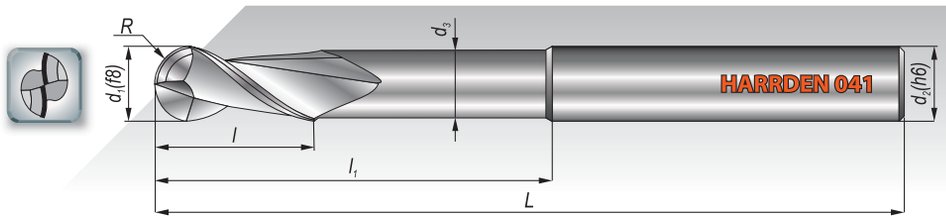
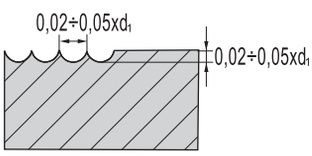
HARRDEN 041 – 2-ostrzowe; 2-flute



Charakterystyka; Features

Zastosowanie; Application

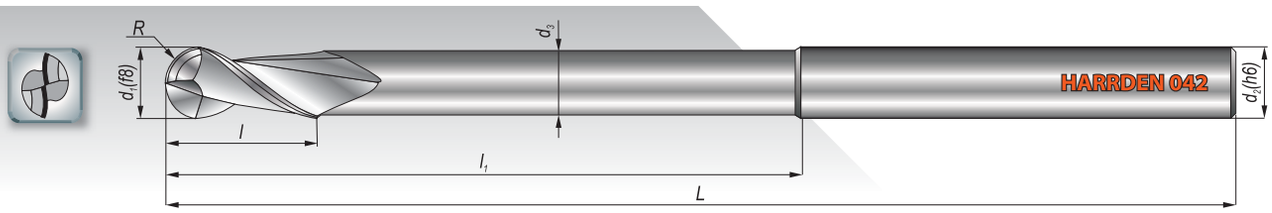


dla frezów 2-ostrzowych HARRDEN 041;
for 2-flute end mills HARRDEN 041

$d_1=d_2$	d_3	L	l	l_1
4	3,7	75	13	35
5	4,6	75	15	39
6	5,5	100	16	43
8	7,5	100	22	53
10	9,4	100	25	59
12	11,4	100	26	59
14	13,2	100	26	59
16	15	150	30	91
20	19	150	40	91

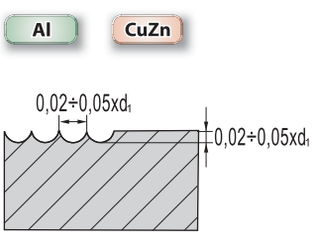
Parametry skrawania - strona [55]; Machining parameters – page [55]

HARRDEN 042 – 2-ostrzowe; 2-flute



Charakterystyka; Features

Zastosowanie; Application

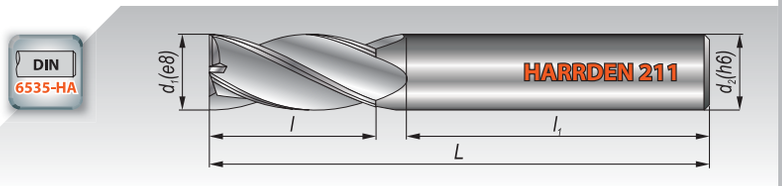


dla frezów 2-ostrzowych HARRDEN 042;
for 2-flute end mills HARRDEN 042

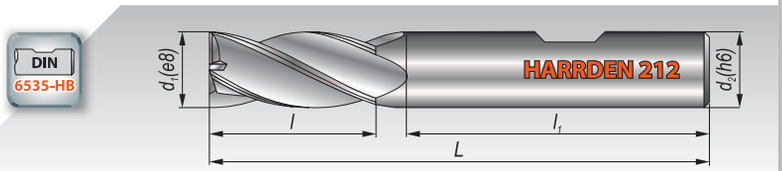
$d_1=d_2$	d_3	L	l	l_1
6	5,5	150	16	93
8	7,5	150	22	103
10	9,4	150	25	105
12	11,4	150	26	104
16	15	250	30	191

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

HARRDEN 211 – z chwytem walcowym gładkim; with plane straight shank

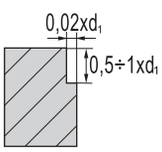


HARRDEN 212 – z chwytem Weldona; with Weldon shank



Charakterystyka; Features

Zastosowanie; Application



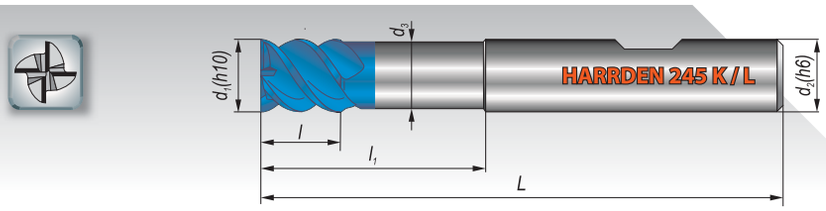
dla frezów 4-ostrzowych HARRDEN 211 i 212;
for 4-flute end mills HARRDEN 211 and 212

d_1	d_2	L	l	l_1
3	6	50	8	36
4	6	54	11	36
5	6	54	13	36
6	6	54	13	36
7	8	58	16	36
8	8	58	19	36
9	10	66	19	40
10	10	66	22	40
12	12	73	26	45
14	14	75	26	45
16	16	82	32	48
18	18	84	32	48
20	20	92	38	50

Parametry skrawania; Machining parameters

Materiał Material	Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		Stal kwasoodporna; Acid resistant steel Stal nierdzewna; Stainless steel		Stal hartowana; Hardened steel		Stal hartowana; Hardened steel	
HRC	30		30÷45		–		45÷55		55÷65	
Parameter	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
3	8920	320	5560	200	4620	170	3360	60	1900	60
4	7560	570	4620	350	3880	280	2940	60	1480	60
5	6300	600	3780	360	3160	300	2320	70	1260	60
6	5560	660	3360	410	2840	330	2000	80	1100	60
8	4200	710	2520	380	2100	350	1680	110	840	60
10	3260	610	2000	300	1680	300	1360	90	680	50
12	2740	520	1680	250	1360	240	1160	80	560	50
16	1680	410	1360	200	1060	200	900	60	440	30
20	1360	320	1060	160	840	150	680	40	320	30

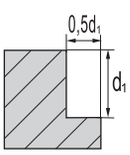
HARRDEN 245 K / L – 4-ostrzowe; 4-flute



Warunkowo dopuszczalne jest zastosowanie powłoki FUTURA NANO;
In special cases application of FUTURA NANO coating is acceptable

Charakterystyka; Features

Zastosowanie; Application



dla frezów 4-ostrzowych HARRDEN 245 K odmiana krótka;
for 4-flute end mills HARRDEN 245 short series

$d_1=d_2$	d_3	L	l	l_1
6	5,5	57	7	20
8	7,4	63	9	26
10	9,2	72	11	31
12	11	83	12	37
16	15	92	16	43
20	19	104	20	53

dla frezów 4-ostrzowych HARRDEN 245 L odmiana długa;
for 4-flute end mills HARRDEN 245 long series

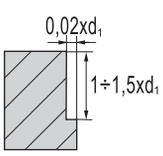
$d_1=d_2$	d_3	L	l	l_1
6	5,5	70	7	33
8	7,4	80	9	43
10	9,2	84	11	43
12	11	97	12	51
16	15	115	16	66
20	19	130	20	79

Parametry obróbki HPC w materiale o twardości ~ 50 HRC;
HPC machining parameters in material with ~ 50 HRC hardness

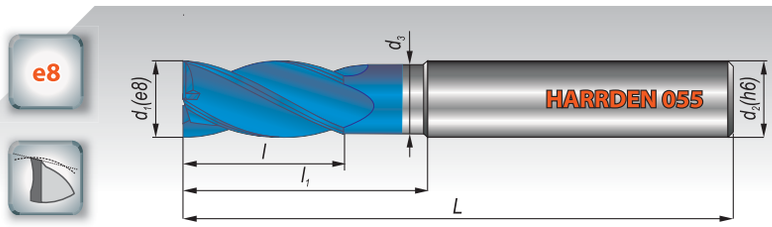
D	z	V_c	f_z	a_p	a_e	n
mm	–	m/min	mm	mm	mm	min^{-1}
6	4	40	0,020	6,00	3,00	2120
8	4	40	0,025	8,00	4,00	1590
10	4	40	0,030	10,00	5,00	1270
12	4	40	0,040	12,00	6,00	1060
16	4	40	0,050	16,00	8,00	795

Charakterystyka; Features

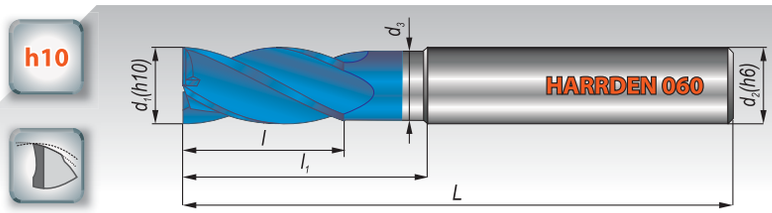
Zastosowanie; Application



HARRDEN 055 – ostrza obwodowe ścinowe; flat clearance angle



HARRDEN 060 – ostrza obwodowe z zaszlifem; flutes with relief grinding



Warunkowo dopuszczalne jest zastosowanie powłoki FUTURA NANO;
In special cases application of FUTURA NANO coating is acceptable

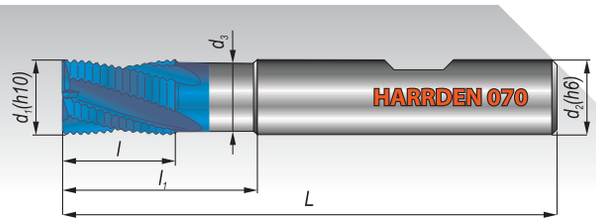
dla frezów 4-ostrzowych HARRDEN 055 i 060
for 4-flute end mills HARRDEN 055 and 060

$d_1=d_2$	d_3	L	l	l_1
4	3,8	57	13	29
5	4,8	57	15	29
6	5,8	57	16	21
7	6,8	63	20	27
8	7,8	63	22	27
9	8,8	72	25	32
10	9,8	72	25	32
12	11,8	83	28	38
14	13,8	83	30	38
16	15,8	92	35	44
18	17,8	92	35	44
20	19,8	104	40	54

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

HARRDEN 070 – spirala 20°; helix 20°

Z 3÷4



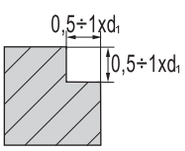
Warunkowo dopuszczalne jest zastosowanie powłoki FUTURA NANO;
In special cases application of FUTURA NANO coating is acceptable

Charakterystyka; Features

HN · h10 · VHM · DIN 6535-HB · HR · λ≈20° · XC

Zastosowanie; Application

<1000 N/mm² · >1000 N/mm² · Ti · GG



dla frezów 3 i 4-ostrzowych HARRDEN 070;
for 3 and 4-flute end mills HARRDEN 070

d_1	d_2	d_3	L	l	l_1	z
6	6	5,5	54	8	18	3
7	8	6,5	58	11	–	3
8	8	7,5	58	11	22	3
9	10	8,5	66	13	–	4
10	10	9,5	66	13	26	4
12	12	11	73	16	28	4
14	14	13	75	16	30	4
16	16	15	82	19	34	4
18	18	17	84	19	36	4
20	20	19	92	19	42	4

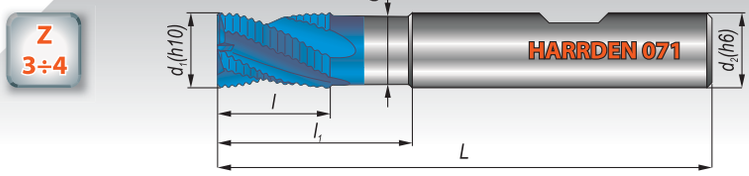
Parametry skrawania; Machining parameters

Materiał; Material	FREZOWANIE KONWENCJONALNE; CONVENTIONAL MILLING: Stal stopowa; Alloy steel / Stal niestopowa; Non-alloy steel / Żeliwo; Cast iron		Stal stopowa; Alloy steel / Stal żaroodporna; Heat-resisting steel		Stal stopowa; Alloy steel / Stal żaroodporna; Heat-resisting steel		FREZOWANIE SZYBKOŚCIOWE; HIGH-SPEED MILLING: Stal hartowana; Hardened steel		Stal hartowana; Hardened steel	
HRC	30		30÷38		38÷45		45÷55		55÷65	
d_1	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
6	15600	2320	12400	840	8400	570	3400	260	2400	190
7	15600	2320	12400	840	8400	570	3400	260	2400	190
8	11600	2320	9200	840	6300	570	2400	240	1800	180
9	11600	2320	9200	840	6300	570	2400	240	1800	180
10	9200	2320	7600	840	5100	570	2000	290	1300	190
12	8000	2400	6000	800	4200	570	1680	260	1200	190
14	6800	2400	5200	840	3600	570	1400	200	900	130
16	6000	2400	4800	760	3300	510	1200	160	800	110
18	5200	2320	4400	720	2700	420	1100	150	700	100
20	4800	2160	3600	560	2400	360	1000	150	660	100

**Frezy 3 i 4-ostrzowe do obróbki zgrubnej materiałów trudnoskrawalnych z kątem spirali 20°;
3 and 4-flute roughing end mills for machining poor machinable materials with 20° helix angle**

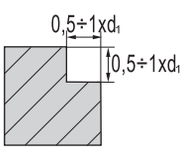
HARRDEN 071 – spirala 30°; helix 30°

Charakterystyka; Features



Warunkowo dopuszczalne jest zastosowanie powłoki FUTURA NANO;
In special cases application of FUTURA NANO coating is acceptable

Zastosowanie; Application



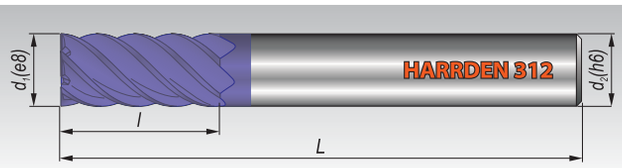
dla frezów 3 i 4-ostrzowych HARRDEN 071;
for 3 and 4-flute end mills HARRDEN 071

	d_1	d_2	d_3	L	l	l_1	z
	6	6	5,5	54	8	18	3
	7	8	6,5	58	11	–	3
	8	8	7,5	58	11	22	3
	9	10	8,5	66	13	–	4
	10	10	9,5	66	13	26	4
	12	12	11	73	16	28	4
	14	14	13	75	16	30	4
	16	16	15	82	19	34	4
	18	18	17	84	19	36	4
	20	20	19	92	19	42	4

Parametry skrawania; Machining parameters

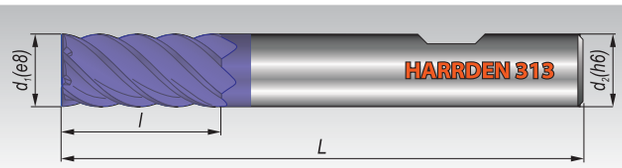
Materiał; Material	FREZOWANIE KONWENCJONALNE; CONVENTIONAL MILLING Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		FREZOWANIE SZYBKOŚCIOWE; HIGH-SPEED MILLING Stal hartowana; Hardened steel		Stal hartowana; Hardened steel	
HRC	30		30÷38		38÷45		45÷55		55÷65	
d_1	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
6	15600	2320	12400	840	8400	570	3400	260	2400	190
7	15600	2320	12400	840	8400	570	3400	260	2400	190
8	11600	2320	9200	840	6300	570	2400	240	1800	180
9	11600	2320	9200	840	6300	570	2400	240	1800	180
10	9200	2320	7600	840	5100	570	2000	290	1300	190
12	8000	2400	6000	800	4200	570	1680	260	1200	190
14	6800	2400	5200	840	3600	570	1400	200	900	130
16	6000	2400	4800	760	3300	510	1200	160	800	110
18	5200	2320	4400	720	2700	420	1100	150	700	100
20	4800	2160	3600	560	2400	360	1000	150	660	100

HARRDEN 312 – z chwytem walcowym gładkim; with plane straight shank



DIN 6535-HA

HARRDEN 313 – z chwytem Weldona; with Weldon shank



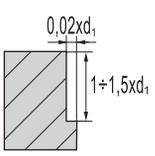
DIN 6535-HB

Charakterystyka; Features

HP | e8 | VHM | NH | λ≈45° | FN

Zastosowanie; Application

<1000 N/mm² | >1000 N/mm² | >45 HRC | Inox



dla frezów 6-ostrzowych HARRDEN 312 i 313;
for 6-flute end mills HARRDEN 312 and 313

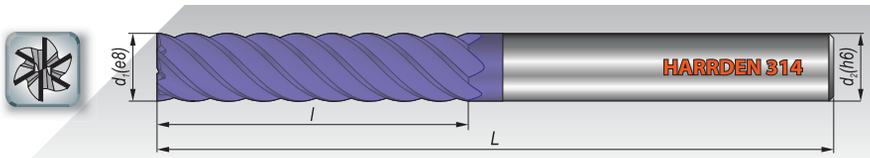
$d_1=d_2$	L	l
6	57	13
8	63	19
10	72	22
12	83	26
16	83	26
20	92	32

Parametry skrawania; Machining parameters

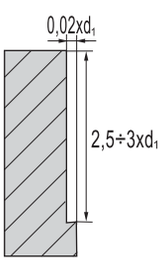
Materiał; Material	Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		Hardened steel; Stal hartowana		Hardened steel; Stal hartowana	
HRC	**40**		**40÷50**		**50÷60**		**60÷65**	
d_1	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
6	2230	470	1670	350	1390	250	1110	200
8	1670	450	1250	330	1050	240	840	180
10	1330	440	1000	300	840	230	680	160
12	1110	400	840	270	690	210	560	150
16	840	330	630	230	530	170	420	130
20	670	280	500	200	420	150	320	120

HARRDEN 314 – 6-ostrzowe; 6-flute

Charakterystyka; Features



Zastosowanie; Application



dla frezów 6-ostrzowych HARRDEN 314;
for 6-flute end mills HARRDEN 314

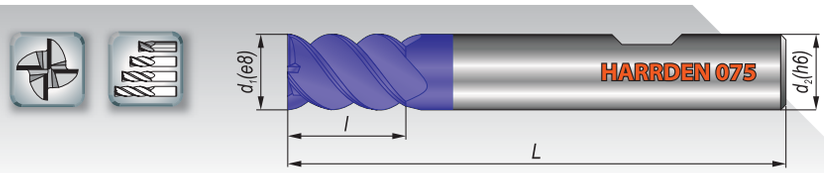
$d_1=d_2$	L	l
6	70	26
8	90	36
10	100	46
12	110	56
16	130	66
20	140	76

Parametry skrawania; Machining parameters

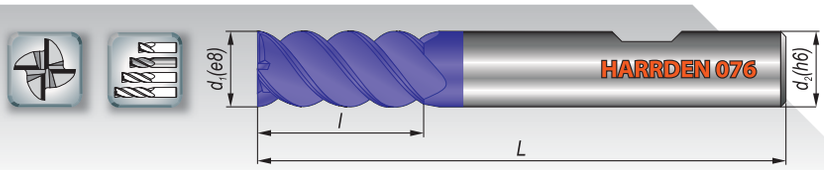
Materiał; Material	Stal stopowa; Alloy steel Stal niestopowa; Non-alloy steel Żeliwo; Cast iron		Stal stopowa; Alloy steel Stal żaroodporna; Heat-resisting steel		Hardened steel; Stal hartowana		Hardened steel; Stal hartowana	
HRC	**40**		**40÷50**		**50÷60**		**60÷65**	
d_1	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
6	2230	470	1670	350	1390	250	1110	200
8	1670	450	1250	330	1050	240	840	180
10	1330	440	1000	300	840	230	680	160
12	1110	400	840	270	690	210	560	150
16	840	330	630	230	530	170	420	130
20	670	280	500	200	420	150	320	120

Frezy 6-ostrzowe, bardzo długie do obróbki materiałów trudnoskrawalnych;
6-flute roughing end mills, very long for machining poor machinable materials

HARRDEN 075 – krótkie; short



HARRDEN 076 – długie; long

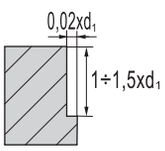


Charakterystyka; Features

DIN 6528 | e8 | VHM | DIN 6535-HB | NH | λ≈52° | FN

Zastosowanie; Application

<1000 N/mm² | >1000 N/mm² | Ti | Inox



dla frezów 4-ostrzowych HARRDEN 075;
for 4-flute end mills HARRDEN 075

$d_1=d_2$	L	l
6	54	10
8	58	12
10	66	14
12	73	16
14	75	18
16	82	22
18	84	24
20	92	26

dla frezów 4-ostrzowych HARRDEN 076;
for 4-flute end mills HARRDEN 076

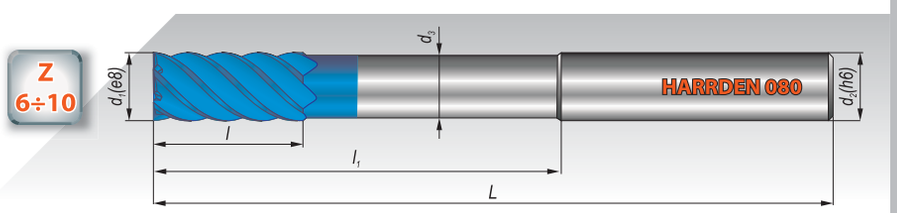
$d_1=d_2$	L	l
6	57	13
8	63	19
10	72	22
12	83	26
14	83	26
16	92	32
18	92	32
20	104	38

Parametry skrawania; Machining parameters

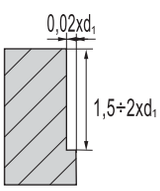
d_1	z	V_c	f_z	a_p	a_e	n
mm/mm	–	m/min	mm	mm	mm	min^{-1}
6	4	40	0,020	6,00	3,00	2120
8	4	40	0,025	8,00	4,00	1590
10	4	40	0,030	10,00	5,00	1270
12	4	40	0,040	12,00	6,00	1060
14	4	40	0,040	14,00	7,00	900
16	4	40	0,050	16,00	8,00	795
18	4	40	0,055	18,00	9,00	700
20	4	40	0,060	20,00	10,00	640

HARRDEN 080 –wieloostrzowe; multi-flute

Charakterystyka; Features



Zastosowanie; Application



dla frezów wieloostrzowych HARRDEN 080;
for multi-flute end mills HARRDEN 080

$d_1=d_2$	d_3	L	l	l_1	z
6	5,8	80	16	40	6
8	7,7	100	19	50	6
10	9,7	100	25	50	6
12	11,6	120	30	70	6
16	15,6	150	40	100	8
20	19,6	150	50	100	10

Parametry skrawania; Machining parameters

d_1	V_c	f_z	a_p	a_e	n
mm/mm	m/min	mm	mm	mm	min^{-1}
6	40	0,020	6,00	3,00	2120
8	40	0,025	8,00	4,00	1590
10	40	0,030	10,00	5,00	1270
12	40	0,040	12,00	6,00	1060
16	40	0,050	16,00	8,00	795
20	40	0,060	20,00	10,00	640