FANAR®

MASTERMILL

A real Master in the metal machining industry

MASTERMILL *is a tool for users with the highest requirements. It is able to machine effectively most of used materials in metal industry (up to 45 HRC). Our newest achivement is TS coating produced in HiPIMS technology. In combination with variable helix angle, special microgeometry which protects cutting edges and high quality solid carbide, gives us a real Master in the metal machining industry!*

VARIANTS

645

For finishing and achieving the best surface quality

440N/R440N

For slots milling, roughing and semi-finishing

B440N

For curves and complicated shapes

FEATURES

- *The design of the cutters allows for efficient work in most materials. It means, now choise of productive solution is easier than ever before!*
- *Safe linear and circular ramping is possible, due to special design of tool face with large space for chips.*
- *The TS coating guarantees the highest durability due to temperature and abrasive wear resistance.*
- *The high rigidity of the tool and the geometry to prevent vibrations ensure perfect surface quality.*

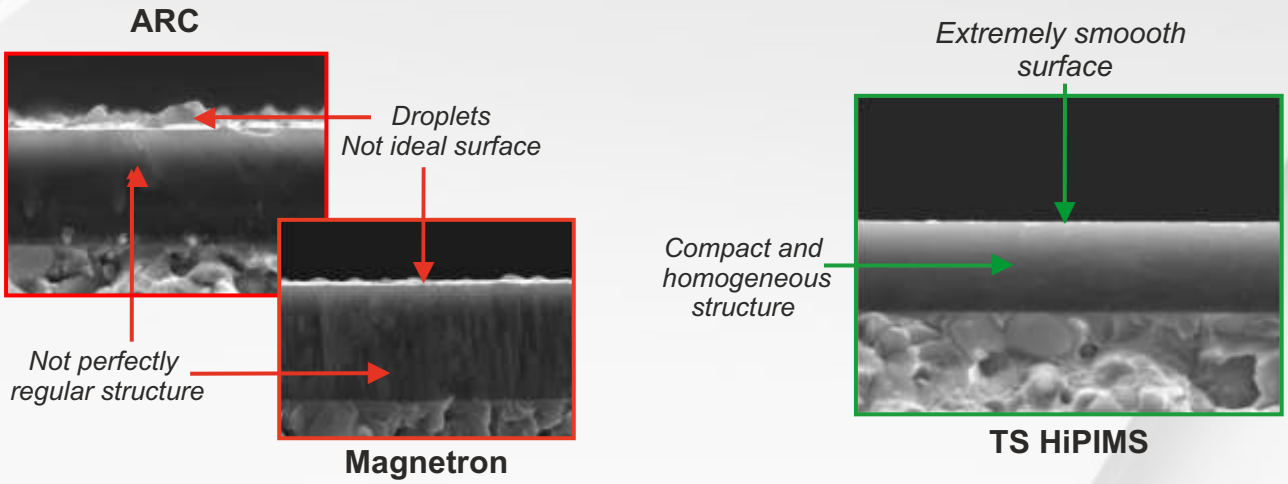
MASTERMILL

FANAR®

TS COATING

The ideal temperature barrier is the newly developed TS coating produced in HiPIMS technology. This technology provides much better adhesion and a more compact coating structure as compared to the coating techniques used to date. In-house PVD department ensures full control over the coatings.

Older coating technologies	The newest HiPIMS technology

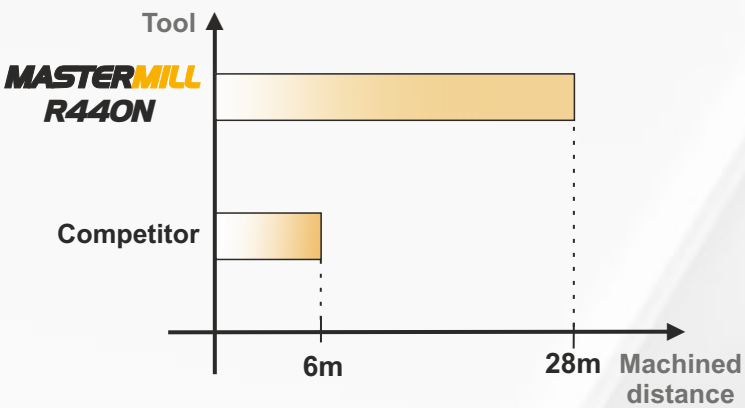


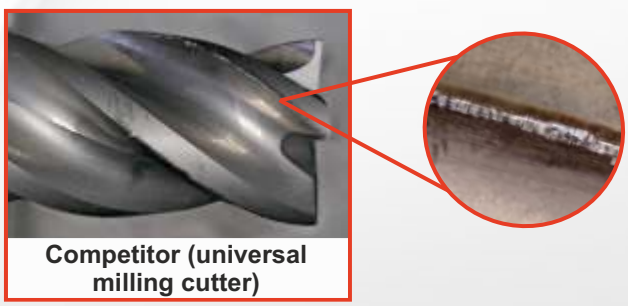
TEST RESULTS

Comparison of tool life in stainless steel 1.4301

Tool diameter Ø10
Number of flutes: z = 4

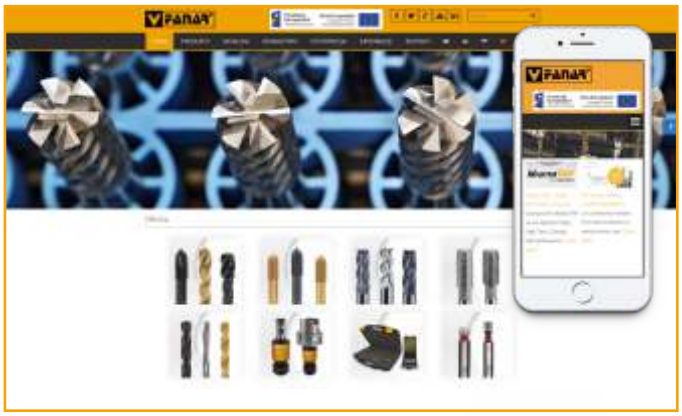
V_c = 110 m/min f_z = 0,035 mm
a_e = 5 mm a_p = 10 mm





Technical information

Detailed information on the website **www.fanar.eu**



Cutting geometry

Z=4	Number of flutes		Possible feed directions
	Square corner		Corner radius
	Ball nose		For High Feed Machining
40°	Helix angle	35°-39°	Variable helix angle
	Equal pitch		Unequal pitch

Groups of Tools by Applications

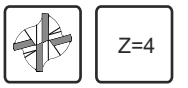
MASTERMILL High performance end mills dedicated to work on machining centers, for machining steel, stainless steel up to 45 HRC, cast iron and difficult to machine materials based on titanium and nickel.

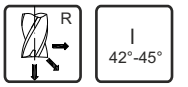
				Annealed	A			
				Tempered	QT			
				Hardened and tempered	HT			
				Precipitation hardened	PH			
						Rm	HB	HRC
Material group			**Steel**					
P	P1	Non-alloyed steel	Free cutting steel		A	750	220	
	P2		C ≤ 0,55 %		A	650	190	-
	P3		C > 0,55 %		A	650	190	-
	P4		C ≤ 0,55 %		QT	700	210	-
	P5		C > 0,55 %		QT	1000	300	32
	P6	Low-alloyed steel			A	600	175	-
	P7				QT	1000	300	32
	P8				QT	1200	380	41
	P9				QT	1400	420	45
	P10	High-alloyed steel and high-alloyed tool steel			A	700	210	-
	P11				A	1000	300	32
	P12				HT	1400	420	45
	P13	Stainless steel	Ferritic/martensitic		A	700	210	-
	P14		Martensitic		QT	1100	330	34
		Stainless steel						
M	M1	Stainless steel	Austenitic			700	210	-
	M2		Austenitic (PH)		PH	1000	300	32
	M3		Duplex			800	240	23
		Cast iron						
K	K1	Grey cast iron(GJL)				400	120	-
	K2	Cast iron with vermicular graphite (GJV) CGI				550	160	-
	K3	Malleable cast iron (GJMW / GJMB)				500	150	-
	K4	Malleable cast iron (GJMB)				800	240	-
	K5	Cast iron with spheroidal graphite (GJS)				700	210	-
	K6	Cast iron with spheroidal graphite (GJS) ADI				1400	420	45
		Non-ferrous metals						
N	N1	Aluminium wrought alloys				200	-	-
	N2				PH	500	152	-
	N3	Cast aluminium alloys	Si ≤ 12%			250	75	-
	N4		Si ≤ 12%		PH	300	90	-
	N5		Si> 12 %			450	130	-
	N6	Magnesium alloys				250	70	-
	N7	Copper and copper alloys	Pure, Non-alloyed			350	100	-
	N8		Cu-alloys, long-chipping			600	180	-
	N9		Cu-alloys, short-chipping			400	120	-
	N10		High-strength,			1000	300	32
		Superalloys and titanium						
S	S1	Heat-resistant alloys	Fe-based		A	675	200	-
	S2				PH	950	280	29
	S3		Ni / Co base		A	850	250	25
	S4				PH	1200	350	38
	S5				C	1100	320	34
	S6	Titanium alloys	Pure titanium			675	200	-
	S7		α and β alloys			1250	375	40
	S8		β alloys			1400	410	44
		Hard materials						
H	H1	Hardened steel			HT			50
	H2				HT			55
	H3				HT			60
	H4	Hardened cast iron			HT			55

For machining steel and cast iron with hardness up to 45 HRC, stainless steel and difficult to machine materials

MASTERMILL

	440N	R440N
		
Workpiece material	P M K N S H	P M K N S H
Shank		
Tool material	VHM	VHM
Coating	TS	TS
Corner type		

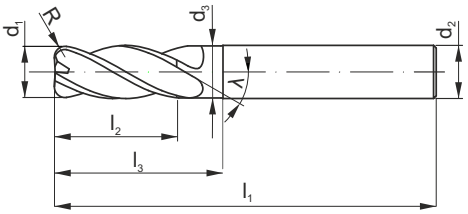




VHM

TS

Version without corner radius is protected by corner chamfer f_1 = 0,2x45°



d_1	d_2h6	d_3	l_1	l_2	l_3	Z	R	INDEX	
6	6	5,5	57	13	21	4	0,25	M9-44GMA0-0060	M9-44GMAC-0060
6	6	5,5	57	13	21	4	0,5	-	M9-44GMA1-0060
8	8	7,5	63	19	27	4	0,5	M9-44GMA0-0080	M9-44GMA1-0080
10	10	9,5	72	22	32	4	0,5	M9-44GMA0-0100	M9-44GMA1-0100
12	12	11,5	83	26	38	4	0,5	M9-44GMA0-0120	M9-44GMA1-0120
14	14	13	83	26	38	4	0,5	M9-44GMA0-0140	M9-44GMA1-0140
16	16	15	92	32	44	4	0,5	M9-44GMA0-0160	M9-44GMA1-0160
16	16	15	92	32	44	4	1	-	M9-44GMA3-0160
18	18	17	92	32	44	4	0,5	M9-44GMA0-0180	M9-44GMA1-0180
20	20	19	104	38	55	4	0,5	M9-44GMA0-0200	M9-44GMA1-0200
20	20	19	104	38	55	4	1	-	M9-44GMA3-0200

ISO		Vc [m/min]	d_1 [mm]							
			6	8	10	12	14	16	18	20
			fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]
P	P1-P4	150-200	0,020	0,030	0,045	0,055	0,060	0,065	0,070	0,080
	P5-P12	120-160	0,015	0,030	0,040	0,045	0,050	0,055	0,060	0,065
	P13	70-130	0,010	0,020	0,020	0,035	0,040	0,045	0,050	0,055
	P14	70-110	0,010	0,020	0,020	0,035	0,040	0,045	0,050	0,055
M	M1	80-120	0,010	0,020	0,020	0,035	0,040	0,045	0,050	0,055
	M2-M3	60-100	0,015	0,025	0,040	0,045	0,050	0,055	0,060	0,065
K	K1-K6	140-200	0,020	0,025	0,040	0,045	0,050	0,055	0,060	0,065
N	N1-N5	240-280	0,050	0,055	0,065	0,075	0,080	0,085	0,090	0,095
	N7-N10	260-300	0,050	0,055	0,060	0,070	0,075	0,080	0,085	0,090
S	S1-S5	30-50	0,020	0,030	0,050	0,055	0,060	0,065	0,070	0,075
	S6-S8	40-70	0,020	0,035	0,050	0,055	0,060	0,065	0,070	0,075

Example of order

M9-44GMAC-0060
MASTERMILL R440N 6x5,5x6x13x21x57 R0,25 VHM TS

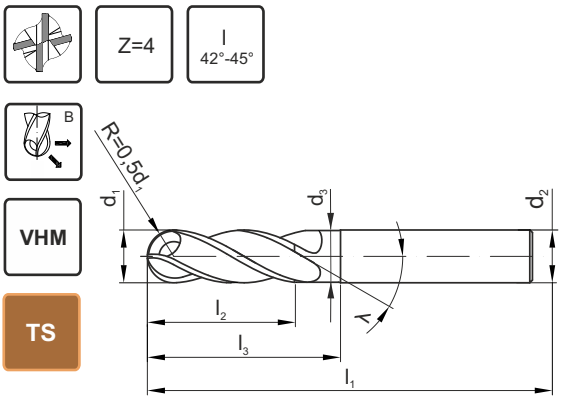
R - for tools with corner radius

Another tool dimensions available on request

For machining steel and cast iron with hardness up to 45 HRC, stainless steel and difficult to machine materials

MASTERMILL

B440N



Workpiece material	P M K N S H
Shank	
Tool material	VHM
Coating	TS
Corner type	

d_1	d_2h6	d_3	l_1	l_2	l_3	Z	R	INDEX
3	6	-	57	8	-	4	1,5	M9-44GMAX-0030
4	6	-	57	11	-	4	2,0	M9-44GMAX-0040
5	6	-	57	13	-	4	2,5	M9-44GMAX-0050
6	6	5,5	57	13	21	4	3,0	M9-44GMAX-0060
8	8	7,5	63	19	27	4	4,0	M9-44GMAX-0080
10	10	9,5	72	22	32	4	5,0	M9-44GMAX-0100
12	12	11,5	83	26	38	4	6,0	M9-44GMAX-0120
14	14	13	83	26	38	4	7,0	M9-44GMAX-0140
16	16	15	92	32	44	4	8,0	M9-44GMAX-0160
18	18	17	92	32	44	4	9,0	M9-44GMAX-0180
20	20	19	104	38	55	4	10,0	M9-44GMAX-0200

ISO		Vc [m/min]	d_1 [mm]										
			3	4	5	6	8	10	12	14	16	18	20
			fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]
P	P1-P4	150-200	0,025	0,025	0,030	0,040	0,050	0,060	0,070	0,075	0,080	0,085	0,090
	P5-P12	120-160	0,025	0,025	0,030	0,035	0,050	0,055	0,060	0,065	0,070	0,075	0,080
	P13	70-130	0,025	0,025	0,030	0,030	0,045	0,045	0,050	0,055	0,060	0,065	0,070
	P14	70-110	0,015	0,015	0,025	0,030	0,045	0,045	0,050	0,055	0,060	0,065	0,070
M	M1	80-120	0,020	0,020	0,025	0,030	0,045	0,045	0,050	0,055	0,060	0,065	0,070
	M2-M3	60-100	0,020	0,020	0,025	0,040	0,045	0,050	0,055	0,060	0,065	0,070	0,075
K	K1-K5	140-200	0,025	0,025	0,030	0,040	0,060	0,060	0,070	0,075	0,080	0,085	0,090
N	N1-N5	240-280	0,035	0,040	0,050	0,050	0,055	0,065	0,075	0,080	0,085	0,090	0,095
	N7-N10	260-300	0,030	0,035	0,045	0,050	0,055	0,060	0,070	0,075	0,080	0,085	0,090
S	S3-S5	30-50	0,010	0,010	0,010	0,015	0,025	0,025	0,040	0,045	0,050	0,055	0,060
	S6-S8	40-70	0,010	0,010	0,015	0,020	0,030	0,030	0,040	0,045	0,050	0,060	0,065

Example of order

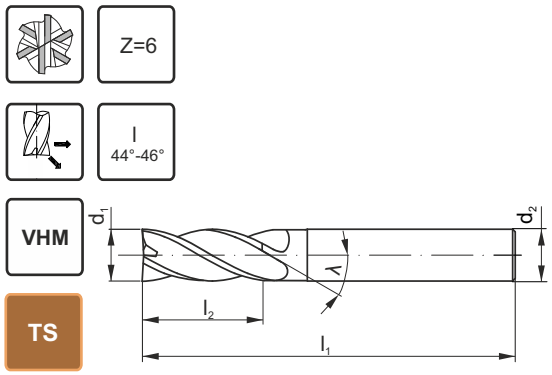
M9-44GMAX-0100
MASTERMILL B440N 10x9,5x10x22x32x72 VHM TS

Another tool dimensions available on request

For machining steel and cast iron with hardness up to 45 HRC, stainless steel and difficult to machine materials

MASTERMILL

645



Workpiece material	P M K N S H
Shank	
Tool material	VHM
Coating	TS
Corner type	

d_1	d_2h6	l_1	l_2	Z	INDEX
6	6	57	16	6	M9-64GM00-0060
8	8	63	20	6	M9-64GM00-0080
10	10	72	25	6	M9-64GM00-0100
12	12	83	30	6	M9-64GM00-0120
14	14	83	35	6	M9-64GM00-0140
16	16	92	40	6	M9-64GM00-0160
20	20	104	45	6	M9-64GM00-0200

ISO		Vc [m/min]	d_1 [mm]						
			6	8	10	12	14	16	20
			fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]	fz [mm]
P	P1-P4	170-220	0,015	0,020	0,025	0,030	0,035	0,040	0,050
	P5-P12	160-190	0,010	0,020	0,020	0,030	0,030	0,040	0,050
	P13	120-150	0,010	0,010	0,020	0,025	0,030	0,030	0,040
	P14	80-130	0,010	0,010	0,020	0,025	0,030	0,030	0,040
M	M1	100-130	0,010	0,010	0,020	0,025	0,030	0,030	0,040
	M2-M3	70-110	0,015	0,020	0,035	0,040	0,045	0,045	0,055
K	K1-K6	105-135	0,015	0,020	0,025	0,030	0,030	0,035	0,045
N	N1-N5	200-250	0,015	0,020	0,025	0,030	0,035	0,040	0,045
	N7-N10	150-200	0,010	0,010	0,020	0,025	0,030	0,030	0,040
S	S3-S5	40-70	0,015	0,025	0,025	0,040	0,045	0,050	0,060
	S6-S8	60-90	0,020	0,030	0,030	0,040	0,045	0,050	0,065

Example of order

M9-64GM00-0060
MASTERMILL 645 6x6x16x57 VHM TS

Corner radius and another tool dimensions available on request

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