

# UFA

## Obróbka aluminium

*-węglkowe frezy monolityczne*

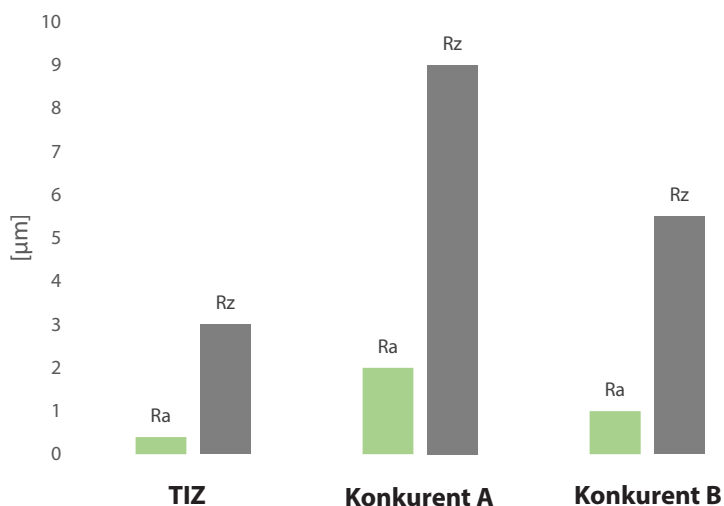


**FREZY UFA** przeznaczone są do obróbki  
szybkościowej (OS) aluminium i jego stopów,  
miedzi, grafitu (wariant ekonomiczny)  
oraz materiałów nieżelaznych.

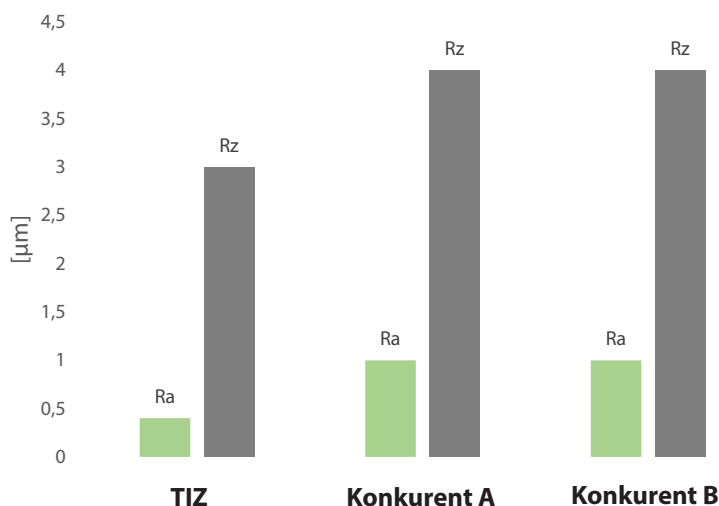
**N**

**FREZY UFA przede wszystkim zalecane są do obróbki szybkościowej (OS) aluminium i jego stopów, miedzi, grafitu (wykonanie ekonomiczne) oraz materiałów nieżelaznych.**

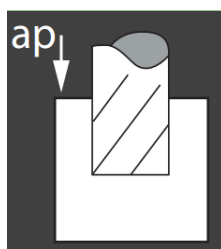
### Frezowanie rowków



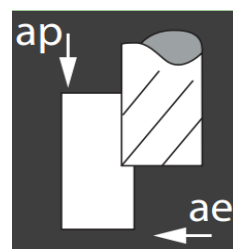
### Frezowanie obwodowe



| Warunki skrawania  |                      |
|--------------------|----------------------|
| Narzędzie          | 2 zęby, 45° skrętu   |
| Rozmiar            | Ø10xØ10x27x70        |
| Materiał obrabiany | Aluminium 6061       |
| Obroty             | 7500 [obr/min]       |
| Posuw              | 1750 [mm/min]        |
| Warstwa skrawana   | Ap=3 [mm], Ae=10[mm] |
| Chłodziwo          | Tak                  |

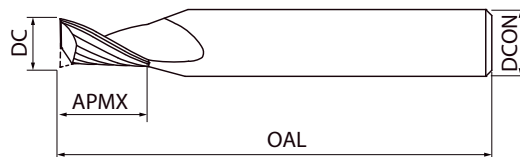


| Warunki skrawania  |                          |
|--------------------|--------------------------|
| Narzędzie          | 2 zęby, 45° skrętu       |
| Rozmiar            | Ø10xØ10x27x70            |
| Materiał obrabiany | Aluminium 6061           |
| Obroty             | 7500 [obr/min]           |
| Posuw              | 2500 [mm/min]            |
| Warstwa skrawana   | Ap=20 [mm], Ae=0.15 [mm] |
| Chłodziwo          | Tak                      |



## UFA11

Węglkowe, 1 ostrzowe



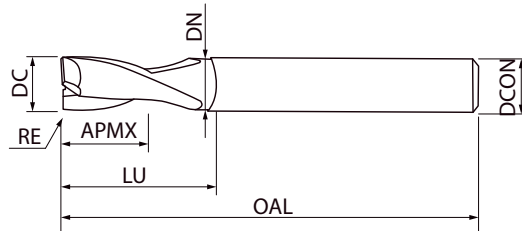
- Przeznaczony do obróbki materiałów nieżelaznych i innych metali takich jak aluminium oraz akryl.
- 1 krawędź skrawająca pozwala na doskonałe wykończenie powierzchni oraz odprowadzanie wióra.



| KOD                  | OAL | APMX | DC | DCON |
|----------------------|-----|------|----|------|
| UFA11020000A03008050 | 50  | 8    | 2  | 3    |
| UFA11030000A03012050 | 50  | 12   | 3  | 3    |
| UFA11040000A04015060 | 60  | 15   | 4  | 4    |
| UFA11050000A05017060 | 60  | 17   | 5  | 5    |
| UFA11060000A06020065 | 65  | 20   | 6  | 6    |
| UFA11080000A08022065 | 65  | 22   | 8  | 8    |
| UFA11100000A10025075 | 75  | 25   | 10 | 10   |
| UFA11120000A12030080 | 80  | 30   | 12 | 12   |

## UFA14

Węglkowe, 2 ostrzowe, 25° linii śrubowej, z promieniem



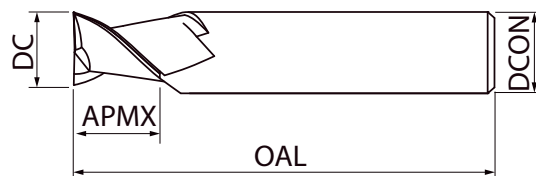
- Przeznaczony do obróbki aluminium oraz jego stopów, materiałów nieżelaznych.
- Podwyższona trwałość narzędzia oraz większa dokładność obróbki.
- Maksymalny ubytek materiału.
- Bardzo dobre odprowadzanie wiórów.
- Promień naroża pozwala uniknąć wyszczerbień.
- Powierzchnia lustro – doskonałe wykończenie powierzchni.



| KOD                  | OAL | APMX | DC | DCON | DN   | LU | RE  |
|----------------------|-----|------|----|------|------|----|-----|
| UFA14002002A03006040 | 40  | 3    | 25 | 2    | 1.9  | 6  | 0,2 |
| UFA14003002A04008040 | 40  | 4    | 25 | 3    | 2.9  | 8  | 0,2 |
| UFA14004002A05012050 | 50  | 5    | 25 | 4    | 3.8  | 12 | 0,2 |
| UFA14005002A08014050 | 50  | 8    | 25 | 5    | 4.8  | 14 | 0,2 |
| UFA14006002A08018065 | 65  | 8    | 25 | 6    | 5.7  | 18 | 0,2 |
| UFA14008002A10022070 | 70  | 10   | 25 | 8    | 7.7  | 22 | 0,2 |
| UFA14010002A14028080 | 80  | 14   | 25 | 10   | 9.7  | 28 | 0,2 |
| UFA14012002A16035090 | 90  | 16   | 25 | 12   | 11.5 | 35 | 0,2 |
| UFA14016002A20040090 | 90  | 20   | 25 | 16   | 15.5 | 40 | 0,2 |
| UFA14020002A25050100 | 100 | 25   | 25 | 20   | 19.5 | 50 | 0,2 |

## UFA17

Węglkowe, 2 ostrzowe, 25° linii śrubowej, krótkie



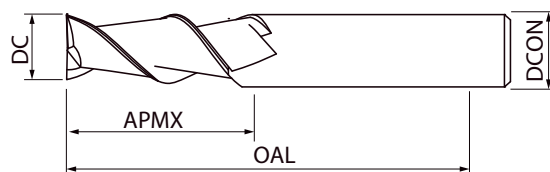
- Powierzchnia lustro – doskonałe wykończenie powierzchni.
- Przeznaczony do obróbki szybkościowej aluminium oraz materiałów nieżelaznych.
- Obniżone wyszczerbienia ostrzy.



| KOD                  | OAL | APMX | DC | DCON |
|----------------------|-----|------|----|------|
| UFA17030000A06005050 | 50  | 5    | 45 | 3    |
| UFA17040000A06008054 | 54  | 8    | 45 | 4    |
| UFA17050000A06009054 | 54  | 9    | 45 | 5    |
| UFA17060000A06010054 | 54  | 10   | 45 | 6    |
| UFA17080000A08012058 | 58  | 12   | 45 | 8    |
| UFA17100000A10014066 | 66  | 14   | 45 | 10   |
| UFA17120000A12016073 | 73  | 16   | 45 | 12   |
| UFA17140000A14018075 | 75  | 18   | 45 | 14   |
| UFA17160000A16022082 | 82  | 22   | 45 | 16   |
| UFA17180000A18024084 | 84  | 24   | 45 | 18   |
| UFA17200000A20026092 | 92  | 26   | 45 | 20   |

## UFA12

Węglkowe, 2 ostrzowe, 45° linii śrubowej, długie



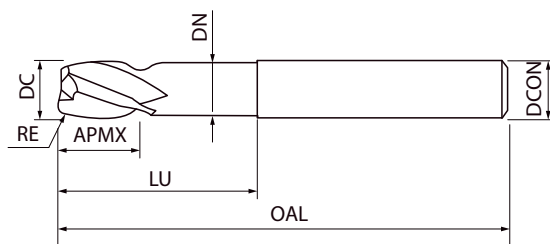
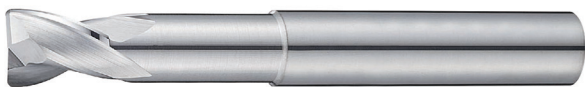
- Powierzchnia lustro – doskonałe wykończenie powierzchni.
- Przeznaczony do obróbki szybkościowej aluminium oraz materiałów nieżelaznych.
- Obniżone wyszczerbienia ostrzy.



| KOD                  |                      | OAL | APMX | DC | DCON | LU |
|----------------------|----------------------|-----|------|----|------|----|
| UFA12030000B06008057 | UFA12030000A06008057 | 57  | 8    | 45 | 3    | 6  |
| UFA12050000A06013057 | UFA12040000A06011057 | 57  | 11   | 45 | 4    | 6  |
| UFA12060000A06013057 | UFA12040000B06011057 | 57  | 11   | 45 | 4    | 6  |
| UFA12060000B06013057 | UFA12050000B06013057 | 57  | 13   | 45 | 5    | 6  |
| UFA12080000A08019063 | UFA12080000B08019063 | 63  | 19   | 45 | 8    | 8  |
| UFA12100000A10022072 | UFA12100000B10022072 | 72  | 22   | 45 | 10   | 10 |
| UFA12120000B12026083 | UFA12120000A12026083 | 83  | 26   | 45 | 12   | 12 |
| UFA12140000A14026083 | UFA12140000B14026083 | 83  | 26   | 45 | 14   | 14 |
| UFA12160000B16032092 | UFA12180000B18032092 | 92  | 32   | 45 | 18   | 18 |
| UFA12160000A16032092 | UFA12180000A18032092 | 92  | 32   | 45 | 18   | 18 |
| UFA12200000B20038104 | UFA12200000A20038104 | 104 | 38   | 45 | 20   | 20 |

## UFA18

Węglkowe, 2 ostrzowe, z promieniem naroża oraz przewężeniem



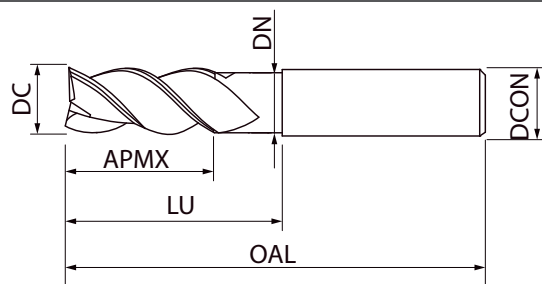
- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Lustrzana powierzchnia – doskonałe wykończenie powierzchni.



| KOD                  | OAL | APMX | DC | DCON | DN   | LU | RE  |
|----------------------|-----|------|----|------|------|----|-----|
| UFA18004003A05010050 | 50  | 5    | 4  | 6    | 3.6  | 10 | 0,3 |
| UFA18006005A08020060 | 60  | 8    | 6  | 6    | 5.7  | 20 | 0,5 |
| UFA18008006A10030070 | 70  | 10   | 8  | 8    | 7.2  | 30 | 0,6 |
| UFA18010008A12036080 | 80  | 12   | 10 | 10   | 9    | 36 | 0,8 |
| UFA18012010A14040090 | 90  | 14   | 12 | 12   | 11   | 40 | 1   |
| UFA18016013A18045100 | 100 | 18   | 16 | 16   | 14.5 | 45 | 1,3 |
| UFA18020016A24045100 | 100 | 24   | 20 | 20   | 18   | 45 | 1,6 |

## UFA19

Węglkowe, 3 ostrzowe, 45° linii śrubowej, z przewężeniem



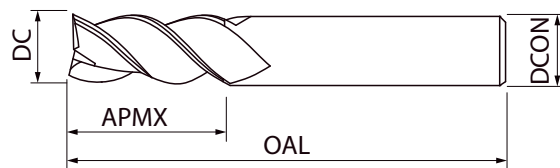
- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Lustrzana powierzchnia – doskonałe wykończenie powierzchni.
- Doskonałe usuwanie wiórów.



| KOD                  | OAL | APMX | DC | DN  | DCON | LU |
|----------------------|-----|------|----|-----|------|----|
| UFA19030000A06008012 | 57  | 8    | 3  | 2.7 | 6    | 12 |
| UFA19040000A06011018 | 57  | 11   | 4  | 3.7 | 6    | 18 |
| UFA19050000A06013018 | 57  | 13   | 5  | 4.7 | 6    | 18 |
| UFA19060000A06013018 | 57  | 13   | 6  | 5.7 | 6    | 18 |
| UFA19080000A08021025 | 63  | 21   | 8  | 7.4 | 8    | 25 |
| UFA19100000A10022030 | 72  | 22   | 10 | 9.2 | 10   | 30 |
| UFA19120000A12026036 | 83  | 26   | 12 | 11  | 12   | 36 |
| UFA19160000A16036042 | 92  | 36   | 16 | 15  | 16   | 42 |
| UFA19200000A20041052 | 104 | 41   | 20 | 19  | 20   | 52 |

## UFA20

Węglkowe, 3 ostrzowe, 45° linii śrubowej, długie



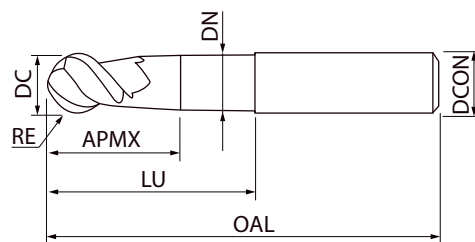
- Powierzchnia lustro – doskonałe wykończenie powierzchni.
- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Obniżone wyszczerbienia ostrzy.



| KOD                  | OAL | APMX | DC | DCON |
|----------------------|-----|------|----|------|
| UFA20030000A06012057 | 57  | 12   | 3  | 6    |
| UFA20040000A06015057 | 57  | 15   | 4  | 6    |
| UFA20050000A06020057 | 57  | 20   | 5  | 6    |
| UFA20060000A06020065 | 65  | 20   | 6  | 6    |
| UFA20080000A08022065 | 65  | 22   | 8  | 8    |
| UFA20120000A12025075 | 75  | 25   | 12 | 12   |
| UFA20100000A10025070 | 70  | 25   | 10 | 10   |
| UFA20160000A16035090 | 90  | 35   | 16 | 16   |
| UFA20200000A20040100 | 100 | 40   | 20 | 20   |

## UFA15

Węglkowe, 2 ostrzowe, 50° linii śrubowej, kuliste, z przewężeniem



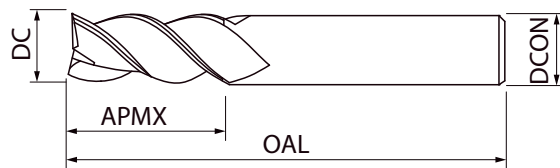
- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.



| KOD                  | OAL | APMX | DC | DCON | DN   | LU | RE |
|----------------------|-----|------|----|------|------|----|----|
| UFA15006003A06025055 | 55  | 5,5  | 6  | 6    | 5.4  | 25 | 3  |
| UFA15008004A07030065 | 65  | 7    | 8  | 8    | 7.2  | 30 | 4  |
| UFA15010005A09035075 | 75  | 8,5  | 10 | 10   | 9    | 35 | 5  |
| UFA15012006A11040075 | 75  | 10,5 | 12 | 12   | 11   | 40 | 6  |
| UFA15016008A14050090 | 90  | 14   | 16 | 16   | 14.5 | 50 | 8  |
| UFA15020010A17050100 | 100 | 17   | 20 | 20   | 18   | 50 | 10 |

## UFA21

Węglkowe, 3 ostrzowe, 45° linii śrubowej, z przewężeniem



- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Lustrzana powierzchnia – doskonałe wykończenie powierzchni.
- Doskonałe usuwanie wiórów.

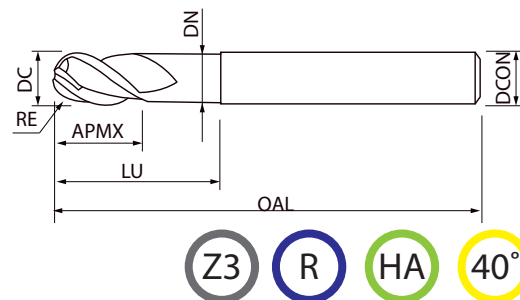


| KOD                  | OAL | APMX | DC | DCON | LU  |
|----------------------|-----|------|----|------|-----|
| UFA21030005A06012057 | 57  | 12   | 3  | 6    | 0,5 |
| UFA21030010A06012057 | 57  | 12   | 3  | 6    | 1   |
| UFA21040010A06015057 | 57  | 15   | 4  | 6    | 1   |
| UFA21040005A06015057 | 57  | 15   | 4  | 6    | 0,5 |
| UFA21050010A06020057 | 57  | 20   | 5  | 6    | 1   |
| UFA21050005A06020057 | 57  | 20   | 5  | 6    | 0,5 |
| UFA21060010A06020065 | 65  | 20   | 6  | 6    | 1   |
| UFA21060005A06020065 | 65  | 20   | 6  | 6    | 0,5 |
| UFA21080010A08022065 | 65  | 22   | 8  | 8    | 1   |
| UFA21080005A08022065 | 65  | 22   | 8  | 8    | 0,5 |
| UFA21100005A10025070 | 70  | 25   | 10 | 10   | 0,5 |
| UFA21100010A10025070 | 70  | 25   | 10 | 10   | 1   |
| UFA21100020A10025070 | 70  | 25   | 10 | 10   | 2   |
| UFA21120010A12025075 | 75  | 25   | 12 | 12   | 1   |
| UFA21120020A12025075 | 75  | 25   | 12 | 12   | 2   |
| UFA21120005A12025075 | 75  | 25   | 12 | 12   | 0,5 |
| UFA21160005A16035090 | 90  | 35   | 16 | 16   | 0,5 |
| UFA21160010A16035090 | 90  | 35   | 16 | 16   | 1   |
| UFA21160020A16035090 | 90  | 35   | 16 | 16   | 2   |
| UFA21200020A20040100 | 100 | 40   | 20 | 20   | 2   |
| UFA21200005A20040100 | 100 | 40   | 20 | 20   | 0,5 |
| UFA21200010A20040100 | 100 | 40   | 20 | 20   | 1   |



## UFA31

Węglkowe, 3 ostrzowe, 40° linii śrubowej, kuliste, z przewężeniem

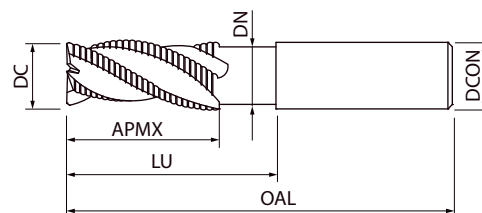


- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Lustrzana powierzchnia – doskonałe wykończenie powierzchni.

| KOD                  | OAL | APMX | DC  | DCON | LU  | RE   |
|----------------------|-----|------|-----|------|-----|------|
| UFA31020010A03060060 | 60  | 3    | 2   | 6    | 5   | 1    |
| UFA31025013A04060060 | 60  | 4    | 2,5 | 6    | 6   | 1,25 |
| UFA31030015A04560060 | 60  | 4,5  | 3   | 6    | 6,5 | 1,5  |
| UFA31035018A05065060 | 65  | 5    | 3,5 | 6    | 7   | 1,75 |
| UFA31040020A06065060 | 65  | 6    | 4   | 6    | 8   | 2    |
| UFA31050025A07565060 | 65  | 7,5  | 5   | 6    | 10  | 2,5  |
| UFA31060030A09075060 | 75  | 9    | 6   | 6    | 12  | 3    |
| UFA31080040A12075080 | 75  | 12   | 8   | 8    | 25  | 4    |
| UFA31100050A15080100 | 80  | 15   | 10  | 10   | 30  | 5    |
| UFA31120060A18090120 | 90  | 18   | 12  | 12   | 36  | 6    |
| UFA31160080A24010160 | 100 | 24   | 16  | 16   | 40  | 8    |

## UFA32

Węglkowe, 3 ostrzowe, zgrubne, z przewężeniem



- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.

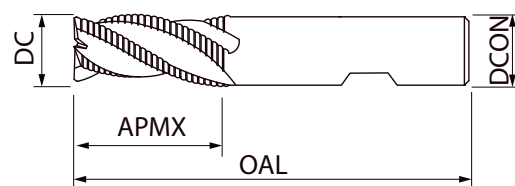


| KOD                  |                      | OAL | APMX | DC | DCON | LU |
|----------------------|----------------------|-----|------|----|------|----|
| UFA32060000B06016020 | UFA32060000A06016020 | 57  | 16   | 6  | 6    | 20 |
| UFA32080000B08016025 | UFA32080000A08016025 | 63  | 16   | 8  | 8    | 25 |
| UFA32100000B10022030 | UFA32100000A10022030 | 72  | 22   | 10 | 10   | 30 |
| UFA32120000B12026036 | UFA32120000A12026036 | 83  | 26   | 12 | 12   | 36 |
| UFA32160000B16032042 | UFA32160000A16032042 | 92  | 32   | 16 | 16   | 42 |
| UFA32200000B20038052 | UFA32200000A20038052 | 104 | 38   | 20 | 20   | 52 |



## UFA27

Węglkowe, 3 ostrzowe, długie, do obróbki zgrubnej



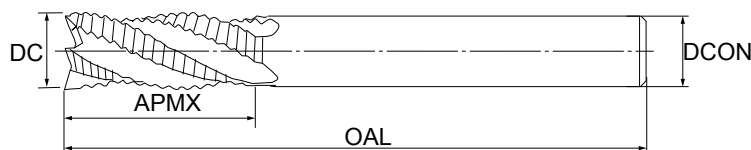
- Ulepszona żywotność narzędzia oraz zwiększona dokładność frezowania.
- Doskonale sprawuje się do obróbki aluminium oraz miedzi.
- Lustrzana powierzchnia – doskonałe wykończenie powierzchni.
- Obniżone wyszczerbienia ostrzy.



| KOD                  |                      | OAL | APMX | DC | DCON |
|----------------------|----------------------|-----|------|----|------|
| UFA27060000A06016057 | UFA27060000B06016057 | 57  | 16   | 6  | 6    |
| UFA27070000A08016063 | UFA27070000B08016063 | 63  | 16   | 7  | 8    |
| UFA27080000A08016063 | UFA27080000B08016063 | 63  | 16   | 8  | 8    |
| UFA27090000A10019072 | UFA27090000B10019072 | 72  | 19   | 9  | 10   |
| UFA27100000A10022072 | UFA27100000B10022072 | 72  | 22   | 10 | 10   |
| UFA27120000A12026083 | UFA27120000B12026083 | 83  | 26   | 12 | 12   |
| UFA27140000A14026083 | UFA27140000B14026083 | 83  | 26   | 14 | 14   |
| UFA27160000A16032092 | UFA27160000B16032092 | 92  | 32   | 16 | 16   |
| UFA27180000A18032092 | UFA27180000B18032092 | 92  | 32   | 18 | 18   |
| UFA27200000A20038104 | UFA27200000B20038104 | 104 | 38   | 20 | 20   |
| UFA27250000A25045121 | UFA27250000B25045121 | 121 | 45   | 25 | 25   |

## PMA22

PM, 3 ostrzowe, 42° linii śrubowej, krótkie, do obróbki zgrubnej, powlekane TiAlN



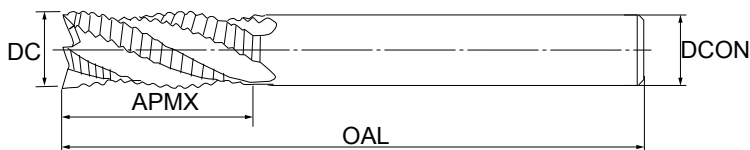
- Maksymalna wydajność skrawania.
- Obniżone wyszczerbienia ostrzy.



| KOD        |          | OAL | APMX | DC | DCON |
|------------|----------|-----|------|----|------|
| PMA22120HB | PMA22120 | 83  | 26   | 12 | 12   |
| PMA23140   | PMA22140 | 83  | 26   | 14 | 12   |
| PMA22160HB | PMA22160 | 92  | 32   | 16 | 16   |
| PMA23180   | PMA22180 | 92  | 32   | 18 | 16   |
| PMA22200HB | PMA22200 | 104 | 38   | 20 | 20   |
| PMA23220   | PMA22220 | 104 | 38   | 22 | 20   |
| PMA22250HB | PMA22250 | 121 | 45   | 25 | 25   |
| PMA23280   | PMA22280 | 121 | 45   | 28 | 25   |
| PMA23320   | PMA22320 | 133 | 53   | 32 | 32   |

# PMA24

PM, 3 ostrzowe, 42° linii śrubowej, długie, do obróbki zgrubnej, powlekane TiAlN



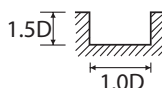
- Maksymalna wydajność skrawania.
- Obniżone wyszczerbienia ostrzy.



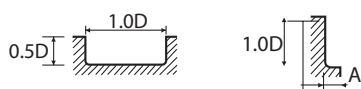
| KOD        |          | OAL | APMX | DC | DCON |
|------------|----------|-----|------|----|------|
| PMA24140HB | PMA24120 | 110 | 53   | 12 | 12   |
| PMA24120HB | PMA24140 | 110 | 53   | 14 | 12   |
| PMA24160HB | PMA24180 | 123 | 63   | 18 | 16   |
| PMA24180HB | PMA24160 | 123 | 63   | 16 | 16   |
| PMA24200HB | PMA24220 | 141 | 75   | 22 | 20   |
| PMA24220HB | PMA24200 | 141 | 75   | 20 | 20   |
| PMA24280HB | PMA24250 | 166 | 90   | 25 | 25   |
| PMA24250HB | PMA24280 | 166 | 90   | 28 | 25   |
| PMA24320HB | PMA24320 | 186 | 106  | 32 | 32   |

## ZALECANE PARAMETRY SKRAWANIA

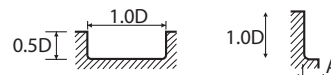
| UFA11    |        |       |     |       |                             |       |     |       |
|----------|--------|-------|-----|-------|-----------------------------|-------|-----|-------|
| MATERIAŁ | AKRYL  |       |     |       | ALUMINIUM & STOPY ALUMINIUM |       |     |       |
| ŚREDNICA | OBROTY | POSUW | Vc  | Fz    | OBROTY                      | POSUW | Vc  | Fz    |
| 2.0      | 32000  | 2200  | 200 | 0.069 | 23000                       | 1500  | 145 | 0.065 |
| 3.0      | 25000  | 2400  | 235 | 0.096 | 18000                       | 1700  | 170 | 0.094 |
| 4.0      | 20000  | 2400  | 250 | 0.120 | 15000                       | 1800  | 190 | 0.120 |
| 5.0      | 15000  | 2200  | 235 | 0.147 | 12000                       | 1800  | 190 | 0.150 |
| 6.0      | 13500  | 2300  | 255 | 0.170 | 10000                       | 1800  | 190 | 0.180 |
| 8.0      | 10000  | 2400  | 250 | 0.240 | 7800                        | 1900  | 195 | 0.244 |
| 10.0     | 8000   | 2400  | 250 | 0.300 | 6000                        | 2000  | 190 | 0.333 |
| 12.0     | 6700   | 2300  | 255 | 0.343 | 5000                        | 2200  | 190 | 0.440 |



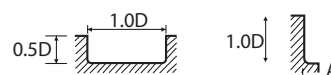
| UFA14    |                             |       |     |       |        |       |     |       |
|----------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 2.0      | 10400                       | 460   | 65  | 0.022 | 10400  | 810   | 65  | 0.039 |
| 3.0      | 10400                       | 720   | 100 | 0.035 | 10400  | 960   | 100 | 0.046 |
| 4.0      | 10400                       | 960   | 130 | 0.046 | 10400  | 1120  | 130 | 0.054 |
| 5.0      | 10400                       | 1040  | 165 | 0.050 | 10400  | 1360  | 165 | 0.065 |
| 6.0      | 10400                       | 1200  | 195 | 0.058 | 10400  | 1600  | 195 | 0.077 |
| 8.0      | 8000                        | 1440  | 200 | 0.090 | 8000   | 1840  | 200 | 0.115 |
| 10.0     | 8000                        | 1760  | 250 | 0.110 | 8000   | 2160  | 250 | 0.135 |
| 12.0     | 8000                        | 2160  | 300 | 0.135 | 8000   | 2720  | 300 | 0.170 |
| 16.0     | 6400                        | 2000  | 320 | 0.156 | 6400   | 2480  | 320 | 0.194 |
| 20.0     | 4000                        | 1600  | 250 | 0.200 | 4000   | 2000  | 250 | 0.250 |



| UFA18    |                             |       |     |       |        |       |     |       |
|----------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 4.0      | 10400                       | 960   | 130 | 0.046 | 10400  | 1120  | 130 | 0.054 |
| 6.0      | 10400                       | 1200  | 195 | 0.058 | 10400  | 1600  | 195 | 0.077 |
| 8.0      | 8000                        | 1440  | 200 | 0.090 | 8000   | 1840  | 200 | 0.115 |
| 10.0     | 8000                        | 1760  | 250 | 0.110 | 8000   | 2160  | 250 | 0.135 |
| 12.0     | 8000                        | 2160  | 300 | 0.135 | 8000   | 2720  | 300 | 0.170 |
| 16.0     | 6400                        | 2000  | 320 | 0.156 | 6400   | 2480  | 320 | 0.194 |
| 20.0     | 4000                        | 1600  | 250 | 0.200 | 4000   | 2000  | 250 | 0.250 |

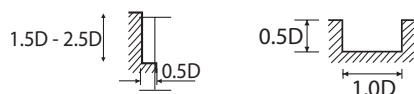


| UFA12, UFA17 |                             |       |     |       |        |       |     |       |
|--------------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ     | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA     | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 3.0          | 10000                       | 700   | 95  | 0.035 | 10000  | 900   | 95  | 0.045 |
| 4.0          | 10000                       | 900   | 125 | 0.045 | 10000  | 1100  | 125 | 0.055 |
| 5.0          | 10000                       | 1000  | 155 | 0.050 | 10000  | 1300  | 155 | 0.065 |
| 6.0          | 10000                       | 1200  | 190 | 0.060 | 10000  | 1500  | 190 | 0.075 |
| 8.0          | 8000                        | 1400  | 200 | 0.088 | 8000   | 1800  | 200 | 0.113 |
| 10.0         | 8000                        | 1700  | 250 | 0.106 | 8000   | 2100  | 250 | 0.131 |
| 12.0         | 8000                        | 2100  | 300 | 0.131 | 8000   | 2600  | 300 | 0.163 |
| 14.0         | 6000                        | 1800  | 265 | 0.150 | 6000   | 2200  | 265 | 0.183 |
| 16.0         | 6000                        | 1900  | 300 | 0.158 | 6000   | 2400  | 300 | 0.200 |
| 18.0         | 4000                        | 1400  | 225 | 0.175 | 4000   | 1800  | 225 | 0.225 |
| 20.0         | 4000                        | 1600  | 250 | 0.200 | 4000   | 1900  | 250 | 0.238 |

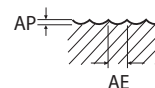


## PARAMETRY SKRAWANIA

| UFA19, UFA20 |                             |       |     |       |        |       |     |       |
|--------------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ     | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA     | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 3.0          | 7000                        | 940   | 65  | 0.045 | 7000   | 730   | 65  | 0.035 |
| 4.0          | 7000                        | 1150  | 90  | 0.055 | 7000   | 940   | 90  | 0.045 |
| 5.0          | 7000                        | 1360  | 110 | 0.065 | 7000   | 1050  | 110 | 0.050 |
| 6.0          | 7000                        | 1580  | 130 | 0.075 | 7000   | 1250  | 130 | 0.060 |
| 8.0          | 5600                        | 1900  | 140 | 0.113 | 5600   | 1470  | 140 | 0.088 |
| 9.0          | 5600                        | 2050  | 160 | 0.122 | 5600   | 1630  | 160 | 0.097 |
| 10.0         | 5600                        | 2200  | 175 | 0.131 | 5600   | 1780  | 175 | 0.106 |
| 12.0         | 5600                        | 2740  | 210 | 0.163 | 5600   | 2200  | 210 | 0.131 |
| 16.0         | 4200                        | 2520  | 210 | 0.200 | 4200   | 1990  | 210 | 0.158 |
| 20.0         | 2800                        | 2000  | 175 | 0.238 | 2800   | 1680  | 175 | 0.200 |
| 20.0         | 4000                        | 1600  | 250 | 0.200 | 4000   | 1900  | 250 | 0.238 |



| UFA31       |                             |       |     |       |              |       |     |       |
|-------------|-----------------------------|-------|-----|-------|--------------|-------|-----|-------|
| MATERIAŁ    | ALUMINIUM & STOPY ALUMINIUM |       |     |       | STOPY MIEDZI |       |     |       |
| ŚREDNICA    | OBROTY                      | POSUW | Vc  | Fz    | OBROTY       | POSUW | Vc  | Fz    |
| R1.0 X 2.0  | 21600                       | 760   | 135 | 0.018 | 6400         | 190   | 40  | 0.015 |
| R1.25 X 2.5 | 17600                       | 760   | 140 | 0.022 | 5200         | 190   | 40  | 0.018 |
| R1.5 X 3.0  | 14400                       | 760   | 135 | 0.026 | 4400         | 190   | 40  | 0.022 |
| R1.75 X 3.5 | 14400                       | 800   | 160 | 0.028 | 4400         | 190   | 50  | 0.022 |
| R2.0 X 4.0  | 14400                       | 1000  | 180 | 0.035 | 4400         | 250   | 55  | 0.028 |
| R2.5 X 5.0  | 14400                       | 1080  | 225 | 0.038 | 4400         | 270   | 70  | 0.031 |
| R3.0 X 6.0  | 14400                       | 1400  | 270 | 0.049 | 4400         | 350   | 85  | 0.040 |
| R4.0 X 8.0  | 11200                       | 1600  | 280 | 0.071 | 3360         | 400   | 85  | 0.060 |
| R5.0 X 10.0 | 11200                       | 1880  | 350 | 0.084 | 3360         | 465   | 105 | 0.069 |
| R6.0 X 12.0 | 11200                       | 2400  | 420 | 0.107 | 3360         | 600   | 125 | 0.089 |
| R8.0 X 16.0 | 8800                        | 2160  | 440 | 0.123 | 2640         | 535   | 135 | 0.101 |



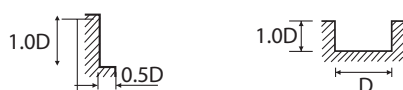
| UFA21    |                             |       |     |       |        |       |     |       |
|----------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 3.0      | 10000                       | 1490  | 95  | 0.050 | 10000  | 1160  | 95  | 0.039 |
| 4.0      | 10000                       | 1820  | 125 | 0.061 | 10000  | 1490  | 125 | 0.050 |
| 5.0      | 10000                       | 2150  | 155 | 0.072 | 10000  | 1650  | 155 | 0.055 |
| 6.0      | 10000                       | 2480  | 190 | 0.083 | 10000  | 1980  | 190 | 0.066 |
| 8.0      | 8000                        | 3000  | 200 | 0.125 | 8000   | 2310  | 200 | 0.096 |
| 10.0     | 8000                        | 3470  | 250 | 0.145 | 8000   | 2810  | 250 | 0.117 |
| 12.0     | 8000                        | 4290  | 300 | 0.179 | 8000   | 3470  | 300 | 0.145 |
| 16.0     | 6000                        | 3960  | 300 | 0.220 | 6000   | 3140  | 300 | 0.174 |
| 20.0     | 4000                        | 3140  | 250 | 0.262 | 4000   | 2640  | 250 | 0.220 |
| 20.0     | 2800                        | 2000  | 175 | 0.238 | 2800   | 1680  | 175 | 0.200 |
| 20.0     | 4000                        | 1600  | 250 | 0.200 | 4000   | 1900  | 250 | 0.238 |



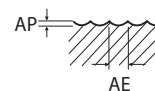
| PMA22, PMA24 |                             |       |     |       |        |       |     |       |
|--------------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ     | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA     | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 12.0         | 2800                        | 550   | 105 | 0.065 | 2800   | 410   | 105 | 0.049 |
| 14.0         | 2500                        | 600   | 110 | 0.080 | 2500   | 450   | 110 | 0.060 |
| 16.0         | 2200                        | 625   | 110 | 0.095 | 2200   | 465   | 110 | 0.070 |
| 18.0         | 1950                        | 680   | 110 | 0.116 | 1950   | 510   | 110 | 0.087 |
| 20.0         | 1700                        | 700   | 105 | 0.137 | 1700   | 525   | 105 | 0.103 |
| 22.0         | 1600                        | 685   | 110 | 0.143 | 1600   | 515   | 110 | 0.107 |
| 25.0         | 1400                        | 625   | 110 | 0.149 | 1400   | 465   | 110 | 0.111 |
| 28.0         | 1250                        | 675   | 110 | 0.180 | 1250   | 505   | 110 | 0.135 |
| 32.0         | 1100                        | 700   | 110 | 0.212 | 1100   | 525   | 110 | 0.159 |



| UFA27, UFA32 |                             |       |     |       |        |       |     |       |
|--------------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ     | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA     | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| 6.0          | 13500                       | 6800  | 254 | 0.168 | 10500  | 5300  | 198 | 0.168 |
| 8.0          | 10500                       | 5300  | 264 | 0.168 | 8000   | 4000  | 201 | 0.167 |
| 10.0         | 8500                        | 4300  | 267 | 0.169 | 6500   | 3500  | 204 | 0.179 |
| 12.0         | 8500                        | 4200  | 320 | 0.165 | 6400   | 3200  | 241 | 0.167 |
| 16.0         | 6400                        | 3200  | 322 | 0.167 | 4800   | 2400  | 241 | 0.167 |
| 20.0         | 5100                        | 2500  | 320 | 0.163 | 3850   | 1900  | 242 | 0.165 |
| 10.0         | 5600                        | 2200  | 175 | 0.131 | 5600   | 1780  | 175 | 0.106 |
| 12.0         | 5600                        | 2740  | 210 | 0.163 | 5600   | 2200  | 210 | 0.131 |
| 16.0         | 4200                        | 2520  | 210 | 0.200 | 4200   | 1990  | 210 | 0.158 |
| 20.0         | 2800                        | 2000  | 175 | 0.238 | 2800   | 1680  | 175 | 0.200 |
| 20.0         | 4000                        | 1600  | 250 | 0.200 | 4000   | 1900  | 250 | 0.238 |



| UFA15        |                             |       |     |       |        |       |     |       |
|--------------|-----------------------------|-------|-----|-------|--------|-------|-----|-------|
| MATERIAŁ     | ALUMINIUM & STOPY ALUMINIUM |       |     |       |        |       |     |       |
| ŚREDNICA     | OBROTY                      | POSUW | Vc  | Fz    | OBROTY | POSUW | Vc  | Fz    |
| R3.0 X 6.0   | 14400                       | 1400  | 270 | 0.049 | 4400   | 350   | 85  | 0.040 |
| R4.0 X 8.0   | 11200                       | 1600  | 280 | 0.071 | 3360   | 400   | 85  | 0.060 |
| R5.0 X 10.0  | 11200                       | 1880  | 350 | 0.084 | 3360   | 465   | 105 | 0.069 |
| R6.0 X 12.0  | 11200                       | 2400  | 420 | 0.107 | 3360   | 600   | 125 | 0.089 |
| R8.0 X 16.0  | 8800                        | 2160  | 440 | 0.123 | 2640   | 535   | 135 | 0.101 |
| R10.0 X 20.0 | 5600                        | 1760  | 350 | 0.157 | 1680   | 440   | 105 | 0.131 |



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