SPK CUTTING TOOLS

New Milling Applications

CeramTec
THE CERAMIC EXPERTS

MIXED CERAMIC

Mixed ceramic is a composite of aluminium oxide and a hard titanium material with excellent wear resistance and edge stability even at high temperatures. The application for mixed ceramic in milling lies in the finishing and fine finishing of cast iron parts.

SH 2 has an extremely homogeneous submicron structure. This produces improved mechanical and thermal resistance and enables the ultra-precise finishing of cutting edges. This mixed ceramic grade is therefore ideal for finishing applications.

SILICON NITRIDE AND SIALON CERAMIC

The most varied demands are placed on our cutting materials when milling: high feed milling, face milling in a range of cast iron materials that are difficult to machine. Our extensive range of cutting materials offers the optimum cutting material grade for a wide range of milling tasks.

SL 808
The optimised toughness and wear resistance of SL 808 ensures the longest milling paths when rough milling at high feed per tooth for parts made from GJL (GG) and GJS (GGG).

SL 850 C
Coated silicon nitride ceramic with an Al2O3 multilayer coating. It provides high performance when milling GJS (GGG) and Si-GJS (GGG) materials.

SL 854 C
The TiN multilayer coating minimises wear and significantly reduces the friction between the cutting material and material. This leads to higher durability when milling GJL (GG) and GJS (GGG).

SL 858 C
Maximum toughness and wear resistance make the Al2O3 coated grade a milling specialist for high-performance roughing and rough finishing of GJL (GG) and GJS (GGG) components.

PCBN

A wide range of PCBN high-performance cutting materials enables the reliable HPC milling of cast iron parts. They set new standards with their excellent wear behaviour. Their performance is also impressive in terms of red hardness, compressive strength and chemical stability.

WBN 101
The grade outstanding toughness and very good wear behaviour ensure excellent cutting values. The grade shows excellent strengts when rough finishing and fine finishing GJL (GG) parts.

WBN 115
Outstanding thermal stability and excellent toughness along with high edge stability and exceptional wear resistance produce a cutting material that is ideal for roughing, finishing and fine finishing GJL (GG) materials as well as for machining hardened cast iron.

WXM 845
This low-grade PcBN cutting material finds its application in hard milling. Its excellent edge stability and outstanding toughness give the cutting material exceptional wear resistance.

CERMET

Cermets are excellent for all machining where a high surface quality, dimensional stability and narrow tolerances must be observed. They achieve high durability with small and medium stressed cross-sections and uniform measurements. Their preferred application lies in the fine finishing and finishing of steel, sintered metal and ductile cast iron.

SC 60
This grade shows its strengths when roughing steel and cast iron as it exhibits a comparatively higher level of toughness.

SC 7015
This coated milling grade has its application in the finishing and fine milling of GJS (GGG) as well as machining of steel.

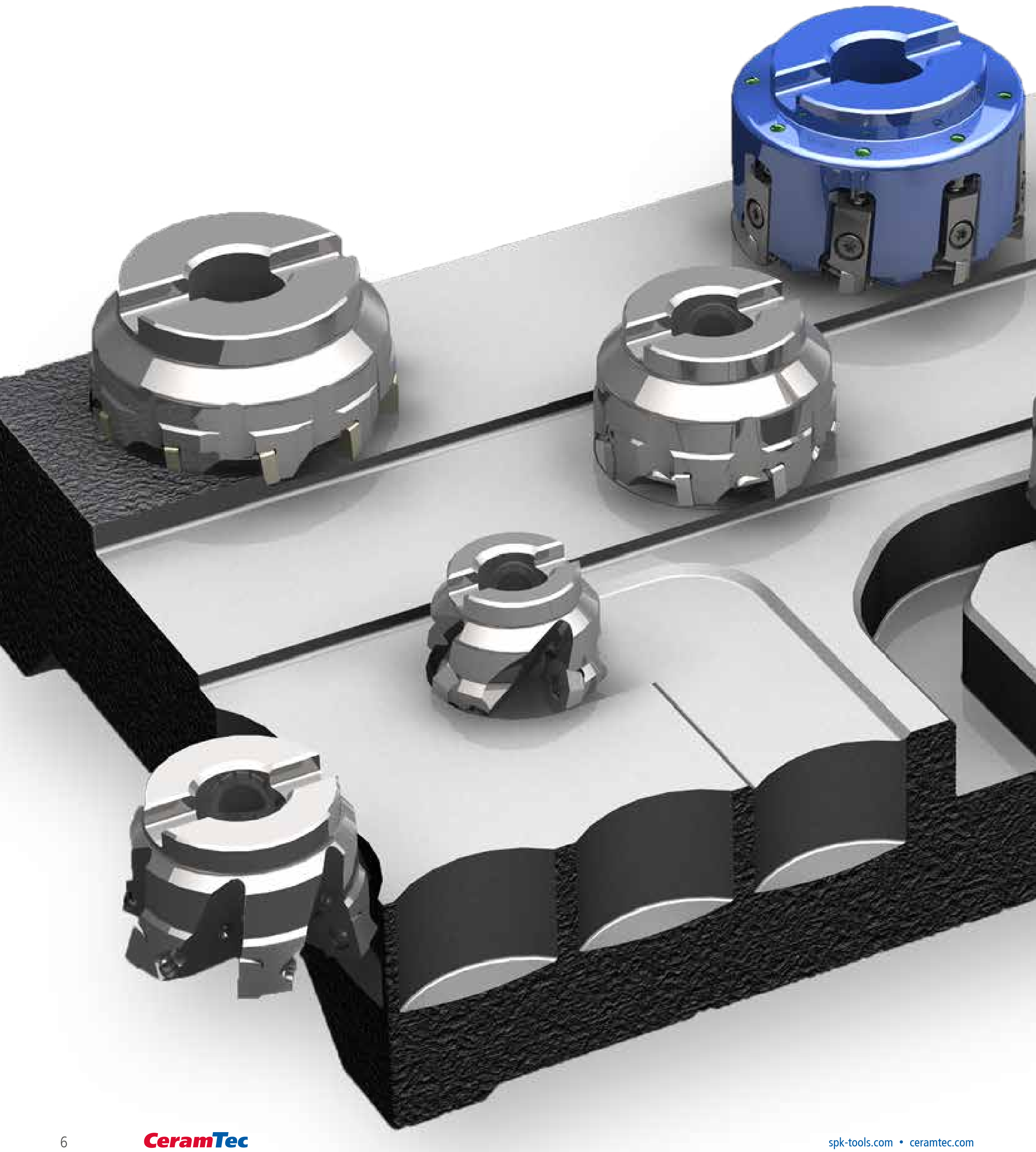
	SPK-grade	ISO*	Material group			Machining type			Area of application (DIN ISO 513)				
									01	10	20	30	40
Applications			P	K	H	T	M	G					
Mixed ceramic	SH 2	CM-K10	●	●	●	●	●	○					
Silicon nitride ceramic and SiAlON	SL 808	CN-K30-M		●			●						
Coated	SL 850 C	CC-K30-M		●			●						
	SL 854 C	CC-K25-M		●			●						
	SL 858 C	CC-K30-M		●			●						
Cermet	SC 60	HT-P25-M	●	○			●						
	SC 7015	HC-P20	●	●			●						
PcBN	WBN 101	BH-K25		●		●	●	●					
	WBN 115	BH-K20		●	○	●	●	●					
	WXM 845	BC-H10-M		○	●		●						

***ISO: ISO application group**

Material group:
P = steel
K = cast iron
H = hard materials

Machining type:
T = turning
M = milling
G = grooving

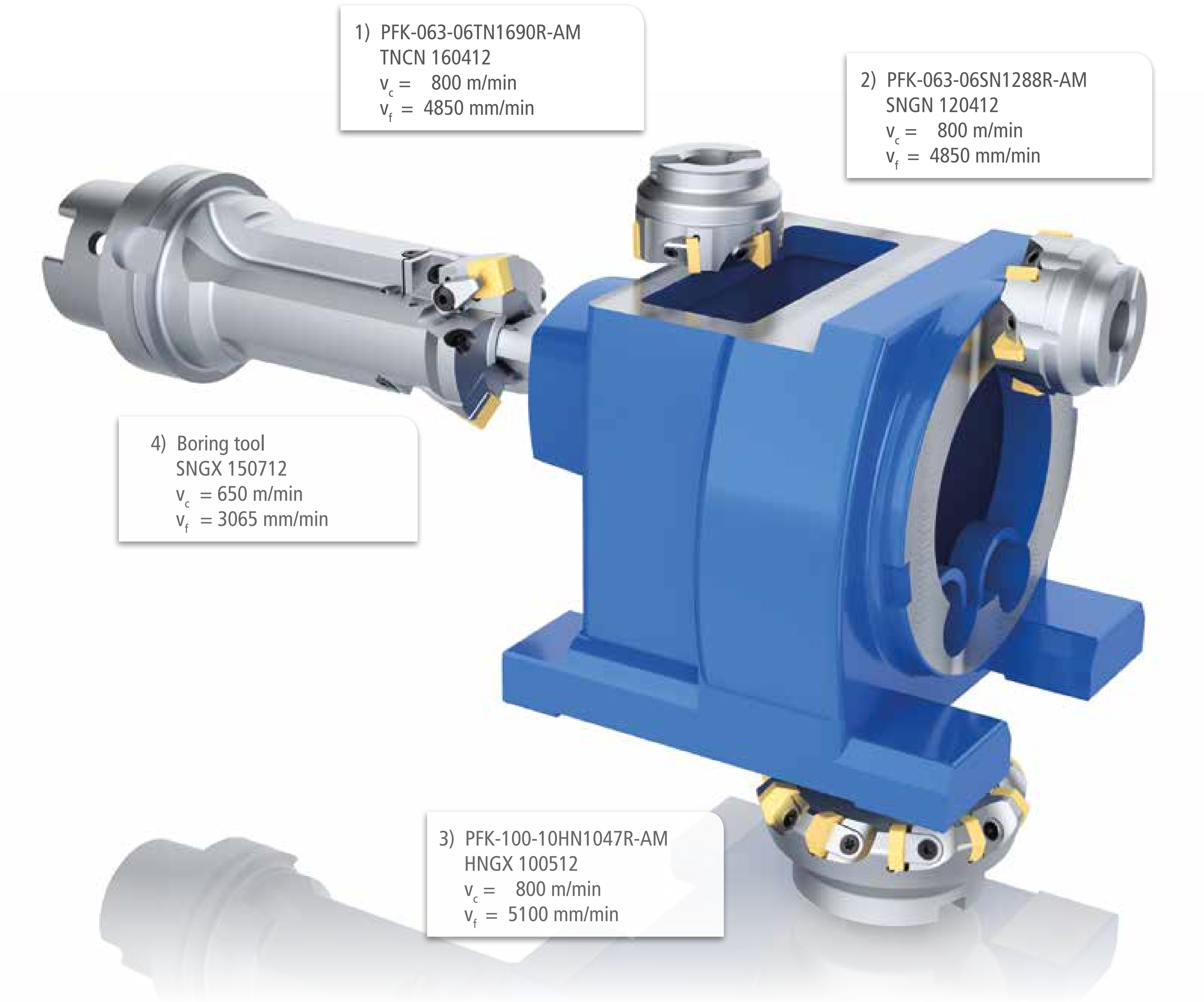
Focus in the area of application
Area of application
● Main applications
○ Other applications



Variety of milling solutions

We support our customer with numerous milling solutions for face milling, corner and slot milling, plunge milling in a Z-direction, helical/circular milling and contour milling for the milling of parts made of cast iron and steel. The milling cutter design and cutting materials enable milling to be carried out with high-performance cutting data, for example with cutting speeds of up to 2000 m/min. But we can also offer our customers milling cutters and cutting materials for producing fine finishing surfaces, Ra up to 0.5 microns.

Our CeramTec Solution Team also provides on-site support with the design of milling tasks all around the world. Contact at **solutionteam@ceramtec.de**


1) PFK-063-06TN1690R-AM
TNCN 160412
v_c = 800 m/min
v_f = 4850 mm/min
2) PFK-063-06SN1288R-AM
SNGN 120412
v_c = 800 m/min
v_f = 4850 mm/min
4) Boring tool
SNGX 150712
v_c = 650 m/min
v_f = 3065 mm/min
3) PFK-100-10HN1047R-AM
HNGX 100512
v_c = 800 m/min
v_f = 5100 mm/min

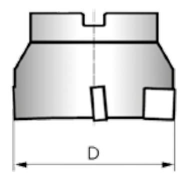



SOLUTION TEAM

Our CeramTec Solution Team provides support with the complete design of the machining task if it cannot be solved with standard tools. Starting with the definition of the tool cutter, the cutting geometry and the choice of cutting material through to the definition of the cutting data and the on-site operational support all around the world. The Ceramtec Solution Team adopts the following guiding principle with its designs: to use as many standard tools as possible and as many special tools as necessary to complete the machining task in order to create the best technical and economical machining solution for our customers.
Contact at **solutionteam@ceramtec.de**



SPK designation system for milling tools



Tool type

B	Boring tool
P	Face milling cutter
E	Shoulder milling cutter

Attachment type

C	Cartridge
K	Wedge clamping
L	Hole clamping
X	Special clamping

Milling cutter diameter D

050	50 mm
063	63 mm
080	80 mm
100	100 mm
125	125 mm
...	...
315	315 mm
...	...

Insert shape

H	120°	⬡
T	60°	△
S	90°	□
O	135°	○

P	F	L	-	080	-	08	S

Pocket details

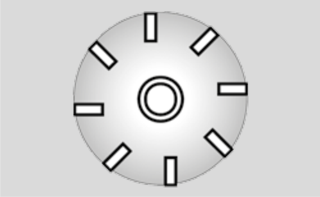
F	All insert seats fixed
E	All insert seats adjustable
M	Some insert seats adjustable
D	Dual insert seats 90° adjustable, 88° fixed
P	all adjustable Prismatic guide

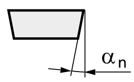
Versions

-	Standard
S	Special milling cutter
M	Mixed arrangement

Number of teeth z

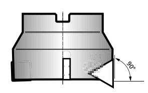
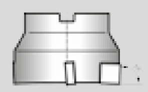
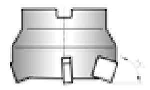
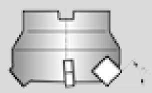
01	1 tooth
02	2 teeth
03	3 teeth
04	4 teeth
...	...
28	28 teeth
...	...





N	0°
C	7°
P	11°
D	15°
E	20°

Insert clearance angle α_n

90°	
88°	
75°	
45°	

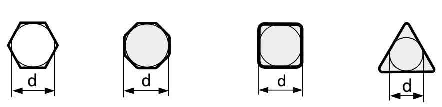
Approach angle κ_r

AM	Metric arbour milling cutters
AI	Inch arbour milling cutters

Holder

P	13	88	R	-	AM	

Insert size



H		O		S		T	
10	16.2	05	13.5	09	9.52	06	3.97
		06	16.5	12	12.7	09	5.56
				13	13.5	11	6.35
				15	15.88	16	9.52
				16	16.5	22	12.70
				19	19.05	27	15.88
						33	19.05

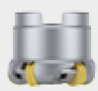
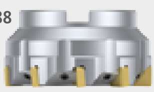
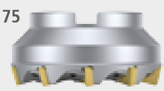
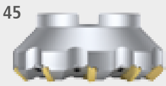
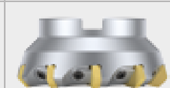
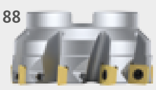
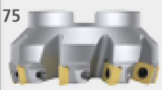
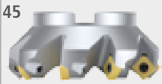
Rotational direction of milling cutter

L	Left
R	Right

Special design

	None
CL	Cutting edge interior cooling
CV	Cooling with a distributor cap

ROUGHING

	***DURO**CUT*	***INDI**CUT*	***HEXA**CUT*	***CERAM**LINE* 90	***CERAM**LINE* 88 ***CERAM**LINE* 75 ***CERAM**LINE* 45	***CERAM**LINE* 47H	***EASY**CUT* 88 ***EASY**CUT* 75 ***EASY**CUT* 45
TYPES	PFK RN-AM	PFKS RN-AM	PFK 47R-AM	PFK 90R-AM	PFK 88R-AM PFK 75R-AM PFK 45R-AM	PFK 47R-AM	PFL SP13/88° PFL SP13/75° PFL SP13/45°
MILLING CUTTERS					88  75  45 		88  75  45 
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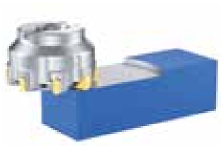
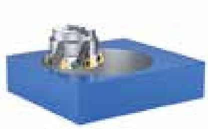
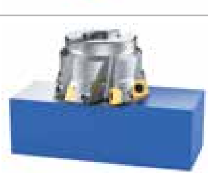
APPLICATION							
Rough facing 	✓	✓	✓	✓	✓	✓	✓
Finish facing 					✓	✓	✓
Square-shoulder milling 				✓	✓		
Groove milling 				✓			
Helical milling 							
High-feed milling 							

FINISHING

EASYCUT 43	SOFTCUT 43	OCTOCUT 43	SPEEDMAX	TWINMILL / TWINMILL CP	SUPERFINMILL	FINMILL	CARTFIN	CARTMILL 88
PFL OP-06	PFL OE-06	PFL ON-06	BFL SP13/75°	PMK 88R-AM PMKS 88R-AM	PDK 88R-AM	PEK 88R-AM	PPCM 88R-AM PPC 88R-AM	MFS 88-M4
				CP				
36	38	40	42	44 - 46	48	50	52 - 54	56
✓ (primary)	✓ (primary)	✓ (primary)	✓ (primary)	✓ (additional)				✓ (additional)
				✓ (primary)	✓ (primary)	✓ (primary)	✓ (primary)	✓ (primary)
			✓ (primary)					
			✓ (primary)					

✓ Primary application ✓ Additional application

TYPE: PFK RN-AM

Hard milling

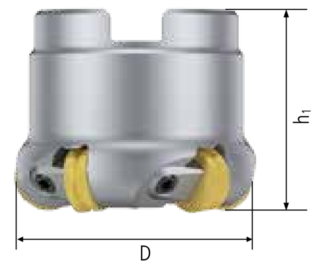
v_c = 150 - 300 m/min
f_z = 0.15 - 0.30 mm
a_p = 0.50 - 2 mm

6.3

negative cutting inserts

stable components

with / without cooling



Axial rake angle $\gamma_a = -6°$
Radial rake angle $\gamma_r = -12°$
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-050-05RN1200R-AM	771.00.069.21	50	5	-	40	18000
PFK-063-06RN1200R-AM	771.00.069.31	63	6	-	40	13000
PFK-080-08RN1200R-AM	771.00.069.41	80	8	-	50	10000
PFK-100-10RN1200R-AM	771.00.069.51	100	10	-	50	8000

Milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0


70.91.50.328.0

Torx bit 10


70.91.55.707.0

T-handle


70.91.55.706.0

Tightening torque 5 Nm


70.91.55.547.0


70.91.50.354.0

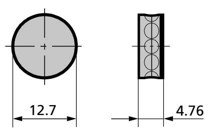
Torx bit 15


70.91.55.708.0

T-handle


70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
RNCX 1204 .. S	RNCX 120400 S01025	WXM 845	✦	✦	✦	✦	✦																		✦	✧	✧			14.48.057.46.5



ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PFKS RN-AM

Face milling cast iron

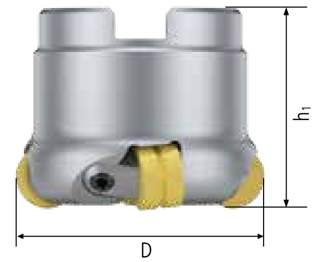
v_c = 500 - 1200 m/min
f_z = 0.15 - 0.30 mm
a_p = 0.50 - 5 mm

6.3

negative cutting inserts

stable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r = -12°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFKS-050-04RN1200R-AM	771.00.068.21	50	4	-	40	18000
PFKS-063-05RN1200R-AM	771.00.068.31	63	5	-	40	13000
PFKS-080-07RN1200R-AM	771.00.068.41	80	7	-	50	10000
PFKS-100-09RN1200R-AM	771.00.068.51	100	9	-	50	8000

Milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0


70.91.50.328.0

Torx bit 10


70.91.55.707.0

T-handle


70.91.55.706.0

Tightening torque 5 Nm


70.91.55.547.0


70.91.50.354.0

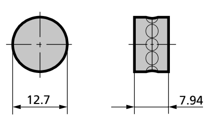
Torx bit 15


70.91.55.708.0

T-handle


70.91.55.706.0

			K																							H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	**TYPE**	**GRADE**	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	**SPK REF. NO.**
RNCX 1207 .. T	RNCX 120700 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧		✧	✧						✦		17.40.196.20.1
		SL 800	✦	✦	✦	✦	✦		✧	✧	✧																	✧		17.40.196.20.8



ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PFK47R-AM

Face milling
Ra up to 6.3

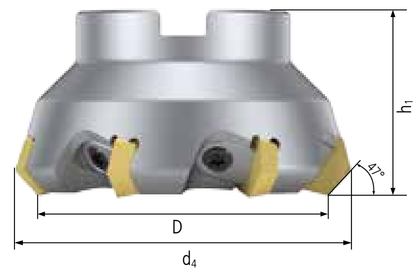
v_c = 500 - 1200 m/min
f_z = 0.12 - 0.30 mm
a_p = 1 - 5.50 mm

12.5 ▽ 6.3 ▽

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +7°$
Radial rake angle $\gamma_r = +3°$
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-080-07HD1047R-AM	771.00.061.45	80	7	92.5	40	18000
PFK-100-09HD1047R-AM	771.00.061.55	100	9	112.5	40	13000
PFK-125-11HD1047R-AM	771.00.061.65	125	11	137.5	50	10000
PFK-160-14HD1047R-AM	771.00.061.75	160	14	172.5	50	8000

Tightening torque 5 Nm*


70.91.55.704.0


70.91.50.357.0

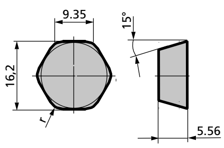
Torx bit


70.91.55.710.0

T-handle


70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	**TYPE**	**GRADE**	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	**SPK REF. NO.**
HDGX 10 05 .. T	HDGX 100512 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.62.014.20.1
	HDGX 100512 T02030	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.62.014.52.1



ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application ✧

Milling cutter type
CERAMLINE 90

TYPE: PFK 90R-AM

Face milling
Shoulder milling
Slot milling
Ra up to 6.3

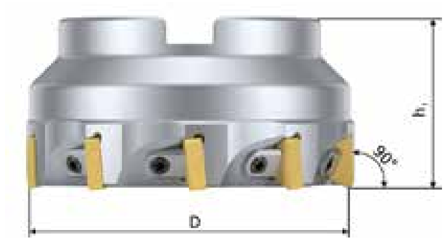
v_c = 600 - 1000 m/min
f_z = 0.16 - 0.3 mm
a_p = 0.5 - 1.0 mm

12.5 ∇ 6.3 ∇

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r = -10°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-050-05TN1690R-AM	771.00.042.23	50	5	-	40	18000
PFK-063-06TN1690R-AM	771.00.042.33	63	6	-	40	13000
PFK-080-08TN1690R-AM	771.00.042.43	80	8	-	50	10000
PFK-100-10TN1690R-AM	771.00.042.53	100	10	-	50	8000
PFK-125-12TN1690R-AM	771.00.042.63	125	12	-	63	6000
PFK-160-16TN1690R-AM	771.00.042.73	160	16	-	63	5000

For CERAMLINE[90] milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0


70.91.50.328.0

Torx bit 10


70.91.55.707.0

T-handle


70.91.55.706.0

For CERAMLINE[90] milling cutter with Ø = 63 - 160 mm

Tightening torque 5 Nm*


70.91.55.547.0

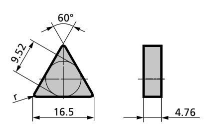
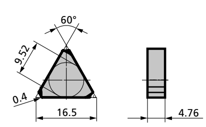

70.91.50.354.0

Torx bit 15


70.91.55.708.0

T-handle


70.91.55.706.0

INSERT	TYPE	GRADE	K: GJL: EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	GJS: EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	ADI: EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	SI GJS: EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	GJV: EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	H: STEEL HARDENED	CHILLED CASTING	DIE CASTING	S: SPECIAL ALLOY	P: STEEL	SPK REF. NO.
TNCN 1604 .. T	TNCN 160404 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.30.190.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.30.190.20.9
	TNCN 160408 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.30.191.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.30.191.20.9
	TNCN 160412 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.30.192.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.30.192.20.9
TNCN 1604 PC T 	TNCN 1604 PC T	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.30.189.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
CERAMLINE 88

TYPE: PFK 88R-AM

Face milling
Ra up to 6.3

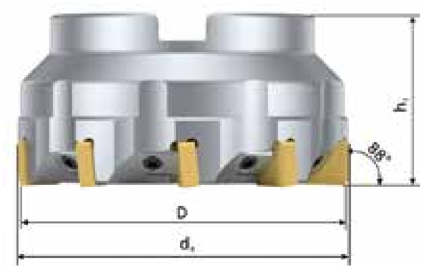
v_c = 600 - 1200 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 6 mm

12.5 ▽ 6.3 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r je nach Ø = -7° bis -12°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-040-04SN0988R-AM	771.00.030.12	40	4	41	40	23000
PFK-050-05SN1288R-AM	771.00.030.22	50	5	51	40	18000
PFK-063-06SN1288R-AM	771.00.030.32	63	6	64	40	13000
PFK-080-08SN1288R-AM	771.00.030.42	80	8	81	50	10000
PFK-100-10SN1288R-AM	771.00.030.52	100	10	101	50	8000
PFK-125-12SN1288R-AM	771.00.030.62	125	12	126	63	8000
PFK-160-15SN1288R-AM	771.00.030.72	160	15	161	63	6000

For CERAMLINE[88] milling cutter with Ø = 40 - 50 mm

Tightening torque 3.5 Nm

70.91.55.677.0

70.91.50.328.0

Torx bit 10

70.91.55.707.0

T-handle

70.91.55.706.0

For CERAMLINE[88] milling cutter with Ø = 63 - 160 mm

Tightening torque 5 Nm*

70.91.55.547.0

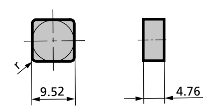
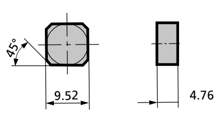
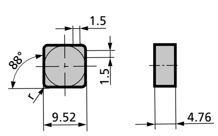
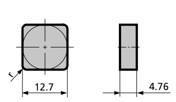
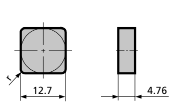
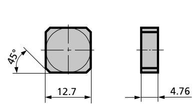
70.91.50.354.0

Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

INSERT	TYPE	GRADE	K GJL EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	K GJS EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	K ADI EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	K SI GJS EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	K GJV EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	H STEEL HARDENED	H CHILLED CASTING	H DIE CASTING	S SPECIAL ALLOY	P STEEL	SPK REF. NO.
SNCN 0904 .. T 	SNCN 090404 T00520	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.454.03.1
SNCN 0904 ZN T 	SNCN 0904 ZN T00520	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.445.03.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.445.03.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						
SNGN 090404 T - 88Z150 	SNGN 090404 T - 88Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.490.20.1
	SNGN 090404 T01020 - S88Z150	WBN 115																												12.12.093.20.0
SNCN 1204 .. T 	SNCN 120404 T00520	SL 500	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧											36.10.431.03.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.431.03.1
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						21.10.431.03.1
SNGN 1204 .. T 	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧											36.10.009.20.1
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✧						✦	✦	✦	✧	✧	✧	✧							15.10.009.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.009.20.9
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✧						✦	✦	✦	✧	✧	✧	✧							15.10.009.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.009.20.9
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						17.10.058.20.9
SNCN 1204 ZN T 	SNCN 1204 ZN T00520	SL 500	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧											36.10.409.03.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.409.03.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.409.03.9

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
CERAMLINE 75

TYPE: PFK 75R-AM

Face milling
Ra up to 6.3

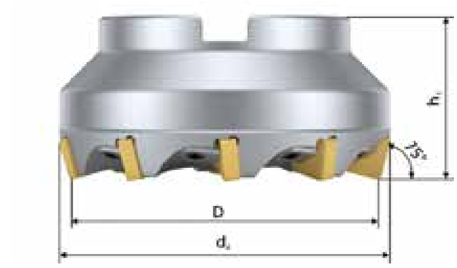
v_c = 600 - 1200 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 6 mm

12.5 ▽ 6.3 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r = -10°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-050-05SN1275R-AM	771.00.031.22	50	5	56	40	18000
PFK-063-06SN1275R-AM	771.00.031.32	63	6	69	40	13000
PFK-080-08SN1275R-AM	771.00.031.42	80	8	86	50	10000
PFK-100-10SN1275R-AM	771.00.031.52	100	10	106	50	8000
PFK-125-12SN1275R-AM	771.00.031.62	125	12	131	63	8000
PFK-160-15SN1275R-AM	771.00.031.72	160	15	166	63	6000

For CERAMLINE[75] milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0 70.91.50.328.0

Torx bit 10

70.91.55.707.0

T-handle

70.91.55.706.0

For CERAMLINE[75] milling cutter with Ø = 63 - 160 mm

Tightening torque 5 Nm*

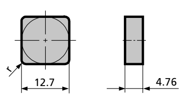
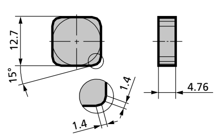

70.91.55.547.0 70.91.50.354.0

Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

INSERT	TYPE	GRADE	K																						H			S	P	SPK REF. NO.
			GJL					GJS					ADI				SI GJS			GJV										
			EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	
SNGN 1204 .. T	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.009.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✧						✦	✦	✦	✧	✧	✧	✧							15.10.009.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.009.20.9
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧	✧	✧	✧	✧							17.10.058.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✧						✦	✦	✦	✧	✧	✧	✧							15.10.009.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.009.20.9
SNGN 1204 EN T	SNGN 1204EN T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.261.20.0
																														

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PFK 45R-AM

Face milling
Ra up to 6.3

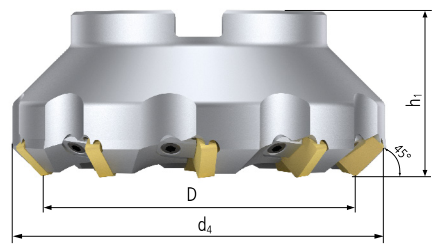
v_c = 600 - 1200 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 5 mm

12.5 ▽ 6.3 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = -6°$
Radial rake angle $\gamma_r = -12°$
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-050-05SN1245R-AM	771.00.032.22	50	5	65	40	18000
PFK-063-06SN1245R-AM	771.00.032.32	63	6	78	40	13000
PFK-080-08SN1245R-AM	771.00.032.42	80	8	95	50	10000
PFK-100-10SN1245R-AM	771.00.032.52	100	10	115	50	8000
PFK-125-12SN1245R-AM	771.00.032.62	125	12	140	63	8000
PFK-160-15SN1245R-AM	771.00.032.72	160	15	175	63	6000

For CERAMLINE[45] milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0 70.91.50.328.0

Torx bit 10

70.91.55.707.0

T-handle

70.91.55.706.0

For CERAMLINE[45] milling cutter with Ø = 63 - 160 mm

Tightening torque 5 Nm*

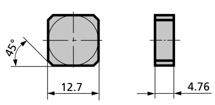
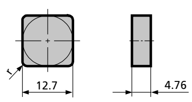
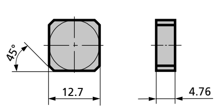

70.91.55.547.0 70.91.50.354.0

Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SNCN 1204 ZN T 	SNCN 1204 ZN T00520	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.409.03.0
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.409.03.9
SNGN 1204 .. T 	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✧						✦	✦	✦											15.10.058.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						36.10.058.20.9
SNGN 1204 ZN T - . 88Z240 	SNGN 1204 AN T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.232.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.232.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter

CERAMLINE 47H

TYPE: PFK 47R-AM

Face milling
Ra up to 6.3

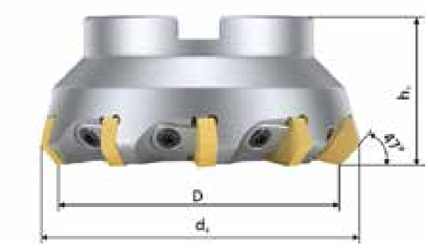
v_c = 600 - 1200 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 5 mm

12.5 6.3

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r = -10°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFK-080-08HN1047R-AM	771.00.049.45	80	8	92.5	50	10000
PFK-100-10HN1047R-AM	771.00.049.55	100	10	112.5	50	8000
PFK-125-12HN1047R-AM	771.00.049.65	125	12	137.5	63	6000
PFK-160-16HN1047R-AM	771.00.049.75	160	16	172.5	63	5000

Tightening torque 5 Nm*

70.91.55.704.0

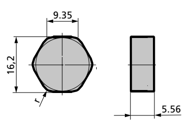
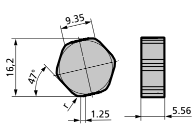
70.91.50.357.0

Torx bit 25

70.91.55.710.0

T-handle

70.91.55.706.0

INSERT	TYPE	GRADE	K																						H			S	P	SPK REF. NO.
			GJL					GJS					ADI				SI GJS			GJV										
			EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	
HNGX 1005 .. T	HNGX 100512 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.60.123.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.60.123.20.1
	HNGX 100516 T01020	SL 500	✦	✦	✦	✦	✦																							36.60.124.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.60.124.20.1
HNGX 100516 T - 47Z125	HNGX 100516 T01020 - 47Z125	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.60.120.20.0
	HNGX 100516 T03020 - 47Z125	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.60.120.23.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PFL SP13/88°

Face milling
Roughing and
rough finishing
up to Ra 6.3

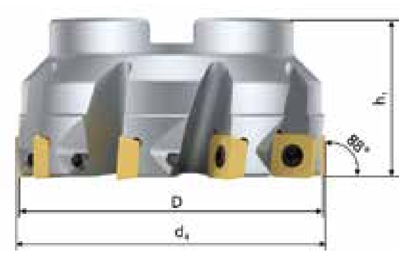
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 5 mm

12.5 6.3

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +5°$
Radial rake angle γ_r je nach Ø = -5° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-063-05SP1388R-AM	771.00.000.32	63	5	64	40	13000
PFL-080-07SP1388R-AM	771.00.000.42	80	7	81	50	10000
PFL-100-09SP1388R-AM	771.00.000.52	100	9	101	50	8000
PFL-125-11SP1388R-AM	771.00.000.62	125	11	126	63	8000
PFL-160-13SP1388R-AM	771.00.000.72	160	13	161	63	6000
PFL-200-17SP1388R-AM	771.00.000.82	200	17	201	63	4000

Tightening torque 5 Nm*

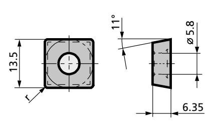
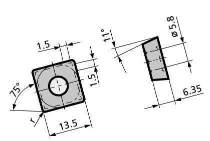
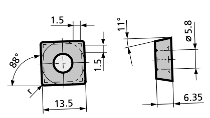
70.91.50.689.0

Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SPHX 130612 T 	SPHX 130612 T02030	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.535.52.1
SPHX 130612 T - 75Z150 	SPHX 130612 T01020 - 75Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.537.20.1
SPHX 130612 T - 88Z150 	SPHX 130612 T01020 - 88Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.536.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
EASYCUT 75

TYPE: PFL SP13/75°

Face milling
Roughing and
rough finishing
up to Ra 6.3

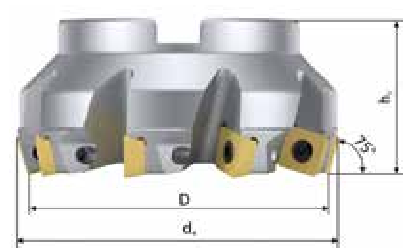
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 5 mm

12.5 6.3

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +5°$
Radial rake angle γ_r je nach Ø = -5° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-050-04SP1375R-AM	771.00.001.22	50	4	56.5	40	18000
PFL-063-05SP1375R-AM	771.00.001.32	63	5	69.5	40	13000
PFL-080-07SP1375R-AM	771.00.001.42	80	7	86.5	50	10000
PFL-100-09SP1375R-AM	771.00.001.52	100	9	106.5	50	8000
PFL-125-11SP1375R-AM	771.00.001.62	125	11	131.5	63	8000
PFL-160-13SP1375R-AM	771.00.001.72	160	13	166.5	63	6000
PFL-200-17SP1375R-AM	771.00.001.82	200	17	206.5	63	4000

Tightening torque 5 Nm*

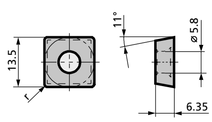
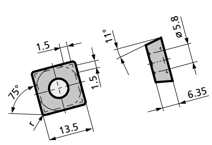
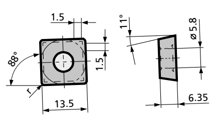
70.91.50.689.0

Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SPHX 130612 T 	SPHX 130612 T02030	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.535.52.1
SPHX 130612 T - 75Z150 	SPHX 130612 T01020 - 75Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.537.20.1
SPHX 130612 T - 88Z150 	SPHX 130612 T01020 - 88Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.536.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PFL SP13/45°

Face milling
Roughing and
rough finishing
up to Ra 6.3

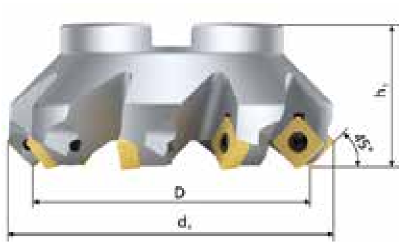
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 5 mm

12.5 6.3

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +5°$
Radial rake angle γ_r je nach Ø = -5° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-050-05SP1345R-AM	771.00.002.22	50	5	67	40	18000
PFL-063-06SP1345R-AM	771.00.002.32	63	6	80	40	13000
PFL-080-07SP1345R-AM	771.00.002.42	80	7	97	50	10000
PFL-100-09SP1345R-AM	771.00.002.52	100	9	117	50	8000
PFL-125-11SP1345R-AM	771.00.002.62	125	11	142	63	8000
PFL-160-13SP1345R-AM	771.00.002.72	160	13	177	63	6000
PFL-200-17SP1345R-AM	771.00.002.82	200	17	217	63	4000

Tightening torque 5 Nm*

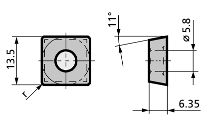
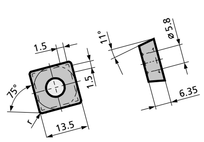
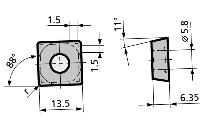
70.91.50.689.0

Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
SPHX 130612 T 	SPHX 130612 T02030	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.535.52.1
SPHX 130612 T - 75Z150 	SPHX 130612 T01020 - 75Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.537.20.1
SPHX 130612 T - 88Z150 	SPHX 130612 T01020 - 88Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.536.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
EASYCUT *43*

TYPE: PFL OP-06

Face milling
Roughing and
rough finishing
up to Ra 6.3

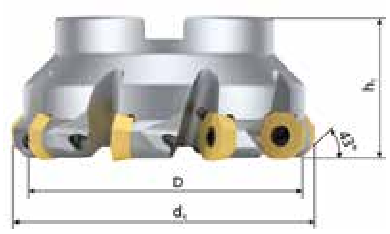
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 4 mm

12.5 6.3

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +5°$
Radial rake angle γ_r je nach Ø = -5° bis -7°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-050-05OP0643R-AM	771.00.004.24	50	5	61	40	18000
PFL-063-06OP0643R-AM	771.00.004.34	63	6	74	40	13000
PFL-080-07OP0643R-AM	771.00.004.44	80	7	91	50	10000
PFL-100-09OP0643R-AM	771.00.004.54	100	9	111	50	8000
PFL-125-11OP0643R-AM	771.00.004.64	125	11	136	63	8000
PFL-160-13OP0643R-AM	771.00.004.74	160	13	171	63	6000
PFL-200-15OP0643R-AM	771.00.004.84	200	15	211	63	4000

Tightening torque 5 Nm*

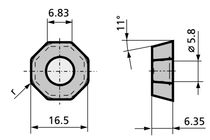
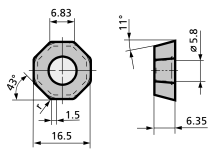
70.91.50.689.0

Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																							H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
OPHX 060616 T 	OPHX 060616 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.014.201
OPHX 060608 T - 43Z150 	OPHX 060608 T01020 - 43Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.015.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧		

TYPE: PFL OE-06

Face milling
Roughing and
rough finishing
up to Ra 6.3

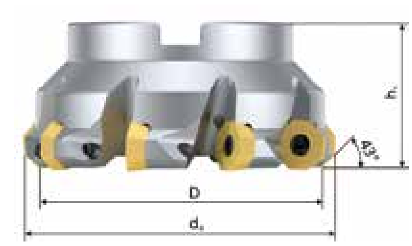
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 4 mm

12.5 ▽ 6.3 ▽

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +14°$
Radial rake angle $\gamma_r = +2°$
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-050-04OE0643R-AM	771.00.005.24	50	4	60.2	40	18000
PFL-063-05OE0643R-AM	771.00.005.34	63	5	73.2	40	13000
PFL-080-06OE0643R-AM	771.00.005.44	80	6	90.2	50	10000
PFL-100-07OE0643R-AM	771.00.005.54	100	7	110.2	50	8000
PFL-125-09OE0643R-AM	771.00.005.64	125	9	135.2	63	8000
PFL-160-11OE0643R-AM	771.00.005.74	160	11	170.2	63	6000
PFL-200-13OE0643R-AM	771.00.005.84	200	13	210.2	63	4000

Tightening torque 5 Nm*

70.91.50.689.0

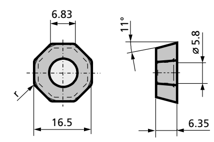
Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	**TYPE**	**GRADE**	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	**SPK REF. NO.**
OEHX 060616 T	OEHX060616 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.016.20.1



ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
OCTOCUT 43

TYPE: PFL ON-06

Face milling
Roughing and
rough finishing
up to Ra 6.3

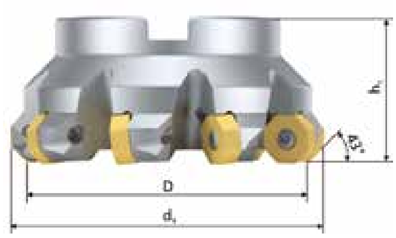
v_c = 600 - 1000 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 4 mm

12.5 ∇ 6.3 ∇

negative cutting inserts

stable / unstable components

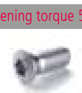
with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r = -6°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PFL-063-06ON0643R-AM	771.00.039.34	63	6	74	40	13000
PFL-080-07ON0643R-AM	771.00.039.44	80	7	91	50	10000
PFL-100-09ON0643R-AM	771.00.039.54	100	9	111	50	8000
PFL-125-10ON0643R-AM	771.00.039.64	125	10	136	63	8000
PFL-160-12ON0643R-AM	771.00.039.74	160	12	171	63	6000

Tightening torque 5 Nm*



70.91.50.689.0

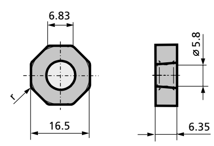
Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
ONHX 060616 T	ONHX 060608 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.019.20.1
	ONHX 060612 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.020.20.1
	ONHX 060616 T01020	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.76.017.20.1



ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application ✦	Additional application ✧

TYPE: BFL SP13/75°

High-feed milling
Helical milling
Ra up to 6.3

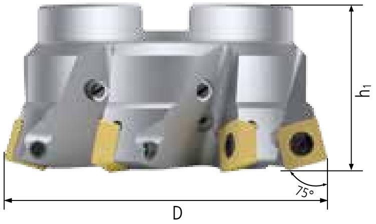
v_c = 600 - 1400 m/min
f_z = 0.14 - 0.3 mm
a_p = up to 2 mm

12.5 6.3

positive cutting inserts

stable / unstable components

with / without cooling



Axial rake angle $\gamma_a = +5°$
Radial rake angle $\gamma_r = 0°$
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
BFL-063-05SP1375R-AMCL	775.00.000.32	63	5	-	40	13000
BFL-080-06SP1375R-AMCL	775.00.000.42	80	6	-	50	10000
BFL-100-07SP1375R-AMCL	775.00.000.52	100	7	-	50	6000

Tightening torque 5 Nm*

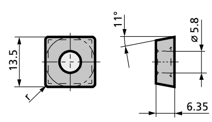
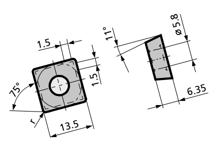
70.91.50.689.0

Torx bit 20

70.91.55.709.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SPHX 130612 T	SNCN 1204 ZN T00520	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.535.20.1
	SPHX 130612 T02030	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.535.52.1
SPHX 130612 T - 75Z150 	SPHX 130612 T01020 - 75Z150	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.16.537.20.1

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PMK 88R-AM

Face milling
Fine milling Ra up to 0.8
Semi-finishing

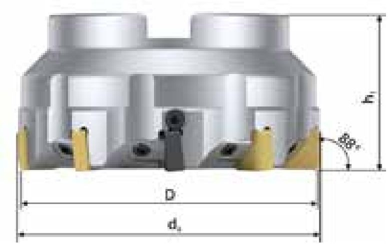
v_c = 700 - 1000 m/min
f_z = 0,16 - 0,3 mm
a_p = 0.5 - 1.0 mm

6.3 ▽ 3.2 ▽ 0.8 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r je nach Ø = -6° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PMK-063-06SN1288R-AM	771.00.033.32	63	6 (5+1)	64	40	13000
PMK-080-08SN1288R-AM	771.00.033.42	80	8 (7+1)	81	50	10000
PMK-100-10SN1288R-AM	771.00.033.52	100	10 (9+1)	101	50	8000
PMK-125-12SN1288R-AM	771.00.033.62	125	12 (10+2)	126	63	6000
PMK-160-14SN1288R-AM	771.00.033.72	160	14 (12+2)	161	63	6000
PMK-200-16SN1288R-AM	771.00.033.82	200	16 (14+2)	201	63	4000
PMK-250-21SN1288R-AM	771.00.033.92	250	21 (18+3)	251	63	3000

Tightening torque 5 Nm*

70.91.55.547.0

70.91.50.354.0

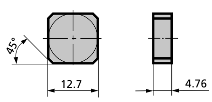
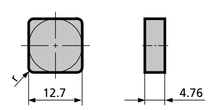
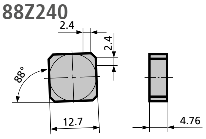
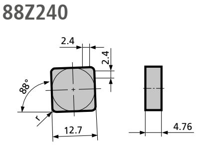
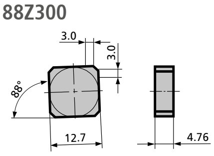
70.91.50.356.0

Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SNCN 1204 ZN T	SNCN 1204 ZN T00520	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.409.03.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.409.03.9
SNGN 1204 .. T	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.009.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✦	✦	✦											15.10.058.20.2
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.058.20.9
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						21.10.058.20.1
SNGN 1204 ZN T - . 88Z240	SNGN 1204 ZN T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.048.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.493.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.493.20.1
	SNGN 1204 ZN T01020 - S 88Z240	WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											12.12.089.20.0
SNGN 120408 T - 88Z240	SNGN 120408 T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.049.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.503.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.503.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.503.20.9
SNGN 1204 ZN T - S 88Z300	SNGN 1204 ZN T01015 - S 88Z300	WBN 101	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											20.12.085.37.1
		WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧										✦	12.12.085.37.0

ISO application group

K	Cast iron	H	Hard materials	S	Special alloy	P	Steel	Main application	✦	Additional application	✧

Face-milling cutter
TWINMILL CP

TYPE: PMKS 88R-AM

Face milling
Fine milling Ra up to 0.8
Rough finishing

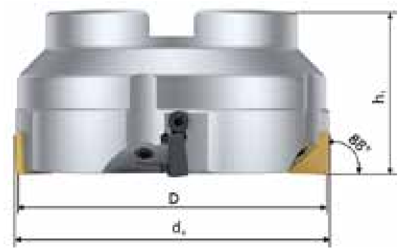
v_c = 700 - 1000 m/min
f_z = 0.16 - 0.2 mm
a_p = 0.5 - 1.0 mm

6.3 ▽ 3.2 ▽ 0.8 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r je nach Ø = -6° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PMK S 063-04SN1288R-AM	778.00.000.32	63	4 (3+1)	64	40	13000
PMK S 080-05SN1288R-AM	778.00.000.42	80	5 (4+1)	81	50	10000
PMK S 100-05SN1288R-AM	778.00.000.52	100	5 (4+1)	101	50	8000
PMK S 125-06SN1288R-AM	778.00.000.62	125	6 (5+1)	126	63	8000
PMK S 160-08SN1288R-AM	778.00.000.72	160	8 (7+1)	161	63	6000

Tightening torque 5 Nm*

70.91.55.547.0

70.91.50.354.0

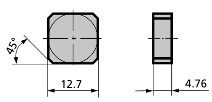
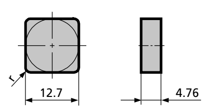
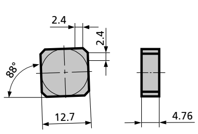
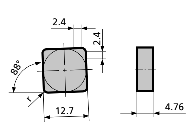
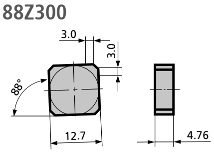
70.91.50.356.0

Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SNCN 1204 ZN T	SNCN 1204 ZN T00520	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.409.03.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.409.03.9
SNGN 1204 .. T	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.009.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 850 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧											
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.058.20.9
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						21.10.058.20.1
SNGN 1204 ZN T - . 88Z240	SNGN 1204 ZN T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.048.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.493.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.493.20.1
	SNGN 1204 ZN T01020 - S 88Z240	WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											12.12.089.20.0
SNGN 120408 T - 88Z240	SNGN 120408 T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.049.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.503.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.503.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.503.20.9
SNGN 1204 ZN T - S 88Z300	SNGN 1204 ZN T01015 - S 88Z300	WBN 101	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											20.12.085.37.1
		WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧										✦	12.12.085.37.0

ISO application group

K		Cast iron	H		Hard materials	S		Special alloy	P		Steel	Main application	✦	Additional application	✧

Face-milling cutter
***SUPERFIN**MILL*

TYPE: PDK 88R-AM

Face milling
Fine milling up to Ra = 0.5

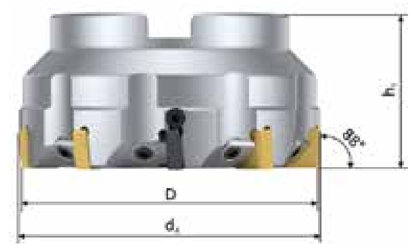
v_c = 700 - 1000 m/min
f_z = 0.16 - 0.2 mm
a_p = 0.5 - 1.0 mm

3.2 ▽ 0.8 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r je nach Ø = -6° bis -9°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PDK-063-06SN1288R-AM	778.00.004.22	63	6 (5+1)	64	40	13000
PDK-080-08SN1288R-AM	778.00.003.42	80	8 (7+1)	81	50	10000
PDK-100-10SN1288R-AM	778.00.003.92	100	10 (9+1)	101	50	8000
PDK-125-12SN1288R-AM	778.00.003.72	125	12 (10+2)	126	63	8000
PDK-160-14SN1288R-AM	778.00.004.32	160	14 (12+2)	161	63	6000
PDK-200-16SN1288R-AM	778.00.004.02	200	16 (14+2)	201	63	4000
PDK-250-18SN1288R-AM	778.00.003.12	250	18 (15+3)	251	63	3000

Tightening torque 5 Nm*


70.91.55.547.0


70.91.50.354.0

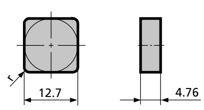
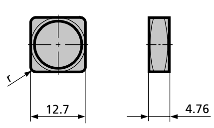
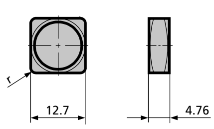

70.91.50.356.0

Torx bit 15


70.91.55.708.0

T-handle


70.91.55.706.0

INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
SNGN 1204 T	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
	SNGN 120412 T	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.001.40.2
SNGX 1204 .. T124 	SNGX 120412 T124	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.016.99.2
SNHX 1204 .. T125	SNHX 120412 T125	SH 2	✦	✦	✦	✦	✦																							36.10.266.99.7
	SNHX 120412 T125-S	WBN 101	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧										✦	20.18.801.99.1
		WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧										✦	12.18.801.99.0

ISO application group

K	Cast iron	H	Hard materials	S	Special alloy	P	Steel	Main application	✦	Additional application	✧

TYPE: PEK 88R-AM

Face milling
Fine milling up to Ra 0.8

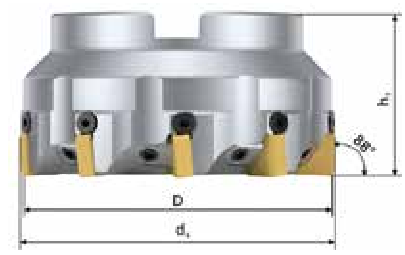
v_c = 700 - 1000 m/min
f_z = 0.12 - 0.2 mm
a_p = 0.5 - 1.0 mm

6.3 3.2 0.8

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -6°
Radial rake angle γ_r je nach Ø = -6° bis -10°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
PEK-050-05SN1288R-AM	771.00.036.22	50	5	51	40	18000
PEK-063-06SN1288R-AM	771.00.036.32	63	6	64	40	13000
PEK-080-08SN1288R-AM	771.00.036.42	80	8	81	50	10000
PEK-100-10SN1288R-AM	771.00.036.52	100	10	101	50	8000
PEK-125-12SN1288R-AM	771.00.036.62	125	12	126	63	6000
PEK-160-15SN1288R-AM	771.00.036.72	160	15	161	63	6000
PEK-200-20SN1288R-AM	771.00.036.82	200	20	201	63	4000
PEK-250-24SN1288R-AM	771.00.036.92	250	24	251	63	3000

For FINMILL milling cutter with Ø = 50 mm

Tightening torque 3.5 Nm


70.91.55.677.0


70.91.50.328.0

Torx bit 10

70.91.55.707.0

T-handle

70.91.55.706.0

For FINMILL milling cutter with Ø = 63 - 250 mm

Tightening torque 5 Nm*


70.91.55.547.0


70.91.50.354.0


70.91.50.356.0

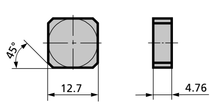
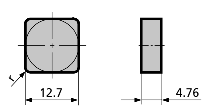
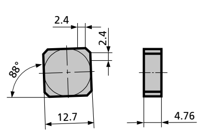
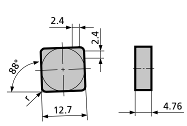
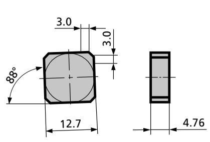
Torx bit 15

70.91.55.708.0

T-handle

70.91.55.706.0

Einstellanleitung auf Seite 61

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
SNCN 1204 ZN T	SNCN 1204 ZN T00520	SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.409.03.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.409.03.9
SNGN 1204 .. T	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.009.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.058.20.9
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						21.10.058.20.1
SNGN 1204 ZN T - . 88Z240	SNGN 1204 ZN T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.048.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.493.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.493.20.1
	SNGN 1204 ZN T01020 - S 88Z240	WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											12.12.089.20.0
SNGN 120408 T - 88Z240	SNGN 120408 T01020 - 88Z240	SC 60	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦					✧	✧	✧										✦	46.10.049.20.6
		SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.503.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.503.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.503.20.9
SNGN 1204 ZN T - S 88Z300	SNGN 1204 ZN T01015 - S 88Z300	WBN 101	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧											20.12.085.37.1
		WBN 115	✦	✦	✦	✦	✦	✧	✧	✧	✧	✧					✧	✧	✧										✦	12.12.085.37.0

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Milling cutter type
CARTFIN With fine finishing cartridge 90°

TYPE: PPCM 88 R-AM WITH FINE FINISHING CARTRIDGE

Face milling
Fine milling up to Ra 0.5

v_c = 600 - 1200 m/min
f_z = 0.12 - 0.30 mm
a_p = 0.20 - 0.80 mm

3.2 0.5

positive cutting inserts

stable / unstable components

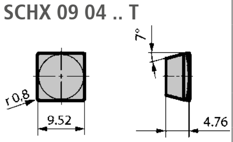
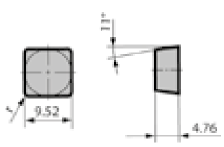
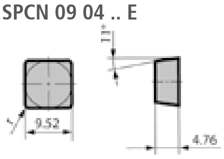
with / without cooling

Axial rake angle $\gamma_a = +7°$
Radial rake angle $\gamma_r = +2°$
Mounting according to DIN 8030

WITH FINE FINISHING CARTRIDGE

TYPE	SPK REF. NO.	DIMENSIONS					
		D	t	d_4	h_1	n_{max} (min^{-1})	Weight in kg
WIDE PITCH							
PPCM-080-04SP0988R-AM	771.20.211.42	80	3+1	-	63	8500	0.726
PPCM-100-06SP0988R-AM	771.20.211.52	100	5+1	-	63	6400	1.050
PPCM-125-08SP0988R-AM	771.20.211.62	125	7+1	-	63	5200	1.575
PPCM-160-10SP0988R-AM	771.20.211.72	160	8+2	-	63	4000	2.392
PPCM-200-14SP0988R-AM	771.20.211.82	200	12+2	-	63	3200	3.488
PPCM-250-18SP0988R-AM	771.20.211.92	250	16+2	-	63	2600	5.440
PPCM-315-20SP0988R-AM	771.20.211.02	315	18+2	-	63	2100	10.227
STANDARD PITCH							
PPCM-080-06SP0988R-AM	771.20.511.42	80	5+1	-	63	8500	0.769
PPCM-100-08SP0988R-AM	771.20.511.52	100	7+1	-	63	6400	1.093
PPCM-125-12SP0988R-AM	771.20.511.62	125	10+2	-	63	5200	1.660
PPCM-160-14SP0988R-AM	771.20.511.72	160	12+2	-	63	4000	2.475
PPCM-200-20SP0988R-AM	771.20.511.82	200	18+2	-	63	3200	3.614
PPCM-250-24SP0988R-AM	771.20.511.92	250	21+3	-	63	2600	5.568
PPCM-315-28SP0988R-AM	771.20.511.02	315	24+4	-	63	2100	10.392

Spare parts on page 62 | Assembly instructions on page 63 | Setting instructions on page 64

INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
FOR 90° CARTRIDGES																														
SCHX 09 04 .. T 	SCHX 090408 T113	TS 5115	✦	✦	✦	✦	✦																						✦	50.19.001.99.8
		WBN 101	✦	✦	✦	✦	✦																							20.18.001.99.1
		WBN 115	✦	✦	✦	✦	✦																							12.18.001.99.0
FOR 88° CARTRIDGES																														
SPCN 09 04 .. T 	SPCN 090408 T01020	SL 500	✦	✦	✦	✦	✦																							36.12.427.20.0
		SL 506	✦	✦	✦	✦	✦																							19.12.427.20.1
		SL 800	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.12.427.20.8
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.12.427.20.1
SPCN 09 04 .. E 	SPCN 090408 E	TS 5115	✦	✦	✦	✦	✦																						✦	50.19.000.40.8

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

TYPE: PPC 88 R-AM WITH FINISHING CARTRIDGE

Face milling
Fine milling up to Ra 0.8

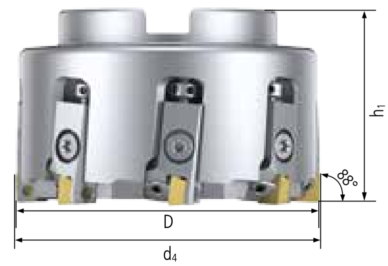
v_c = 600 - 1200 m/min
f_z = 0.12 - 0.30 mm
a_p = 0.20 - 0.80 mm

3.2 0.8

positive cutting inserts

stable / unstable components

with / without cooling

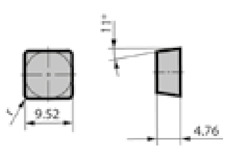
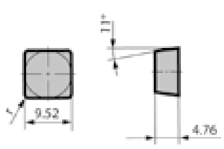
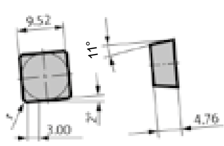
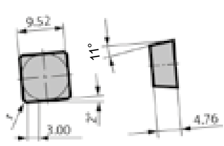


Axial rake angle $\gamma_a = +7°$
Radial rake angle $\gamma_r = +2°$
Mounting according to DIN 8030

WITH FINISHING CARTRIDGE

TYPE	SPK REF. NO.	DIMENSIONS					
		D	t	d_4	h_1	n_{max} (min^{-1})	Weight in kg
WIDE PITCH							
PPC-080-04SP0988R-AM	771.20.111.42	80	4	81	63	8500	0.726
PPC-100-06SP0988R-AM	771.20.111.52	100	6	101	63	6400	1.050
PPC-125-08SP0988R-AM	771.20.111.62	125	8	126	63	5200	1.575
PPC-160-10SP0988R-AM	771.20.111.72	160	10	161	63	4000	2.392
PPC-200-14SP0988R-AM	771.20.111.82	200	14	201	63	3200	3.488
PPC-250-18SP0988R-AM	771.20.111.92	250	18	251	63	2600	5.440
PPC-315-20SP0988R-AM	771.20.111.02	315	20	316	63	2100	10.227
STANDARD PITCH							
PPC-080-06SP0988R-AM	771.20.411.42	80	6	81	63	8500	0.769
PPC-100-08SP0988R-AM	771.20.411.52	100	8	101	63	6400	1.093
PPC-125-12SP0988R-AM	771.20.411.62	125	12	126	63	5200	1.660
PPC-160-14SP0988R-AM	771.20.411.72	160	14	161	63	4000	2.475
PPC-200-20SP0988R-AM	771.20.411.82	200	20	201	63	3200	3.614
PPC-250-24SP0988R-AM	771.20.411.92	250	24	251	63	2600	5.568
PPC-315-28SP0988R-AM	771.20.411.02	315	28	316	63	2100	10.392

Spare parts on page 62 | Assembly instructions on page 63 | Setting instructions on page 64

			K																						H			S	P	
			GJL					GJS					ADI				SI GJS			GJV										
INSERT	TYPE	GRADE	EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	SPK REF. NO.
FOR 88° CARTRIDGES																														
SPCN 09 04 .. T 	SPCN 090408 T01020	SL 500	✦	✦	✦	✦	✦																							36.12.427.20.0
		SL 506	✦	✦	✦	✦	✦																							19.12.427.20.1
		SL 800	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.12.427.20.8
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.12.427.20.1
SPCN 09 04 .. E 	SPCN 090408 E	TS 5115	✦	✦	✦	✦	✦										✧	✧	✧										✦	50.19.000.40.8
SPCN 09 04 .. T - 88Z300 	SPCN 090408 T - 88Z300	SL 506	✦	✦	✦	✦	✦																							19.12.429.20.1
	SPCN 090408 T - S88Z300	WBN 101	✦	✦	✦	✦	✦																							20.18.002.20.1
		WBN 115	✦	✦	✦	✦	✦																							12.18.002.20.0
SPCN 09 04 .. E - 88Z300 	SPCN 090408 E - 88Z300	TS 5115	✦	✦	✦	✦	✦																						✦	50.19.002.40.8

ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

Face-milling cutter
CARTMILL 88

TYPE: MFS 88-M4

Face milling
Fine milling up to Ra 0.8

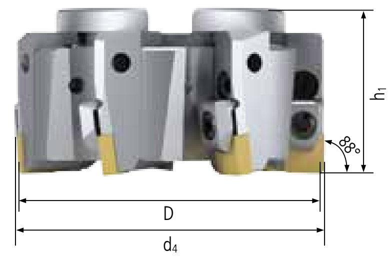
v_c = 500 - 800 m/min
f_z = 0.10 - 0.25 mm
a_p = 0.1 - 1.0 mm

6.3 ▽ 3.2 ▽ 0.8 ▽

negative cutting inserts

stable / unstable components

with / without cooling



Axial rake angle γ_a = -7°
Radial rake angle γ_r = -8°
Mounting according to DIN 8030

TYPE	SPK REF. NO.	DIMENSIONS				
		D	t	d_4	h_1	n_{max} (min^{-1})
MFS 080-06-88 M4	772.91.537.93	80	5 + 1	81	53	6700
MFS 100-07-88 M4	772.91.538.93	100	6 + 1	101	53	6000
MFS 125-08-88 M4	772.91.539.93	125	7 + 1	126	66	5400
MFS 160-10-88 M4	772.91.540.93	160	9 + 1	161	66	4700
MFS 200-12-88 M4	772.91.541.93	200	11 + 1	201	66	4200
MFS 250-16-88 M4	772.91.543.93	250	15 + 1	251	66	3800

88 F4 SN

772.95.536.03

Tightening torque 5 Nm*

70.91.11.468.0

Torx bit 20

70.91.55.210.0

O Z4 SN

772.95.538.03

Tightening torque 5 Nm*

70.91.11.468.0

Torx bit 20

70.91.55.210.0

Tightening torque 5 Nm*

70.91.50.615.0

70.91.54.033.0

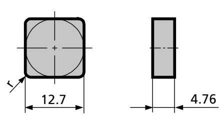
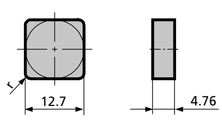
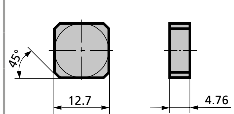
Torx bit 20

70.91.55.210.0

SW 4

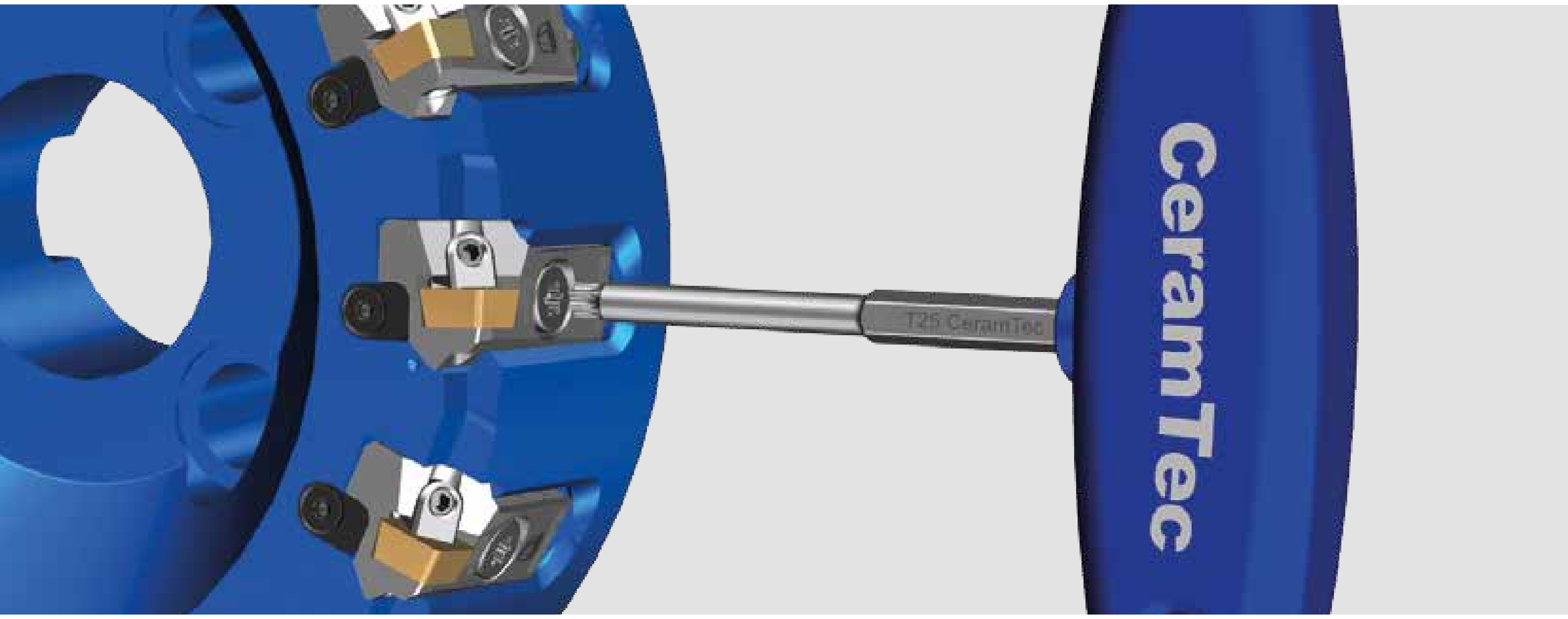
33.60.0911.004.0

Assembly and Setting instructions on page 65

INSERT	TYPE	GRADE	K																						H			S	P	SPK REF. NO.
			GJL					GJS					ADI				SI GJS			GJV										
			EN-GJL 150	EN-GJL 200	EN-GJL 250	EN-GJL 300	EN-GJL 350	EN-GJS 400-15	EN-GJS 500-7	EN-GJS 600-3	EN-GJS 700-2	EN-GJS 800-2	EN-GJS 800-8	EN-GJS 1000-5	EN-GJS 1200-2	EN-GJS 1400-0	EN-GJS 450-18	EN-GJS 500-14	EN-GJS 600-10	EN-GJV 300	EN-GJV 350	EN-GJV 400	EN-GJV 450	EN-GJV 500	STEEL HARDENED	CHILLED CASTING	DIE CASTING	SPECIAL ALLOY	STEEL	
SNCN 1204 .. T	SNCN 120404 T00520	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.431.03.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.409.03.1
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						21.10.431.03.1
SNGN 1204 .. T	SNGN 120408 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.009.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.009.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.009.20.9
	SNGN 120412 T01020	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											36.10.058.20.0
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											17.10.058.20.1
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						21.10.058.20.1
		SL 858 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦						17.10.058.20.9
SNCN 1204 ZN T	SNCN 1204 ZN T00520	SL 500	✦	✦	✦	✦	✦										✧	✧	✧											46.10.048.20.6
		SL 808	✦	✦	✦	✦	✦	✧	✦	✦	✦	✧					✧	✧	✧											36.10.493.20.0
		SL 854 C	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✦	✧	✧	✧	✦	✦	✦	✦	✦						17.10.493.20.1

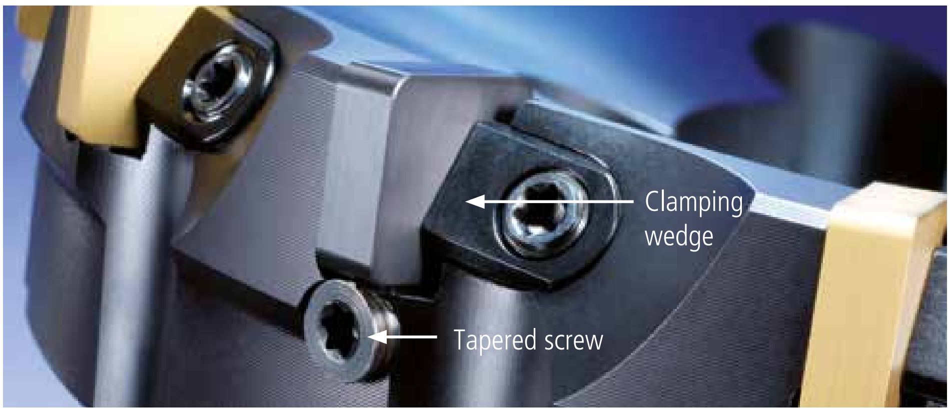
ISO application group

K	■	Cast iron	H	■	Hard materials	S	■	Special alloy	P	■	Steel	Main application	✦	Additional application	✧

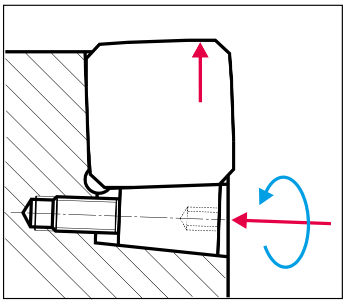

CeramTec
T25 CeramTec

Overview of tightening torques for fastening cutting inserts	
Hole tension	5 Nm*
Wedge clamping	3.5 - 5 Nm*
Wedge clamping in cartridges	5 Nm*

* Please refer to the catalogue section on pages 14 - 56 for the exact value for the tightening torque.

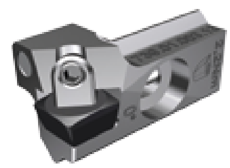


Fine adjustment

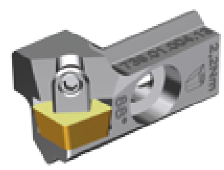


Fine adjustment using a tapered screw

1. Position all the tapered screws so that they are flush on the outer diameter of the milling cutter
2. Place the inserts firmly in the pocket and hand tighten using the clamping wedge
3. Screw in the tapered screws until you feel a slight resistance
4. Place the milling cutter in a setting device and set each of the replaceable inserts to the same height by turning the tapered screw in a clockwise direction in the µm range
5. Tighten the clamping wedge with a torque of 5 Nm



CARTFIN fine finishing cartridge for type PPCM
90° approach angle
SPK order no. 739.01.003.13

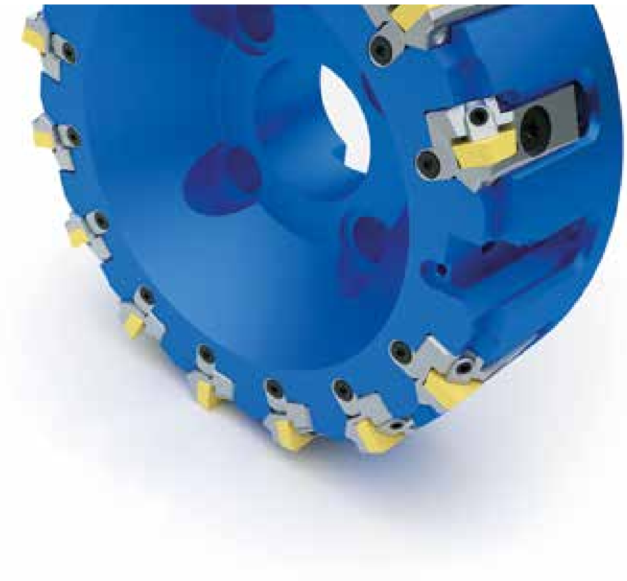


CARTFIN finishing cartridge for type PPC / PPCM
88° approach angle
SPK order no. 739.01.004.13

1	**Wedge and double threaded screw are included in the delivery!**

		Description	SPK order no.
2		Setting screw	70.91.50.917.0
3		Disc spring	70.91.55.718.0
4		Clamping screw	70.91.50.916.0
5		Double threaded screw	70.91.50.648.0
6		Wedge	70.91.55.696.0
7		Compression spring	70.91.55.717.0
8		Cover plate	70.91.55.716.0
9		Countersunk screw	60.09.63.002.0

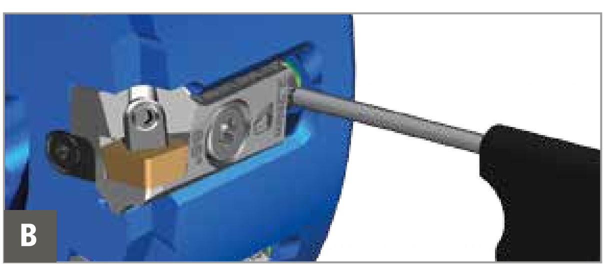
Torx bit 25	SW 2	Cross-handle	Torx 9
			
70.91.55.710.0	70.91.55.725.0	70.91.55.706.0	70.91.55.218.0

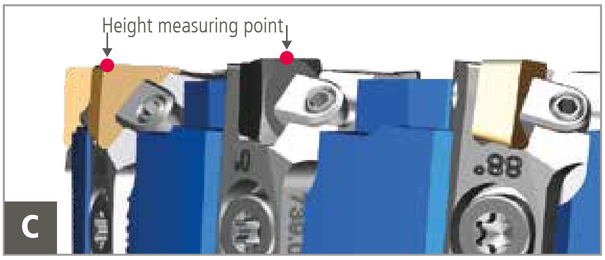


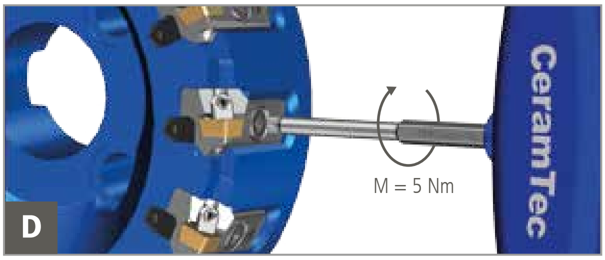
1	Cartridge
2	Setting screw
3	Disc spring
4	Clamping screw
5	Double threaded screw
6	Wedge
7	Compression spring
8	Cover plate
9	Countersunk screw

Screw the setting screw (2) into the rear side of the cartridge until it reaches the centre of the hole circle.
Insert the cartridge into the prismatic guide and screw the setting screw (2) into the body until the cartridge head slightly protrudes.
Gently fix the cartridge with the clamping screw (4) and disc spring (3).
Fasten the compression spring (7) and cover plate (8) with the countersunk screw (9).
Screw the double threaded screw (5) into the wedge (6) and screw it into the cartridge using an SW2 Allen key.

Place the milling cutter fitted with cartridges and cutting inserts onto the setting device.
Gently tighten the cartridge clamping screw.
Set all cutting inserts to the same height with the aid of the cartridge setting screw (Figures A+B). - Rough setting of the cartridges on the back of the milling cutter (Figure A) - Fine setting of the cartridges on the side of the milling cutter (Figure B)
Height measuring point with the milling cutter type PPCM with a fine finishing cartridge (see Figure C): - The height measuring point with 88° finishing cartridges is on the cutting corner of the cutting insert - The height measuring point with 90° fine finishing cartridges is in the centre of the cutting edge
Set the fine finishing cartridges 0.03 - 0.05 mm higher than the finishing cartridges.
Tighten the clamping screw with 5 Nm (Figure D).





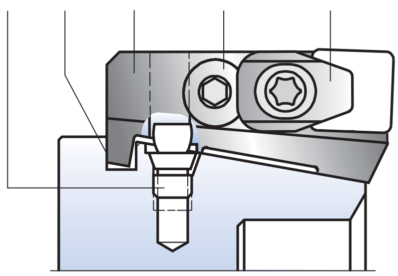


FINE FINISHING SETTING OF THE CARTFIN

The CARTFIN produces excellent surface qualities with an Ra value of 0.5 µm with the following setting:

- Set the axial run-out of all cartridges
- Set the fine finishing cartridges 0.03 - 0.05 mm higher than the finishing cartridges

With this setting, the SCHX cutting inserts with an approach angle of 90° produce the surface quality with their fine wiper geometries, while the cutting inserts in the finishing cartridges with an approach angle of 88° remove the material in the feed direction.



Allen key SW 4 for clamping screw - 4 -

T20 Torx screwdriver for adjusting bolt -1-

1. Screw the adjusting bolt -1- into the main body with the T20 Torxscrewdriver. Loosen after the sheath comes into contact with the conical surfaces for approx. 2 revolutions in a counterclockwise direction.

2. Place the cartridge - 3 - onto the ring groove side - 2 - on the main body and press it into position. Tighten the clamping screw - 4 - with the screwdriver SW4 (15 Nm).

3. Turn the adjusting bolt -1- slightly with the screwdriver by turning it clockwise.

4. Insert the clamping element - 5.

5. Press the milling insert into the insert seat and tighten the clamping element screw by hand (5 Nm).

6. Determine the highest axial point after installing all of the cartridges and raise this by approx. 0.01 mm by turning the adjusting bolt -1- clockwise with a screwdriver.

7. Align the remaining cartridges under the highest axial point determined in point 6; make sure that the pre-tensioning of the adjusting bolt -1- is based on the precise micron setting. This is achieved by releasing the tension on the adjusting bolt by turning it in an counterclockwise direction and tightening it again without any pre-tension.

Resetting cartridges to the original position

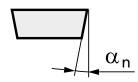
Use the screwdriver to turn the adjusting bolt counterclockwise, then move it back onto the ring groove side - 2 - that is free of play (tap on the ring groove side - 2 - with the copper bolt).
Then align the cartridges to the axial run-out according to points 6 and 7.

Designation system for milling inserts according to ISO 1832

Insert shape

R		○
S	90°	□
T	60°	△
H	120°	⬡
O	135°	⯃

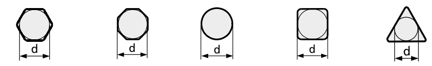
Clearance angle α_n



N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°
O	Clearance angle which requires special data.

Insert size

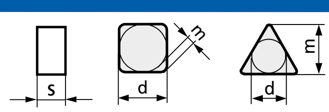
Inscribed circle



d mm	H 120°	O 135°	RC, RN	S 90°	T 60°
3.97					06
5.56					09
6.35					11
9.52			09	09	16
12.70			12	12	22
13.50		05		13	
15.88	09		15	15	27
16.20	10				
16.50		06			
19.05			19	19	33
25.40			25	25	44

S	N	C	N	12	04

Tolerances



* Permissible deviations for the insert form, depending on the insert size

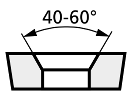
	S = ± mm	d = ± mm	m = ± mm	Inscribed circle d mm	Tolerance class J, K, L, M (d = ± mm)	U (d = ± mm)	M, N (m = ± mm)	U (m = ± mm)
A	0.025	0.025	0.005					
C	0.025	0.025	0.013					
E	0.025	0.025	0.025					
F	0.025	0.013	0.005	3.97	0.05	0.08	0.08	0.13
G	0.130	0.025	0.025	5.56				
H	0.025	0.013	0.013	6.35				
J	0.025	0.05-0,.13*	0.005	9.52				
K	0.025	0.05-0.13*	0.013	12.70	0.08	0.13	0.13	0.2
L	0.025	0.05-0.13*	0.025	15.88	0.1	0.18	0.15	0.27
M	0.130	0.05-0.13*	0.08-0.18*	19.05				
U	0.130	0.08-0.25*	0.13-0.38*	25.40	0.13	0.25	0.18	0.38

Insert type

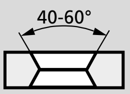
N

A

W

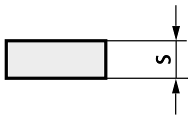


Q



X Special design

Insert thickness



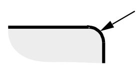
01	1.59
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52
12	12.70

Insert edge preperation

F

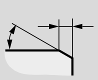
Sharp

E



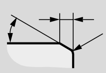
Rounded

T



Chamfered

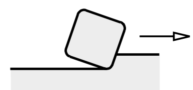
S



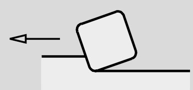
Chamfered and rounded

Cutting direction

R



L



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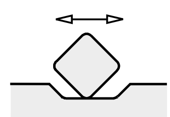
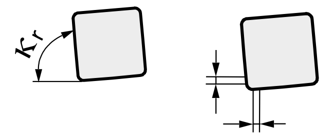


Designation key for ZZ geometries

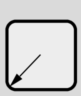


Approach angle κ_r	Width of the ZZ chamfer
43 = 43°	125 = 1.25 mm
47 = 47°	150 = 1.50 mm
75 = 75°	240 = 2.40 mm
88 = 88°	

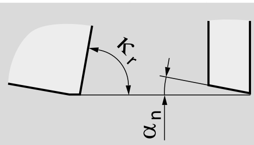
AN T N 01020 - 88Z240

Corner radius

Insert with corner radius



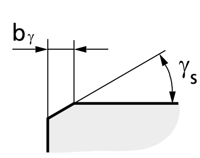
Insert with cutting edge



00	RN, RC
M0	RB
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6
24	2.4
32	3.2
40	4.0

Approach angle of the main cutting edge κ_r		Clearance angle α_n	
A	45°	N	0°
D	60°	C	7°
E	75°	P	11°
F	85°	D	15°
P	90°	E	20°
Z	other angles	F	25°

Chamfer size

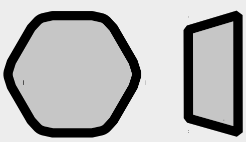


Chamfer width w_γ in 1/100 mm and angle γ_s without degree symbol

z.B.
0,10 x 20° = 01020
0,05 x 20° = 00520

Contents: ceramic cutting inserts for milling

HDGX



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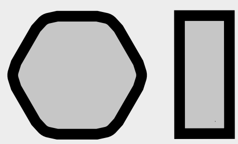
HNGX



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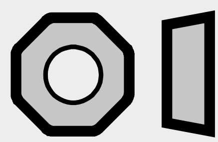
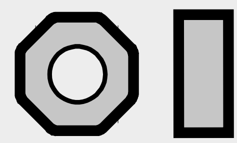
ODHW, OEHX, OPHX



Pages 71 - 72

ONHQ



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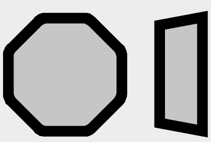
OPHN



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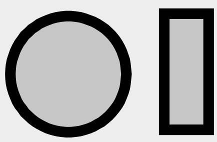
RNGN, RNCX



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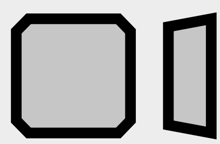
SCHX, SDCN, SECN, SOCN, SPCN, SPGN, SPHN, SPKN



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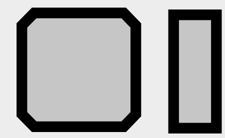
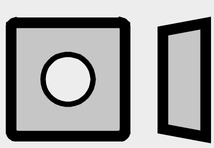
SNCN, SNFN, SNGN, SNHX



Pages 74 - 76

SDHW, SEHW



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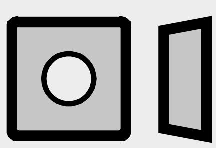
SPHX



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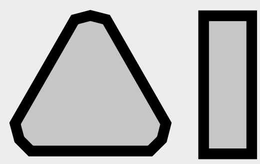
TNCN



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TPCN

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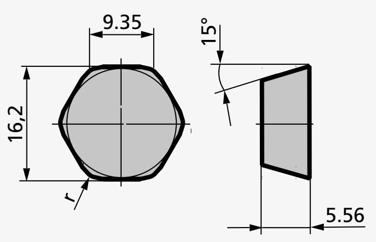
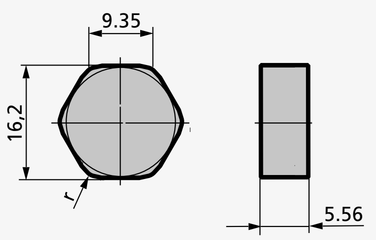
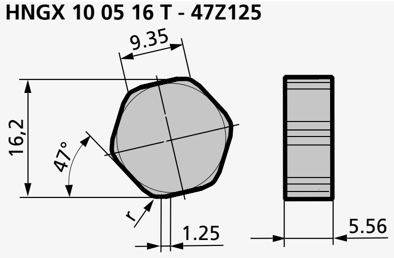
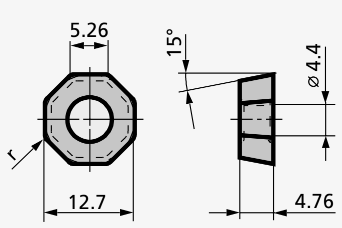
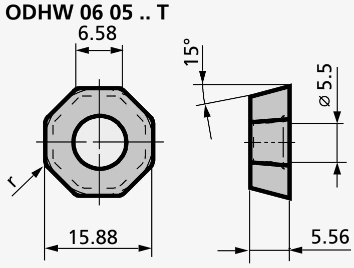
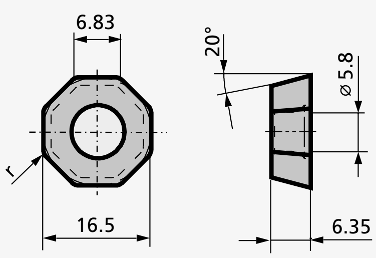
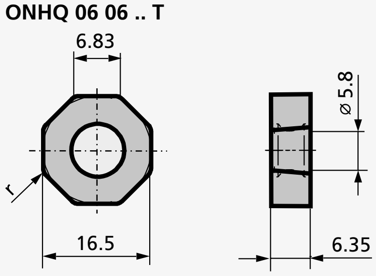
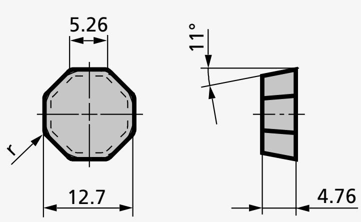
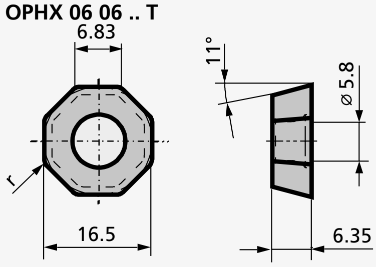
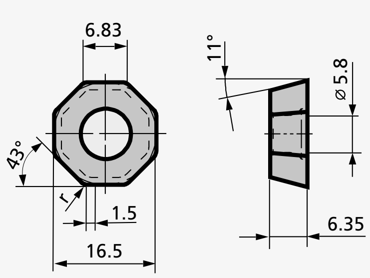
INSERT	TYPE	GRADE	SPK REF. NO.
HDGX 10 05 .. T 	HDGX 100512 T01020	SL 808	17.62.014.20.1
	HNGX 100512 T02030	SL 808	17.62.014.52.1
HNGX 10 05 .. T 	HNGX 100512 T01020	SL 500	36.60.123.20.0
		SL 808	17.60.123.20.1
	HNGX 100516 T01020	SL 500	36.60.124.20.0
		SL 808	17.60.124.20.1
HNGX 10 05 16 T - 47Z125 	HNGX 100516 T01020 - 47Z125	SL 500	36.60.120.20.0
	HNGX 100516 T03020 - 47Z125	SL 808	17.60.120.23.1
ODHW 05 04 .. T 	ODHW 050408 T 01020	SL 500	36.76.001.20.0
	ODHW 050412 T 01020	SL 500	36.76.002.20.0
ODHW 06 05 .. T 	ODHW 060516 T 01020	SL 500	36.76.003.20.0

INSERT	TYPE	GRADE	SPK REF. NO.
OEHX 06 06 .. T 	OEHX 060616 T 01020	SL 808	17.76.016.20.1
ONHQ 06 06 .. T 	ONHQ 060616 T 01020	SL 808	17.76.017.20.1
OPHN 05 04 .. T 	OPHN 050412 T 01020	SL 500	36.72.001.20.0
		SL 800	17.72.001.20.8
		SL 808	17.72.001.20.1
OPHX 06 06 .. T 	OPHX 060616 T 01020	SL 808	17.76.014.20.1
OPHX 06 06 08 T - 43Z150 	OPHX 060608 T 01020 - 43Z150	SL 808	17.76.015.20.1

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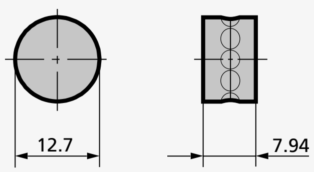
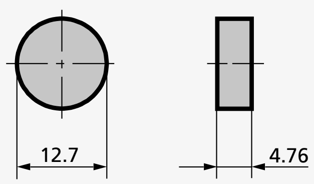
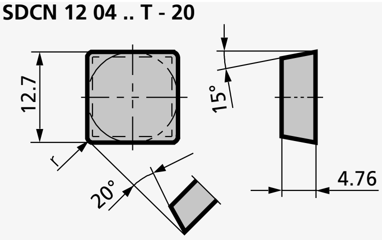
		SL 808	17.40.196.20.1
RNGN 12 04 00 T 03015	RNGN 120400 T 03015	SH 2	36.40.027.35.7
			
SDCN 12 04 .. T - 20	SDCN 120408 T - 20	SL 500	36.12.340.20.0
		SL 808	17.12.340.20.1
	SDCN 120412 T - 20	SL 500	36.12.341.20.0
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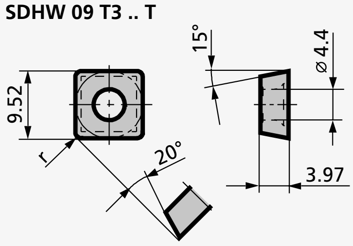
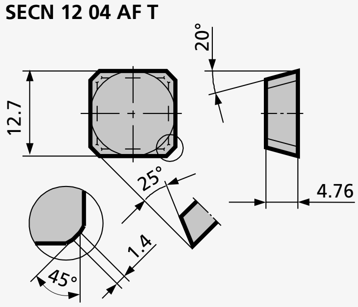
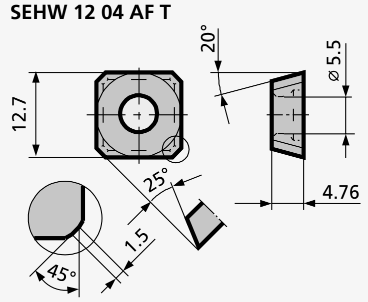
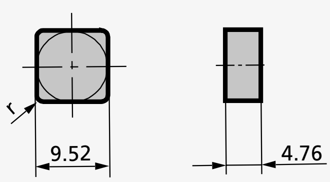
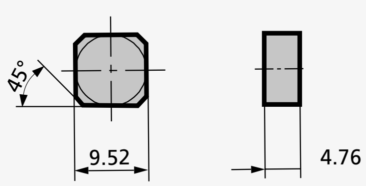
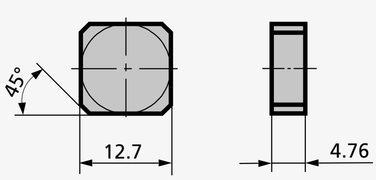
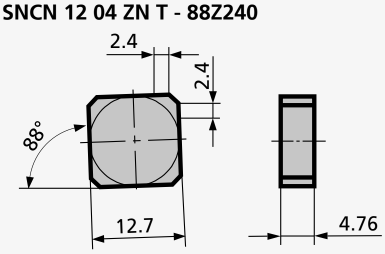
SDHW 09 T3 .. T	SDHW 09T312 T 01020	SL 500	36.16.505.20.0
			
SECN 12 04 AF T	SECN 1204 AF T 01020	SL 500	36.12.357.20.0
			

INSERT	TYPE	GRADE	SPK REF. NO.
SEHW 12 04 AF T 	SEHW 1204 AF T 01020	SL 500	36.16.519.20.0
SNCN 09 04 .. T 	SNCN 090404 T 00520	SL 808	17.10.454.03.1
SNCN 09 04 ZN T 	SNCN 0904 ZN T 00520	SL 500	36.10.445.03.0
		SL 808	17.10.445.03.1
		SL 854 C	17.10.445.03.9
SNCN 12 04 ZN T 	SNCN 1204 ZN T 00520	SL 500	36.10.409.03.0
		SL 808	17.10.409.03.1
		SL 854 C	17.10.409.03.9
SNCN 12 04 ZN T - 88Z240 	SNCN 1204 ZN T 01020 - 88Z240	SL 500	36.10.493.20.0
		SL 808	17.10.493.20.1

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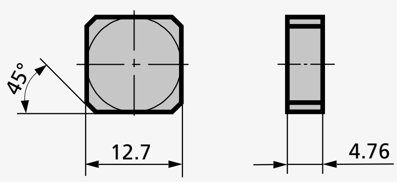
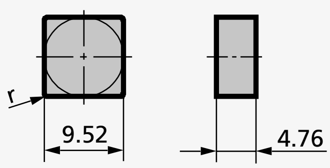
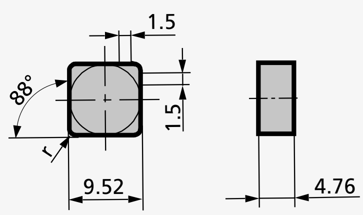
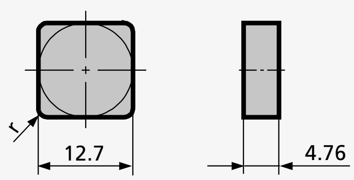
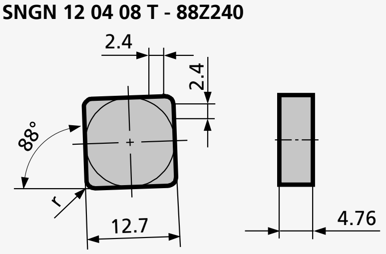
SNFN 12 04 AN T 	SNFN 1204 AN T 03015	SH 2	36.10.223.35.7
SNGN 09 04 .. T 	SNGN 090412 T 01020	SL 500	36.10.050.20.0
	SNGN 090412 T 03015	SH 2	36.10.050.35.7
SNGN 09 04 04 T - 88Z150 	SNGN 090404 T 01020 - 88Z150	SL 808	17.10.490.20.1
SNGN 12 04 .. T 	SNGN 120408 T 01020	SL 500	36.10.009.20.0
		SL 808	17.10.009.20.1
		SL 850 C	15.10.009.20.2
		SL 854 C	17.10.009.20.9
	SNGN 120412 T01020	SL 500	36.10.058.20.0
		SL 808	17.10.058.20.1
		SL 850 C	15.10.058.20.2
		SL 854 C	17.10.058.20.9
		SL 858 C	21.10.058.20.1
	SNGN 120412 T 03015	SH 2	36.10.058.35.7
SNGN 12 04 08 T - 88Z240 	SNGN 120408 T 01020 - 88Z240	SL 500	36.10.503.20.0
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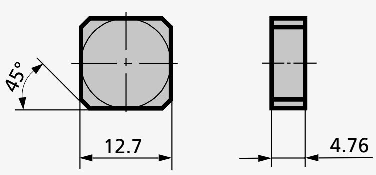
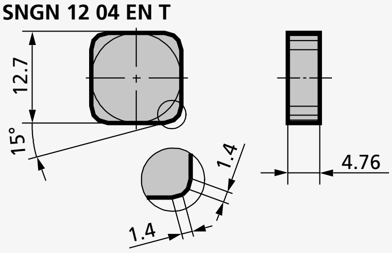
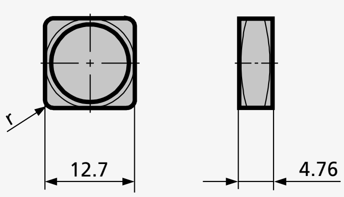
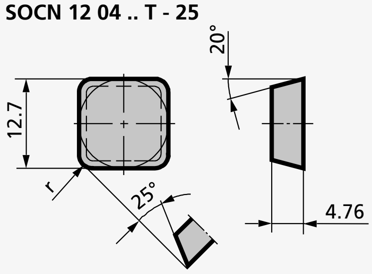
SNGN 12 04 AN T 	SNGN 1204 AN T 01020	SL 500	36.10.232.20.0
		SL 808	17.10.232.20.1
SNGN 12 04 EN T 	SNGN 1204 EN T 01020	SL 500	36.10.261.20.0
		SL 808	17.10.261.20.0
SNHX 12 04 .. T 125 	SNHX 120412 T 125	SH 2	36.10.266.99.7
SOCN 12 04 .. T - 25 	SOCN 120416 T - 25	SL 500	36.12.314.20.0
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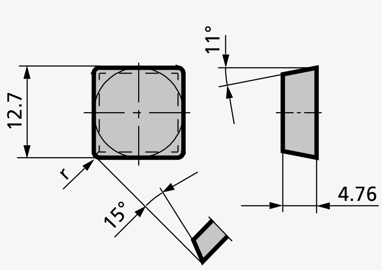
SPCN 09 04 .. T 	SPCN 090408 T01020	SL 500	36.12.427.20.0
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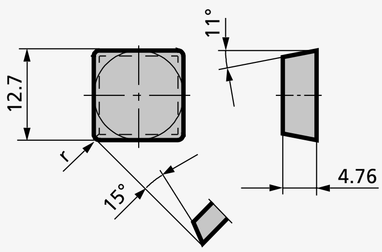
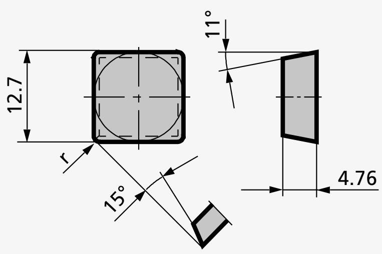
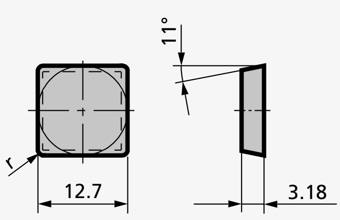
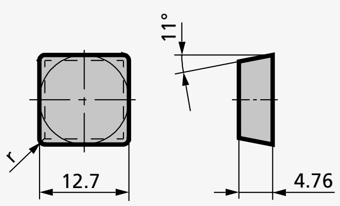
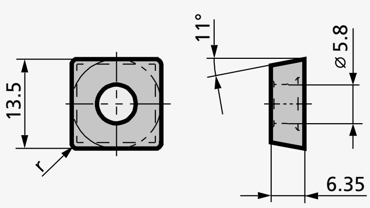
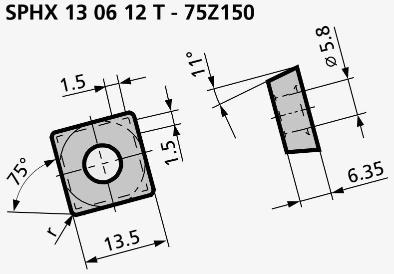
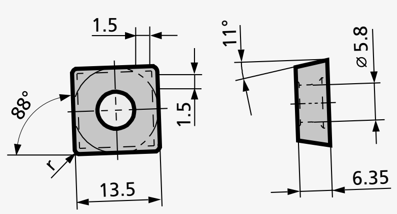
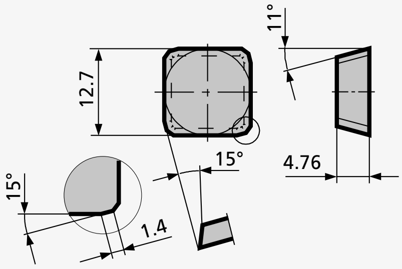
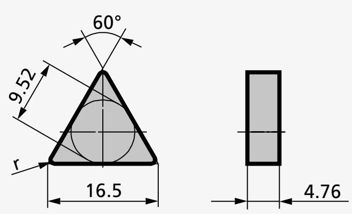
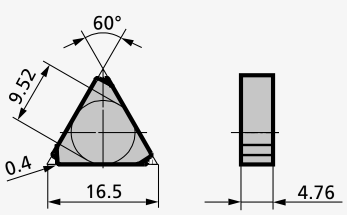
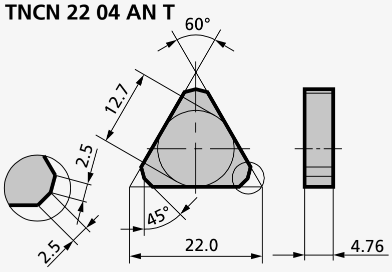
SPCN 09 04 .. T - 88Z300 	SPCN 090408 T - 88Z300	SL 506	19.12.429.20.1
SPCN 12 04 .. T - 15 	SPCN 120416 T - 15	SL 500	36.12.325.20.0
		SL 808	17.12.325.20.1
SPGN 12 03 .. T 	SPGN 120312 T 01020	SL 500	36.12.155.20.0
SPGN 12 04 .. T 	SPGN 120412 T 01020	SL 500	36.12.163.20.0
		SL 808	17.12.163.20.1

INSERT	TYPE	GRADE	SPK REF. NO.
SPHX 13 06 .. T 	SPHX 130612 T 01020	SL 808	17.16.535.20.1
SPHX 13 06 12 T - 75Z150 	SPHX 130612 T 01020 - 75Z150	SL 808	17.16.537.20.1
SPHX 13 06 12 T - 88Z150 	SPHX 130612 T 01020 - 88Z150	SL 808	17.16.536.20.1
SPKN 12 04 ED TR 	SPKN 1204 ED TR 01020	SL 500	36.12.246.20.0

INSERT	TYPE	GRADE	SPK REF. NO.
TNCN 16 04 .. T	TNCN 160404 T 01020	SL 808	17.30.190.20.1
		SL 854 C	17.30.190.20.9
	TNCN 160408 T 01020	SL 808	17.30.191.20.1
		SL 854 C	17.30.191.20.9
	TNCN 160412 T 01020	SL 808	17.30.192.20.1
		SL 854 C	17.30.192.20.9
TNCN 16 04 PC T	TNCN 1604 PC T 01020	SL 808	17.30.209.20.1
TNCN 22 04 AN T	TNCN 2204 AN T 01020	SL 500	36.30.100.20.0
		SL 808	17.30.100.20.1
		SL 854 C	17.30.100.20.9





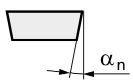


Designation system for inserts for milling according to ISO 1832

Insert shape

R		○
S	90°	□
T	60°	△
H	120°	⬡
O	135°	⯃

Clearance angle



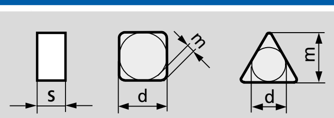
N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°
O	Clearance angle which requires special data.

Insert size

Inscribed circle d mm	H 120°	O 135°	RC, RN	S 90°	T 60°
3.97					06
5.56					09
6.35					11
9.52			09	09	16
12.70			12	12	22
13.50		05		13	
15.88	09		15	15	27
16.20	10				
16.50		06			
19.05			19	19	33
25.40			25	25	44

S	N	C	N	12	04

Tolerances



* Permissible deviations for the insert form, depending on the insert size

	S = ± mm	d = ± mm	m = ± mm
A	0.025	0.025	0.005
C	0.025	0.025	0.013
E	0.025	0.025	0.025
F	0.025	0.013	0.005
G	0.130	0.025	0.025
H	0.025	0.013	0.013
J	0.025	0.05-0.13*	0.005
K	0.025	0.05-0.13*	0.013
L	0.025	0.05-0.13*	0.025
M	0.130	0.05-0.13*	0.08-0.18*
U	0.130	0.08-0.25*	0.13-0.38*

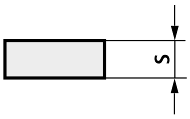
Inscribed circle	Tolerance class			
	J, K, L, M	U	M, N	U
d mm	d = ± mm		m = ± mm	
3.97	0.05	0.08	0.08	0.13
5.56				
6.35				
9.52				
12.70	0.08	0.13	0.13	0.2
15.88	0.1	0.18	0.15	0.27
19.05				
25.40	0.13	0.25	0.18	0.38

Insert type

N 

X Special design

Insert thickness



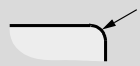
01	1.59
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52
12	12.70

Cutting edge preperation

F

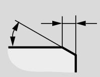
Sharp

E



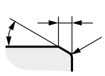
Rounded

T



Chamfered

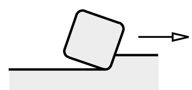
S



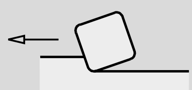
Chamfered and rounded

Cutting direction

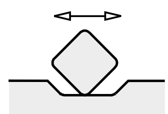
R



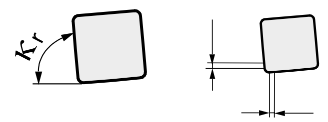
L



N



Designation key for ZZ geometries

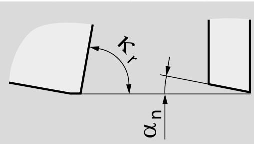


Approach angle κ_r	Width of the ZZ chamfer
43 = 43°	125 = 1.25 mm
47 = 47°	150 = 1.50 mm
75 = 75°	240 = 2.40 mm
88 = 88°	

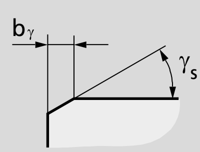
AN	T	N	01020	-	F	88Z240

Cutting edge radius

Insert with edge radius		Insert with face cutting edge			
		Approach angle of the main cutting edge κ_r		Clearance angle α_n	
00	RN, RC				
M0	RB				
02	0.2				
04	0.4				
08	0.8	A	45°	N	0°
12	1.2	D	60°	C	7°
16	1.6	E	75°	P	11°
24	2.4	F	85°	D	15°
32	3.2	P	90°	E	20°
40	4.0	Z	other angles	F	25°



Chamfer size



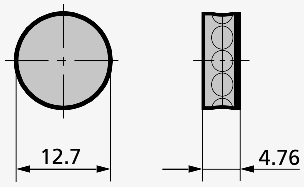
Chamfer width w_γ in 1/100 mm and angle γ_s without degree symbol

e.g.
0,10 x 20° = 01020
0,05 x 20° = 00520

CBN design

S	Solid CBN

Contents PcBN cutting inserts, full face laminated, for milling

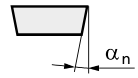
INSERT	TYPE	GRADE	SPK REF. NO.
RNCX 12 04 .. S 	RNCX 120400 S01025	WXM 845	14.48.057.46.5

Designation system for PcBN cutting inserts, solid, for milling according to ISO 1832

Insert shape

R		○
S	90°	□
T	60°	△
H	120°	⬡
O	135°	octagon

Clearance angle



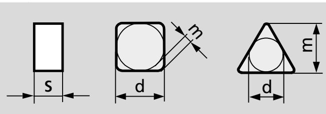
N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°
O	Clearance angle which requires special data.

Insert size

Inscribed circle d mm	H 120°	O 135°	RC, RN	S 90°	T 60°
3.97					06
5.56					09
6.35					11
9.52			09	09	16
12.70			12	12	22
13.50		05		13	
15.88	09		15	15	27
16.20	10				
16.50		06			
19.05			19	19	33
25.40			25	25	44

S	N	C	N	12	04

Tolerances

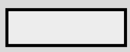


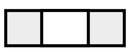
* Permissible deviations for the insert form, depending on the insert size

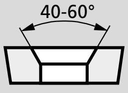
	S = ± mm	d = ± mm	m = ± mm
A	0.025	0.025	0.005
C	0.025	0.025	0.013
E	0.025	0.025	0.025
F	0.025	0.013	0.005
G	0.130	0.025	0.025
H	0.025	0.013	0.013
J	0.025	0.05-0.13*	0.005
K	0.025	0.05-0.13*	0.013
L	0.025	0.05-0.13*	0.025
M	0.130	0.05-0.13*	0.08-0.18*
U	0.130	0.08-0.25*	0.13-0.38*

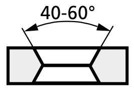
Inscribed circle d mm	Tolerance class J, K, L, M: d = ± mm	U: d = ± mm	M, N: m = ± mm	U: m = ± mm
3.97	0.05	0.08	0.08	0.13
5.56				
6.35				
9.52				
12.70	0.08	0.13	0.13	0.2
15.88	0.1	0.18	0.15	0.27
19.05				
25.40	0.13	0.25	0.18	0.38

Insert type

N 

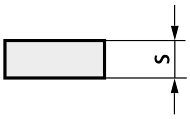
A 

W 

Q 

X Special design

Insert thickness



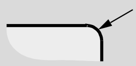
01	1.59
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52
12	12.70

Cutting edge preperation

F

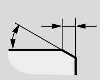
Sharp

E



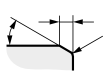
Rounded

T



Chamfered

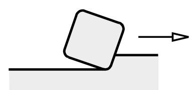
S



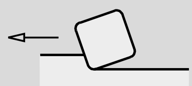
Chamfered and rounded

Cutting direction

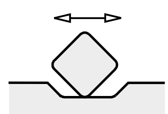
R



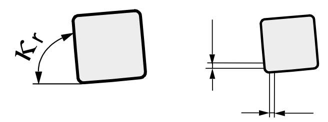
L



N



Designation key for ZZ geometries

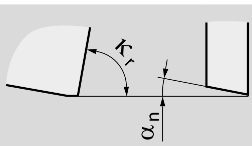


Approach angle κ_r	Width of the ZZ chamfer
43 = 43°	125 = 1.25 mm
47 = 47°	150 = 1.50 mm
75 = 75°	240 = 2.40 mm
88 = 88°	

AN	T	N	01020	-	F	88Z240

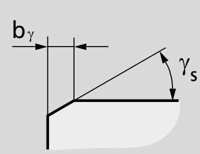
Cutting edge radius

Insert with edge radius | Insert with face cutting edge



Insert with edge radius		Approach angle of the main cutting edge κ_r		Clearance angle α_n	
00	RN, RC				
M0	RB				
02	0.2				
04	0.4				
08	0.8	A	45°	N	0°
12	1.2	D	60°	C	7°
16	1.6	E	75°	P	11°
24	2.4	F	85°	D	15°
32	3.2	P	90°	E	20°
40	4.0	Z	other angles	F	25°

Chamfer size



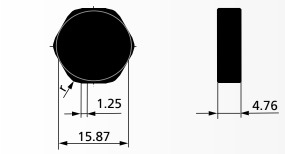
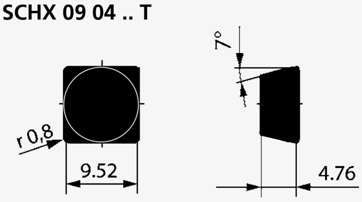
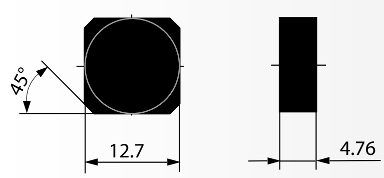
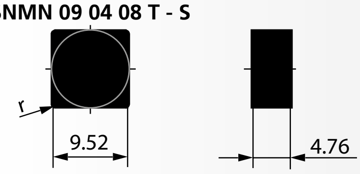
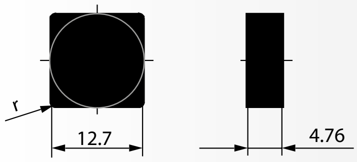
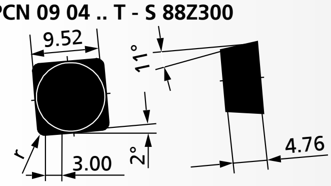
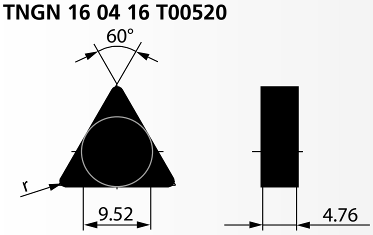
Chamfer width w_γ in 1/100 mm and angle γ_s without degree symbol

e.g.
0.10 x 20° = 01020
0.05 x 20° = 00520

CBN design

S	Solid CBN

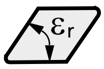
Contents: PcBN cutting inserts, solid for milling

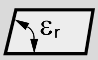
INSERT	TYPE	GRADE	SPK REF. NO.
HNGN 09 04 16 T - S 	HNGN 090416 T - S - ZZ	WBN 101	20.62.011.20.1
SCHX 09 04 .. T 	SCHX 090408 T113	WBN 101	20.18.001.99
		WBN 115	12.19.001.99
SNGN 12 04 ZN T - S 88Z300 	SNGN 1204 ZN T01015 - S 88Z300	WBN 101	20.12.085.37.1
	SNGN 1204 ZN T01015 - S 88Z300	WBN 115	12.12.085.37.0
SNMN 09 04 08 T - S 	SNMN 090408 T00520 - S	WBN 101	20.10.021.03.1
SNMN 12 04 .. T - S 	SNMN 120408 T00520 - S	WBN 115	12.10.029.03.0
	SNMN 120412 T01020 - S	WBN 115	12.10.030.20.0
SPCN 09 04 .. T - S 88Z300 	SPCN 09 04 08 T - S 88Z300	WBN 101	20.18.002.20.1
		WBN 115	12.18.002.20.0
TNGN 16 04 16 T00520 	TNGN 160416 T00520	WBN 101	20.30.016.03.1

Designation system for Cermet cutting inserts for milling in accordance with ISO 1832

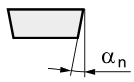
Insert shape

V	35°	
D	55°	
E	75°	
C	80°	
M	86°	
K	55°	
B	82°	
A	85°	
R		
S	90°	
T	60°	
W	80°	
L		
P	108°	
H	120°	
O	135°	





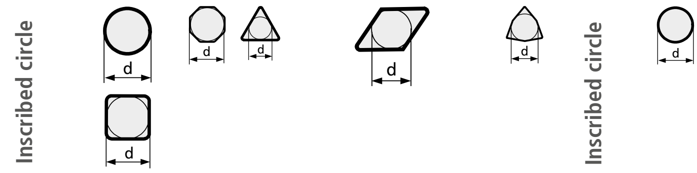
Clearance angle



N	0°
A	3°
B	5°
C	7°
P	11°
D	15°
E	20°
F	25°
G	30°
O	↓

Clearance angle which requires special data.

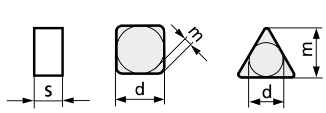
Insert size



d mm	RC, RN S	O 135°	T 60°	C 80°	E 75°	D 55°	V 35°	W 80°	d mm	RB (Type MO)
3.97			06						6.0	06
5.56			09						7.0	07
6.35			11	06		07			8.0	08
9.52	09		16	09		11	16	06	9.0	09
10.00						12			10.0	10
12.70	12	05	22	12	13	15	22	08	12.0	12
15.88	15	06	27	16					16.0	16
19.05	19		33						20.0	20
25.40	25		44						25.0	25

S N C N 12

Tolerances



* Permissible deviations for the insert form, depending on the insert size

	S = ± mm	d = ± mm	m = ± mm
A	0.025	0.025	0.005
C	0.025	0.025	0.013
E	0.025	0.025	0.025
F	0.025	0.013	0.005
G	0.130	0.025	0.025
H	0.025	0.013	0.013
J	0.025	0.05-0.13*	0.005
K	0.025	0.05-0.13*	0.013
L	0.025	0.05-0.13*	0.025
M	0.130	0.05-0.13*	0.08-0.18*
U	0.130	0.08-0.25*	0.13-0.38*

Inscribed circle	Tolerance class			
	J, K, L, M	U	M, N	U
d mm	d = ± mm		m = ± mm	
3.97	0.05	0.08	0.08	0.13
5.56				
6.35				
9.52				
12.70	0.08	0.13	0.13	0.2
15.88	0.1	0.18	0.15	0.27
19.05				
25.40	0.13	0.25	0.18	0.38

Insert type

N		T	40-60°
R		Q	40-60°
F		U	40-60°
A		B	70-90°
M		H	70-90°
G		C	70-90°
W	40-60°	J	70-90°

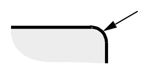
X Special design

Cutting edge preperation

F

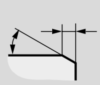
Sharp

E



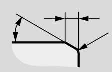
Rounded

T



Chamfered

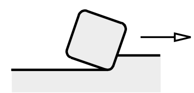
S



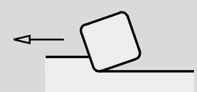
Champfered and rounded

Cutting direction

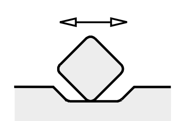
R



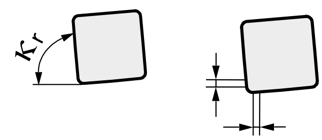
L



N



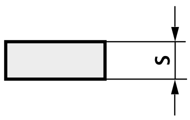
Designation key for ZZ geometries



Approach angle κ_r	Width of the ZZ chamfer
75 = 75°	125 = 1.25 mm
88 = 88°	150 = 1.50 mm
89 = 89°	240 = 2.40 mm

04 ZN F N 01020 - 89Z240

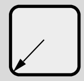
Insert thickness



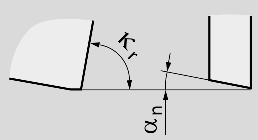
01	1.59
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52
12	12.70

Cutting edge radius

Insert with edge radius

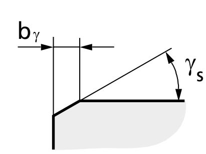


Insert with face cutting edge



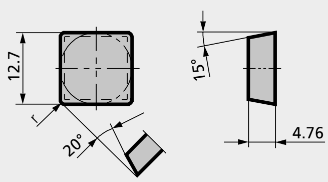
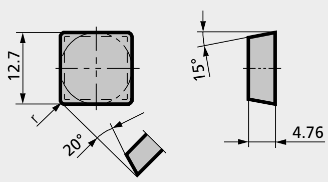
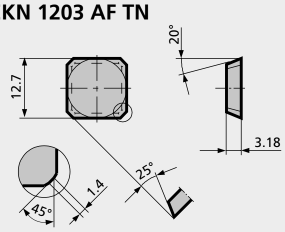
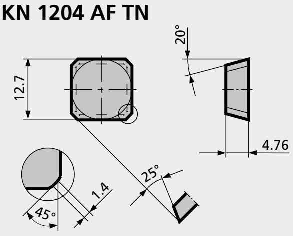
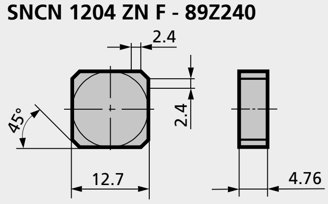
		Approach angle of the main cutting edge κ_r		Clearance angle α_n	
00	RN, RC				
M0	RB				
02	0.2				
04	0.4				
08	0.8	A	45°	N	0°
12	1.2	D	60°	C	7°
16	1.6	E	75°	P	11°
24	2.4	F	85°	D	15°
32	3.2	P	90°	E	20°
40	4.0	Z	Sonder	F	25°

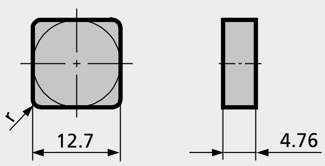
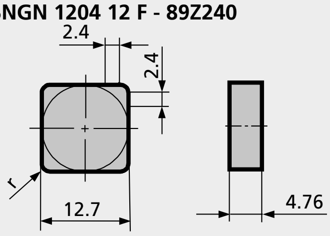
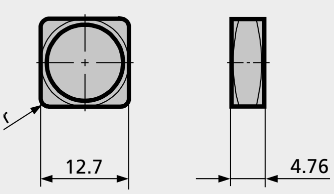
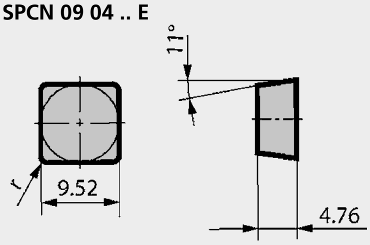
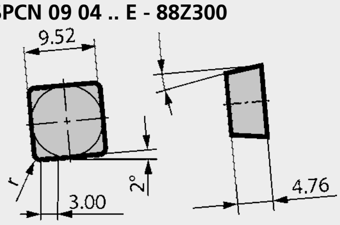
Chamfer size

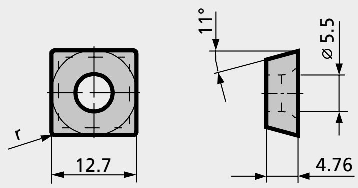
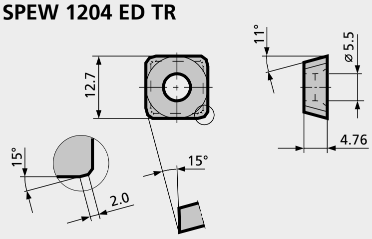
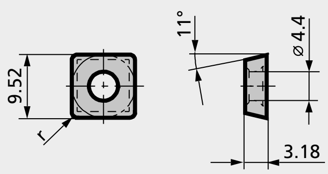
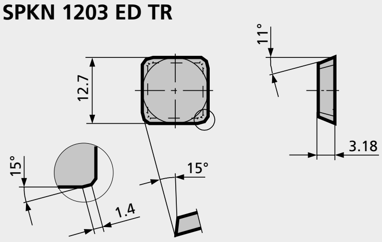
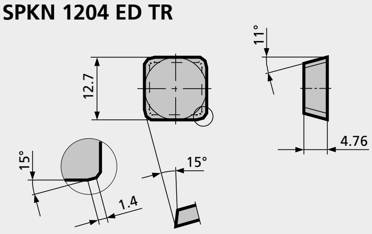


Chamfer width w_γ in 1/100 mm and angle γ_s without degree symbol

e.g.
0.10 x 20° = 01020
0.05 x 20° = 00520

INSERT	TYPE	GRADE	SPK REF. NO.
SCHX 09 04 .. T 	SCHX 090408 T113	TS 5115	50.19.001.99
SDCN 120408 E - 20 	SDCN 120408 E - 20	SC 7015	46.15.104.41.9
SEKN 1203 AF TN 	SEKN 1203 AF TN	SC 60	46.15.035.40.6
		SC 7015	46.15.035.40.9
SEKN 1204 AF TN 	SEKN 1204 AF TN	SC 60	46.15.068.01.6
		SC 7015	46.15.068.01.9
SNCN 1204 ZN F - 89Z240 	SNCN 1204 ZN F - 89Z240	SC 7015	46. 10.042.01.9

INSERT	TYPE	GRADE	SPK REF. NO.
SNGN 1204 .. T 	SNGN 120412 T	SC 60	46.10.001.40.6
		SC 7015	46.10.001.40.9
SNGN 1204 12 F - 89Z240 	SNGN 120412 F - 89Z240	SC 60	46.10.037.01.6
		SC 7015	46.10.037.01.9
SNGX 1204 .. T124 	SNGX 120412 T124	SC 7015	46.10.016.99.9
SPCN 09 04 .. E 	SPCN 090408 E	TS 5115	50.19.000.40.8
SPCN 09 04 .. E - 88Z300 	SPCN 090408 E - 88Z300	TS 5115	50.19.002.40.8

INSERT	TYPE	GRADE	SPK REF. NO.
SPEW 1204 .. T 	SPEW 120408 T	SC 60	46.15.037.40.6
		SC 7015	46.15.037.40.9
SPEW 1204 ED TR 	SPEW 1204 ED TR	SC 60	46.15.040.40.6
		SC 7015	46.15.040.40.9
SPGB 0903 .. T 123 	SPGB 090308 T123	SC 60	46.17.013.40.6
		SC 7015	46.17.013.40.9
SPKN 1203 ED TR 	SPKN 1203 ED TR	SC 60	46.15.010.40.6
		SC 7015	46.15.010.40.9
SPKN 1204 ED TR 	SPKN 1204 ED TR	SC 60	46.15.065.40.6
		SC 7015	46.15.065.40.9

CAST IRON WITH LAMELLAR GRAPHIT (FLAKE)

Operational guidelines for roughing, ap ≤ 4.0 mm, surface qualities Ra = 6.3 - 12.5 µm

GJL (GG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Hardness (HB)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
190-210	800	600-2000	0.18	0.12-0.30	0.12-0.20	0.12-0.22	SL 500
	1000	800-2000	0.20	0.14-0.30	0.14-0.20	0.14-0.25	SL 808
	1500	800-2000	0.20	0.10-0.22	0.10-0.18	0.10-0.20	WBN 101
	1500	800-2000	0.18	0.10-0.25	0.10-0.18	0.10-0.22	WBN 115
220-240	800	500-1300	0.18	0.12-0.30	0.12-0.20	0.12-0.22	SL 500
	1000	500-1500	0.20	0.14-0.30	0.14-0.20	0.14-0.25	SL 808
	1200	500-1500	0.20	0.10-0.22	0.10-0.18	0.10-0.20	WBN 101
	1200	500-1500	0.18	0.10-0.25	0.10-0.18	0.10-0.22	WBN 115
250-280	700	400-1200	0.18	0.12-0.30	0.12-0.20	0.12-0.22	SL 500
	800	300-1200	0.20	0.14-0.30	0.14-0.20	0.14-0.25	SL 808
	900	300-1200	0.20	0.10-0.22	0.10-0.18	0.10-0.20	WBN 101
	900	300-1200	0.18	0.10-0.25	0.10-0.18	0.10-0.22	WBN 115

Operational guidelines for finishing, ap = 0.5 - 1.0 mm, surface qualities Ra = 3.2 µm

GJL (GG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Hardness (HB)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
190-210	700	200-900	0.10	0.08-0.20	0.08-0.15	0.08-0.15	SH 2
	1300	800-1500	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 850C
	1300	800-1500	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 854C
	1500	800-2000	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C
	1500	800-2000	0.14	0.10-0.20	0.10-0.15	0.08-0.15	WBN 101
	1500	800-2000	0.14	0.10-0.20	0.10-0.15	0.10-0.20	WBN 115
220-240	500	200-700	0.10	0.08-0.20	0.08-0.15	0.08-0.15	SH 2
	900	500-1300	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 850C
	900	500-1300	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 854C
	1000	500-1500	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C
	1200	500-1500	0.14	0.10-0.20	0.10-0.15	0.08-0.15	WBN 101
	1200	500-1500	0.14	0.10-0.20	0.10-0.15	0.10-0.20	WBN 115
250-280	400	200-500	0.10	0.08-0.20	0.08-0.15	0.08-0.15	SH 2
	800	300-1000	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 850C
	800	300-1000	0.12	0.12-0.20	0.12-0.18	0.12-0.20	SL 854C
	800	300-1200	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C

Operational guidelines for fine finishing, ap = 0.1 - 0.5 mm, surface qualities Ra = 0.5 µm

GJL (GG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Hardness (HB)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
190-210	1200	800-2000	0.12	0.10-0.20	0.10-0.15	0.08-0.15	WBN 101
	1200	800-2000	0.12	0.10-0.20	0.10-0.15	0.08-0.15	WBN 115
220-240	1000	500-1500	0.12	0.10-0.20	0.10-0.15	0.08-0.15	WBN 101
	1000	500-1500	0.12	0.10-0.20	0.10-0.15	0.08-0.15	WBN 115

CAST IRON WITH SPHEROIDAL GRAPHITE (E.G. DUCTILE IRON)

Operational guidelines for roughing, ap ≤ 5.0 mm, surface qualities Ra = 6.3 - 12.5 µm

GJS (GGG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
400-500	800	600-1000	0.18	0.15-0.30	0.12-0.20	0.14-0.21	SL 808
500-700	700	500-800	0.18	0.15-0.30	0.12-0.20	0.14-0.21	SL 808

Operational guidelines for rough finishing, ap ≤ 0.5 - 1.0 mm, surface qualities Ra = 6.3 µm

GJS (GGG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
400-500	800	600-1000	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 850C
	800	600-1000	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 854C
	800	600-100	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 858C
500-700	700	500-800	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 850C
	700	500-800	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 854C
	700	500-800	0.16	0.15-0.30	0.12-0.25	0.12-0.20	SL 858C

Operational guidelines for finish milling, ap ≤ 0.5 - 1.0 mm, surface qualities Ra = 3.2 µm

GJS (GGG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
400-500	500	350-600	0.12	0.10-0.20	0.10-0.15	0.08-0.15	SC 7015
500-700	400	250-500	0.12	0.10-0.20	0.10-0.15	0.08-0.15	SC 7015

Operational guidelines for finish milling, ap ≤ 1.0 mm, surface qualities Ra = 0.8 - 1.6 µm

GJS (GGG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
400-500	500	350-600	0.12	0.10-0.20	0.10-0.15	0.08-0.15	SC 60
500-700	400	250-500	0.12	0.10-0.20	0.10-0.20	0.08-0.15	SC 60

Operational guidelines for fine milling, ap ≤ 0.1 - 0.5 mm, surface qualities Ra = 0.8 µm

GJS (GGG)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
400-500	500	350-600	0.10	0.08-0.20	0.08-0.15	0.08-0.15	SC 60
500-700	400	250-500	0.10	0.08-0.20	0.08-0.15	0.08-0.15	SC 60

CAST IRON WITH VERMICULAR GRAPHITE

Operational guidelines for roughing, ap ≤ 5,0 mm, surface qualities Ra = 6.3 - 12.5 µm

GJV (GGV)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
300	800	500-1000	0.20	0.15-0.22	0.12-0.22	0.12-0.22	SL 850C
	800	500-1000	0.18	0.12-0.22	0.12-0.22	0.12-0.22	SL 854C
	800	500-1000	0.2	0.12-0.22	0.12-0.22	0.12-0.22	SL 858C
350-400	600	400-800	0.18	0.12-0.20	0.12-0.20	0.12-0.20	SL 850C
	600	400-800	0.16	0.12-0.20	0.12-0.20	0.12-0.18	SL 854C
	600	400-800	0.18	0.12-0.20	0.12-0.20	0.12-0.20	SL 858C
450-500	400	200-600	0.16	0.12-0.16	0.12-0.20	0.12-0.20	SL 850C
	400	200-600	0.14	0.12-0.16	0.10-0.20	0.12-0.18	SL 854C
	400	200-600	0.16	0.12-0.16	0.12-0.20	0.12-0.20	SL 858C

HIGH SILICON CAST IRON WITH SPHEROIDAL GRAPHITE

Operational guidelines for roughing, ap ≤ 5. mm, surface qualities Ra = 6.3 - 12.5 µm

GJS (highly siliceous)	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
Tensile strength RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
450	1500	800-1100	0.18	0.10-0.22	0.10-0.22	0.12-0.22	SL 850C
	1500	800-2000	0.16	0.10-0.20	0.10-0.16	0.12-0.22	SL 854C
	1500	800-2000	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C
500	1500	800-1000	0.16	0.10-0.20	0.10-0.20	0.12-0.22	SL 850C
	1500	800-2000	0.16	0.10-0.20	0.10-0.16	0.12-0.22	SL 854C
	1500	800-2000	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C
600	1200	800-900	0.16	0.10-0.20	0.10-0.20	0.12-0.22	SL 850C
	1200	800-2000	0.16	0.10-0.20	0.10-0.16	0.12-0.22	SL 854C
	1200	800-2000	0.16	0.10-0.20	0.10-0.15	0.12-0.22	SL 858C

CHILLED CAST IRON

Operational guidelines for finish milling, ap = 0.1 - 0.5 mm, surface qualities Ra = 1.6 - 3.2 µm

GJN (Hartguss)	recommended value v_c	total range v_c	recommended value f_z	total range f_z	Cutting material
cast HRC	m/min	m/min	mm/z		
35-40	300	100-450	0.10	0.05-0.15	SH 2
40-45	300	100-450	0.10	0.05-0.15	SH 2
45-50	250	80-400	0.10	0.05-0.15	SH 2
hardened HRC					
55-63	250	80-400	0.10	0.05-0.15	SH 2
58-64	200	80-350	0.10	0.05-0.15	SH 2
60-65	180	80-300	0.10	0.05-0.15	SH 2

Operational guidelines for fine milling, ap = 0.1 - 0.5 mm, surface qualities Ra = 0.8 - 3.2 µm

Hardened cast iron	recommended value v_c	total range v_c	recommended value f_z	total range f_z	Cutting material
Härte (Shore C)	m/min	m/min	mm/z		
68	250	80-400	0.10	0.05-0.15	WBN 115
73	250	80-400	0.10	0.05-0.15	WBN 115
80	220	80-300	0.10	0.05-0.15	WBN 115
87	200	80-300	0.10	0.05-0.15	WBN 115
93	180	80-250	0.10	0.05-0.15	WBN 115

STRUCTURAL AND CONSTRUCTIONAL STEELS

Operational guidelines for roughing and rough finishing, ap ≤ 5.0 mm, surface qualities Ra = 6.3 - 12.5 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
300-600	350	250-450	0.20	0.15-0.30	0.10-0.25	0.08-0.20	SC 60
600-800	300	200-350	0.20	0.15-0.30	0.10-0.25	0.08-0.20	SC 60

Operational guidelines for finish milling, ap = 0.5 - 1.0 mm, surface qualities Ra = 3.2 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
	400	250-400	0.12	0.10-0.20	0.10-0.15	0.08-0.15	SC 7015
	300	200-350	0.12	0.10-0.20	0.10-0.15	0.08-0.15	SC 7015

Operational guidelines for fine milling, ap = 0.1 - 0.5 mm, surface qualities Ra = 0.8 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
300-500	400	250-450	0.10	0.08-0.15	0.05-0.12	0.05-0.12	SC 7015
550-700	300	200-350	0.10	0.08-0.15	0.05-0.12	0.05-0.12	SC 7015

CASE-HARDENED AND TEMPERED STEEL

Operational guidelines for roughing and rough finishing, ap ≤ 5.0 mm, surface qualities Ra = 6.3 - 12.5 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
600-900	250	100-350	0.20	0.15-0.30	0.10-0.25	0.08-0.20	SC 60
900-1300	200	100-250	0.20	0.15-0.30	0.10-0.25	0.08-0.20	SC 60

Operational guidelines for fine milling, ap = 0.5 - 1.0 mm, surface qualities Ra = 3.2 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
600-900	350	250-400	0.12	0.10-0.20	0.10-0.15	0.05-0.12	SC 7015
900-1300	250	200-350	0.12	0.10-0.20	0.10-0.15	0.05-0.12	SC 7015

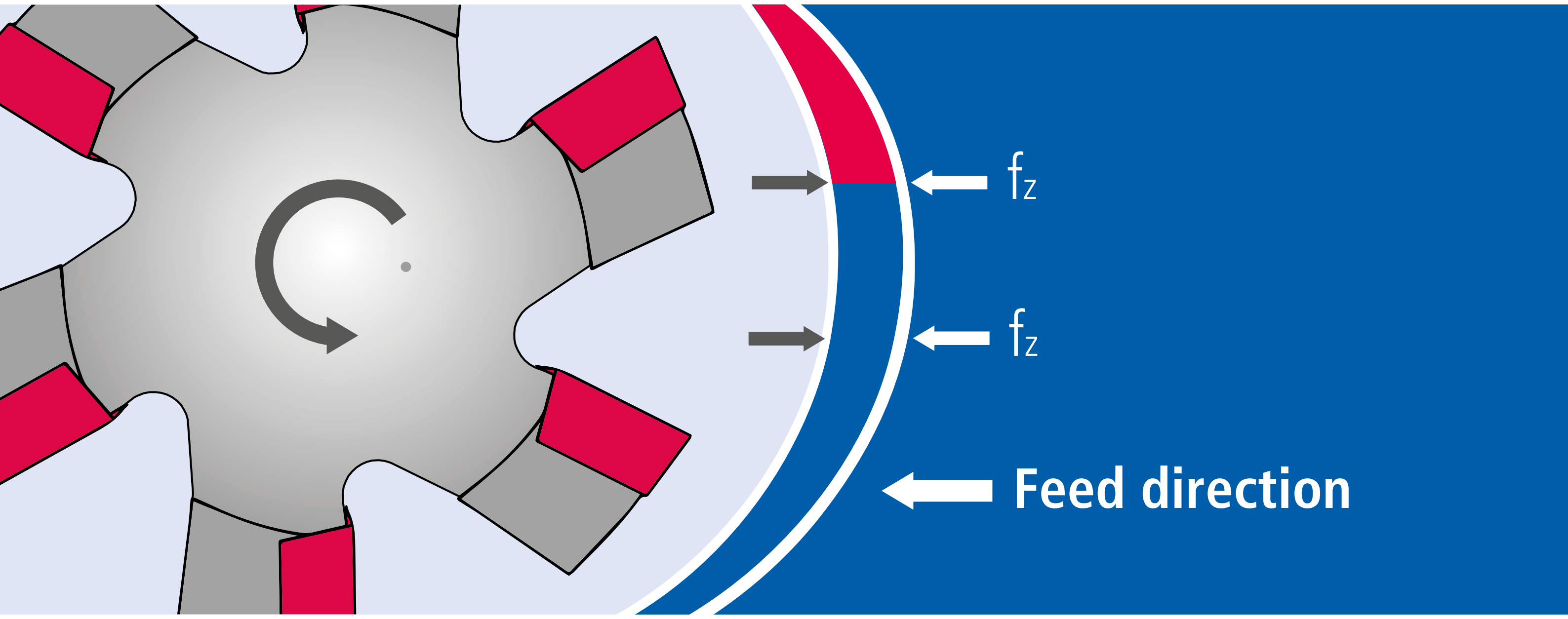
Operational guidelines for fine milling, ap = 0.10 - 0.0 mm, surface qualities Ra = 0.8 µm

Tensile strength	recommended value v_c	total range v_c	recommended value f_z	total range f_z			Cutting material
RM (N/mm²)	m/min	m/min	mm/z	43°/45°	75°	88°/90°	
600-900	250	250-400	0.10	0.08-0.15	0.05-0.12	0.05-0.12	SC 7015
900-1300	250	200-350	0.10	0.08-0.15	0.05-0.12	0.05-0.12	SC 7015

HARDENED STEEL

Operational guidelines for fine milling, ap = 0.10 - 1.0 mm, surface qualities Ra = 0.8 - 3.2 µm

Hardness	recommended value v_c	total range v_c	recommended value f_z	total range f_z	Cutting material
HRC	m/min	m/min	mm/z		
48	120	100-150	0.12	0.05-0.20	WXM 845
52	120	100-150	0.12	0.05-0.20	WXM 845
56	100	80-130	0.10	0.05-0.20	WXM 845
60	90	80-130	0.10	0.05-0.20	WXM 845
64	90	80-130	0.10	0.05-0.20	WXM 845



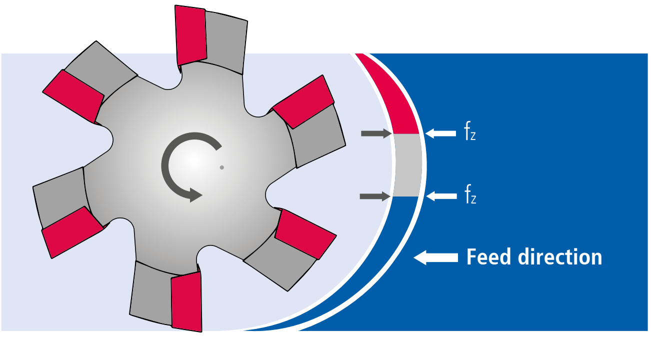
f_z
f_z
Feed direction

BASICS FOR MILLING

In order to go deeper into the topic of milling, it is useful to understand the cutting path that occurs during milling. This allows many problems to be clarified quickly and easily. It is well known that the tool rotates during milling. The rotation of the milling cutter causes the cutting edge to trace a circular path.

The workpiece itself follows a longitudinal path (feeding movement), which for face milling is perpendicular to the axis of rotation of the milling cutter. This causes overlapping movement to occur at the cutting point (cycloidal movement). The following figure shows the chip cross section that results during milling due to this overlapping movement.

CLIMB/CONVENTIONAL MILLING



Cross section of the material removed by one tooth

As can be seen by the three colours of the chip, chip formation can be divided into three areas:

Blue area: Area of the entry cut. The chip is initially very thin and because a lot of friction arises initially, there is a risk here that chip welding can occur and transfer heat to the insert and the workpiece. A hardening of the material can occur in this entry zone. This hardening lessens as the chip cross section increases.

Grey area: In this area, the chip cross section corresponds to the feed rate per tooth (fz). The forces primarily work in the direction opposite the feed direction.

Red area: In the exit area, the chip cross section decreases quickly and any heat transfer is minimised. However, the cutting forces are perpendicular to the feed direction.

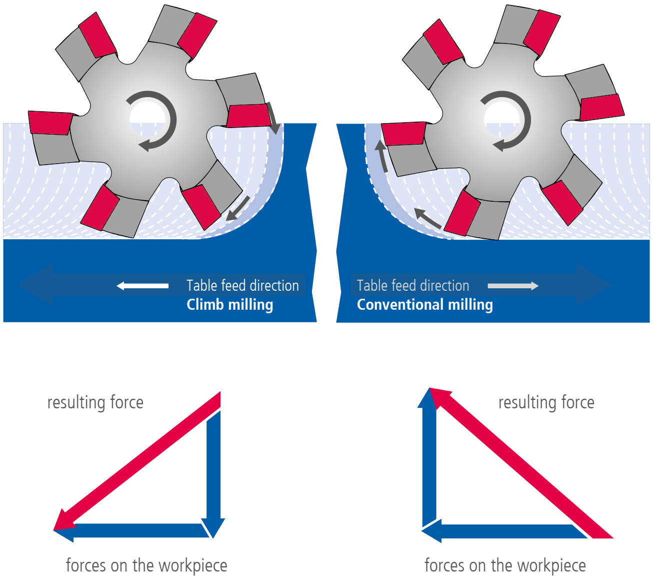
The chip formation has been described here for conventional milling.

A favourable alternative to conventional milling is climb milling. The chip cross section that forms during this method is the same as for conventional milling. However, the red area is now the entry zone and the blue area is the exit zone.

Red area: The impact strain on the insert and the workpiece material is high here. If the size and position of the milling cutter are optimal, the insert meets the workpiece with full width, fz, and full depth, ap, upon impact.

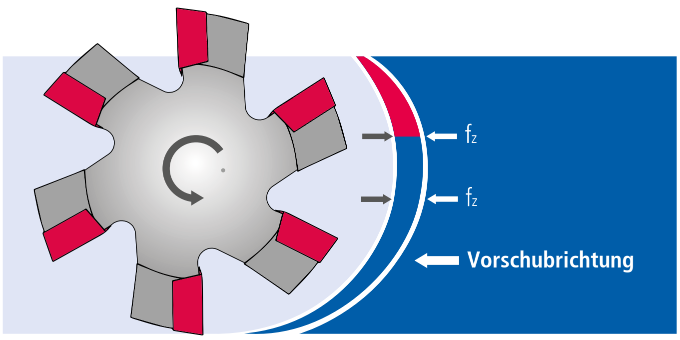
Blue area: The chip cross section shrinks as the insert is leaving the material. Heat transfer to the insert and the workpiece are minimised, as is hardening of the workpiece material.

During climb milling, the forces act more in the feed direction and press the workpiece into the clamping device, with conventional milling the forces act more to pull the part from the clamping device.



SIZE AND POSITION OF THE MILLING CUTTER

The blue area in the following figure shows the part of the chip cross section that should be aimed for in an optimal milling situation. This shows that the entry and exit points are important factors during milling.



Cross section of the material removed by one tooth

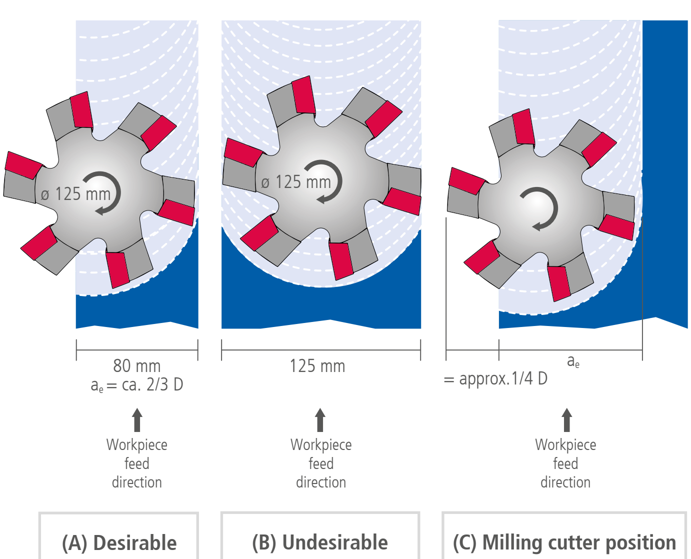
It is therefore important to approach the desired blue area as closely as possible. The variables to adjust here are the milling cutter position and the milling cutter diameter. The optimal diameter for the milling cutter during face milling depends on the width of material to be milled. 2 basic cases can be distinguished:

Case 1:
Narrow milling paths that can be machined with a single cut. In this case, the rule of thumb is that the milling cutter should be 1.5 times larger than the width of the milling path. For example, if the width of the milling path is 80 mm, the diameter of the milling cutter should be about 120 mm (A).

Case 2:
Wide milling paths that require multiple cuts to machine. In this case (B), the milling machine, the clamping set-up and the stability of the component must first be taken into account.

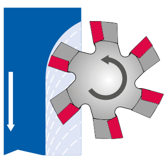
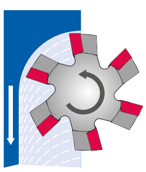
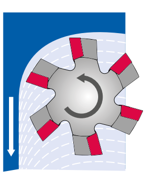
a) Machine rigidity, spindle power and the holder for the milling cutter: You must select a milling cutter width that corresponds to the spindle power and the rigidity of the holder.
b) Clamping set-up: Note the primary direction of the machining forces.
c) Thin-walled and unstable components: Note the stability of the component.

As a rule, approximately 2/3 of the milling cutter should be engaged in this case. For example, if a milling cutter has a diameter of 250 mm, you can calculate a desired contact width of 166 mm. The width of the milling path can also be increased (overlapping milling paths) depending on the machine situation. However, as a rule of thumb, overlaps of more than 80% are not recommended. If the correct milling cutter diameter is not available, approximately 25% of the milling cutter should not be engaged (C). The number of milling paths must then be selected accordingly.



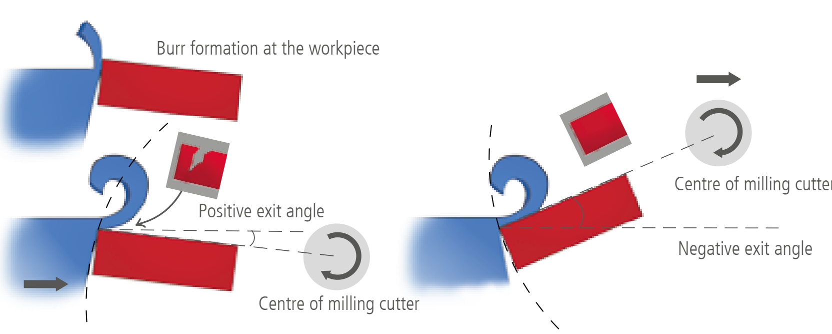
The position of the milling cutter should always be slightly off centre, since the cutting length per insert is shortest here. As shown, in (C) the entry and exit points of the cut lead to good chip formation and moderate impact strain in this case. If the cutter is positioned centrally, the radial forces at the entry and exit points will be equal. Since the entry and exit cuts do not occur simultaneously, this can lead to vibrations. As a result the spindle of the milling machine can be damaged, the wear on the insert increases and the surface quality worsens (B).

The images on page 107 indicate that favourable or unfavourable balances of forces at the entry and exit points can result from the chosen amount of overlap. 3 cases are used to demonstrate the major influencing factors.

Position of the milling cutter centre	Impact strain	Chip thickness	Strain on insert
	Moderate	Moderate	Very high. The impact strain is absorbed by the tip, the weakest point of the insert upon entry and exit.
	Very high	Corresponds to f_z	The strain on the insert is the highest, but strain is exerted on the rake face of the insert in proportion to the chip thickness h. This reduces the strain on the fragile tip, since during entry and exit the rake face is subjected to strain over a length given by fz, starting from the tip down.
	Moderate	Moderate	Soft entry cut strain is exerted further back on the insert. The problem here is that burrs can form on the edge of the workpiece and that the insert is subjected to higher strain upon exiting the workpiece.

EXIT ANGLE

The angle at which the insert exits the workpiece influences the amount of burr formation. In case of a positive exit angle, the remaining material may bend. As the insert continues its path, this remaining material is dragged along the end face of the cutting edge (and may be stretched). A part of the deformed material then remains on the edge of the workpiece as a burr. In this process, additional tensile forces are exerted on the end face of the cutting edge, which causes additional strain. The insert should exit the workpiece with a negative angle relative to the cutting edge. This leaves more material remaining at the workpiece edge, which can be more easily removed.



PITCH OF THE MILLING CUTTER

	Coarse pitch	Normal pitch	Fine pitch
Cutting forces	Low	Moderate	High
Machine power	Low	Moderate	High
Feed rate per tooth	High	Moderate	Low
Table feed rate	Moderate	Moderate	High
Milling forces	High	Moderate	Low
Number of interruptions in cutting along the milling path	Few	Moderate	Many

Coarse pitches are suitable for general milling tasks with relatively low machine power.

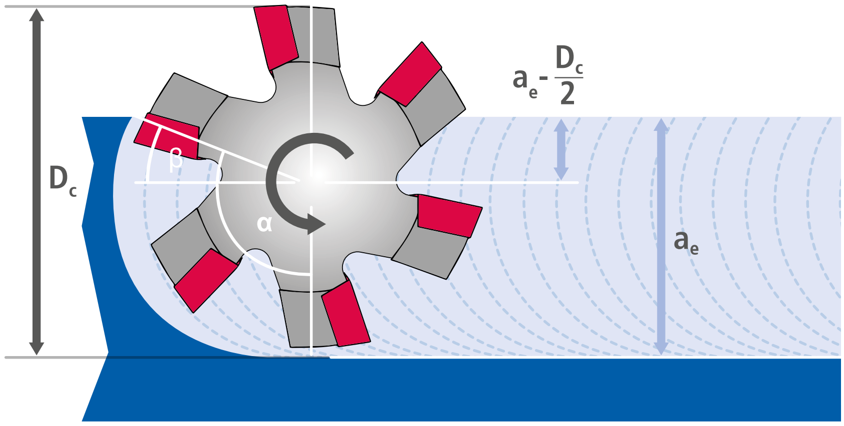
Normal pitch – The impact forces during the entry cut are reduced because more inserts are in contact with the workpiece. However, the necessary spindle power increases because the radial machining forces increase.

Fine pitch is especially suited for applications with many interruptions in cutting along the milling path, high table-feed rates, moderate cutting depths and sufficient spindle power.

NUMBER OF INSERTS ENGAGED

The number of inserts that are simultaneously in contact with the workpiece is determined by the number of inserts on the milling cutter and the overlap angle α. The angle α depends on the overlap distance a_e and the effective diameter of the milling cutter D_c.

This can be calculated by the formula: $Z_c = Z \times \alpha°/360°$
It follows that the same effects described above also apply for milling cutters with fine, normal and coarse pitches.

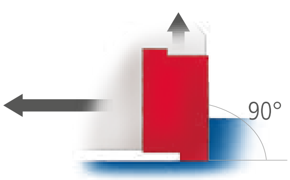


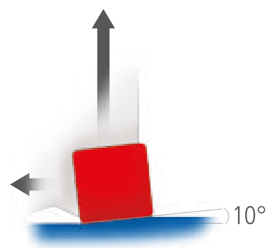
α = engagement angle
β = angle between centre line of milling cutter and milling cutter radius at the peripheral point of the exit or entry cut
a_e = width of cut
D_c = effective diameter of milling cutter

Diagram for calculating the number of inserts involved in a cut

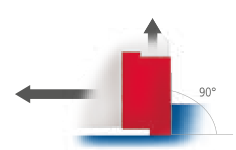
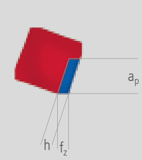
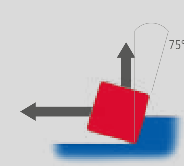
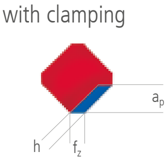
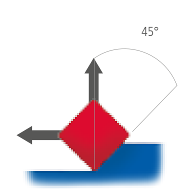
APPROACH ANGLE, CUTTING FORCES AND CHIP THICKNESS

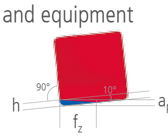
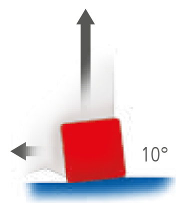
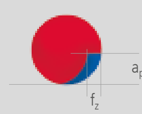
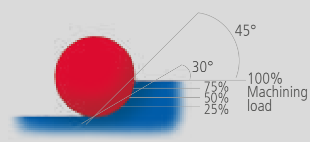
The distribution of forces in the axial and radial directions depends on the approach angle of the insert. The approach angle of the insert also defines the chip thickness h. Inversely, the chip thickness (h) is determined by the approach angle of the insert and the parameters with which the insert contacts the workpiece surface. The chip thickness decreases as the approach angle decreases. A smaller approach angle means that a greater length of the cutting edge is in contact with the workpiece. As the angle at which the insert meets the workpiece decreases, the radial forces acting opposite the feed direction decrease proportionately (left figure below); accordingly, the axial forces acting in the direction of the spindle increase proportionately (right figure below).





Relationship between approach angle and distribution of forces:

Approach angle	Advantages	Effects	Distribution of forces
90°	· For 90° shoulders · Suitable for thin-walled components, since the force mainly acts opposite the feed direction	· Highest radial machining forces · Cutting tip subjected to very high cutting forces during the entry cut · Probable burr formation and breakout during exit cut	
75°	· For rough machining · Reduced strain on cutting tip during the entry cut · Better balance of radial and axial forces · Optimal ratio of cutting depth to insert size	· High radial machining forces · Cutting tip subjected to high cutting forces during the entry cut · Probable burr formation during exit cut 	
45°	· Balanced distribution between axial and radial cutting forces · Minimised impact strain on cutting tip during the entry cut · Suitable for brittle materials · Breakage/burr formation can be avoided · High table feed rates possible	· Greater headspace needed at entry and exit cut points – collision with clamping device possible · Limited cutting depths 	

Approach angle	Advantages	Effects	Distribution of forces
10°	· For the highest table feed rates · Suitable for plunge milling · Axial cutting forces predominate · Minimal tendency toward vibration	· High axial strain on the spindle bearings · Stable components and equipment required 	
Round inserts	· Suitable for many applications and materials · Formation of thin chips allows for high feed rates · Magnitude of cutting force depends on depth of engagement · Burrs formed	· Moderate strain on spindle 	

CHIP THICKNESS H AS A FUNCTION OF APPROACH ANGLE

Approach angle	Chip thickness h
90°	$h = f_z$
75°	$h = 0.96 \text{ x } f_z$
45°	$h = 0.707\text{x } f_z$
10°	$h = 0.17 \text{ x } f_z$
Round inserts	$= (iC^2 \text{ x } (iC-2a_p)^2 \text{ x } f_z)^{-\square}$

The correction factors for calculating the chip thickness h apply for the case where the milling cutter is centred.

The correction factor clearly shows that the chip thickness h decreases as the approach angle decreases. A smaller chip thickness h means that higher feed advance speeds can be employed and that productivity can be increased.

In general the chip thickness h can be calculated: $h = \sin K_r \text{ x } f_z$

CALCULATION OF THE MACHINE POWER

In order to determine the necessary spindle power, you must first calculate the machining volume (Q). The machining volume is also a measure of the efficiency of the machining process. The unit of measurement is mm3/min. The higher the machining volume, the faster the workpiece can be machined.

Machining volume Q
The machining volume can be calculated as follows, according to the approach angle: $Q = h \cdot v_f$ ($mm^2 \cdot mm/min$)
In general, the machining volume can also be calculated using the contact width a_e: $Q = a_p \cdot a_e \cdot v_f$ (mm^3/min)

Calculation of the drive power P_c
For a simplified calculation of the required spindle power, the machining volume Q can be used as an output variable:
$Q = a_p \cdot a_e \cdot v_f$ (mm^3/min)

The cutting performance P_c can then be calculated as: $P_c = \frac{Q}{K}$

The spindle power can be calculated with:
$P_c = \frac{a_p \cdot a_e \cdot v_f \cdot k_c}{60 \cdot 10^3}$ [W], Respectively: $P_c = \frac{a_p \cdot a_e \cdot v_f \cdot k_c}{60 \cdot 10^6}$ [kW]

The following table gives the K factor for different workpiece hardness for the GJL, GJS and malleable cast iron types.

GJL and GJS	k_c factor [N/mm²]
GJL 150	1.500
GJL 200	1.800
GJL 250	2.100
GJS 400	1.800
GJS 500	1.850
GJS 600	3.100
GJS 700	3.200
Approximated value h = 0.10 mm	

k_c follows from the formula $K = \frac{1}{k_c}$
That implies the required drive power Pm with an efficiency factor η (η = 0.75 - 0.90) η can be calculated with: $P_m = \frac{P_c}{\eta}$ [kW]

SURFACE QUALITY DURING MILLING

The surface quality that results when a workpiece is milled is a critical measure for assessing the quality of the manufacturing process. For milling with ceramics, PcBN and Cermets, surface qualities with roughness values (Ra) of less than 0.5 up to 12.5 can be achieved with high process reliability. In addition to roughness, waviness and flatness are also important values for surface quality.

The values that can be achieved depend on many factors:
Rigidity of the machine, spindle parameters, clamping set-up, machinability of the workpiece material, cutting speed and cutting depth, milling cutter design, design of cutting edge, wear characteristics/current wear of the insert

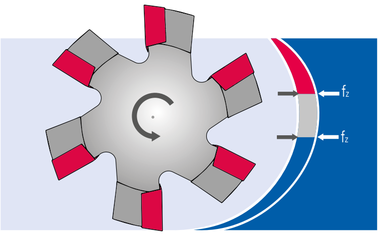
One of the most important ways to influence the surface quality is in the preparation of the cutting edge.
The following table shows the options.

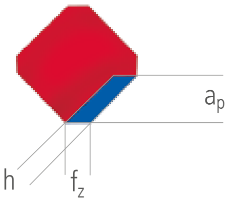
Design of the cutting edge		
	Small corner radius	· Pronounced feed marks · For rough surfaces
	Large corner radius	· Moderate feed marks · Produces rough surfaces
	With wiper edge	· Inserts with wiper-edge and wiper (ZZ) designs create minimal feed marks · Depending on the design of the cutting edge, surface qualities with Ra values less than 0.5 can be achieved
	Round inserts	· Round inserts create a uniform wave profile because of how these inserts contact the workpiece, surfaces with rough-finishing qualities can be achieved

The figures demonstrate how the various designs of milling cutters and inserts can affect the surface quality.
There are further options for improving the surface quality. One such option is increasing the cutting speed while reducing the feed rate. However, this can lead to problems with heat removal. The heat transfer into the workpiece is higher, and the thermal load on the insert also increases. The axial run-out of the milling head has a significant effect on the surface quality. A precise axial run-out produces significantly higher surface qualities.
Finely finished surfaces can be best achieved using inserts with a wiper design and milling cutters with insert seatings that can be adjusted in the Z-direction. The adjustable insert pocket seats are equipped with ZZ inserts and protrude in the Z-direction from 0.025 to 0.1 mm.

FORMULAS

FORMULAS FOR CALCULATING MILLING QUANTITIES	
Cutting speed (m/min):	$v_c = \frac{\pi \cdot D_c \cdot n}{1000}$
Spindle speed (rpm):	$n = \frac{v_c \cdot 1000}{\pi \cdot D_c}$
Feed advance speed (table feed rate) (mm/min):	$v_f = f_z \cdot n \cdot z_n$
Feed rate per tooth (mm/min):	$f_z = \frac{v_f}{n \cdot z_n}$
Feed rate per revolution (mm/rev):	$f_n = \frac{v_f}{n}$
Machining volume (cm^3):	$Q = \frac{a_p \cdot a_e \cdot v_f}{1000}$
Median chip thickness (mm) (peripheral and face milling) when $a_e / D_c > 0.1$:	$h_m = f_z \sqrt{\frac{a_e}{D_c}}$
Average chip thickness (mm) when $a_e / D_c \geq 0.1$:	$h_m = \frac{\sin K_f \cdot 180 \cdot a_e \cdot f_z}{\pi \cdot D_c \cdot \arcsin \frac{a_e}{D_c}}$
Machining time (min):	$T_c = \frac{l_m}{v_f}$
Drive power (kW):	$P_c = \frac{a_p \cdot a_e \cdot v_f \cdot k_c}{60 \cdot 10^6 \cdot \eta}$





FORMULAS FOR FACE MILLING WITH NEGATIVE AND POSITIVE INSERTS:	
Max. diameter for a given cutting depth (mm):	$D_c = D + \frac{2 \cdot a_p}{\tan \varphi}$
Centred milling, feed rate per tooth (mm/tooth):	$f_z = \frac{h}{\sin \varphi}$

FORMULAE FOR FACE MILLING WITH HIGH-FEED MILLING CUTTERS

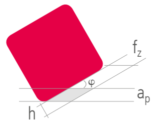
Calculation of tooth feed taking account of an h_m-value at a pressure angle < 90°

x° = degree of approach angle, f_z = tooth feed, h_m = centre chip thickness

f_z lt. according to program = 0.15 mm/Z (nominal), x°= 15°
$h_m = f_z \cdot \sin x°$ ($h_m = 0.15 \cdot 0.25882 = 0.0388$ mm)

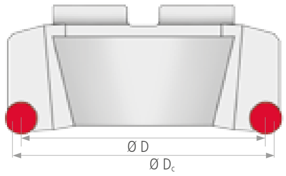
At an approach angle of 15°, a programmed tooth feed f_z of 0.15
only produces an actual chip thickness of just 0.04 mm!
Goal: Chip thickness $h_m = 0.15$

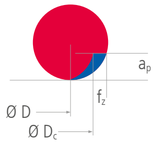
Necessary correction for f_z:
$f_z = h_m / \sin x°$ ($f_z = 0.15 / 0.25882 = 0.57955$ mm)
At an f_z of 0.588 mm = actual chip thickness of 0.15 mm



FACE MILLING WITH ROUND INSERTS

Max. diameter for a given cutting depth (mm):	$D_c = D + \sqrt{iC^2 - (iC - 2a_p)^2}$
Centred milling, feed rate per tooth (mm/tooth):	$f_z = \frac{iC \cdot h}{2 \cdot \sqrt{a_p \cdot iC - a_p^2}}$



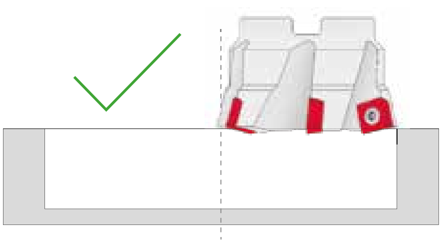


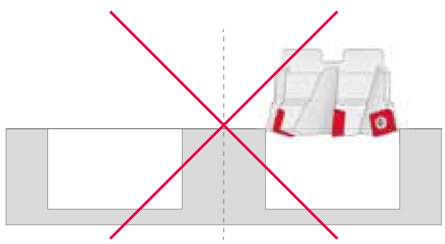
1. SELECT THE MILLING CUTTER DIAMETER DEPENDING ON THE BORE SIZE

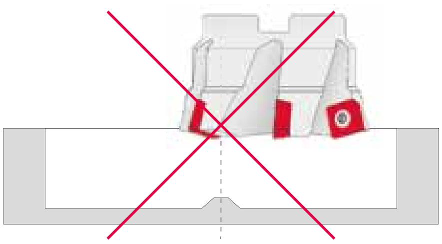
The correct ratio of cutting miller diameter and bore diameter is crucial for helical milling. It is important to ensure that the cutting insert cuttings along its central axis.

If the chosen milling cutter diameter is too small, a core remains in the centre.

If the chosen milling cutter diameter is too large, the centre remains unmachined and a cone shape emerges. This develops more and more and collides with the part and tool.

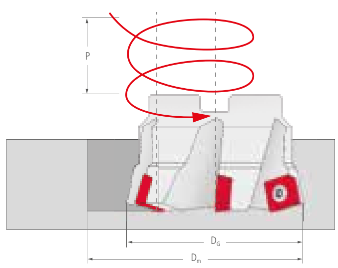






2. PITCH

The pitch (P) is dependent on the bore diameter, milling cutter diameter and entry angle. It cannot be greater than the maximum ap of the respective milling cutter.



3. FEED RATE

The feed rate is always dependent on the h_m value, which corresponds to the peripheral feed rate v_{fm}. Machines frequently need a tool centre feed v_f, which is to be calculated accordingly:

$$f_z = h_m$$

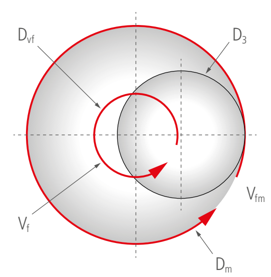
$$v_{fm} = n \cdot f_z \cdot z_c$$

$$v_f = \frac{D_{vf}}{D_m} \cdot v_{fm}$$

D_{vf} = programmed milling path (circular milling)
D_m = outside external diameter (milled)

Programmed feed rate:

v_{fm} = (with radius compensation)
Feed rate - tool periphery
v_f = (with radius compensation)
Feed rate - tool central axis



4. HELICAL MILLING IN SOLID MATERIAL / ENLARGING THE BORE

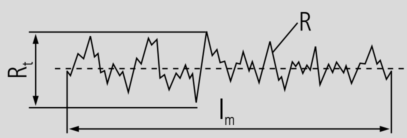
a) Helical milling in solid material

Milling cutter diameter (mm)	63	80	100
Bore diameter (mm)	113 - 126	147 - 160	187 - 200

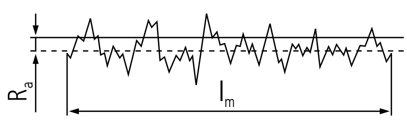
Note: Select the smaller milling cutter with a diameter of 63 mm for a bore diameter between two specified areas, such as 130 mm; two machining steps are then required.

b) Enlarging the bore (no face machining)
– Milling cutter diameter = ≤ 0.5 x bore diameter

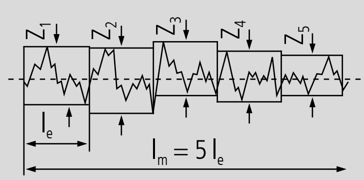
OVERVIEW: R_t, R_a, R_z, W AND W_t



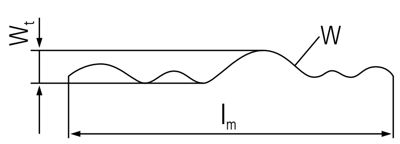
Maximum roughness depth R_t
Is the vertical distance between the highest and lowest point of the roughness profile R within the overall measuring path l_m.



Average roughness value R_a
Is the arithmetic average of the absolute values of all distances of the roughness profile R from the centre line within the overall measuring path l_m.



Average roughness depth R_z
Is the average of the individual roughness depths of ive successive individual measuring paths l_e.
$R_z = \quad (Z_1 + Z_2 + Z_3 + Z_4 + Z_5)$



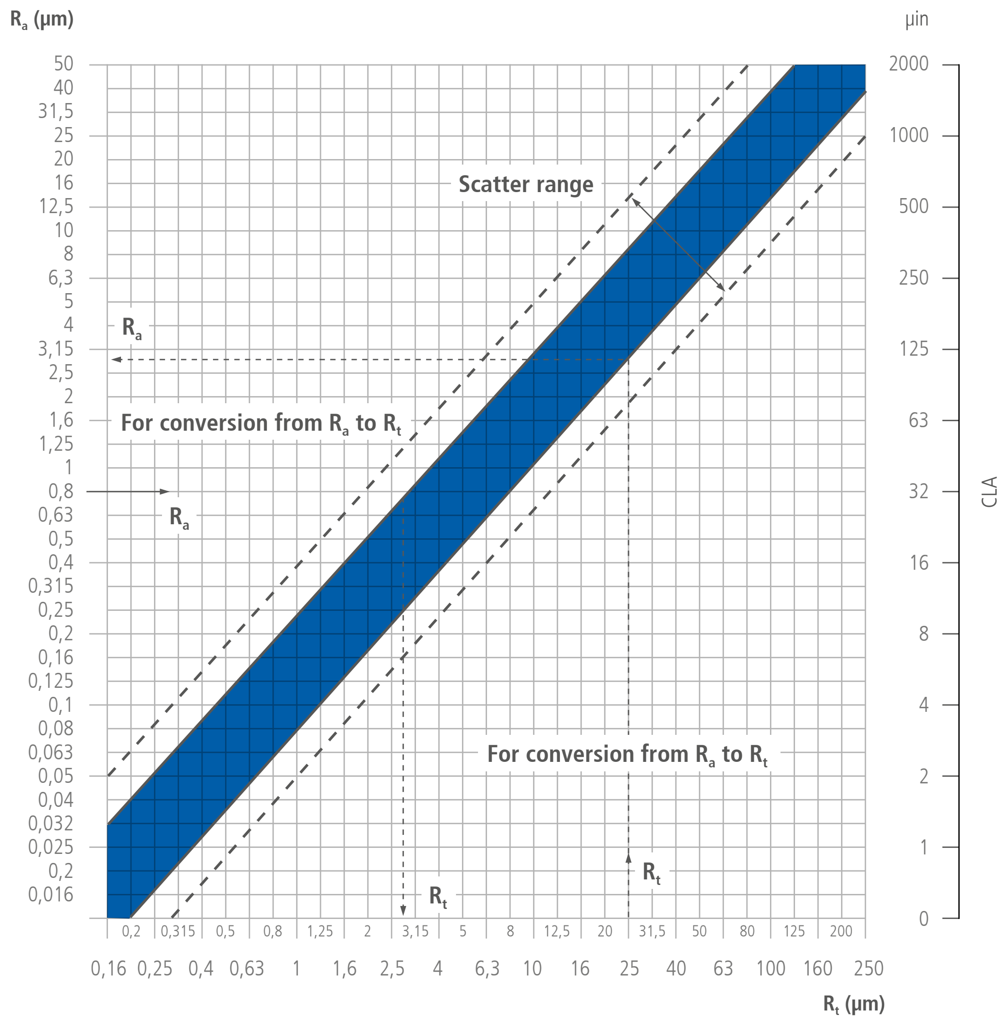
Wave profile W
Is the centre line through the traced profile P.
Maximum wave depth W_t is the vertical distance between the highest and lowest point of the wave profile W within the overall measuring path l_m.

Meaning according to DIN 3141	Assignment of the max. permissible roughness depth R_t to the average roughness value R_a					Meaning
		1	2	3	4	
	any					Surfaces on which no specific demands are placed.
	any					Surfaces on which demands for greater uniformity and a better appearance are placed.
	Rt	160	100	63	25	Surfaces with a roughness that must not exceed the upper limit of the average rough
	Ra	25	12.5	6.3	3.2	
	Rt	40	25	16	10	
	Ra	6,3	3.2	1.6	0.8	
	Rt	16	6.3	4	2.5	
	Ra	1.6	0.8	0.4	0.2	
	Rt		1	1	0.4	
	Ra		0.1	0.1	0.025	

a = average roughness value Ra in µm

Determining the surface roughness R_t at a specified average roughness value R_a or determining the average roughness value R_a at a specified surface roughness R_t taking into account the scatter range and reasonable certainty.

The dark shaded field delimited by the two straight lines within the scatter range (broad band) includes a minimum of 70% of the roughness value pair R_t and R_a from all the surfaces produced by machining. If the top line within the scatter range is used to determine the upper limit of the R_t-value at the specified R_a-value, it can be assumed with certainty that a minimum of 85% of all the applications of the specified R_a-value are not exceeded. The same applies for the R_t-value.



Comparative values: R_a - R_t

COMPARATIVE VALUES FOR R_a

R_a (µm)	CLA (µin)	RMS (µin)	R_t (µm)
0.02	0.8	0.9 - 1.0	0.1 - 0.3
0.04	1.6	1.8 - 1.9	0.2 - 0.5
0.06	2.4	2.8 - 2.9	0.3 - 0.7
0.08	3.2	3.5 - 3.8	0.4 - 0.8
0.10	4.0	4.4 - 4.8	0.5 - 1.0
0.12	4.8	5.3 - 5.8	0.6 - 1.2
0.14	5.6	6.2 - 6.7	0.7 - 1.6
0.16	6.4	7.0 - 7.7	0.7 - 1.6
0.18	7.2	7.9 - 8.6	0.8 - 1.7
0.20	8.0	8.8 - 9.6	0.9 - 1.9
0.25	10.0	11.0 - 12.0	1.1 - 2.3
0.30	12.0	13.2 - 14.4	1.3 - 2.7
0.35	14.0	15.4 - 16.8	1.5 - 3.0
0.40	16.0	17.6 - 19.2	1.7 - 3.4
0.45	18.0	19.8 - 21.6	1.9 - 3.8
0.65	26.0	28.6 - 31.2	2.7 - 5.2
0.9	36.0	39.6 - 43.2	3.7 - 7.0
1.1	44.0	48.4 - 52.8	4.5 - 8.2
1.3	52.0	57 - 62	5.2 - 9.5
1.5	60.0	66 - 72	6.0 - 10.5
1.8	72.0	79 - 86	7.1 - 12.5
2.5	100.0	110 - 120	9.6 - 16.5
3.5	140.0	154 - 168	13 - 22
4.5	180.0	198 - 216	17- 28
5.0	200.0	220 - 240	18 - 30
6.0	240.0	264 - 288	22 - 35
7.0	280.0	308 - 336	25 - 40
8.0	320.0	352 - 384	28 - 45
9.0	360.0	396 - 432	32 - 50
10.0	400.0	440 - 480	35 - 56
11.0	440.0	484 - 528	38 -60
13.0	520.0	572 - 624	45 - 70
15.0	600.0	660 - 720	51 - 78

COMPARATIVE VALUES FOR R_t

R_t (µm)	R_a (µm)	CLA (µin)	RMS (µin)
0.01	0.007 - 0.02	0.3 - 0.8	0.3 - 1.0
0.02	0.016 - 0.04	0.6 - 1.6	0.7 - 1.9
0.03	0.025 - 0.06	1.0 - 2.4	1.1 - 2.9
0.04	0.035 - 0.08	1.4 - 3.2	1.5 - 3.8
0.5	0.045 - 0.11	1.8 - 4.4	2.0 - 5.3
0.6	0.055 - 0.13	2.2 - 5.2	2.4 - 6.2
0.7	0.065 - 0.15	2.6 - 6.0	2.9 - 7.2
0.8	0.075 - 0.18	3.0 - 7.2	3.3 - 8.6
0.9	0.085 - 0.20	3.4 - 8.0	3.8 - 9.6
1.0	0.10 - 0.22	4.0 - 8.8	4.3 - 10.6
1.2	0.12 - 0.27	4.8 - 10.8	5.3 - 12.9
1.4	0.15 - 0.32	6.0 - 12.8	8.4 - 15.4
1.6	0.17 - 0.37	6.8 - 14.8	7.5 - 17.8
1.8	0.19 - 0.42	7.6 - 16.8	8.5 - 20.2
2.0	0.22 - 0.47	8.8 - 18.8	9.7 - 22.6
2.5	0.28 - 0.59	11.4 - 25.2	12.4 - 28.3
3.0	0.35 - 0.72	14.0 - 28.8	15.4 - 34.5
4.0	0.48 - 0.98	19.2 - 39.2	21.1 - 47.0
5.0	0.62 - 1.25	24.8 - 50.0	27.3 - 60.0
6.0	0.76 - 1.50	30.4 - 60.0	33.4 - 72.0
7.0	0.90 - 1.77	36.0 - 71.0	39.6 - 85.2
8.0	1.06 - 2.05	42.5 - 82.0	46.8 - 98.4
9.0	1.2 - 2.3	48.0 - 92.0	52,8 - 110
10.0	1.4 - 2.6	55 - 104	62 - 125
12.0	1.7 - 3.2	68 - 128	75 - 154
14.0	2.0 - 3.8	80 - 152	88 - 182
16.0	2.4 - 4.3	96 - 172	106 - 206
18.0	2.7 - 4.9	108 - 196	119 - 235
20.0	3.1 - 5.5	124 - 220	136 - 264
25.0	4.0 - 7.0	160 - 280	176 - 336
30.0	5.0 - 8.5	200 - 340	220 - 406
40.0	7.0 - 11.5	280 - 460	308 - 552
50.0	9.0 - 15.0	360 - 600	396 - 720

A more accurate computational comparison of R_t, R_a, CLA and RMS is not possible.
The values specified in the table are therefore comparative values that were determined empirically.

CONVERSION TABLES FROM METRIC TO IMPERIAL

DIAMETER	
mm	inches
8.0	.314
9.5	.375
10.0	.393
12.0	.472
12.7	.500
15.9	.625
16.0	.630
19.1	.750
20.0	.787
22.2	.875
25.0	.984
25.4	1.000
32.0	1.259
38.1	1.500
50.0	1.968
50.8	2.000
63.0	2.480
63.5	2.500

DIAMETER	
mm	inches
76.2	3.000
80.0	3.149
88.9	3.500
100.0	3.937
101.6	4.000
125.0	4.921
127.0	5.000
152.4	6.000
160.0	6.299
177.8	7.000
200.0	7.874
203.2	8.000
250.0	9.842
254.0	10.000
304.8	12.000
315.0	12.401
355.6	14.000
400.0	15.748

DEPTH OF CUT	
mm	inches
0.254	.010
0.381	.015
0.762	.030
1.270	.050
2.540	.100
3.175	.125
3.810	.150
6.350	.250
9.525	.375
12.700	.500

CUTTING SPEED	
m/min.	sfm
91	300
122	400
152	500
183	600
244	800
305	1000
366	1200
610	2000
1219	4000
3048	10000

FEED C.P.T.	
mm/T	Zoll/T
0.076	.003
0.12	.004
0.127	.005
0.152	.006
0.178	.007
0.203	.008
0.229	.009
0.254	.010
0.279	.011
0.305	.012

SURFACE QUALITY (RA)	
µm	µ Zoll
12.5	500
6.3	250
3.2	125
1.6	63
0.8	32
0.4	16

RELATION BETWEEN BRINELL HARDNESS AND ROCKWELL C

Rockwell-C hardness value (HRC)		Conversion Rockwell-C hardness (HRC) into Brinell hardness (HB)
from	to	
21	30	HB = 5.970 x HRC + 104.7
31	40	HB = 8.570 x HRC + 27.6
41	50	HB = 11.158 x HRC + 79.6
51	60	HB = 17.515 x HRC - 401

RELATION BETWEEN BRINELL HARDNESS AND ROCKWELL B

Rockwell-B hardness value (HRB)		Conversion Rockwell-B hardness (HRB) into Brinell hardness (HB)
from	to	
55	69	HB = 1.646 x HRB + 8.7
70	79	HB = 2.394 x HRB - 42.7
80	89	HB = 3.297 x HRB - 114
90	100	HB = 5.582 x HRB - 319

HARDNESS		
Brinell	Rockwell	
HB	HRB	HRC
654*	–	60
634*	–	59
615	–	58
595	–	57
577	–	56
560	–	55
543	–	54
525	–	53
512	–	52
496	–	51
481	–	50
469	–	49
455	–	48
443	–	47
432	–	46
421	–	45
409	–	44
400	–	43
390	–	42
381	–	41
371	–	40
362	–	39
353	–	38
344	–	37
336	109.0*	36

HARDNESS		
Brinell	Rockwell	
HB	HRB	HRC
327	108.5*	35
319	108.0*	34
311	107.5*	33
301	107.0*	32
294	106.0*	31
286	105.5*	30
279	104.5*	29
271	104.0*	28
264	103.0*	27
258	102.5*	26
253	101.5	25
247	101.0	24
243	100.0	23
237	99.0	22
231	98.5	21
228	98.0	20
222	97.0	18.6*
216	96.0	17.2*
210	95.0	15.7*
205	94.0	14.3*
200	93.0	13*
195	92.0	11.7*
190	91.0	10.4*
185	90.0	9.2*
180	89.0	8*

HARDNESS		
Brinell	Rockwell	
HB	HRB	HRC
176	88.0	6.9*
172	87.0	5.8*
169	86.0	4.7*
165	85.0	3.6*
162	84.0	2.5*
159	83.0	1.4*
156	82.0	0.3*
153	81.0	–
150	80.0	–
147	79.0	–
144	78.0	–
141	77.0	–
139	76.0	–
137	75.0	–
135	74.0	–
132	73.0	–
130	72.0	–
127	71.0	–
125	70.0	–
123	69.0	–

* The highlighted values are outside the standard range.

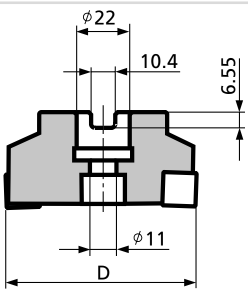
a_e	mm	Contact width
a_e/D		Contact ratio
a_p	mm	Depth of cut
b	mm	Chip width
b_γ	mm	Chamfer width
D	mm	Cutter diameter
D_c	mm	Effective diameter
D_m	mm	Outside diameter (workpiece)
D_{vf}	mm	Circular path diameter
F_c	N	Feed/tooth
f_z	mm	Vorschub/Zahn
h	mm	Chip thickness
h_m	mm	Average chip thickness
k_c	N/mm^2	Specific cutting force
$k_{c\,1.1}$	N/mm^2	Specific cutting force (based on the chip profile $b \cdot h = 1 \cdot 1mm^2$)
l	mm	Cutting edge length
l_c	m	Cutting path
l_e	mm	Individual measuring path
l_f	m	Milling path
l_{fz}	m	Milling path/tooth
l_m	mm	Overall measuring path
n	min-1	Speed
P_c	kW	Spindle power
P_{mot}	kW	Motor output
R	µm	Roughness profile
R_a	µm	Arithm. average roughness value
R_m	N/mm2	Tensile strength
R_t	µm	Maximum roughness depth
R_z	µm	Average roughness depth
r_ε	mm	Cutting edge radius
s	mm	Cutting insert thickness
T	min	Service life
VB	mm	Width of wear marks
v_C	m/min	Cutting speed

v_f	mm/min	Feed rate
v_{fm}	mm/min	Peripheral feed rate
z		Number of teet
Z_t	µm	Individual roughness depth
η		Efficiency of machine tool
α_n	Degree	Clearance angle
β_n	Degree	Wedge angle
γ_a	Degree	Axial rake angle
γ_n	Degree	Rake angle
γ_r	Degree	Radial rake angle
γ_s	Degree	Chamfer angle
χ_r	Degree	Approach angle
λ_s	Degree	Pitch angle
φ	Degree	Pressure angle
φ_A	Degree	Exit angle
φ_E	Degree	Entry angle

Country									
Europe	Germany	Great Britain		Sweden	USA	France	Italy	Spain	Japan
Standard									
DIN EN	W.-Nr.	BS	EN	SS	AISI/SAE/ASTM	AFNOR	UNI	UNE	JIS
Malleable cast iron									
-	-	8 290/6	-	0814	-	MN 32-8	-	-	FCMB310
EN-GJMB350-10	0.8135	B 340/12	-	0815	32510	MN 35-10	-	-	FCMW330
EN-GJMB450-6	0.8145	P 440/7	-	0852	40010	Mn 450	GMN 45	-	FCMW370
EN-GJMB550-4	0.8155	P 510/4	-	0854	50005	MP 50-5	GMN 55	-	FCMP490
		P 570/3		0858	70003	MP 60-3			FCMP540
EN-GJMB650	0.8165	P 570/3	-	0856	A220-70003	Mn 650-3	GMN 65	-	FCMP590
EN-GJMB700-2	0.8170	P 690/2	-	0862	A220-80002	Mn 700-2	GMN 70	-	FCMP690
Grey cast iron									
-	-	-	-	0100	-	-	-	-	-
EN-GJL-100	0.6010	-	-	0110	No 20 B	Ft 10 D	-	-	FC100
EN-GJL-150	0.6015	Grade 150	-	0115	No 25 B	Ft 15 D	G 15	FG 15	FC150
EN-GJL-200	0.6020	Grade 220	-	0120	No 30 B	Ft 20 D	G 20	-	FC200
EN-GJL-250	0.6025	Grade 260	-	0125	No 35 B	Ft 25 D	G 25	FG 25	FC250
EN-JLZ	0.6040	Grade 400	-	0140	No 55 B	Ft 40 D	-	-	-
EN-GJL-300	0.6030	Grade 300	-	0130	No 45 B	Ft 30 D	G 30	FG 30	FC300
EN-GJL-350	0.6035	Grade 350	-	0135	No 50 B	Ft 35 D	G 35	FG 35	FC350
GGL-NiCr20-2	0.6660	L-NiCuCr202	-	0523	A436 Type 2	L-NC 202	-	-	-
Spheroidal graphite cast iron									
EN-GJS-400-15	0.7040	SNG 420/12	-	0717-02	60-40-18	FCS 400-12	GS 370-17	FGE 38-17	FCD400
EN-GJS-400-18-LT	0.7043	SNG 370/17	-	0717-12	-	FGS 370-17	-	-	-
EN-GJS-350-22-LT	0.7033	-	-	0717-15	-	-	-	-	-
EN-GJS-800-7	0.7050	SNG 500/7	-	0727	80-55-06	FGS 500-7	GS 500	FGE 50-7	FCD500
EN-GJS-600-3	0.7060	SNG 600/3	-	0732-03	-	FGS 600-3	-	-	FCD600
EN-GJS-700-2	0.7070	SNG 700/2	-	0737-01	100-70-03	FGS 700-2	GS 700-2	FGS 70-2	FCD700
EN-GJSA-XNiCr20-2	0.7660	Grade S6	-	0776	A43D2	S-NC 202	-	-	-
Vermicular graphite cast iron									
EN-GJV-300									
EN-GJV-350									
EN-GJV-400									
EN-GJV-450									
EN-GJV-500									
Austenitic-bainitic cast iron									
EN-GJS-800-8	-	-	-	-	ASTM A897 No. 1	-	-	-	-
EN-GJS-1000-5	-	-	-	-	ASTM A897 No. 2	-	-	-	-
EN-GJS-1200-2	-	-	-	-	ASTM A897 No. 3	-	-	-	-
EN-GJS-1400-1	-	-	-	-	ASTM A897 No. 4	-	-	-	-
-	-	-	-	-	ASTM A897 No. 5	-	-	-	-

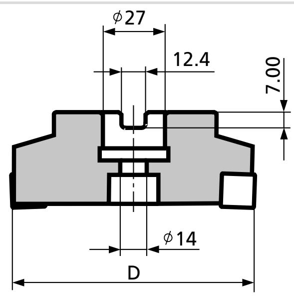
Mounting dimension table according to DIN 8030

Adapter style A



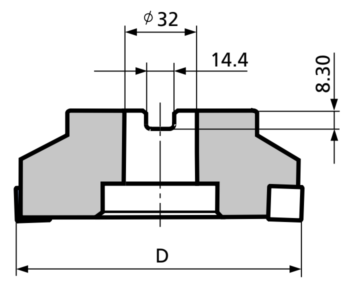
D = 50 mm - 63 mm

Adapter style A



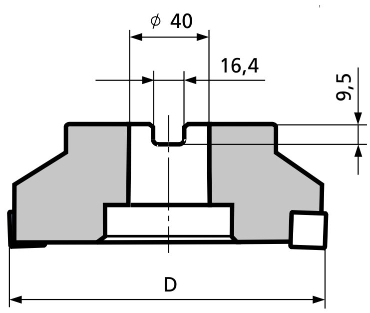
D = 80 mm

Adapter style B



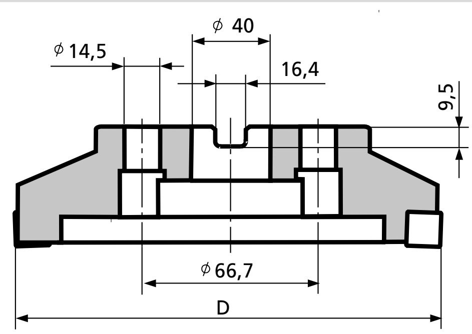
D = 100 mm

Adapter style B



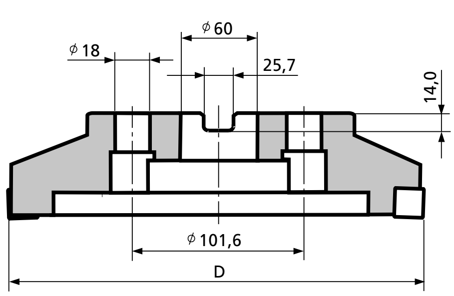
D = 125 mm

Adapter style C



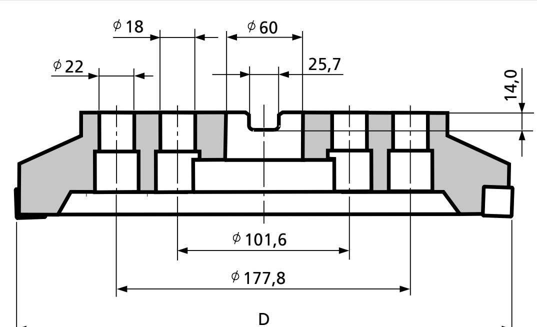
D = 160 mm

Adapter style C



D = 200 - 250 mm

Adapter style C



D = 315 mm

Problem	Cause	Action: Switch to a more resistant grade	Switch to a more tougher grade	Cutting speed Vc	Feed rate per tooth fz	Cutting depth ap	Check cutting width ae	Wiper ZZ	Clearance angle	Corner radius	Chamfer	Check workpiece clamping
Increasing flank wear *	Inappropriate cutting data			↓	↑							
	Inappropriate workpiece shape/insert	✓							↑			
Increasing crater wear	Inappropriate cutting data			↓	↓	↓						
	Inappropriate workpiece shape/insert	✓							↓			
Breakage on cutting edge	Inappropriate cutting data			↓	↓	↓						
	Inappropriate workpiece shape/insert		✓							↑	↑	
Poor surface quality	Inappropriate cutting data				↑			✓				✓
	Inappropriate workpiece shape/insert							✓				✓
Burr formation	Inappropriate cutting data				↓	↓	↓					
	Inappropriate workpiece shape/insert								↑	↓	↓	
Breakage of workpiece edge	Inappropriate cutting data				↓	↓	✓					
	Inappropriate workpiece shape/insert								↑		↓	
Poor planarity/ parallelism	Inappropriate cutting data				↓	↓	↓					✓
	Inappropriate workpiece shape/insert							✓		↓	↓	✓
Heavy chatter/ vibrations	Inappropriate cutting data			↓	↑		✓					✓
	Inappropriate workpiece shape/insert									↓		✓

* Use C2 geometry

Company name		Date
Contact person	E-mail	
Address		Phone
Town/city	ZIP	CeramTec contact

Application:

- ☐ Face milling
- ☐ Shoulder milling
- ☐ Slot milling
- ☐ Plunge milling in a Z-direction
- ☐ Contour milling
- ☐ Helical/circular

Material:

- ☐ Casting
- ☐ Solid material
- ☐ Material: ....
- ☐ Hardness: ....

Surface quality:

- ☐ Roughing
- ☐ Finishing

Required roughness, in ☐ R_a / ☐ R_z ....

Connections:

Clamping mandrel

- ☐ Plug-in milling cutter mounting
- ☐ Type A (cap screw)
- ☐ Type B (clamping screw)
- ☐ Type C (screw circle)

Shaft

- ☐ Cylinder shaft (smooth)
- ☐ Cylinder shaft (clamping surface) (Weldon)

Special connection:

Cutting inserts:

Cutting insert type: ....

Cutting insert size: ....

Cutting insert radius: ....

Milling cutter:

- ☐ Units of measure = ☐ Imperial ☐ Metric
- ☐ Milling cutter diameter D_c: ....
- ☐ Milling cutter height (total length) L: ....
- ☐ Approach angle K_r: ....
- ☐ Number of cutting inserts z: ....
- ☐ Tooth feed f_z: ....
- ☐ Axial depth of cut a_p: ....
- ☐ Contact width (wrapping) a_e: ....

- ☐ Cutting direction: ☐ Right ☐ Left
- ☐ Internal cooling through the tool
- ☐ Cutting insert spacing: ☐ narrow ☐ wide

Sketch:

Please order through your CeramTec contact person or by email at solutionteam@ceramtec.de

Enquiry form

Company name		Date
Contact person	E-mail	
Address		Phone
Town/city	ZIP	CeramTec contact

Application:

☐ Face milling
☐ Shoulder milling
☐ Slot milling
☐ Plunge milling in a Z-direction
☐ Contour milling
☐ Helical/circular

Material: ☐ Casting
☐ Solid material

☐ Material: ....
☐ Hardness: ....

Surface quality:

☐ Roughing
☐ Finishing

Required roughness, in ☐ R_a / ☐ R_z
....

Connections:

Clamping mandrel
☐ Plug-in milling cutter mounting
☐ Type A (cap screw)
☐ Type B (clamping screw)
☐ Type C (screw circle)

Shaft
☐ Cylinder shaft (smooth)
☐ Cylinder shaft (clamping surface) (Weldon)

Special connection:

Cutting inserts:

Cutting insert type: ....
Cutting insert size: ....
Cutting insert radius: ....

Milling cutter:

☐ Units of measure = ☐ Imperial ☐ Metric
☐ Milling cutter diameter D_c: ....
☐ Milling cutter height (total length) L: ....
☐ Approach angle K_r: ....
☐ Number of cutting inserts z: ....
☐ Tooth feed f_z: ....
☐ Axial depth of cut a_p: ....
☐ Contact width (wrapping) a_e: ....

☐ Cutting direction: ☐ Right ☐ Left
☐ Internal cooling through the tool
☐ Cutting insert spacing: ☐ narrow ☐ wide

Sketch:

Please order through your CeramTec contact person or by email at solution-team@ceramtec.de

Notes

We reserve the right to make changes to the product range as well as technical advances and modifications. We reserve the right to make errors as well as technical and product modifications. No liability is accepted for printing errors and mistakes.

Excerpt from the general terms and conditions

Special productions, tools

In the case of goods that have not yet been produced at the time of the purchase order, production-related delivery shortfalls or excess deliveries equivalent to a maximum of 10% of the ordered quantity shall be acceptable without notifying the purchaser. In the case of special productions and orders for new models, we reserve the right to charge the purchaser for proportionate development costs as well as costs for matrices, tools, engravings, moulds and other production equipment; this shall not establish any claims on the part of the purchaser. Costs related to the purchase or manufacture of production equipment, particularly as a result of wear and tear, will be charged to the purchaser.

Condition of goods, guarantees

- In general, only the condition described in our product descriptions, specifications and identifications shall be deemed to describe the condition of the goods. Public statements, promotions or advertisements do not represent information regarding the condition of the goods.
- Guarantees are subject to separate agreements and must be confirmed by us in writing. Any reference to DIN standards or similar standards is only made for the purpose of describing the goods, and does not represent a guarantee.

Exclusion of liability, liability restriction

- Except in cases of claims due to injury to body, life or health, or pursuant to the product liability law, we shall only assume liability for.intentional and grossly negligent action. The same applies to breaches of duty on the part of our vicarious agents.The same applies to any of our agents.
- However, damage compensation shall be limited to the foreseeable direct damages that are typical for the contract, insofar as there is no assumption of liability due to injury to health, body or life, or the assumption of a guarantee or a procurement risk. The aforementioned provisions are not associated with any change to the burden of proof to the disadvantage of the purchaser.
- Contractual damage compensation claims shall lapse after a year. This does not apply in the case of intentional action.
  You can request the full general terms and conditions at info@spk-tools.de.

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