

Jongen Werkzeugtechnik GmbH & Co. KG

# Shell Type Cutter FP 140 with Supporting Insert



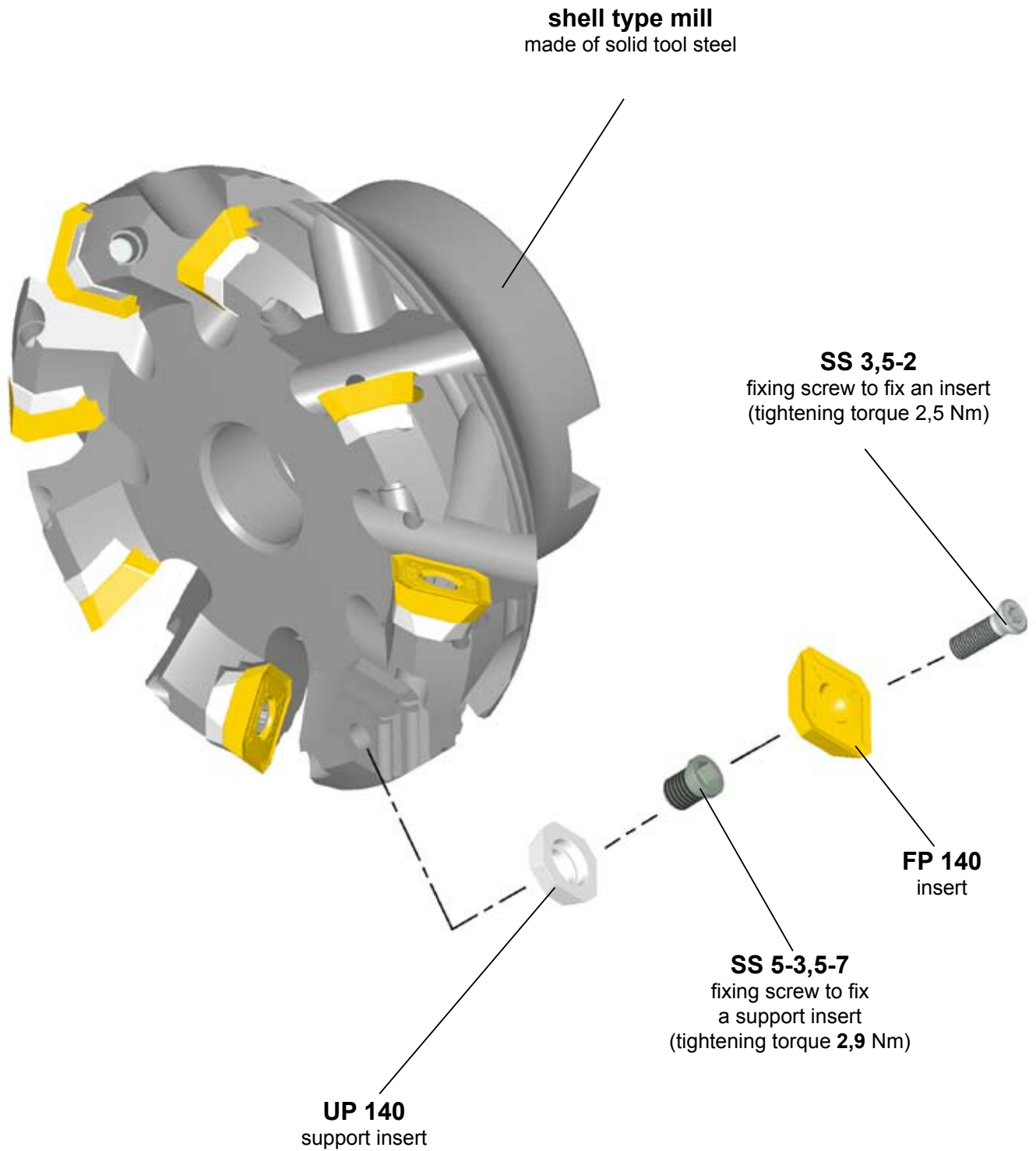
## TOOL

- These new shell type mills have been developed for face milling of highest productivity/ efficiency and with smooth cutting characteristics for all current materials
- The tools are available in regular and close pitch that provides full capacity under various conditions
- All shell type mills are carried out with internal coolant feed/coolant passages up to  $\varnothing$  100
- Holders are made to DIN 8030, from  $\varnothing$  125 the tools are available with supplementary boreholes for a face mill holder
- This high precision shell type mill grants:
  - feed rate per tooth up to 0,5mm
  - axial infeed ( $a_p$ ) up to 6,3mm

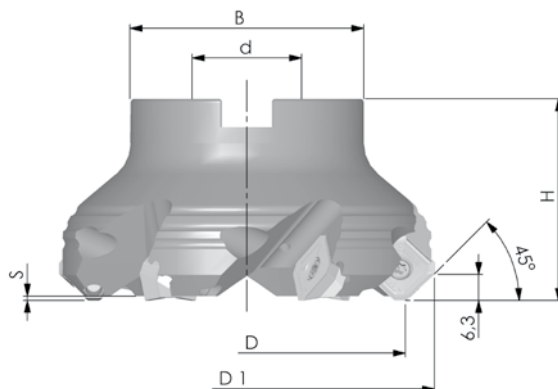
## CAPACITY CRITERIA

Product Characteristics	Advantages
Shell type mills are made of solid tool steel	The tools are very resistant
Self-positioned inserts	Easy to handle
Tenacity of support inserts	Protection of milling cutter, hereby long tool life
Geometries and types of inserts	Secure mode of working procedure
	Provide a very high capacity of machining by optimal application

## THE SET-UP

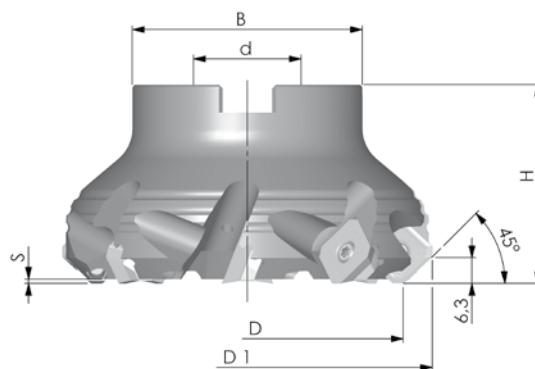


## TECHNICAL DATA



Order No.	D	D <sub>1</sub>	H	d	B	S	Z	MS
45PP-050-140-4	50	63,5	45	22	46	1	4	MS-10x25-912
45PP-063-140-5	63	76,6	45	22	46	1	5	MS-10x25-912
45PP-080-140-6	80	93,6	50	27	58	1	6	MS-12x30-912
45PP-100-140-7	100	113,6	50	32	70	1	7	MS-16x30-6912
45PP-125-140-8	125	138,6	50	40	88	1	8	MS-20x45-7991
45PP-160-140-10	160	173,5	63	40	88	1	10	MS-20x45-7991
45PP-200-140-12	200	213,5	63	60	130	1	12	-

MS= Central screw






Close pitch:

Order No.	D	D <sub>1</sub>	H	d	B	S	Z	MS
45PP-050-140-5	50	63,5	45	22	46	1	5	MS-10x25-912
45PP-063-140-6	63	76,6	45	22	46	1	6	MS-10x25-912
45PP-080-140-8	80	93,6	50	27	58	1	8	MS-12x30-912
45PP-100-140-10	100	113,6	50	32	70	1	10	MS-16x30-6912
45PP-125-140-12	125	138,6	50	40	88	1	12	MS-20x45-7991
45PP-160-140-16	160	173,5	63	40	88	1	16	MS-20x45-7991
45PP-200-140-19	200	213,5	63	60	130	1	19	-

MS= Central screw

## MEASURES







	<b>FP 140</b>	HT30 HT50 K15M	Measures: 14,3 x 14,3 x 4,0 • Insert seat: A13 Precision sintered insert with a polished true rake Application areas: mild roughing as well as finishing
	<b>FP 142</b>	HT50 KT28	Measures: 14,3 x 14,3 x 3,9 • Insert seat: A13 Precision sintered insert slightly chamfered and with rounded cutting edges Application areas: medium roughing as well as finishing
	<b>FP 145</b>	HT50 KT28	Measures: 14,3 x 14,3 x 3,9 • Insert seat: A13 Precision sintered insert strongly chamfered and with rounded cutting edges Application areas: heavy roughing as well as finishing

Packing units: 10 piece

## INSERT'S COATINGS

<b>HT50®</b>	code <b>22</b>	<b>P30</b> <b>P35</b>	Very tough carbide type with a new developed TIALN-coating for middle up to high cutting speeds for high tooth feed rates. This quality is especially suitable for dry milling. Application areas are roughing and finishing almost all materials such as, structural steel, tool steel, tempered steel, unalloyed, low alloyed and high grade steel, as well as grey cast iron, grey cast iron with globular graphite etc.
<b>HT30</b>	code <b>29</b>	<b>M25</b> <b>M35</b>	Hard wearing and tough, finest-grain carbide type with further developed multiple TIALN coating. Especially for high grade, stainless-, austenitic, ferritic and martensitic steels.
<b>KT28</b>	code <b>23</b>	<b>K15</b> <b>K20</b>	Very hard wearing carbide type with a new developed TIALN-coating for medium to high cutting speeds with high tooth feed rates, for machining cast iron such as grey, tempered, vermicular, graphite and globular graphite cast iron.
<b>K15M</b>	code <b>8</b>	<b>K10</b>	Very hard wearing carbide type for machining aluminium up to approx. 8% Si, and all non-ferrous metals and plastics.

## SPARE PARTS

	<b>SS 3,5-2</b>	Fixing screw to fix an insert (tightening torque 2,5 Nm) (Packing units: 10 piece)
	<b>SS 5-3,5-7</b>	Fixing screw to fix a support insert (tightening torque 2,9 Nm) (Packing units: 10 piece)
	<b>UP 140</b>	Support insert (Packing units: 10 piece)
	<b>T15</b>	Screwdriver for a fixing screw of an insert
	<b>SW-3,5</b>	Hexagon spanner for screw of support inserts
	<b>Fett</b>	Heavy duty grease 100g

## MATERIALS SELECTION GUIDE

DIN	Material-N°	Working group	DIN	Material-N°	Working group
10SPb20	1.0772	1	42CrMo4	1.7225	6/9
100Cr6	1.2067	6/7	45WCrV7	1.2542	6/9
105WCr6	1.2419	6/9	50CrV4	1.8159	6/9
12CrMo910	1.7380	6/7	55Cr3	1.7176	6/9
12Ni19	1.5680	10/11	55NiCrMoV6	1.2713	6/9
13CrMo44	1.7335	6/7	55Si7	1.0904	6/9
14MoV63	1.7715	6/7	58CrV4	1.8161	6/9
14Ni6	1.5622	6/7	60SiCr7	1.0961	6/9
14NiCr10	1.5732	6/7	9SMn28	1.0715	1
14NiCr14	1.5752	6/7	9SMn36	1.0736	1
14NiCrMo	1.6657	6/7	9SMnPb28	1.0718	1
15Cr3	1.7015	6/7	9SMnPb36	1.0737	1
15CrMo5	1.7262	6/7	Al99	3.0205	21
15Mo03	1.5415	6/7	AlCuMg1	3.1325	22
16MnCr5	1.7131	6/7	AlMg1	3.3315	21
16Mo5	1.5423	6/7	AlMgSi1	3.2315	22
17CrNiMo	1.6587	6/7	C105 W1	1.1545	3
21NiCrMo2	1.6523	6/8	C105 W	1.1663	3
25CrMo4	1.7218	6/8	St37	1.0037	1
28Mn6	1.1170	2	St52	1.0570	1
32CrMo12	1.7361	6/9	St60	1.0060	2/3
34Cr4	1.7033	6/8	C45	1.0503	2/3
34CrMo4	1.7220	6/9	C55	1.0535	3
34CrNiMo6	1.6582	6/9	C60	1.0601	3
35S20	1.0726	2/3	Cf35	1.1183	2/3
36CrNiMo4	1.6511	6/9	Cf53	1.1213	2/3
36Mn5	1.1167	2/3	Ck101	1.1274	3
36NiCr6	1.5710	3/9	Ck15	1.1141	1
38MnSi4	1.5120	3/9	Ck55	1.1203	3
39CrMoV139	1.8523	6/9	Ck60	1.1221	3
40Mn4	1.1157	2/3	CoCr20W15Ni	2.4764	35
40NiCrMo22	1.6546	6/9	CuZn15	2.0240	27
41Cr4	1.7035	6/9	CuZn36Pb3	2.0375	26
41CrAlMo7	1.8509	6/9	E-Cu57	2.0060	28
40CrMoMn86	1.2311/12	6/9	G-AlSi10Mg	3.2381	24
56NiCrMoV7	1.2714	6/9	G-AlSi2	3.2581	23
41CrMo4	1.7223	6/9	G-AlSi9Cu3	3.2163	23
42Cr4	1.7045	6/9	G-CuSn5ZnPb	2.1096	27

DIN	Material-N°	Working group	DIN	Material-N°	Working group
G-CuZn40Fe	2.0590	28	S6-5-2	1.3343	10/11
G-X120Mn12	1.3401	35	S6-5-2-5	1.3243	10/11
G-X20Cr14	1.4027	12/13	TiAl6V4	3.7165	36
G-X40NiCrSi3818	1.4865	31	X10Cr10	1.4006	12/13
G-X45CrSi93	1.4718	10/11	X10CrNiMoNb1812	1.4583	14
G-X5CrNi134	1.4313	12/13	X10CrNiS189	1.4305	14
G-X5CrNiMoNb1810	1.4581	14	X100CrMoV51	1.2363	10/11
G-X6CrNi189	1.4308	14	X12CrMoS17	1.4104	12/13
G-X6CrNiMo1810	1.4408	14	X12CrNi177	1.4310	14
G-X7Cr13	1.4001	12/13	X12CrNi2212	1.4828	13
GG-10	0.6010	15	X12CrNi2521	1.4845	14
GG-15	0.6015	15	X12CrNiTi189	1.4878	14
GG-20	0.6020	15	X12NiCrSi3616	1.4846	31
GG-25	0.6025	15/16	X15CrNiSi2012	1.4828	13
GG-30	0.6030	16	X165CrMoV12	1.2601	10/11
GG-35	0.6035	16	X2CrNiMo1813	1.4440	14
GG-40	0.6040	16	X2CrNiMoN17133	1.4429	14
GGG-35.3	0.7033	17	X2CrNiN1810	1.4311	14
GGG-40	0.7040	17	X20CrNi172	1.4057	12/13
GGG-40.3	0.7043	17	X210Cr12	1.2080	10/11
GGG-50	0.7050	18	X155CrVMo121	1.2379	10/11
GGG-60	0.7060	18	X36CrMo17	1.2316	10/11
GGG-70	0.7070	18	X38CrMoV53	1.2367	10/11
GGG-NiCr202	0.7660	18	X210CrW12	1.2436	10/11
GGG-NiMn137	0.7652	18	X30WCrV93	1.2581	10/11
GS-Ck45	1.1191	2/3	X40CrMoV51	1.2344	10/11
GTS-35-10	0.8135	19	X46Tr13	1.4034	10/13
GTS-45-06	0.8145	20	X5CrNi189	1.4301	14
GTS-55-04	0.8155	20	X5CrNiMo17133	1.4436	14
GTS-65-02	0.8165	20	X5CrNiMo1810	1.4401	14
GTS-70-02	0.8170	20	X53CrMnNiN219	1.4871	12/13
NiCr20TiAl (Nimonic)	2.4631	33	X5Cr13	1.4000	12/13
NiCr22Mo9Nb (Inocel)	2.4856	33	X6Cr17	1.4016	12/13
NiCu20Al (Monel)	2.4375	34	X6CrMo17	1.4114	12/13
NiFe25CrNbTi	2.4955	34	X6CrNiMoTi17122	1.4571	14
S18-0-1	1.3355	10/11	X6CrNiNb1710	1.4550	14
S18-1-2-5	1.3255	10/11	X6CrNiTi1810	1.4541	14
S2-9-2	1.3348	10/11	X2CrNi188	1.4317	14



## MATERIAL / CLASSIFICATION

	Property	Hardness HB	Tensile strength in N/mm <sup>2</sup>	Working group
Unalloyed steel	< 0,15 % C	125	499	1
	0,15 - 0,45 % C	150-250	500-850	2
	> 0,45 % C	300	1000	3
Low alloy steel		180	600	6
	tempered	250-300	850-1000	7/8
	tempered	350	1200	9
High grade steel	annealed	200	680	10
	tempered	350	1200	11
Stainless (rust-free) steel	annealed ferrite	200	680	12
	tempered martensitic	325	1100	13
Stainless (rust-free) steel	ferrite / martensitic	200	680	14
	austenitic	180	600	14
		230-260	770-880	14
Grey cast iron	perlitic / ferrite	180		15
	perlitic / martensitic	260		16
Grey cast iron with globular graphite	ferrite / martensitic	160		17
	perlitic	250		18
Tempered cast iron	ferrite	130		19
	perlitic	230		20
Aluminium knead-alloy	not precipitation (Age) hardenable	60		21
	precipitation (Age) hardenable	100		22
Aluminium cast alloy	> 8 % Si	80		23
	precipitation < 8% Si	90		24
	< 8 % Si	130		25
Copper and copper alloys	brass / red brass	90		27
	bronze	100		28
	electrolite copper	100		28
Non-metallic materials	glass fibre	90		29
		100		29
	hard rubber	100		30
Heat resistant alloys	annealed / Fe basis	200	680	31
	hardened / Fe basis	280	950	32
	annealed / Ni or Co basis	250	850	33
	hardened / Ni or Co	350	1180	34
	cast / Ni or Co	320	1080	35
Titanium alloys	pure titanium	Rm 400		36
Hardened steel	hardened and tempered	55 HRC		38
	hardened and tempered	60 HRC		39
Chilled cast iron	cast	400		40
Hardened cast iron	hardened and tempered	55 HRC		40

The above-mentioned data are standard values.

Up and down corrections are admitted depending on the machine type, tool and setting.



COATED CARBIDE TYPES cutting speed $V_C$ (m/min)			
HT50	HT30	KT28	K15M
315 (210-420)			
270 (180-360)			
190 (120-260)			
300 (180-420)			
190 (120-260)			
160 (90-240)			
280 (180-380)			
160 (90-240)			
270 (180-360)	270 (180-360)		
250 (140-360)	250 (140-360)		
280 (180-380)	280 (180-380)		
350 (220-480)	350 (220-480)		
280 (180-380)	280 (180-380)		
360 (240-480)		270 (190-360)	120 (80-150)
320 (220-420)		270 (190-360)	110 (80-130)
270 (180-360)		270 (190-360)	120 (80-150)
230 (160-300)		270 (190-360)	
270 (180-360)		270 (190-360)	110 (80-130)
160 (120-190)			100 (80-120)
			630 (250-1000)
			500 (200-800)
			630 (250-1000)
			630 (250-1000)
			500 (200-800)
			170 (150-180)
			220 (180-250)
			370 (250-500)
			290 (80-500)
			190 (80-300)
			190 (80-300)
40			
30			
50 (40-60)			
	80 (40-120)		
		170 (70-260)	70 (60-80)
		170 (70-260)	50 (30-60)
		170 (70-260)	50 (30-60)
		170 (70-260)	70 (60-80)

## CUTTING DATA - CONTINUED

Feed rates per tooth $F_z$ (in mm)				
	HT50	HT30	KT28	K15M
<b>FP 140</b>	0,2 (0,1-0,3)	0,15 (0,1-0,3)	-	0,25 (0,2-0,4)
<b>FP 142</b>	0,2 (0,15-0,4)	-	0,2 (0,15-0,4)	-
<b>FP 145</b>	0,3 (0,2-0,5)	-	0,3 (0,2-0,5)	-

## FURTHER TECHNICAL INFORMATION

Calculation of rotation number of main spindle:

$$n = \frac{1000 \cdot v_c}{D \cdot \pi} \quad [\text{min}^{-1}]$$

$n$  = Rotation number ( $\text{min}^{-1}$ )

$v_c$  = Cutting speed (m/min)

$D$  = Diameter of a tool (mm)

Feed rate:

$$v_f = f_z \cdot Z \cdot n \quad [\text{mm/min}]$$

$v_f$  = Feed speed at the tool tip (mm/min)

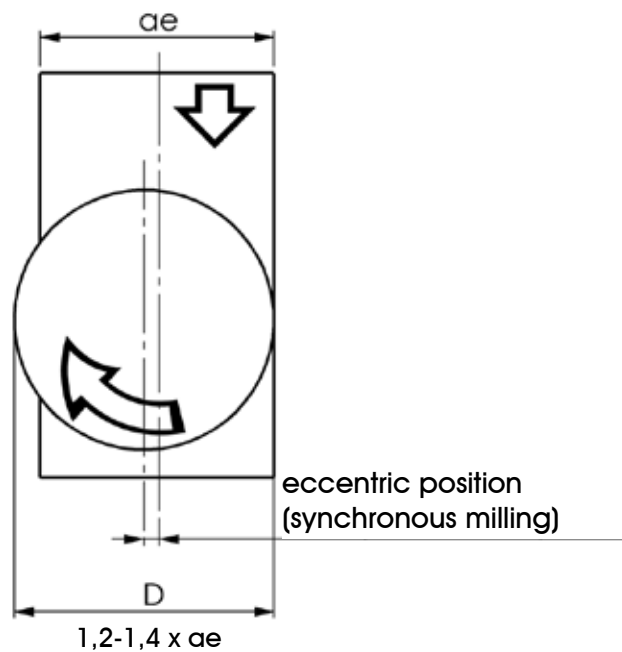
$f_z$  = Feed rate per tooth (mm)

$Z$  = Number of teeth

$n$  = Rotation number ( $\text{min}^{-1}$ )

## HOW TO CHOOSE A PROPER/APPROPRIATE TOOL

### OPTIMAL CHOICE OF TOOL DIAMETER:



Calculation example:

$$ae = 50 \text{ mm}$$

$$D = 50 \times 1,2 = 60$$

→ the optimal diameter of a tool is 63mm

$ae$  = radial infeed

$D$  = tool diameter

### OPTIMAL CHOICE OF A TOOL TYPE:

Regular pitch:

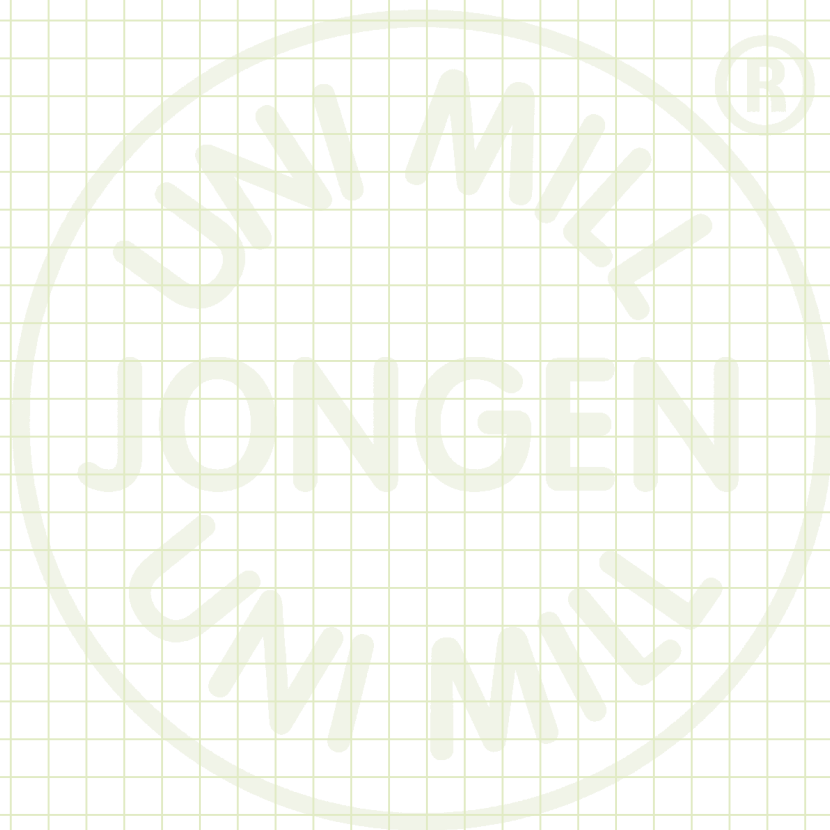
universal milling and application

Close pitch:

maximal number of teeth for high capacity under steady conditions

## NOTES

Milling tools ...



... made by JONGEN