    |      |     |    |    | X.Ceed |        |     |     |   | X.Ceed |        |     |     |   |
|-----|----|------|-----|----|----|--------|--------|-----|-----|---|--------|--------|-----|-----|---|
| D   | d  | d1   | L   | l  | l1 | 04w    | HMC    | Rth | Cr  | Z | 08w    | HMC    | Rth | Cr  | Z |
| h10 | h6 |      |     |    |    |        | €      |     |     |   |        | €      |     |     |   |
| 3   | 6  | 2,6  | 57  | 3  | 8  |        |        |     |     |   | 08w030 | 120,70 | 0,4 | 0,3 | 4 |
| 4   | 6  | 3,6  | 57  | 3  | 11 | 04w040 | 87,40  | 0,6 | 0,5 | 2 | 08w040 | 104,90 | 0,6 | 0,5 | 4 |
| 5   | 6  | 4,6  | 57  | 4  | 15 |        |        |     |     |   | 08w050 | 117,60 | 0,6 | 0,5 | 4 |
| 6   | 6  | 5,6  | 57  | 5  | 18 | 04w060 | 85,10  | 0,7 | 0,6 | 2 | 08w060 | 102,20 | 0,7 | 0,6 | 4 |
| 7   | 8  | 6,4  | 63  | 5  | 21 |        |        |     |     |   | 08w070 | 157,10 | 0,8 | 0,6 | 4 |
| 8   | 8  | 7,3  | 63  | 6  | 24 | 04w080 | 113,70 | 0,8 | 0,6 | 2 | 08w080 | 136,60 | 0,8 | 0,6 | 4 |
| 9   | 10 | 8,2  | 72  | 6  | 28 |        |        |     |     |   | 08w090 | 204,30 | 0,9 | 0,7 | 4 |
| 10  | 10 | 9,0  | 72  | 7  | 32 | 04w100 | 148,00 | 1,0 | 0,7 | 2 | 08w100 | 177,60 | 1,0 | 0,7 | 4 |
| 12  | 12 | 11,0 | 81  | 8  | 36 | 04w120 | 189,70 | 1,2 | 0,8 | 2 | 08w120 | 227,70 | 1,2 | 0,8 | 4 |
| 16  | 16 | 14,4 | 92  | 10 | 44 | 04w160 | 293,70 | 1,7 | 1,0 | 2 | 08w160 | 352,50 | 1,7 | 1,0 | 4 |
|     |    |      |     |    |    | X.Ceed |        |     |     |   | X.Ceed |        |     |     |   |
| D   | d  | d1   | L   | l  | l1 | 09w    | HMC    | Rth | Cr  | Z | 09w    | HMC    | Rth | Cr  | Z |
| h10 | h6 |      |     |    |    |        | €      |     |     |   | Lunga  | €      |     |     |   |
| 3   | 6  | 2,6  | 78  | 3  | 8  |        |        |     |     |   | 09w030 | 132,80 | 0,4 | 0,3 | 4 |
| 4   | 6  | 3,6  | 78  | 3  | 11 |        |        |     |     |   | 09w040 | 115,40 | 0,6 | 0,5 | 4 |
| 5   | 6  | 4,6  | 78  | 4  | 15 |        |        |     |     |   | 09w050 | 129,30 | 0,6 | 0,5 | 4 |
| 6   | 6  | 5,6  | 78  | 5  | 18 |        |        |     |     |   | 09w060 | 112,40 | 0,7 | 0,6 | 4 |
| 7   | 8  | 6,4  | 92  | 5  | 21 |        |        |     |     |   | 09w070 | 173,00 | 0,8 | 0,6 | 4 |
| 8   | 8  | 7,3  | 92  | 6  | 24 |        |        |     |     |   | 09w080 | 150,20 | 0,8 | 0,6 | 4 |
| 9   | 10 | 8,2  | 105 | 6  | 28 |        |        |     |     |   | 09w090 | 224,80 | 0,9 | 0,7 | 4 |
| 10  | 10 | 9,0  | 105 | 7  | 32 |        |        |     |     |   | 09w100 | 195,40 | 1,0 | 0,7 | 4 |
| 12  | 12 | 11,0 | 105 | 8  | 36 |        |        |     |     |   | 09w120 | 250,50 | 1,2 | 0,8 | 4 |

| AIR<br>Pag.251 |     | PARAMETRI DI TAGLIO (Cutting data) Pag.40 |          |          |          |        |
|----------------|-----|---|----------|----------|----------|--------|
|                |     | HRC < 40                                  | HRC < 52 | HRC < 56 | HRC < 60 |        |
| 04w            | HMC | ●   | -        | Vc 150   | Vc 120   | Vc 100 |
| 08w            | HMC | ●   | -        | Vc 150   | Vc 120   | Vc 100 |

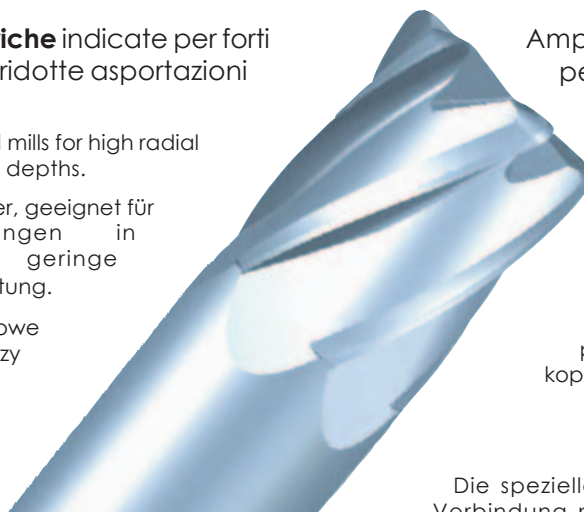


Frese **multitaglienti toriche** indicate per forti asportazioni radiali e ridotte asportazioni assiali.

Multicut corner radius end mills for high radial infeeds and limited axial depths.

Mehrschneidige Torusfräser, geeignet für große Spanabhebungen in Radialrichtung und geringe Abhebungen in Axialrichtung.

Toroidalne frezy wielostrzowe przeznaczone do pracy przy dużych naddatkach promieniowych i zmniejszonych naddatkach osiowych.



Ampia **gamma di corner radius** per lavorazioni di copiatura nel settore degli stampi.

Wide corner radius range for copy milling in mould production.

Große Auswahl an Eckenradien für das Kopierfräsen im Formenbau.

Szeroka gama dostępnych promieni naroży. Wykorzystywane do kopiowania, oraz produkcji form.

La particolare geometria dei corner radius unita alla **micrograna ultrafine** di base, garantisce a questi utensili una eccellente resistenza all'usura.

Die spezielle Geometrie der Eckenradien in Verbindung mit dem Ultrafeinkorn-Hartmetall garantiert hohe Verschleißfestigkeit der Werkzeuge.

Specjalna geometria naroży w połączeniu z ultra drobnym ziarnem węglika daje narzędzie o doskonałej odporności na zużycie.

The special corner radius geometry, along with the ultrafine hard metal grade, gives the tool an excellent wear resistance

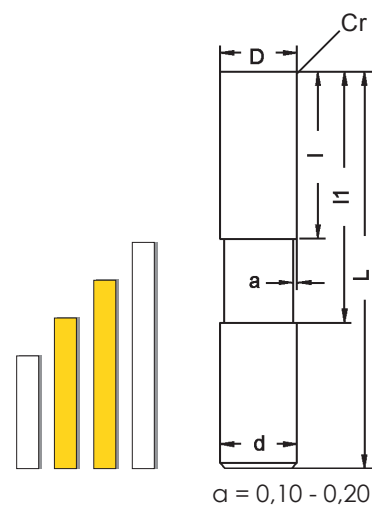
Serie Lunga , Long, Lang, Długa  
HMG 144 F-15%, n-15%

| HRC < 52 |       |        |      |        |        |      |        |        |       | HRC < 56 |       |        |      |        |        |      |  |
|----------|-------|--------|------|--------|--------|------|--------|--------|-------|----------|-------|--------|------|--------|--------|------|--|
| HMC 142  |       |        |      |        |        |      |        |        |       | HMC 142  |       |        |      |        |        |      |  |
|          |       |        |      |        |        |      |        |        |       |          |       |        |      |        |        |      |  |
| m/min    | Vc 91 |        |      | Vc 113 |        |      | Vc 206 |        |       |          | Vc 99 |        |      | Vc 165 |        |      |  |
| D        | fz    | F      | n    | fz     | F      | n    | fz     | F      | n     |          | fz    | F      | n    | fz     | F      | n    |  |
| mm       | mm/z  | mm/min | min  | mm/z   | mm/min | min  | mm/z   | mm/min | min   |          | mm/z  | mm/min | min  | mm/z   | mm/min | min  |  |
| 6,0      | 0,020 | 385    | 4817 | 0,042  | 1003   | 5971 | 0,054  | 2365   | 10947 |          | 0,028 | 589    | 5255 | 0,036  | 1261   | 8758 |  |
| 8,0      | 0,034 | 497    | 3613 | 0,056  | 1010   | 4479 | 0,068  | 2246   | 8211  |          | 0,042 | 668    | 3941 | 0,050  | 1324   | 6568 |  |
| 10,0     | 0,046 | 526    | 2890 | 0,068  | 968    | 3583 | 0,080  | 2090   | 6568  |          | 0,054 | 675    | 3153 | 0,062  | 1294   | 5255 |  |
| 12,0     | 0,055 | 790    | 2408 | 0,077  | 1373   | 2986 | 0,089  | 2912   | 5474  |          | 0,063 | 988    | 2627 | 0,071  | 1856   | 4379 |  |
| 16,0     | 0,069 | 748    | 1806 | 0,091  | 1223   | 2239 | 0,103  | 2538   | 4105  |          | 0,077 | 911    | 1971 | 0,085  | 1676   | 3284 |  |
| HRC < 60 |       |        |      |        |        |      |        |        |       |          |       |        |      |        |        |      |  |
| HMC 142  |       |        |      |        |        |      |        |        |       |          |       |        |      |        |        |      |  |
|          |       |        |      |        |        |      |        |        |       |          |       |        |      |        |        |      |  |
| m/min    | Vc 50 |        |      | Vc 83  |        |      |        |        |       |          |       |        |      |        |        |      |  |
| D        | fz    | F      | n    | fz     | F      | n    |        |        |       |          |       |        |      |        |        |      |  |
| mm       | mm/z  | mm/min | min  | mm/z   | mm/min | min  |        |        |       |          |       |        |      |        |        |      |  |
| 6,0      |       |        |      | 0,021  | 221    | 2627 | 0,027  | 473    | 4379  |          |       |        |      |        |        |      |  |
| 8,0      |       |        |      | 0,035  | 279    | 1971 | 0,041  | 544    | 3284  |          |       |        |      |        |        |      |  |
| 10,0     |       |        |      | 0,047  | 293    | 1576 | 0,053  | 552    | 2627  |          |       |        |      |        |        |      |  |
| 12,0     |       |        |      | 0,056  | 439    | 1314 | 0,062  | 810    | 2189  |          |       |        |      |        |        |      |  |
| 16,0     |       |        |      | 0,070  | 414    | 985  | 0,076  | 749    | 1642  |          |       |        |      |        |        |      |  |



# 142 Frese toriche

# 144 Frese toriche



- Ultra Fine
- 
- Silmax Norm
- λ 30°
- 
- Cr



- Ultra Fine
- 
- Silmax Norm
- λ 30°
- 
- Cr



HRC

|    |    |    |    |     |            | X.Ceed |        | X.Hard |  |  |
|----|----|----|----|-----|------------|--------|--------|--------|--|--|
| D  | d  | L  | l  | Cr  | 142        | HMC    | HMH    | Z      |  |  |
| e8 | h6 |    |    |     |            | €      | €      |        |  |  |
| 3  | 3  | 50 | 4  | 0,3 | 142030Cr03 | 35,00  | 39,00  | 4      |  |  |
| 4  | 4  | 50 | 5  | 0,3 | 142040Cr03 | 39,00  | 43,00  | 4      |  |  |
| 5  | 5  | 50 | 6  | 0,5 | 142050Cr05 | 43,30  | 47,30  | 4      |  |  |
| 6  | 6  | 57 | 7  | 0,5 | 142060Cr05 | 48,90  | 52,90  | 4      |  |  |
| 6  | 6  | 57 | 7  | 1,0 | 142060Cr10 | 48,90  | 52,90  | 4      |  |  |
| 8  | 8  | 63 | 9  | 0,5 | 142080Cr05 | 65,90  | 72,90  | 4      |  |  |
| 8  | 8  | 63 | 9  | 1,0 | 142080Cr10 | 65,90  | 72,90  | 4      |  |  |
| 10 | 10 | 72 | 11 | 1,0 | 142100Cr10 | 101,80 | 108,80 | 4      |  |  |
| 10 | 10 | 72 | 11 | 1,5 | 142100Cr15 | 101,80 | 108,80 | 4      |  |  |
| 12 | 12 | 81 | 12 | 1,5 | 142120Cr15 | 134,80 | 141,80 | 6      |  |  |
| 16 | 16 | 86 | 16 | 1,5 | 142160Cr15 | 242,00 | 254,00 | 6      |  |  |

|    |    |     |    |    |     | X.Ceed |  | X.Hard |            |        |        |   |
|----|----|-----|----|----|-----|--------|--|--------|------------|--------|--------|---|
| D  | d  | L   | l  | l1 | Cr  | 144    |  |        | HMC        | HMH    | Z      |   |
| e8 | h6 |     |    |    |     |        |  |        | €          | €      |        |   |
| 3  | 6  | 80  | 4  |    | 0,3 |        |  |        | 144030Cr03 | 54,70  | 58,70  | 4 |
| 4  | 6  | 80  | 5  |    | 0,3 |        |  |        | 144040Cr03 | 58,80  | 62,80  | 4 |
| 5  | 6  | 80  | 6  |    | 0,5 |        |  |        | 144050Cr05 | 62,80  | 66,80  | 4 |
| 6  | 6  | 80  | 7  | 17 | 0,5 |        |  |        | 144060Cr05 | 61,60  | 65,60  | 4 |
| 6  | 6  | 80  | 7  | 17 | 1,0 |        |  |        | 144060Cr10 | 61,60  | 65,60  | 4 |
| 8  | 8  | 80  | 9  | 19 | 0,5 |        |  |        | 144080Cr05 | 76,20  | 83,20  | 4 |
| 8  | 8  | 80  | 9  | 19 | 1,0 |        |  |        | 144080Cr10 | 76,20  | 83,20  | 4 |
| 10 | 10 | 108 | 11 | 31 | 1,0 |        |  |        | 144100Cr10 | 122,00 | 129,00 | 4 |
| 10 | 10 | 108 | 11 | 31 | 1,5 |        |  |        | 144100Cr15 | 122,00 | 129,00 | 4 |
| 12 | 12 | 108 | 12 | 32 | 1,5 |        |  |        | 144120Cr15 | 147,60 | 154,60 | 6 |
| 16 | 16 | 120 | 16 | 36 | 1,5 |        |  |        | 144160Cr15 | 252,30 | 264,30 | 6 |

|     |     | PARAMETRI DI TAGLIO (Cutting data) Pag.42 |          |          |
|-----|-----|---|----------|----------|
|     |     | HRC < 52                                  | HRC < 56 | HRC < 60 |
| 142 | HMC | Vc 91                                     | --       | --       |
|     |     | Vc 113                                    | Vc 99    | Vc 50    |
|     |     | Vc 206                                    | Vc 165   | Vc 83    |
| 144 | HMC | Vc 77                                     | --       | --       |
|     |     | Vc 96                                     | Vc 84    | Vc 42    |
|     |     | Vc 175                                    | Vc 140   | Vc 70    |



# 043 - 143 - 145

HRC

► Affilatura dello **spigolo frontale** progettata per prevenire scheggiature

Cutting edges developed to avoid chipping at corners

Der spezielle Schliff der Stirnkante verhindert Absplitterungen.

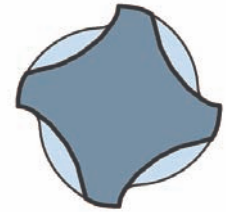
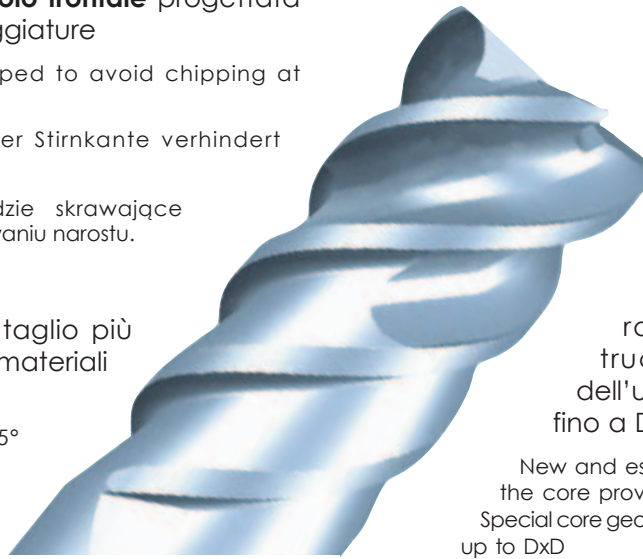
Rozbudowane krawędzie skrawające zapobiegające powstawaniu narostu.

**Elica a 52°** per un taglio più morbido anche dei materiali temprati.

52° elix, rake angle -15° featuring good performance when machining hardened steels

52° Spirale für weicheren Schnitt auch bei gehärteten Werkstoffen.

Kąt pochylenia linii śrubowej 52° umożliwia "miękkie" skrawanie także materiałów utwardzonych.



**Doppia geometria** del nucleo con assottigliamento frontale, per una rapida evacuazione del truciolo massima rigidità dell'utensile per lavorare in cava fino a DxD.

New and especially developed geometry of the core providing a very good chip removal. Special core geometry to machine slots and pockets up to DxD

Doppelgeometrie des Kerns mit stirnseitiger Verjüngung für schnelle Spanabfuhr. Höchste Werkzeugsteifigkeit bei der Nutenbearbeitung bis DxD

Podwójna geometria rdzenia wraz ze specjalnym ostrzeniem pozwala na szybką ewakuację wióra. Umożliwia to wykonywanie rowków DxD przy zachowaniu odpowiedniej sztywności narzędzia.

| HRC < 52 |       |        |      | HRC < 56 |        |      |       | HRC < 60 |      |       |        |      |       |        |     |      |
|----------|-------|--------|------|----------|--------|------|-------|----------|------|-------|--------|------|-------|--------|-----|------|
| HMC 043  |       |        |      | HMC 043  |        |      |       | HMC 043  |      |       |        |      |       |        |     |      |
|          |       |        |      |          |        |      |       |          |      |       |        |      |       |        |     |      |
| m/min    | Vc 50 |        |      | Vc 96    |        |      | Vc 20 |          |      | Vc 78 |        |      | Vc 20 |        |     |      |
| D        | fz    | F      | n    | fz       | F      | n    | fz    | F        | n    | fz    | F      | n    | fz    | F      | n   |      |
| mm       | mm/z  | mm/min | min  | mm/z     | mm/min | min  | mm/z  | mm/min   | min  | mm/z  | mm/min | min  | mm/z  | mm/min | min |      |
| 6,0      | 0,024 | 255    | 2654 | 0,024    | 489    | 5096 | 0,016 | 68       | 1062 | 0,016 | 265    | 4140 |       | 0,012  | 52  | 1083 |
| 8,0      | 0,036 | 283    | 1990 | 0,036    | 543    | 3822 | 0,028 | 88       | 796  | 0,028 | 342    | 3105 |       | 0,024  | 76  | 812  |
| 10,0     | 0,044 | 283    | 1592 | 0,044    | 543    | 3057 | 0,036 | 93       | 637  | 0,036 | 362    | 2484 |       | 0,032  | 84  | 650  |
| 12,0     | 0,052 | 275    | 1327 | 0,052    | 527    | 2548 | 0,044 | 93       | 531  | 0,044 | 362    | 2070 |       | 0,040  | 86  | 541  |
| 16,0     | 0,063 | 252    | 995  | 0,063    | 483    | 1911 | 0,055 | 88       | 398  | 0,055 | 343    | 1553 |       | 0,051  | 83  | 406  |
| 20,0     | 0,072 | 230    | 796  | 0,072    | 441    | 1529 | 0,064 | 82       | 318  | 0,064 | 319    | 1242 |       | 0,060  | 78  | 325  |

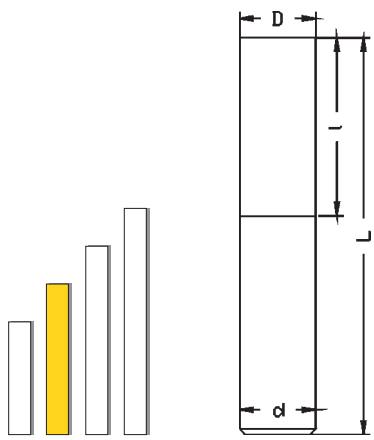
  

| HRC < 52 |        |        |       | HRC < 56 |        |      |        | HRC < 60 |      |       |        |         |       |        |      |       |        |      |
|----------|--------|--------|-------|----------|--------|------|--------|----------|------|-------|--------|---------|-------|--------|------|-------|--------|------|
| HMC 143  |        |        |       | HMC 145  |        |      |        | HMC 143  |      |       |        | HMC 145 |       |        |      |       |        |      |
|          |        |        |       |          |        |      |        |          |      |       |        |         |       |        |      |       |        |      |
| m/min    | Vc 243 |        |       | Vc 49    |        |      | Vc 180 |          |      | Vc 39 |        |         | Vc 65 |        |      | Vc 20 |        |      |
| D        | fz     | F      | n     | fz       | F      | n    | fz     | F        | n    | fz    | F      | n       | fz    | F      | n    | fz    | F      | n    |
| mm       | mm/z   | mm/min | min   | mm/z     | mm/min | min  | mm/z   | mm/min   | min  | mm/z  | mm/min | min     | mm/z  | mm/min | min  | mm/z  | mm/min | min  |
| 6,0      | 0,030  | 2322   | 12898 | 0,030    | 466    | 2588 | 0,020  | 1146     | 9554 | 0,020 | 248    | 2070    | 0,015 | 310    | 3439 | 0,015 | 93     | 1035 |
| 8,0      | 0,042  | 2409   | 9674  | 0,042    | 483    | 1941 | 0,032  | 1355     | 7166 | 0,032 | 293    | 1553    | 0,027 | 410    | 2580 | 0,027 | 123    | 776  |
| 10,0     | 0,050  | 2342   | 7739  | 0,050    | 470    | 1553 | 0,040  | 1391     | 5732 | 0,040 | 301    | 1242    | 0,035 | 439    | 2064 | 0,035 | 132    | 621  |
| 12,0     | 0,058  | 2234   | 6449  | 0,058    | 448    | 1294 | 0,048  | 1368     | 4777 | 0,048 | 296    | 1035    | 0,043 | 441    | 1720 | 0,043 | 133    | 518  |
| 16,0     | 0,069  | 2009   | 4837  | 0,069    | 403    | 970  | 0,059  | 1273     | 3583 | 0,059 | 276    | 776     | 0,054 | 420    | 1290 | 0,054 | 126    | 388  |

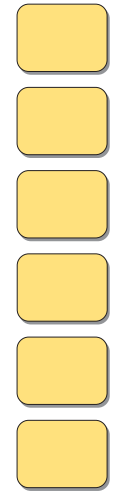


# 043

Frese per la sgrossatura di materiali temprati



- Ultra Fine
- 
- Silmax Norm
- $\lambda 52^\circ$   
 $\gamma -15^\circ$
- 
- 90°



HRC

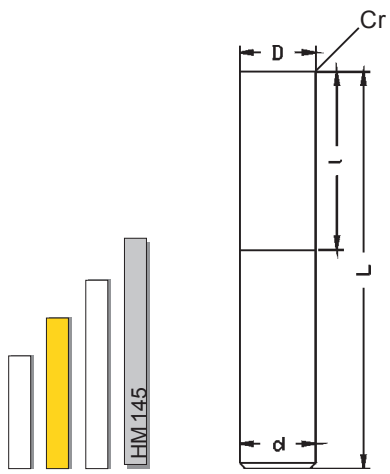
| D  | d  | L   | l  | 043    | X.Ceed | X.Hard | Z |  |  |  |
|----|----|-----|----|--------|--------|--------|---|--|--|--|
|    |    |     |    |        | HMC    | HMH    |   |  |  |  |
| e8 | h6 |     |    |        | €      | €      |   |  |  |  |
| 6  | 6  | 57  | 13 | 043060 | 55,70  | 59,70  | 4 |  |  |  |
| 8  | 8  | 63  | 19 | 043080 | 75,30  | 82,30  | 4 |  |  |  |
| 10 | 10 | 72  | 22 | 043100 | 110,60 | 117,60 | 4 |  |  |  |
| 12 | 12 | 81  | 26 | 043120 | 136,90 | 143,90 | 4 |  |  |  |
| 16 | 16 | 86  | 32 | 043160 | 251,20 | 263,20 | 4 |  |  |  |
| 20 | 20 | 108 | 38 | 043200 | 383,60 | 395,60 | 4 |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
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|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |

|            |            | PARAMETRI DI TAGLIO (Cutting data) Pag.44 |   |                |                |             |
|------------|------------|---|---|----------------|----------------|-------------|
|            |            |   |   | HRC < 52       | HRC < 56       | HRC < 60    |
| <b>043</b> | <b>HMC</b> | ●   | ● | Vc 50<br>Vc 96 | Vc 20<br>Vc 78 | --<br>Vc 20 |
|            |            |   |   |                |                |             |
|            |            |   |   |                |                |             |
|            |            |   |   |                |                |             |



### 143 Frese per la finitura di acciai temperati

### 143 Cr Frese per la finitura di acciai temperati con Comer Radius



- Ultra Fine
- Silmax Norm
- $\lambda 45^\circ$   
 $\gamma-10^\circ$
- 90°



- Ultra Fine
- Silmax Norm
- $\lambda 45^\circ$   
 $\gamma-10^\circ$
- Cr



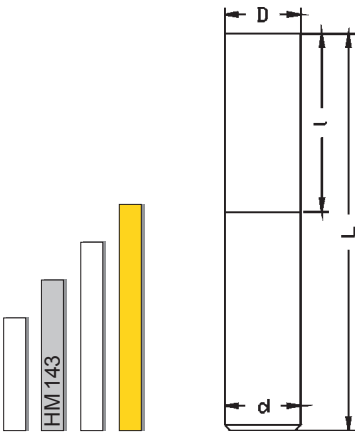
| D  | d  | L  | l  | Cr  | 143    | X.Ceed |        |   | Cr         | x.Hard |        |   |
|----|----|----|----|-----|--------|--------|--------|---|------------|--------|--------|---|
|    |    |    |    |     |        | HMC    | HMH    | Z |            | HMC    | HMH    | Z |
| e8 | h6 |    |    |     |        | €      | €      |   |            | €      | €      |   |
| 3  | 6  | 57 | 7  |     | 143030 | 48,70  | 52,70  | 6 |            |        |        |   |
| 3  | 6  | 57 | 7  | 0,3 |        |        |        |   | 143030Cr03 | 54,10  | 58,10  | 6 |
| 4  | 6  | 57 | 9  |     | 143040 | 51,50  | 55,50  | 6 |            |        |        |   |
| 4  | 6  | 57 | 9  | 0,3 |        |        |        |   | 143040Cr03 | 57,00  | 61,00  | 6 |
| 5  | 6  | 57 | 11 |     | 143050 | 51,50  | 55,50  | 6 |            |        |        |   |
| 5  | 6  | 57 | 11 | 0,3 |        |        |        |   | 143050Cr03 | 57,00  | 61,00  | 6 |
| 6  | 6  | 57 | 13 |     | 143060 | 53,00  | 57,00  | 6 |            |        |        |   |
| 6  | 6  | 57 | 13 | 0,5 |        |        |        |   | 143060Cr05 | 57,60  | 61,60  | 6 |
| 8  | 8  | 63 | 19 |     | 143080 | 71,70  | 78,70  | 6 |            |        |        |   |
| 8  | 8  | 63 | 19 | 0,5 |        |        |        |   | 143080Cr05 | 77,60  | 84,60  | 6 |
| 10 | 10 | 72 | 22 |     | 143100 | 105,40 | 112,40 | 6 |            |        |        |   |
| 10 | 10 | 72 | 22 | 1,0 |        |        |        |   | 143100Cr10 | 111,70 | 118,70 | 6 |
| 12 | 12 | 81 | 26 |     | 143120 | 130,30 | 137,30 | 6 |            |        |        |   |
| 12 | 12 | 81 | 26 | 1,5 |        |        |        |   | 143120Cr15 | 137,70 | 144,70 | 6 |
| 16 | 16 | 86 | 32 |     | 143160 | 239,20 | 251,20 | 6 |            |        |        |   |
| 16 | 16 | 86 | 32 | 1,5 |        |        |        |   | 143160Cr15 | 249,30 | 261,30 | 6 |

|     |     | PARAMETRI DI TAGLIO (Cutting data) Pag.44 |          |          |
|-----|-----|---|----------|----------|
|     |     | HRC < 52                                  | HRC < 56 | HRC < 60 |
| 143 | HMC | Vc 243                                    | Vc 180   | Vc 65    |





## 145 Frese per la finitura di acciai temperati



- Ultra Fine**
- 
- Silmax Norm**
- $\lambda\ 45^\circ$   
 $\gamma\ -10^\circ$
- 
- 90°**



X.Ceed X.Hard

| D  | d  | L   | l  | 145    | HMC    | HMH    | Z |  |  |  |
|----|----|-----|----|--------|--------|--------|---|--|--|--|
| e8 | h6 |     |    |        | €      | €      |   |  |  |  |
| 6  | 6  | 80  | 24 | 145060 | 80,40  | 84,40  | 6 |  |  |  |
| 8  | 8  | 80  | 32 | 145080 | 102,30 | 109,30 | 6 |  |  |  |
| 10 | 10 | 108 | 40 | 145100 | 151,20 | 158,20 | 6 |  |  |  |
| 12 | 12 | 108 | 48 | 145120 | 180,80 | 187,80 | 6 |  |  |  |
| 16 | 16 | 130 | 64 | 145160 | 294,00 | 306,00 | 6 |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |
|    |    |     |    |        |        |        |   |  |  |  |

| 145 | HMC | ● | PARAMETRI DI TAGLIO (Cutting data) Pag.44 |          |          |
|-----|-----|---|---|----------|----------|
|     |     |   | HRC < 52                                  | HRC < 56 | HRC < 60 |
|     |     |   | Vc 49                                     | Vc 39    | Vc 20    |
|     |     |   |   |          |          |
|     |     |   |   |          |          |

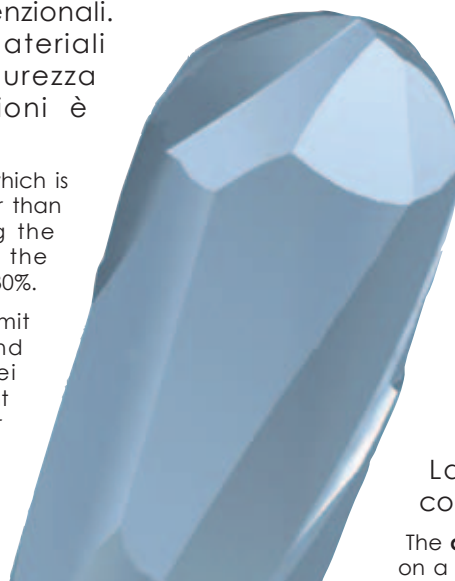


▶ **Metallo duro a nano-struttura** in grado di raggiungere durezza e tenacità superiori ai prodotti convenzionali. Nella lavorazione di materiali temprati ad elevata durezza l'incremento di prestazioni è stimabile in +30%.

**Hard metal with nano-structure**, which is able to reach an hardness higher than conventional products. During the machining of hardened steels the increase of the performances is +30%.

**Hartmetall mit Nanostruktur**, womit weitaus höhere Härte- und Festigkeitswerte als bei herkömmlichen Produkten erreicht werden können. Bei der Bearbeitung von gehärteten Werkstoffen liegt die Leistungssteigerung bei +30%.

**Ultra drobnoziarnisty węglik (nanostruktura)** pozwala uzyskać znacznie wyższą twardość i wytrzymałość niż w przypadku narzędzi konwencjonalnych. Dzięki temu, przy obróbce materiałów utwardzonych uzyskujemy wzrost wydajności o 30%



Geometria sferica con un **grado di mordente costante** su tutto il filo tagliente, partendo dal centro dell'utensile.

Geometry with a **constant rake angle** along the entire cutting edge, starting from the centre of the tool.

Kugelgeometrie mit **konstantem Eingriff** auf der gesamten Schneidkante, ausgehend von der Werkzeugmitte.

Geometria ze **stałym kątem natarcia** na całej długości ostrza, zaczynającym się w osi narzędzia.

La **qualità del filo tagliente** è controllata a livello micrometrico.

The **quality of the cutting edge** is controlled on a micrometric level.

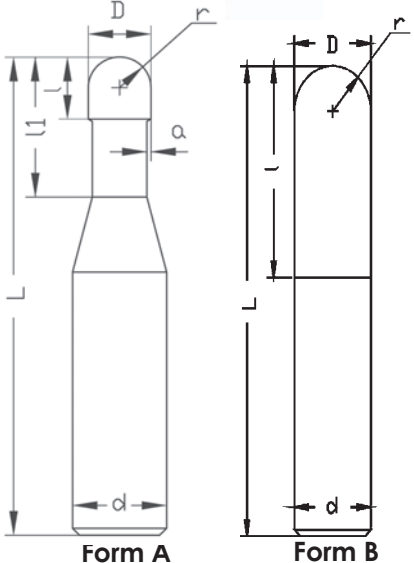
Die **Qualität der Schneidkante** wird im Mikrometerbereich geprüft.

**Jakość krawędzi skrawającej** jest kontrolowana mikrometrycznie.

| HRC < 52     |       |        |       | HRC < 56     |        |      |       | HRC < 60    |      |  |  |
|--------------|-------|--------|-------|--------------|--------|------|-------|-------------|------|--|--|
| HMC 727      |       |        |       | HMC 727      |        |      |       | HMC 727     |      |  |  |
|              |       |        |       |              |        |      |       |             |      |  |  |
| m/min Vc 225 |       |        |       | m/min Vc 180 |        |      |       | m/min Vc 90 |      |  |  |
| D            | fz    | F      | n     | fz           | F      | n    | fz    | F           | n    |  |  |
| mm           | mm/z  | mm/min | min   | mm/z         | mm/min | min  | mm/z  | mm/min      | min  |  |  |
| 6,0          | 0,070 | 1672   | 11943 | 0,046        | 879    | 9554 | 0,035 | 334         | 4777 |  |  |
| 8,0          | 0,082 | 1460   | 8957  | 0,058        | 824    | 7166 | 0,047 | 333         | 3583 |  |  |
| 10,0         | 0,090 | 1296   | 7166  | 0,066        | 762    | 5732 | 0,055 | 318         | 2866 |  |  |
| 12,0         | 0,098 | 1167   | 5971  | 0,074        | 704    | 4777 | 0,063 | 300         | 2389 |  |  |
| 16,0         | 0,109 | 978    | 4479  | 0,085        | 611    | 3583 | 0,074 | 266         | 1791 |  |  |
| 20,0         | 0,118 | 847    | 3583  | 0,094        | 540    | 2866 | 0,083 | 238         | 1433 |  |  |

| HRC < 52     |       |              |       | HRC < 56     |        |              |       | HRC < 60    |      |             |        |      |       |     |      |       |     |      |
|--------------|-------|--------------|-------|--------------|--------|--------------|-------|-------------|------|-------------|--------|------|-------|-----|------|-------|-----|------|
| HMC 729      |       | HMC 147      |       | HMC 729      |        | HMC 147      |       | HMC 729     |      | HMC 147     |        |      |       |     |      |       |     |      |
|              |       |              |       |              |        |              |       |             |      |             |        |      |       |     |      |       |     |      |
| m/min Vc 194 |       | m/min Vc 194 |       | m/min Vc 155 |        | m/min Vc 155 |       | m/min Vc 77 |      | m/min Vc 77 |        |      |       |     |      |       |     |      |
| D            | fz    | F            | n     | fz           | F      | n            | fz    | F           | n    | fz          | F      | n    |       |     |      |       |     |      |
| mm           | mm/z  | mm/min       | min   | mm/z         | mm/min | min          | mm/z  | mm/min      | min  | mm/z        | mm/min | min  |       |     |      |       |     |      |
| 6,0          | 0,060 | 1232         | 10271 | 0,065        | 2670   | 10271        | 0,040 | 657         | 8217 | 0,043       | 1413   | 8217 | 0,030 | 246 | 4108 | 0,035 | 575 | 4108 |
| 8,0          | 0,072 | 1102         | 7703  | 0,074        | 2269   | 7703         | 0,052 | 635         | 6162 | 0,052       | 1273   | 6162 | 0,042 | 256 | 3081 | 0,044 | 538 | 3081 |
| 10,0         | 0,080 | 991          | 6162  | 0,080        | 1980   | 6162         | 0,060 | 596         | 4930 | 0,058       | 1150   | 4930 | 0,050 | 249 | 2465 | 0,050 | 496 | 2465 |
| 12,0         | 0,088 | 901          | 5135  | 0,086        | 1762   | 5135         | 0,068 | 556         | 4108 | 0,064       | 1048   | 4108 | 0,058 | 237 | 2054 | 0,056 | 458 | 2054 |
| 16,0         | 0,099 | 764          | 3852  | 0,094        | 1455   | 3852         | 0,079 | 488         | 3081 | 0,072       | 893    | 3081 | 0,069 | 213 | 1541 | 0,064 | 397 | 1541 |



Form A  
Form B  
 $\alpha=0,10-0,20$

### 727 Frese semisferiche per la lavorazione di Temprati

- Ultra Fine
- 
- Silmax Norm
- $\lambda 17^\circ$
- $\gamma -4^\circ$
- 
- 



### 729 Frese semisferiche per la lavorazione di Temprati

- Ultra Fine
- 
- Silmax Norm
- $\lambda 17^\circ$
- $\gamma -4^\circ$
- 
- 



X.Ceed X.Hard

| 727 |    |     |      |      |      | X.Ceed | X.Hard |        |   |  |  |  |
|-----|----|-----|------|------|------|--------|--------|--------|---|--|--|--|
| D   | d  | L   | l    | r    | Form | HMC    | HMH    | Z      |   |  |  |  |
|     | h6 |     |      | f8   |      | €      | €      |        |   |  |  |  |
| 1   | 6  | 57  | 1,5  | 0,5  | A    | 727010 | 66,60  | 70,00  | 2 |  |  |  |
| 1,5 | 6  | 57  | 2,0  | 0,75 | A    | 727015 | 65,00  | 68,30  | 2 |  |  |  |
| 2   | 6  | 57  | 2,0  | 1,0  | A    | 727020 | 65,00  | 68,30  | 2 |  |  |  |
| 2,5 | 6  | 57  | 2,5  | 1,25 | A    | 727025 | 63,20  | 66,40  | 2 |  |  |  |
| 3   | 6  | 57  | 3,0  | 1,5  | A    | 727030 | 59,60  | 62,60  | 2 |  |  |  |
| 4   | 6  | 57  | 4,0  | 2,0  | A    | 727040 | 59,60  | 62,60  | 2 |  |  |  |
| 5   | 6  | 57  | 5,0  | 2,5  | A    | 727050 | 60,30  | 63,40  | 2 |  |  |  |
| 6   | 8  | 63  | 6,0  | 3,0  | A    | 727060 | 79,00  | 83,00  | 2 |  |  |  |
| 8   | 8  | 63  | 8,0  | 4,0  | B    | 727080 | 72,60  | 76,30  | 2 |  |  |  |
| 10  | 10 | 72  | 10,0 | 5,0  | B    | 727100 | 92,80  | 97,50  | 2 |  |  |  |
| 12  | 12 | 83  | 12,0 | 6,0  | B    | 727120 | 134,90 | 141,70 | 2 |  |  |  |
| 16  | 16 | 92  | 16,0 | 8,0  | B    | 727160 | 210,10 | 220,70 | 2 |  |  |  |
| 20  | 20 | 104 | 20,0 | 10,0 | B    | 727200 | 319,50 | 335,50 | 2 |  |  |  |

| 729 |    |     |    |     |      | X.Ceed | X.Hard |        |   |  |  |  |
|-----|----|-----|----|-----|------|--------|--------|--------|---|--|--|--|
| D   | d  | L   | l  | r   | Form | HMC    | HMH    | Z      |   |  |  |  |
|     | h6 |     |    | f8  |      | €      | €      |        |   |  |  |  |
| 3   | 6  | 78  | 3  | 1,5 | A    | 729030 | 71,50  | 75,10  | 2 |  |  |  |
| 4   | 6  | 78  | 4  | 2,0 | A    | 729040 | 69,80  | 73,30  | 2 |  |  |  |
| 5   | 6  | 105 | 5  | 2,5 | A    | 729050 | 78,20  | 82,20  | 2 |  |  |  |
| 6   | 8  | 105 | 6  | 3,0 | A    | 729060 | 95,20  | 100,00 | 2 |  |  |  |
| 8   | 8  | 105 | 8  | 4,0 | B    | 729080 | 91,00  | 95,60  | 2 |  |  |  |
| 10  | 10 | 120 | 10 | 5,0 | B    | 729100 | 131,00 | 137,60 | 2 |  |  |  |
| 12  | 12 | 125 | 12 | 6,0 | B    | 729120 | 161,80 | 169,90 | 2 |  |  |  |
| 16  | 16 | 130 | 16 | 8,0 | B    | 729160 | 255,60 | 268,40 | 2 |  |  |  |

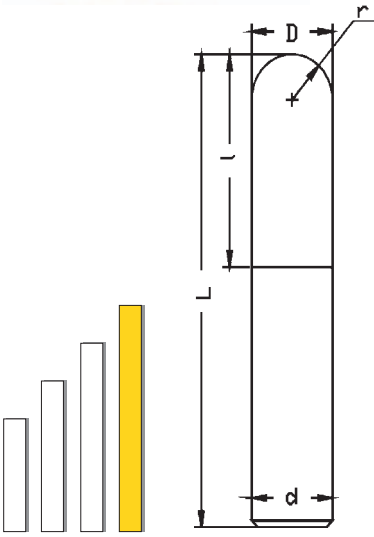
|     |     | PARAMETRI DI TAGLIO (Cutting data) Pag.48 |          |          |  |
|-----|-----|---|----------|----------|--|
|     |     | HRC < 52                                  | HRC < 56 | HRC < 60 |  |
| 727 | HMC | Vc 225                                    | Vc 180   | Vc 90    |  |
| 729 | HMC | Vc 194                                    | Vc 155   | Vc 77    |  |

HRC



# 147

Frese semisferiche per la lavorazione dei Temprati



- Ultra Fine
- 
- Silmax Norm
- $\lambda$  30°
- $\gamma$ -10°
- 
- 



| D  | d  | L   | l  | r   | 147    | X.Ceed | X.Hard | Z |  |  |  |
|----|----|-----|----|-----|--------|--------|--------|---|--|--|--|
|    |    |     |    |     |        | HMC    | HMH    |   |  |  |  |
|    | h6 |     |    | f8  |        | €      | €      |   |  |  |  |
| 6  | 6  | 80  | 10 | 3,0 | 147060 | 66,20  | 70,20  | 4 |  |  |  |
| 8  | 8  | 80  | 16 | 4,0 | 147080 | 85,00  | 92,00  | 4 |  |  |  |
| 10 | 10 | 108 | 19 | 5,0 | 147100 | 129,10 | 136,10 | 4 |  |  |  |
| 12 | 12 | 108 | 22 | 6,0 | 147120 | 154,20 | 161,20 | 4 |  |  |  |
| 16 | 16 | 130 | 26 | 8,0 | 147160 | 261,80 | 273,80 | 4 |  |  |  |
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| 147 | HMC |  | PARAMETRI DI TAGLIO (Cutting data) Pag.48 |          |          |
|-----|-----|--|---|----------|----------|
|     |     |  | HRC < 52                                  | HRC < 56 | HRC < 60 |
|     |     |  | Vc 194                                    | Vc 155   | Vc 77    |
|     |     |  |   |          |          |
|     |     |  |   |          |          |

HRC

# Versione PLUS

## Introduzione

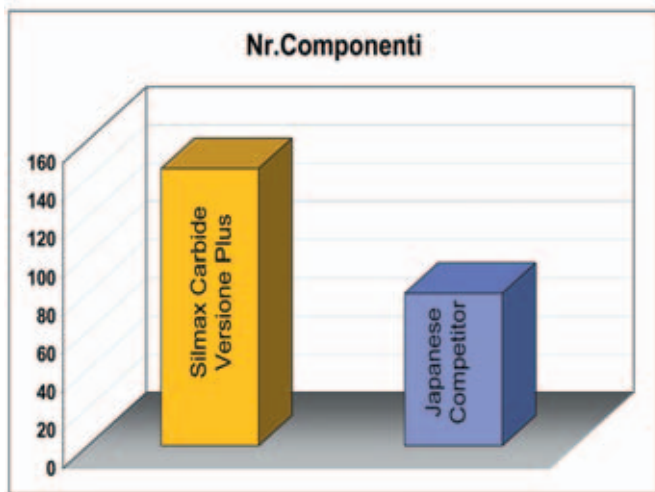
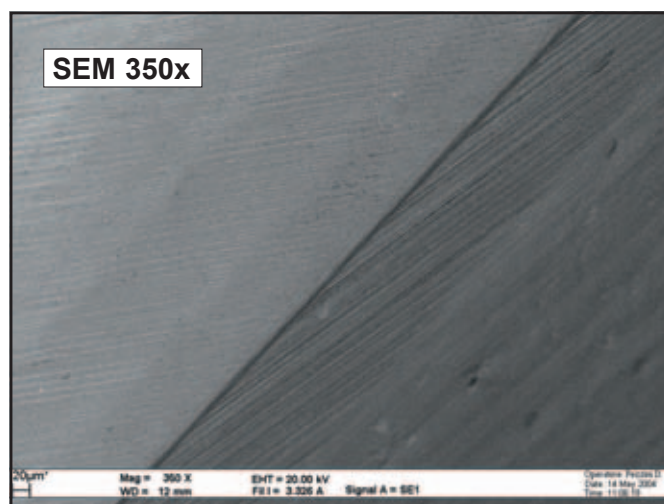
Dalla ricerca Silmax è nata la Versione Plus, che grazie all'utilizzo delle ultime tecnologie disponibili permette un importante aumento delle prestazioni.

*The new PLUS Line has been introduced for some products, which provides an important increase of cutter's performances, thanks to the support of the latest technologies.*

## I Risultati

Presso un importante cliente utilizzatore si è svolto un test comparativo tra una fresa SILMAX HPC **HMC143100 Plus** e una fresa equivalente di un noto produttore giapponese. I risultati sono stati sorprendenti, a fronte di una percorrenza media di **80 componenti** da parte delle frese della concorrenza, le frese SILMAX hanno lavorato mediamente 145 componenti.

*It has been made by one of our important customers a comparative test between a Japanese competitor's cutter dia 10 mm. and one Silmax HPC HMC143100 PLUS. The results are impressive: in comparison with an average working of 80 components by competitor's cutters, Silmax PLUS ones have worked on average 145 components.*



## La tecnologia

Le caratteristiche della Versione PLUS sono il risultato di una intensa attività di ricerca effettuata presso il Centro Ricerche e Sviluppo SILMAX di Lanzo Torinese

- Utilizzo di materiali di base innovativi.
- Utilizzo di nuove metodologie di produzione.
- Grande attenzione alle principali caratteristiche dell'utensile.

*PLUS LINE's features are the result of a deep research of our R&D Dptm in Lanzo Torinese.*

- Use of innovative raw materials of the latest generation
- Use of new experimental productive techniques.
- Particular care of the tool's main features.

## Informazioni

Per ulteriori informazioni su questa nuova linea di prodotto, contattate il servizio commerciale al numero telefonico 02.66802990 oppure alla email [vendite@silmax.it](mailto:vendite@silmax.it).

*For further information on this new product line, please contact our sales department at the phone number +39.02.66802990 or sending an email to [vendite@silmax.it](mailto:vendite@silmax.it)*