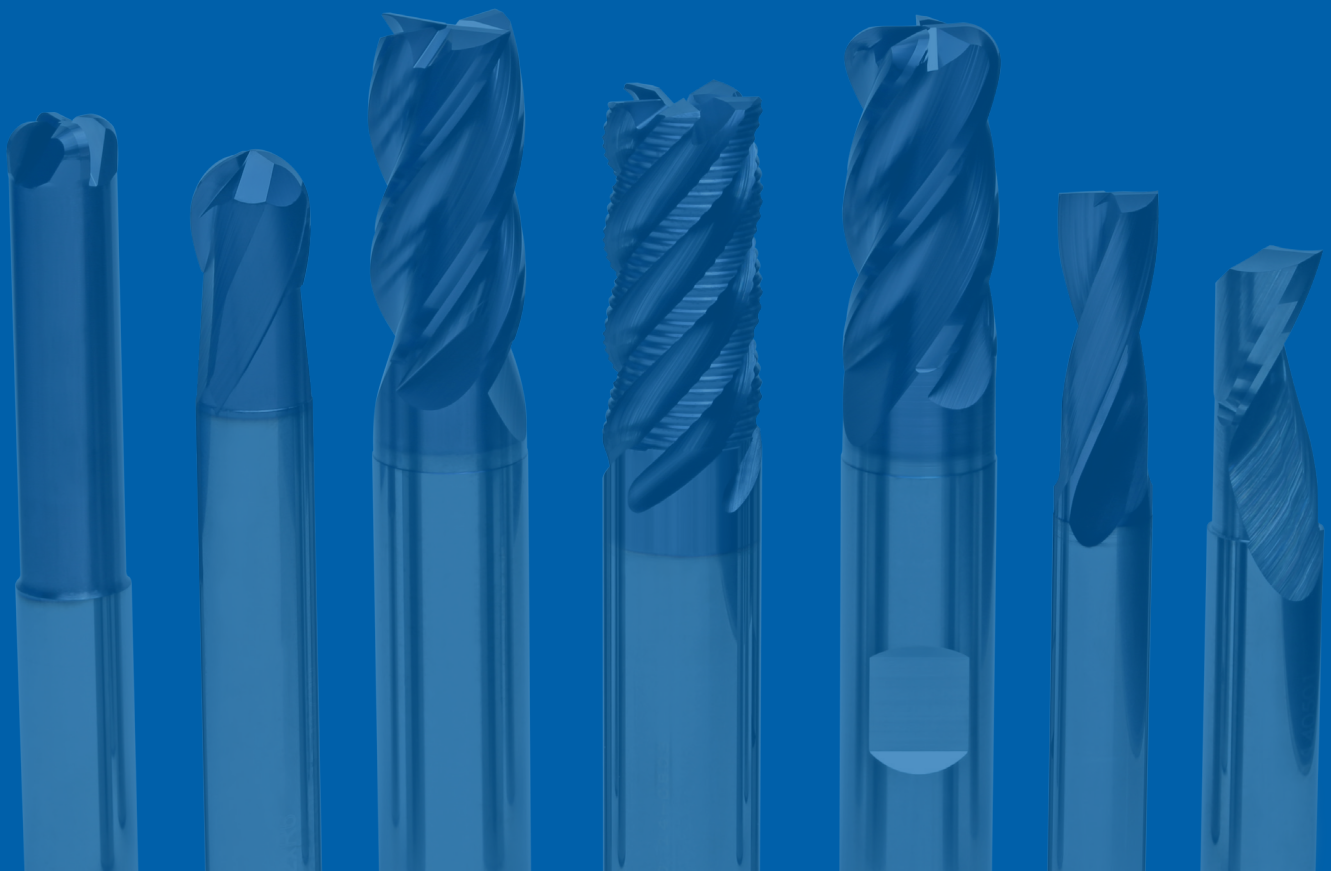
Milling Series

HY-PRO

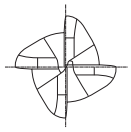
Volume 3

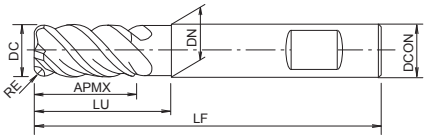
INDEX



HYP-CR-HI-WEMS

Milling | Solid carbide





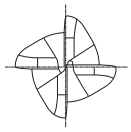
- Carbide end mill with TiAlN coating
- For general applications
- 4 flutes, variable helix and unequal spacing, corner radius
- Weldon shank

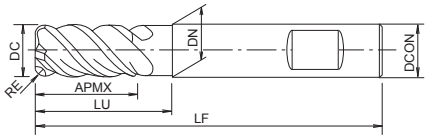
p.12

EDP	ZEFP	DC	RE	LU	LF	APMX	DCON	DN
4832004011	4	4	0,5	-	57	11	6	-
4832005011	4	5	0,5	-	57	13	6	-
4832006011	4	6	0,5	20	57	13	6	5,8
4832006012	4	6	1	20	57	13	6	5,8
4832006013	4	6	1,5	20	57	13	6	5,8
4832006014	4	6	2	20	57	13	6	5,8
4832008011	4	8	0,5	25	63	19	8	7,8
4832008012	4	8	1	25	63	19	8	7,8
4832008013	4	8	1,5	25	63	19	8	7,8
4832008014	4	8	2	25	63	19	8	7,8
4832010011	4	10	0,5	30	72	22	10	9,8
4832010012	4	10	1	30	72	22	10	9,8
4832010013	4	10	1,5	30	72	22	10	9,8
4832010014	4	10	2	30	72	22	10	9,8
4832010016	4	10	3	30	72	22	10	9,8
4832012011	4	12	0,5	38	83	26	12	11,8
4832012012	4	12	1	38	83	26	12	11,8
4832012013	4	12	1,5	38	83	26	12	11,8
4832012014	4	12	2	38	83	26	12	11,8
4832012016	4	12	3	38	83	26	12	11,8
4832016011	4	16	0,5	44	92	32	16	15,8
4832016012	4	16	1	44	92	32	16	15,8
4832016014	4	16	2	44	92	32	16	15,8
4832016016	4	16	3	44	92	32	16	15,8
4832016018	4	16	4	44	92	32	16	15,8
4832020012	4	20	1	54	104	38	20	19,8
4832020014	4	20	2	54	104	38	20	19,8
4832020016	4	20	3	54	104	38	20	19,8
4832020018	4	20	4	54	104	38	20	19,8
4832020020	4	20	5	54	104	38	20	19,8

HYP-CR-HD-WEMS

Milling | Solid carbide





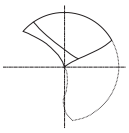
- Carbide end mill with TiAlN coating
- For general applications
- 4 flutes, variable helix and unequal spacing, corner radius
- Weldon shank

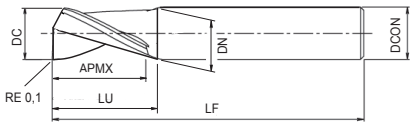
p.12

EDP	ZEFP	DC	RE	LU	LF	APMX	DCON	DN
4833006010	4	6	0,25	20	57	13	6	5,8
4833008010	4	8	0,25	25	63	19	8	7,8
4833010010	4	10	0,25	30	72	22	10	9,8
4833012010	4	12	0,25	38	83	26	12	11,8
4833016010	4	16	0,25	44	92	32	16	15,8
4833020010	4	20	0,25	54	104	38	20	19,8

HYP-F1

Milling | Solid carbide





- Carbide end mill, bright finish
- For aluminium milling
- 1 flute

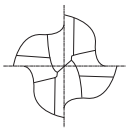
HYPRO CARBIDE 15°

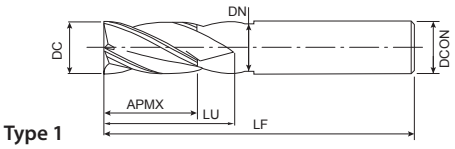
p.12

EDP	ZEFP	DC	LU	LF	APMX	DCON	DN
48360030	1	3	5	40	4	6	-
48360040	1	4	6	50	5	6	-
48360050	1	5	8	50	7	6	-
48360060	1	6	15	50	8	6	5,4
48360080	1	8	20	60	11	8	7
48360100	1	10	25	70	13	10	9
48360120	1	12	30	70	15	12	11

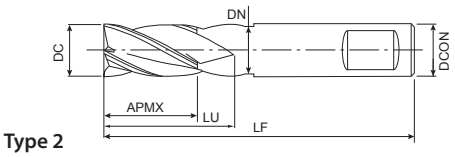
HYP-HI-(W)EMS

Milling | Solid carbide





Type 1



Type 2

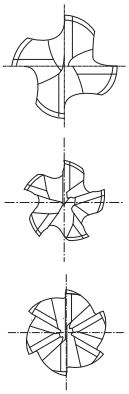
- Carbide end mill with TiAlN coating
- For general applications
- 4 flutes, variable helix and unequal spacing
- Also with Weldon shank

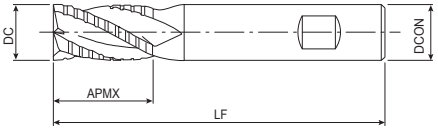
p.12

EDP	ZEFP	DC	LU	LF	APMX	DCON	DN	Type
48320040	4	4	-	57	11	6	-	1
483200401	4	4	-	57	11	6	-	2
48320050	4	5	-	57	13	6	-	1
483200501	4	5	-	57	13	6	-	2
48320060	4	6	20	57	13	6	5,8	1
483200601	4	6	20	57	13	6	5,8	2
48320080	4	8	25	63	19	8	7,8	1
483200801	4	8	25	63	19	8	7,8	2
48320100	4	10	30	72	22	10	9,8	1
483201001	4	10	30	72	22	10	9,8	2
48320120	4	12	38	83	26	12	11,8	1
483201201	4	12	38	83	26	12	11,8	2
48320160	4	16	45	92	32	16	15,8	1
483201601	4	16	45	92	32	16	15,8	2
48320200	4	20	60	104	38	20	19,8	1
483202001	4	20	60	104	38	20	19,8	2

HYP-HP-WRESF

Milling | Solid carbide





- Carbide end mill with TiAlN coating
- For general applications
- Multi flute, for roughing
- Weldon shank

P ~45 HRC | P ~55 HRC | M | K ~350 HB

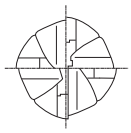
HYPRO | CARBIDE | TiAlN | 45° | HB

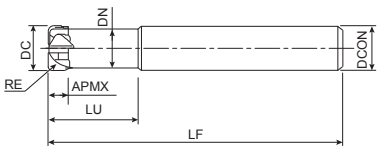
p.13

EDP	ZEFP	DC	LF	APMX	DCON
48624060	4	6	64	19	6
48624080	4	8	64	21	8
48624100	4	10	70	22	10
48624120	4	12	76	25	12
48625160	5	16	89	32	16
48626200	6	20	102	38	20
48626250	6	25	102	38	25

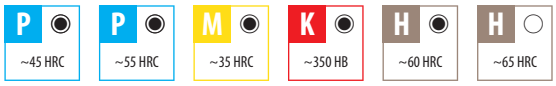
HYP-HS-CRE

Milling | Solid carbide





- Carbide end mill with TiAlN coating
- For hard materials and cast iron
- 4 flutes, super radius

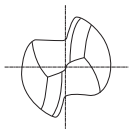


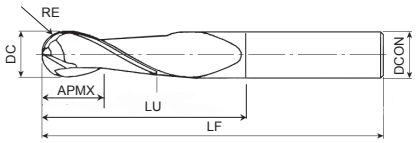
p.13

EDP	ZEFP	DC	RE	LU	LF	APMX	DCON	DN
48340060	4	6	1,5	24	57	2,5	6	5
48340080	4	8	2	32	63	3,5	8	7
48340100	4	10	2	40	72	4	10	9
48340120	4	12	3	48	83	5	12	11

HYP-SB-EBD

Milling | Solid carbide





- Carbide end mill with TiAlN coating
- For general applications
- 2 flutes, ball nose

P ~45 HRC | P ~55 HRC | M ~35 HRC | K ~350 HB | N | S | H ~60 HRC

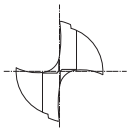
HYPRO | CARBIDE | TiAlN | 30° | SHRINK FIT | ± 0.01

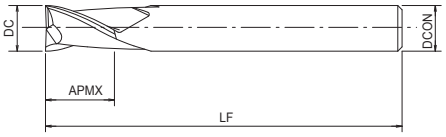
p.14

EDP	ZEFP	DC	RE	LU	LF	APMX	DCON
48350030	2	3	1,5	9	57	4	6
48350040	2	4	2	12	57	5	6
48350050	2	5	2,5	15	57	6	6
48350060	2	6	3	18	57	7	6
48350080	2	8	4	20	63	9	8
48350100	2	10	5	25	72	11	10
48351200	2	12	6	25	83	13	12

HYP-ZDS

Milling | Solid carbide





- Carbide end mill with TiAlN coating
- For general applications
- For counterboring

P ~45 HRC | P ~55 HRC | M ~35 HRC | K ~350 HB | N | S

HYPRO | CARBIDE | TiAlN | 20° | 0~-0.02

p.14

EDP	ZEFP	DC	LF	APMX	DCON
48370040	2	4	50	11	6
48370050	2	5	60	13	6
48370060	2	6	60	13	6
48370070	2	7	70	16	8
48370080	2	8	70	19	8
48370090	2	9	80	19	10
48370100	2	10	80	22	10

CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

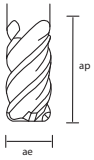
HYP-CR-HI-WEMS / HYP-CR-HD-WEMS

High speed contouring

	Low Carbon - Alloy - Tool Steel									GG-GGG-GTW			Stainless steel			Aluminium - Mg			Ti Alloys		
HB/HRC	HB 150-250			HB 20-30			HRC 30-40			>HB 180			HRC 20						HRC 40-50		
N/mm²	500~800 N/mm²			800~1000 N/mm²			1000~1300 N/mm²			Non - Alloyed			400~700 N/mm²			Non-alloyed					
Vc	160 m/min			120 m/min			100 m/min			140 m/min			50 m/min			180 m/min			65 m/min		
Ø	FZ	S=n	F=Vf	FZ	S=n	F=Vf	FZ	S=n	F=Vf	FZ	S=n	F=Vf	FZ	S=n	F=Vf	FZ	S=n	F=Vf	FZ	S=n	F=Vf
4	0,035	12.730	1.790	0,03	9.550	1.150	0,03	7.960	960	0,035	11.150	1.570	0,03	3.980	480	0,035	14.330	2.010	0,025	5.180	520
6	0,04	8.490	1.360	0,035	6.370	900	0,035	5.310	750	0,04	7.430	1.190	0,035	2.660	380	0,04	9.550	1.530	0,027	3.450	380
8	0,07	6.370	1.790	0,065	4.780	1.250	0,065	3.980	1040	0,7	5.580	1.570	0,065	1.990	520	0,07	7.170	2.010	0,031	2.590	330
10	0,1	5.090	2.040	0,08	3.820	1.230	0,08	3.190	1030	0,1	4.460	1.790	0,08	1.600	520	0,1	5.730	2.300	0,038	2.070	320
12	0,12	4.240	2.040	0,1	3.190	1.280	0,1	2.660	1070	0,12	3.720	1.790	0,1	1.330	540	0,12	4.780	2.300	0,045	1.730	320
16	0,13	3.180	1.660	0,12	2.390	1.150	0,12	1.990	960	0,13	2.790	1.460	0,12	1.000	480	0,13	3.590	1.870	0,052	1.300	280
20	0,15	2.550	1.530	0,12	1.910	920	0,12	1.600	770	0,15	2.230	1.340	0,12	800	390	0,15	2.870	1.730	0,059	1.040	250

ap x d

F(fz) correction



ap	Fakt.
0,5	**1,0**
1,0	0,7
1,5	0,5
2,0	0,3

ae = 1xd

ap	Fakt.
0,5	1,2
1,0	**1,0**
1,5	0,7
2,0	0,5

ae = 0,5xd

ap	Fakt.
0,5	1,3
1,0	1,2
1,5	**1,0**
2,0	0,8

ae = 0,2xd

The above stated application data are as per **RED** marked parameters.

HYP-F1

Slotting

	AL		Plastic	
Ø	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)
3	40.000	2.500	20.000	2.000
4	35.000	2.500	20.000	2.000
5	30.000	3.000	20.000	3.000
6	25.000	3.000	20.000	3.000
8	25.000	3.000	20.000	3.000
10	22.300	3.000	16.000	2.400
12	18.600	3.000	13.500	2.400

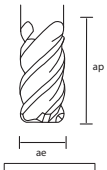
HYP-HI-EMS / HYP-HI-WEMS

Side milling (Contour line finish)

	Low Carbon - Alloy - Tool Steel									GG-GGG-GTW			Stainless steel			Aluminium - Mg			Ti Alloys		
	HB 150-250 500~800 N/mm²			HB 20-30 800~1000 N/mm²			HRC 30-40 1000~1300 N/mm²			>HB 180 Non - Alloyed			HRC 20 400~700 N/mm²			Non - Alloyed			HRC 40-50		
Vc	160 (m/min)			120 (m/min)			100 (m/min)			140 (m/min)			50 (m/min)			180 (m/min)			65 (m/min)		
Ø	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)	Fz (mm)	S (min^{-1})	F (mm/min)
4	0,035	12.730	1.790	0,03	9.550	1.150	0,03	7.960	960	0,035	11.150	1.570	0,03	3.980	480	0,035	14.330	2.010	0,025	5.180	520
6	0,04	8.490	1.360	0,035	6.370	900	0,035	5.310	750	0,04	7.430	1.190	0,035	2.660	380	0,04	9.550	1.530	0,027	3.450	380
8	0,07	6.370	1.790	0,065	4.780	1.250	0,065	3.980	1040	0,7	5.580	1.570	0,065	1.990	520	0,07	7.170	2.010	0,031	2.590	330
10	0,1	5.090	2.040	0,08	3.820	1.230	0,08	3.190	1030	0,1	4.460	1.790	0,08	1.600	520	0,1	5.730	2.300	0,038	2.070	320
12	0,12	4.240	2.040	0,1	3.190	1.280	0,1	2.660	1070	0,12	3.720	1.790	0,1	1.330	540	0,12	4.780	2.300	0,045	1.730	320
16	0,13	3.180	1.660	0,12	2.390	1.150	0,12	1.990	960	0,13	2.790	1.460	0,12	1.000	480	0,13	3.590	1.870	0,052	1.300	280
20	0,15	2.550	1.530	0,12	1.910	920	0,12	1.600	770	0,15	2.230	1.340	0,12	800	390	0,15	2.870	1.730	0,059	1.040	250

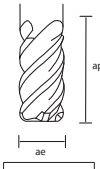
ap x d

F(fz) correction



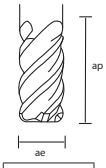
ap	Fakt.
0,5	**1,0**
1,0	0,7
1,5	0,5
2,0	0,3

ae
1xd



ap	Fakt.
0,5	0,7
1,0	**1,0**
1,5	0,7
2,0	0,5

ae
0,5xd



ap	Fakt.
0,5	1,3
1,0	1,2
1,5	**1,0**
2,0	0,8

ae
0,2xd

The above stated application data are as per RED marked parameters.

CUTTING CONDITIONS

HYP-HP-WRESF

Side milling

	GG GG-GGG		C≤0,2% S55C • SS400 ~750 N/mm²		~30 HRC SKD • SKS • SNCM		30~38 HRC NAK55 • HPMI • SKT		38~45 HRC - SUS SUS304 • X210CR12 • X40CRMOV51	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	4.200	585	4.200	585	3.700	370	2.900	230	2.650	210
8	3.150	565	3.150	565	2.750	350	2.150	230	1.950	210
10	2.500	500	2.500	500	2.200	350	1.750	230	1.550	210
12	2.100	500	2.100	500	1.850	330	1.450	230	1.300	210
16	1.550	400	1.550	400	1.350	320	1.050	230	995	210
20	1.250	375	1.250	375	1.100	320	875	240	795	220

Slotting

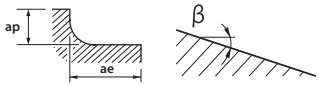
	GG GG-GGG		C≤0,2% S55C • SS400 ~750 N/mm²		~30 HRC SKD • SKS • SNCM		30~38 HRC NAK55 • HPMI • SKT		38~45 HRC - SUS SUS304 • X210CR12 • X40CRMOV51	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6	3.150	315	3.150	315	2.650	265	2.300	180	2.100	165
8	2.350	300	2.350	300	1.950	250	1.750	175	1.550	155
10	1.900	300	1.900	300	1.550	245	1.400	165	1.250	150
12	1.550	280	1.550	280	1.300	235	1.150	160	1.050	145
16	1.150	280	1.150	280	995	235	875	140	795	125
20	955	280	955	280	795	235	700	140	635	125
25	700	245	700	245	640	225	510	125	460	115

HYP-HS-CRE

High speed side milling

	GG		30~38 HRC SKT • SKD • NAK55 • HPM1		38~45 HRC - SUS SUS30 • SKD • NAK80 • HPM50		45~55 HRC		55~60 HRC	
Ø	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)	S (min⁻¹)	F (mm/min)
6 X R 1,5	5.300	6.300	4.250	4.600	3.700	4.000	2.650	2.600	1.600	1.050
8 X R 2	4.000	6.300	3.200	4.600	2.800	4.000	2.000	2.600	1.200	1.050
10 X R 2	3.200	6.300	2.550	4.600	2.250	4.000	1.600	2.600	955	1.050
12 X R 3	2.650	6.300	2.100	4.600	1.850	4.000	1.350	2.600	795	1.050

Max cutting depth



ap	ae
0,1xR	0,3D

R	ap	ae
≤2	0,1xR	0,3D
>2	0,2mm	0,3D

R	ap	ae
≤2	0,05xR	0,3D
>2	0,1mm	0,3D

CUTTING CONDITIONS

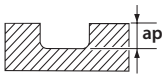
HYP-SB-EBD

Centre cutting

	Cu						30~35 HRC					35~42 HRC					42~55 HRC				
Vc	300 (m/min)						280 (m/min)					260 (m/min)					240 (m/min)				
Ø	Z	fz (mm)	ap (mm)	ae (mm)	n (min^{-1})	F (mm/min)	fz (mm)	ap (mm)	ae (mm)	n (min^{-1})	F (mm/min)	fz (mm)	ap (mm)	ae (mm)	n (min^{-1})	F (mm/min)	fz (mm)	ap (mm)	ae (mm)	n (min^{-1})	F (mm/min)
3	2	0,045	0,15	0,6	31.847	2866	0,045	0,15	0,6	29.724	2675	0,045	0,15	0,6	27.601	2484	0,045	0,15	0,6	25.478	2293
4	2	0,06	0,2	0,8	23.885	2866	0,06	0,2	0,8	22.293	2675	0,06	0,2	0,8	20.701	2484	0,06	0,2	0,8	19.108	2293
5	2	0,075	0,25	1	19.108	2866	0,075	0,25	1	17.834	2675	0,075	0,25	1	16.561	2484	0,075	0,25	1	15.287	2293
6	2	0,09	0,3	1,2	15.924	2866	0,09	0,3	1,2	14.862	2675	0,09	0,3	1,2	13.800	2484	0,09	0,3	1,2	12.739	2293
8	2	0,12	0,4	1,6	11.943	2866	0,12	0,4	1,6	11.146	2675	0,12	0,4	1,6	10.350	2484	0,12	0,4	1,6	9.554	2293
10	2	0,15	0,5	2	9.554	2866	0,15	0,5	2	8.917	2675	0,15	0,5	2	8.280	2484	0,15	0,5	2	7.643	2293
12	2	0,18	0,6	2,4	7.962	2866	0,18	0,6	2,4	7.431	2675	0,18	0,6	2,4	6.900	2484	0,18	0,6	2,4	6.369	2293

HYP-ZDS

Counterboring

	C≤0,2% - GG S55C • SS400 • GG25 ~750 N/mm2		~30 HRC SCM • SKS • SKT • SKD		30~38 HRC NAK55 • HPMI • SKT • SKD		38~45 HRC SUS SUS304 • SKD		Aluminium Alloy A7075		Aluminium Alloy Casting <Si 13%	
Vc	60~80 (m/min)		40~60 (m/min)		30~50 (m/min)		20~40 (m/min)		80~200 (m/min)		40~150 (m/min)	
Ø	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)	S (min^{-1})	F (mm/min)
4	5.950	360	4.950	295	4.000	240	3.200	155	12.500	915	9.550	575
5	4.800	360	3.950	295	3.200	240	2.550	155	10.000	915	7.650	575
6	4.000	360	3.300	295	2.700	240	2.150	155	8.400	915	6.400	575
7	3.400	360	2.800	295	2.300	240	1.850	155	7.200	915	5.500	575
8	3.000	360	2.450	295	2.000	240	1.600	155	6.350	915	4.750	575
9	2.650	360	2.200	295	1.800	240	1.450	155	5.600	915	4.200	575
10	2.400	360	2.000	295	1.600	240	1.300	155	5.000	915	3.800	575
Max cutting depth												

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