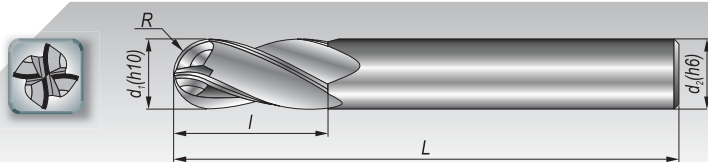
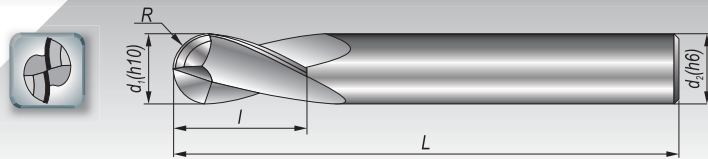
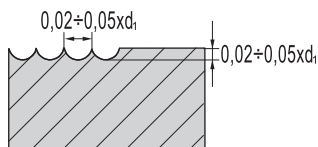


Charakterystyka; Features



Zastosowanie; Application



dla frezów 2-ostrowych; for 2-flute end mills

d_1	d_2	L	I
4	6	57	8
5	6	57	10
6	6	57	10
7	8	63	13
8	8	63	16
9	10	72	16
10	10	72	19
12	12	83	22
14	14	83	22
16	16	92	26
18	18	92	26
20	20	104	32

dla frezów 4-ostrowych; for 4-flute end mills

d_1	d_2	L	I
4	6	57	11
5	6	57	13
6	6	57	13
7	8	63	16
8	8	63	19
9	10	72	19
10	10	72	22
12	12	83	26
14	14	83	26
16	16	92	32
18	18	92	32
20	20	104	38

Parametry skrawania - strona [55]; Machining parameters – page [55]

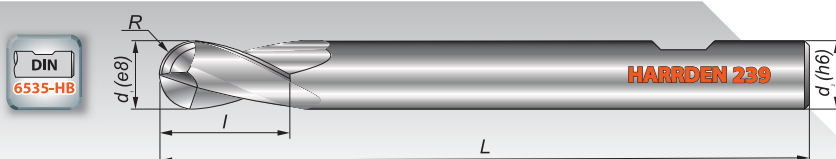


FREZY; END MILLS

HARRDEN 238 – z chwytem walcowym gładkim; with plane straight shank



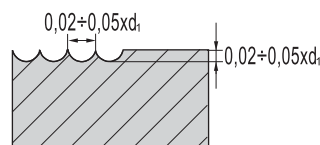
HARRDEN 239 – z chwytem Weldon; with Weldon shank



Charakterystyka; Features



Zastosowanie; Application



dla frezów 2-ostrowych HARRDEN 238 i 239;
for 2-flute end mills HARRDEN 238 and 239

$d_1=d_2$	L	l
3*	80	6
4*	100	8
5*	100	8
6	120	10
8	120	10
10	140	14
12	180	18
16	200	22
20	250	38

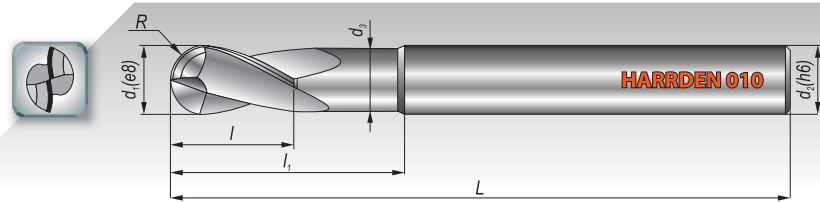
* - tylko HARRDEN 238; only HARRDEN 238



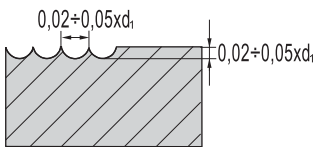
Parametry skrawania; Machining parameters

Materiał Material	FREZOWANIE KOPIOWE; TRACER MILLING				FREZOWANIE KOPIOWE SZYBKOCIOWE, HIGH-SPEED TRACER MILLING					
	Stal stopowa; Alloy steel		Stal stopowa; Alloy steel		Stal hartowana; Hardened steel		Stal stopowa; Alloy steel		Stal hartowana; Hardened steel	
HRC	30		30÷40		45÷65		45		45÷65	
Parameter	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
3	10500	540	8000	370	3620	120	16800	800	13600	420
4	8400	590	6720	420	3360	140	16800	1180	10930	460
5	7310	660	5840	460	2940	140	16800	1440	9600	480
6	6220	670	5040	500	2530	150	16800	1850	8400	500
8	4210	760	3540	530	1680	150	12610	2270	6300	590
10	3700	820	3020	570	1420	150	10930	2440	5040	670
12	3020	720	2350	530	1090	150	8400	2100	4210	670
16	2190	740	1860	520	930	150	6560	2100	3020	570
20	1680	670	1520	500	670	150	5040	2020	2350	420

Charakterystyka; Features



Zastosowanie; Application



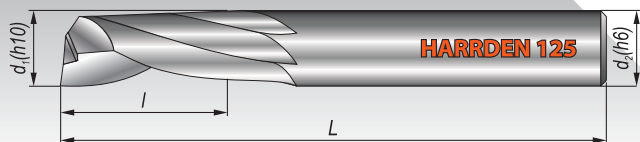
dla frezów 2-ostrowych HARRDEN 010;
for 2-flute end mills HARRDEN 010

d_1	d_2	d_3	L	l	l_1
4	6	–	70	8	16
5	6	–	80	10	24
6	6	5,8	80	10	–
7	8	–	90	13	27
8	8	7,8	90	16	–
10	10	9,8	100	19	–
12	12	11,8	100	22	–
14	12	–	120	22	–
16	16	15,8	140	26	–
18	16	–	140	26	–
20	20	19,8	160	32	–

Parametry skrawania; Machining parameters

Materiał Material	FREZOWANIE KOPIOWE; TRACER MILLING				FREZOWANIE KOPIOWE SZYBKOŚCIOWE, HIGH-SPEED TRACER MILLING					
	Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		Stal hartowana; Hardened steel		Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal hartowana; Hardened steel	
HRC Parameter	30		30÷45		45÷65		45		60÷65	
	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
4	10500	740	8400	530	4200	180	21000	2940	13660	1160
5	9140	820	7300	580	3680	180	21000	3600	12000	1200
6	8490	1020	6900	830	3180	190	21000	4000	10500	1250
8	7160	1290	5770	920	2470	220	16700	4000	8360	1250
10	6370	1530	6090	1020	2040	225	14000	3900	7000	1200
12	5840	1750	4640	1110	1750	245	12200	3900	6100	1160
16	4770	1720	3780	1060	1350	245	9550	3450	4770	1000
20	4140	1660	3260	1040	1110	250	79600	3180	3980	920

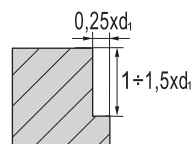




Charakterystyka; Features



Zastosowanie; Application



dla frezów 1-ostrowych HARRDEN 125;
for fly cutters HARRDEN 125

$d_1=d_2$	L	l
6	57	20
8	63	22
10	72	25
12	83	30

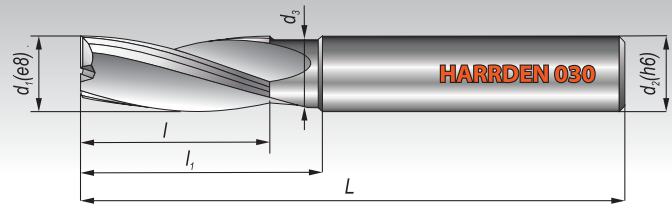
Parametry skrawania - strona [55]; Machining parameters – page [55]



Charakterystyka; Features

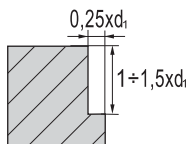


Z
2÷3



Zastosowanie; Application

Al CuZn



dla frezów 2 i 3-ostrzowych HARRDEN 030;
for 2 and 3-flute end mills HARRDEN 030

$d_1=d_2$	d_3	L	l	l_1	z
4	3,8	54	13	16	2
5	4,8	54	15	18	2
6	5,8	64	16	21	2
8	7,8	70	22	27	2
10	9,8	72	25	32	2
12	11,8	83	28	38	3
14	13,8	83	30	42	3
16	15,8	92	36	44	3
18	17,8	92	36	50	3
20	19,8	104	41	54	3

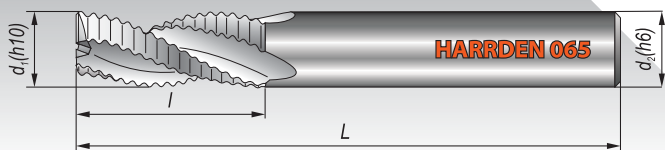
Parametry skrawania; Machining parameters

d_1	Aluminium		Nisko krzemowy stop aluminium Low siliceous aluminium alloy	
	rpm	mm/min	rpm	mm/min
4	13000	1200	13000	1400
5	13000	1300	13000	1700
6	13000	1500	13000	2000
8	10000	1800	10000	2300
10	10000	2200	10000	2700
12	10000	2700	10000	3400
14	8000	2300	8000	2800
16	8000	2500	8000	3100
20	5000	2000	5000	2500

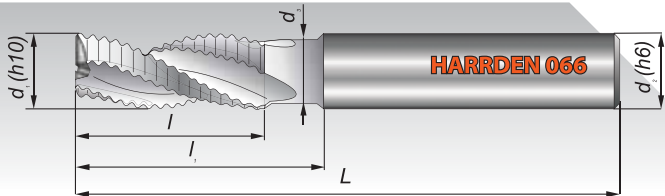


FREZY; END MILLS

HARRDEN 065 – spirala 30°; helix 30°



HARRDEN 066 – spirala 30°; helix 30°



Charakterystyka; Features

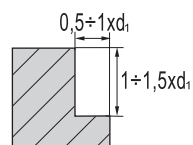


Zastosowanie; Application



* dla Si < 10% zalecany jest HARRDEN 066;

* for Si < 10% HARRDEN 066 is recommended



dla frezów 3-ostrzowych HARRDEN 065;
for 3-flute end mills HARRDEN 065

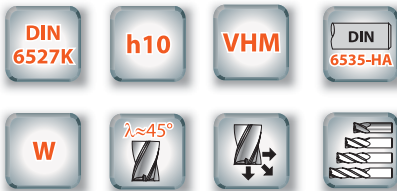
$d_1=d_2$	L	l
6	57	13
8	63	16
10	72	22
12	83	26
14	83	26
16	92	32
18	92	32
20	104	38

dla frezów 3-ostrzowych HARRDEN 066;
for 3-flute end mills HARRDEN 066

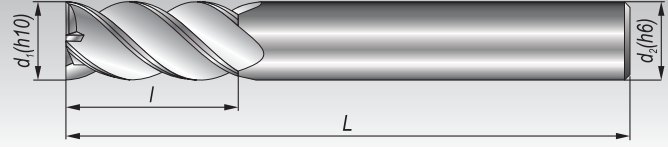
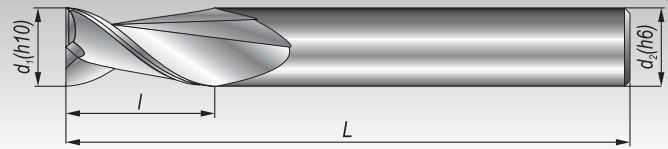
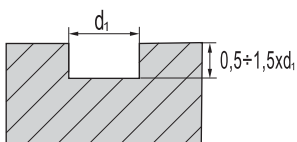
$d_1=d_2$	d_3	L	l	l_1
6	5,8	57	13	21
8	7,8	63	16	27
10	9,8	72	22	32
12	11,6	83	26	38
14	13,6	83	26	38
16	15,5	92	32	44
18	17,5	92	32	44

Parametry skrawania - strona [55]; Machining parameters – page [55]

Charakterystyka; Features



Zastosowanie; Application



dla frezów 2 i 3-ostrzowych; for 2 and 3-flute end mills

d_1	d_2	L	l
5	6	54	6
6	6	54	7
7	8	58	8
8	8	58	9
9	10	66	10
10	10	66	11
12	12	73	12
14	14	75	14
16	16	82	16
18	18	84	18
20	20	92	20

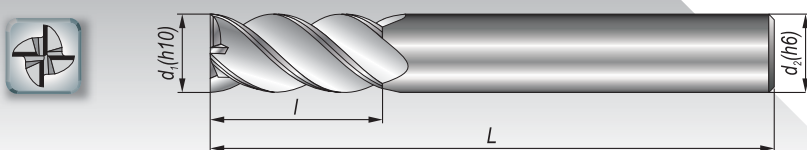
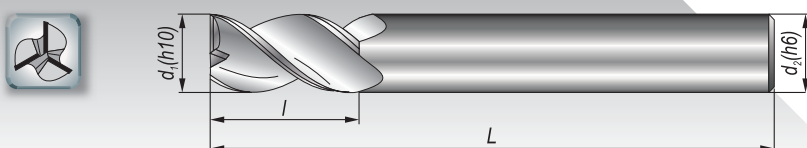
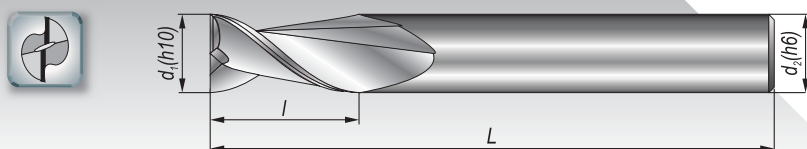
dla frezów 4-ostrzowych; for 4-flute end mills

d_1	d_2	L	l
5	6	54	9
6	6	54	10
7	8	58	11
8	8	58	12
9	10	66	13
10	10	66	14
12	12	73	16
14	14	75	18
16	16	82	22
18	18	84	24
20	20	92	26

Parametry skrawania - strona [55]; Machining parameters – page [55]



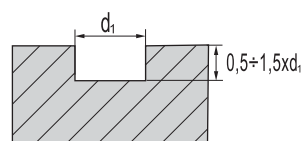
FREZY; END MILLS



Charakterystyka; Features



Zastosowanie; Application



dla frezów 2 i 3-ostrowych; for 2 and 3-flute end mills

d ₁	d ₂	L	l
5	6	57	10
6	6	57	10
7	8	63	13
8	8	63	16
9	10	72	16
10	10	72	19
12	12	83	22
14	14	83	22
16	16	92	26
18	18	92	26
20	20	104	32

dla frezów 4-ostrowych; for 4-flute end mills

d ₁	d ₂	L	l
5	6	57	13
6	6	57	13
7	8	63	16
8	8	63	19
9	10	72	19
10	10	72	22
12	12	83	26
14	14	83	26
16	16	92	32
18	18	92	32
20	20	104	38

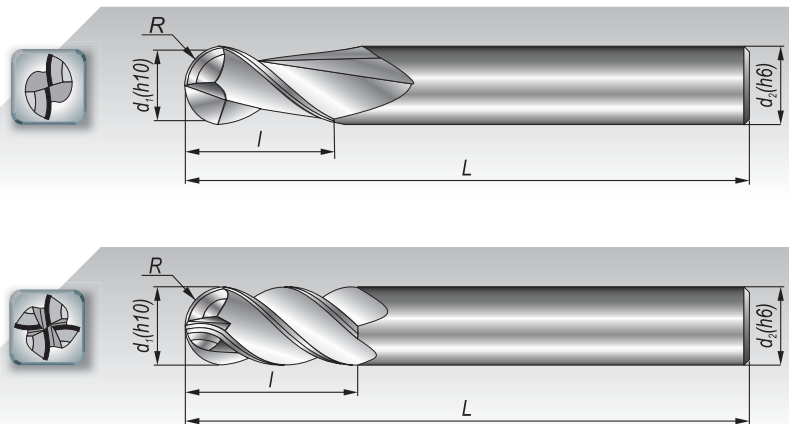
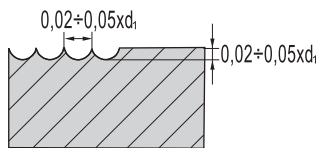
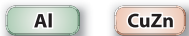
Parametry skrawania - strona [55]; Machining parameters – page [55]



Charakterystyka; Features



Zastosowanie; Application



dla frezów 2-ostrzowych; for 2-flute end mills

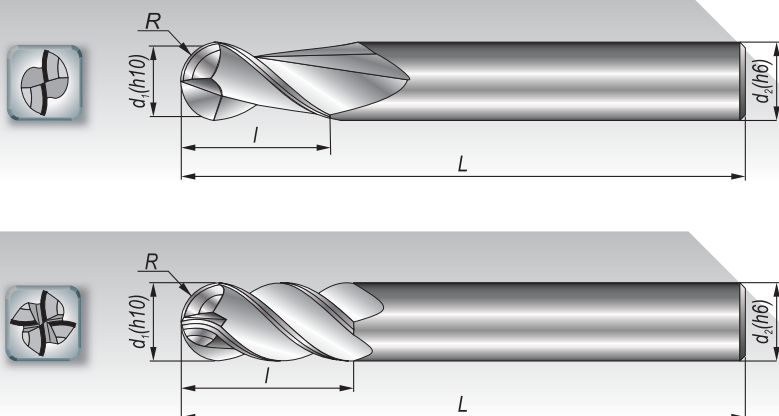
d_1	d_2	L	l
5	6	54	6
6	6	54	7
7	8	58	8
8	8	58	9
9	10	66	10
10	10	66	11
12	12	73	12
14	14	75	14
16	16	82	16
18	18	84	18
20	20	92	20

dla frezów 4-ostrzowych; for 4-flute end mills

d_1	d_2	L	l
5	6	54	9
6	6	54	10
7	8	58	11
8	8	58	12
9	10	66	13
10	10	66	14
12	12	73	16
14	14	75	18
16	16	82	22
18	18	84	24
20	20	92	26

Parametry skrawania - strona [55]; Machining parameters – page [55]

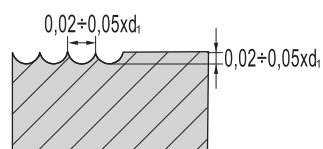




Charakterystyka; Features



Zastosowanie; Application



dla frezów 2-ostrowych; for 2-flute end mills

d ₁	d ₂	L	l
5	6	57	10
6	6	57	10
7	8	63	13
8	8	63	16
9	10	72	16
10	10	72	19
12	12	83	22
14	14	83	22
16	16	92	26
18	18	92	26
20	20	104	32

dla frezów 4-ostrowych; for 4-flute end mills

d ₁	d ₂	L	l
5	6	57	13
6	6	57	13
7	8	63	16
8	8	63	19
9	10	72	19
10	10	72	22
12	12	83	26
14	14	83	26
16	16	92	32
18	18	92	32
20	20	104	38

Parametry skrawania - strona [55]; Machining parameters – page [55]

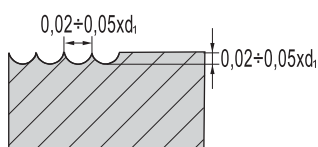
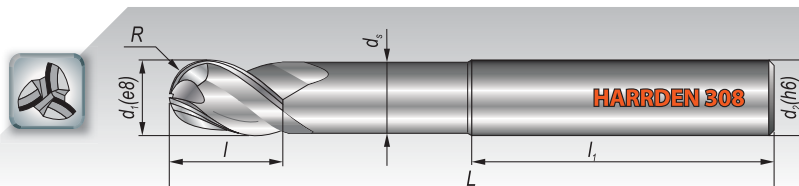


HARDEN 308 – 3-ostrzowe; 3-flute

Charakterystyka; Features



Zastosowanie; Application



dla frezów 3-ostrzowych HARDEN 308;
for 3-flute end mills HARDEN 308

d_1	d_2	d_3	L	l	l_1
3	6	2,8	60	4,5	24
4	6	3,7	65	6	29
5	6	4,6	65	7,5	29
6	6	5,6	75	9	39
8	8	7,4	75	12	39
10	10	9,4	80	15	40
12	12	11,4	90	18	45
16	16	15,4	100	24	52

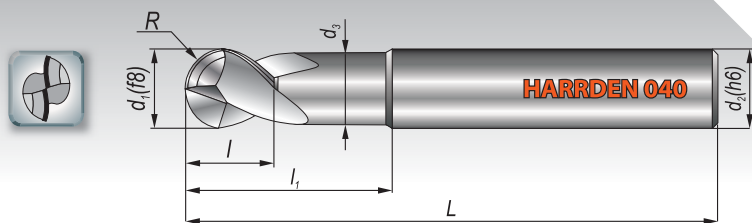
Parametry skrawania; Machining parameters

Parameter	Aluminium Material Stopy aluminium; Aluminium alloys		Stal kwasoodporna; Acid resistant steel Stal nierdzewna; Stainless steel Stopy tytanu; Titanium alloys		Miedź; Copper Mosiądz; Brass Metale nieżelazne; Non-ferrous metals	
	rpm	mm/min	rpm	mm/min	rpm	mm/min
3	18600	550	9000	120	13000	450
4	14000	550	6700	120	10000	460
5	11000	650	5500	120	8000	450
6	9400	650	4400	130	6800	500
8	7200	740	3400	130	5200	500
10	5600	740	2600	130	4000	500
12	4700	860	2200	130	3400	500
16	3500	740	1700	140	2600	500



FREZY; END MILLS

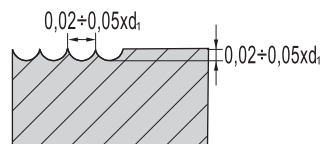
HARRDEN 040 – 2-ostrzowe; 2-flute



Charakterystyka; Features



Zastosowanie; Application



dla frezów 2-ostrzowych HARRDEN 040;
for 2-flute end mills HARRDEN 040

$d_1=d_2$	d_3	L	l	l_1
4	3,7	54	7	16
5	4,6	54	8	17
6	5,5	54	10	20
8	7,5	58	12	25
10	9,4	66	13	30
12	11,4	73	16	37
14	13,2	75	16	37
16	15	82	20	42
20	19	92	25	48

Parametry skrawania - strona [55]; Machining parameters – page [55]