1501 E Milling ابزارهای فرزکاری

ALMASE SAZ

ALMASE SAZ - Milling Programme

ALMASE SAZ ISO Standard Milling Cutters

Universally applicable with positive and negative cutting geometry.

Smooth performance due to unequal tooth pitch. Wedge or screw fixing.

ALMASE SAZ Indexable Inserts - End mills

A high-performance insert programme - end mills for the widest variety of applications.

Indexable insert end mills characterised by stability, good chip clearance, and good chip removal.

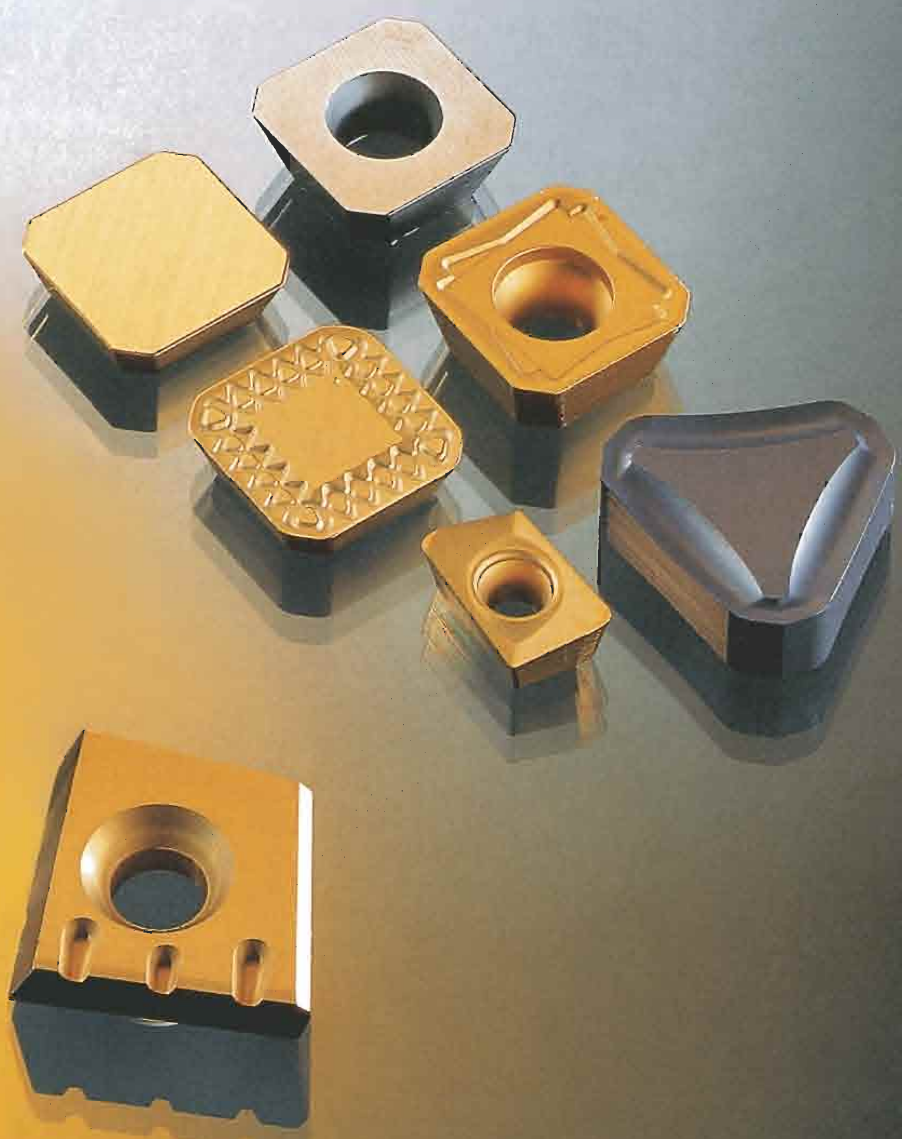
Basic holders

The link between machine spindle and tool can be supplied to meet standard or machine specification. Adaptors are available to increase overhang reduce from large to smaller size or increase the working diameter in large diameter boring operation.

The Almase Saz tool addaptor programme ensure optimum performance from your precision Tools.

ALMASE SAZ - Milling Programme

ALMASE SAZ - Alphabetic numeric Index

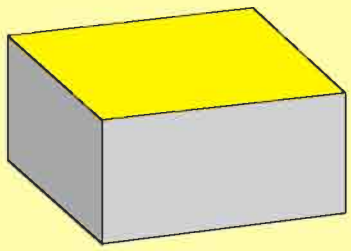


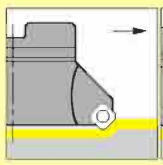
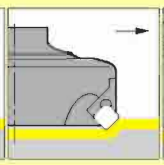
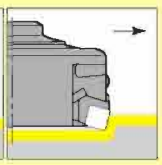
ALMASE SAZ - Machinability Classification

ISO	ALMASE - SAZ Group	Material	Tensile Strength Hardness Tool structure	
P	1	Unalloyed Carbon Steel		$\sigma \leqq 500$ N/mm²
	2			$\sigma < 600$ N/mm²
	3			$\sigma > 600$ N/mm²
	4	Alloy Steel and Cast Steel		$\sigma \leqq 700$ N/mm²
	5			$\sigma \leqq 900$ N/mm²
	6			$\sigma > 900$ N/mm²
	7	High Alloy Steel		$\sigma \leqq 1000$ N/mm²
	8			$\sigma > 1000$ N/mm²
M	9	Stainless,	Ferritic / Martensitic	$\sigma \leqq 750$ N/mm²
	10	Heat Resistant and		$\sigma > 750$ N/mm²
	11	High Heat Resistant Steels	Austenitic	
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	
K	13	Malleable Cast Iron	13.1 White (GTW) 13.2 Black (GTS)	
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	HB < 180 180 < HB < 220 HB > 220
	15	SG Cast Iron	15.1 Ferritic GGG35-GGG55 15.2 Perlitic GGG60-GGG80	HB < 220 HB > 220
	16	Chilled Iron		> 60 Shore C
	17	Titanium and Alloys		
	18	High Strength Steel	18.1 Hardened Steel 18.2 Manganese Steel 12 %	> 45 HRC
	19	Non-ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-eutectic 20.3 Super-eutectic	 <12% Si >12% Si
	21	Sinter Metals	21.1 Fe based 21.2 Tic based	
	22	Composites	22.1 Epoxy based 22.2 Polyester based	

	ISO	Cutting material	Insert	Solid-carbide	Wear resistance / Finishing — Toughness / Roughing v_c max + + f_z max	ALMASE SAZ Group
P	HC	CG4	●			1 - 8
	HC	CF2	●			1 - 8
	HC	CD2	●			1 - 8
	HC	CD4	●			1 - 8
	HW	P2F	●			1 - 8
	HW	GX	●			1 - 8
	HW	PVA	●			1 - 8
	HW	KMF	●	●		1 - 8
M	HC	CG4	●			9 - 11
	HC	CD4	●			9 - 11
	HW	PVA	●			9 - 11
	HW	KMF	●			9 - 12
	HW	KMF	●	●		9 - 12
K	HC	CF3	●			13 - 15
	HC	CG4	●			13 - 15
	HW	KM1	●			13 - 15,17,19 -20
	HW	K20	●			13 - 15,19 - 20
	HW	KMF	●	●		13 - 15,17
	HW	KMF	●	●		13 - 17,19

How to select cutting materials for material machined regarding cutting speed v_c and feed per tooth f_z.

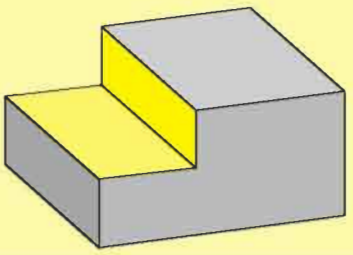
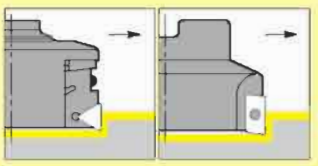


Approach Angle	45°	45°	75°
a_p max	6,0	6,0 8,0	9,0 11,0
			
Milling Cutter	..R 550	..R 551/6	..R 151/6 ..R 252/3
Indexable Insert	SE.X1204	SE.N1203 SE.N1504	SPKN1203 SPKN1504 SPKN1204 SPKN1207
Diameter Range	Ø 50 - 200	Ø 160 - 315	Ø 80 - 315

ISO	ALMASE SAZ Material Groups		Page	19	21	23 - 25 - 27
P	1					
	2	Unalloyed Carbon Steel		■	◪	◢
	3					
	4	Alloy Steel		■	■	◢
	5	and				
	6	Cast Steel				
	7	High Alloy Steel		◪	■	◢
	8					
M	9	Stainless, Heat-Resistant	Ferritic / Martensitic	■	◪	◢
	10	and High Temperature				
	11	Strength Steels	Austenitic			
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	■	◪	◢
K	13	Malleable Cast Iron	13.1 White-heart (GTW) 13.2 Black-heart (GTS)	◪	◪	◪
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	◪	◪	◪
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40 15.2 Perlitic GGG60-GGG80	◪	◪	◪
	16	Chilled Iron				
	17	Titanium and Alloys		■	■	◢
	18	High Strength Steels	18.1 Hardened Steel 18.2 Manganese Steel 12 %			□
	19	Non-Ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	◪	◢	◪
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-Eutectic <12% Si 20.3 Super-Eutectic >12% Si	◪	◢	■
	22	Composites	22.1 Epoxy based 22.2 Polyester based			

■ = ideally suitable ◪ = very suitable ◢ = suitable □ = limited

ALMASE SAZ - Indexable Insert Face Milling Cutters

Approach Angle	90°	90°
a_p max	15,0 20,0	15,0
		
Milling Cutter	..R 371/6	..R 340
Indexable Insert	TPKN 1603 TPKN 2204	APFX 1604
Diameter Range	∅ 80 - 250	∅ 50 - 160
Page	**31**	**29**

ISO		ALMASE SAZ Material Groups			
P	1				
	2	Non-Alloy Carbon Steel		◢	◪
	3				
	4	Alloy Steel		◢	◪
	5	and			
	6	Cast Steel			
	7	High Alloy Steel		◢	◪
	8				
M	9	Stainless, Heat-Resistant	Ferritic / Martensitic	◢	■
	10	and High Temperature			
	11	Strength Steels	Austenitic		
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	◢	■
K	13	Malleable Cast Iron	13.1 White-heart (GTW) 13.2 Black-heart (GTS)	◪	◪
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	◪	◪
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40 15.2 Perlitic GGG60-GGG80	◪	◪
	16	Chilled Iron			
	17	Titanium and Alloys		◪	■
	18	High Strength Steels	18.1 Hardened Steel 18.2 Manganese Steel 12 %		
	19	Non-Ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	◢	◪
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-Eutectic <12% Si 20.3 Super-Eutectic >12% Si	◢	◪
	22	Composites	22.1 Epoxy based 22.2 Polyester based		

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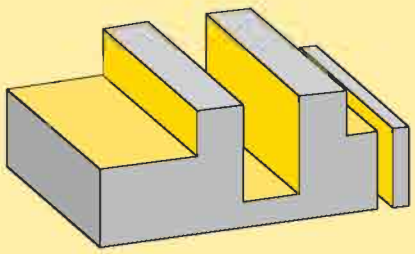
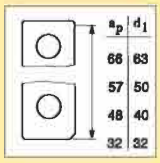
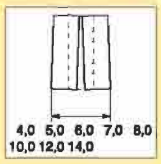
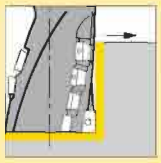
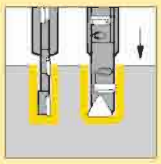
a_p max











			Disck Mill	4·36/9..	4·95.. 4·96..
			Indexable Insert	LD .X 1503 LP .X 1504 SD .X 0903 SP .X 1204	TPAN 1103 PP 514040..
			Diameter Range	Ø 32 - 63	Ø 80 - 250
ISO	ALMASE SAZ Material Groups		Page	35	39
P	1				
	2	Unalloyed Carbon Steel		◢	■
	3				
	4	Alloy Steel		◢	■
	5	and			
	6	Cast Steel			
	7	High Alloy Steel		■	■
	8				
M	9	Stainless, Heat-Resistant	Ferritic / Martensitic	■	■
	10	and High Temperature			
	11	Strength Steels	Austenitic		
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	■	■
K	13	Malleable Cast Iron	13.1 White-heart (GTW) 13.2 Black-heart (GTS)	◢	■
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	◢	■
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40 15.2 Perlitic GGG60-GGG80	◢	■
	16	Chilled Iron			
	17	Titanium and Alloys		◢	■
	18	High Strength Steels	18.1 Hardened Steel 18.2 Manganese Steel 12 %		
	19	Non-Ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	◢	■
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-Eutectic <12% Si 20.3 Super-Eutectic >12% Si	◢	■
	22	Composites	22.1 Epoxy based 22.2 Polyester based		

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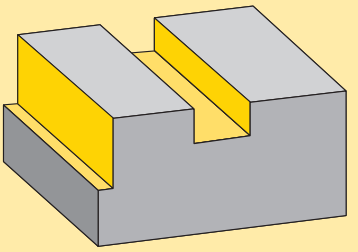
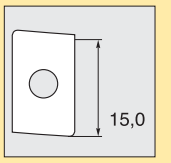
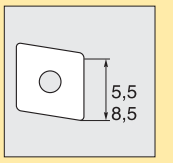
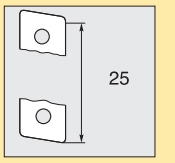
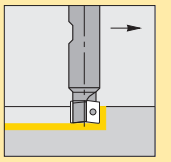
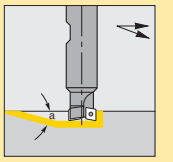
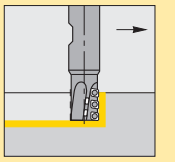
ALMASE SAZ - End Mills



a_p max

	Peripheral and Slot Mill, long Edge, single Row	Peripheral and Slot Mill, short Edge, single Row	Peripheral and Slot Mill, long Edge, multi-Row
			
			
End Mill	4·301..	4·300..	4·320..
Indexable Insert / Solid Carbide End Mill	APFX 1604	CCGX 0602 CCGX 0603 CCGX 09T3 CCGX 0905	CCGX 0603
Diameter Range	∅ 25 - 40	∅ 12 - 40	∅ 20 - 25
Page	**46**	**48**	**50**

ISO	ALMASE SAZ Material Groups				
P	1 2	Unalloyed Carbon Steel		■	■	■
	3 4 5 6	Alloy Steel and Cast Steel		■	■	■
	7 8	High Alloy Steel		■	■	■
M	9 10 11	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	■	■	■
			Austenitic			
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	■	■	■
K	13	Malleable Cast Iron	13.1 White-heart (GTW) 13.2 Black-heart (GTS)	■	■	■
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	■	■	■
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40 15.2 Perlitic GGG60-GGG80	■	■	■
	16	Chilled Iron				
	17	Titanium and Alloys		■	■	■
	18	High Strength Steels	18.1 Hardened Steel 18.2 Manganese Steel 12 %			
	19	Non-Ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	■	■	■
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-Eutectic <12% Si 20.3 Super-Eutectic >12% Si	■	■	■
	22	Composites	22.1 Epoxy based 22.2 Polyester based			

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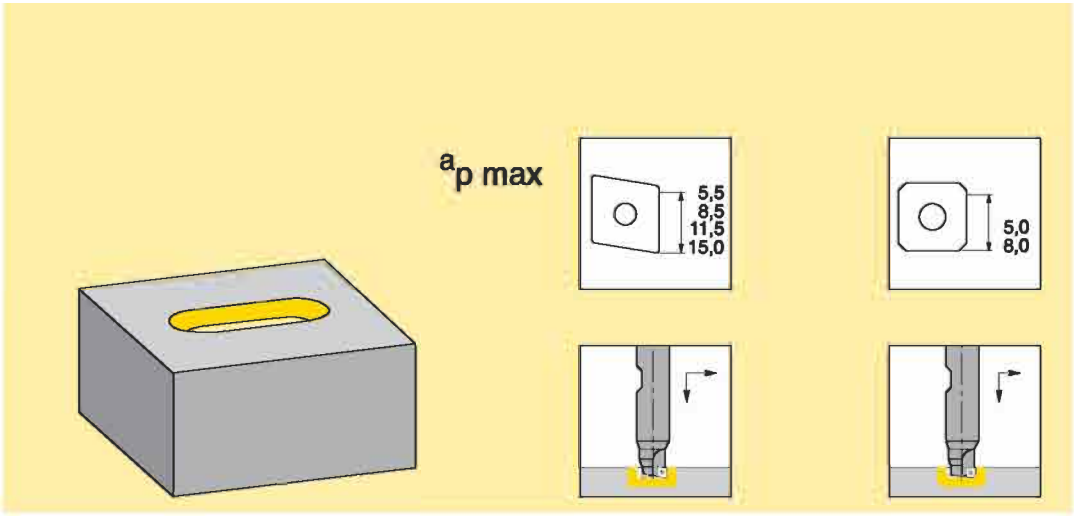

			End Mill	4-31..	4-312..
			Indexable Insert / Solid Carbide End Mill	CCG X .. COG X .. XCG X .. SPG X .. APF X ..	SPGX 0602 SPGX 0903
			Diameter Range	Ø 12 - 40	Ø 18 - 25
ISO	ALMASE SAZ Material Groups		Page	52	54
P	1 2 3 4 5 6 7 8	Unalloyed Carbon Steel; Alloy Steel and Cast Steel; High Alloy Steel		■	■
M	9 10 11	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	■	■
	12	High Heat-Resistant Alloys	Austenitic	■	■
			12.1 Ni based		
			12.2 Co based		
			12.3 Fe based		
			12.4 Co, Mo, Nb, Ta, W		
K	13	Malleable Cast Iron	13.1 White-heart (GTW)	■	■
			13.2 Black-heart (GTS)		
	14	Grey Cast Iron	14.1 GG10-GG20	■	■
			14.2 GG25-GG30		
			14.3 GG35-GG40		
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40	■	■
			15.2 Perlitic GGG60-GGG80		
	16	Chilled Iron			
	17	Titanium and Alloys		■	■
	18	High Strength Steels	18.1 Hardened Steel		
			18.2 Manganese Steel 12 %		
	19	Non-Ferrous Metals	19.1 Lead Alloys	■	■
			19.2 Copper Alloys		
			19.3 Magnesium Alloys		
	20	Aluminium Alloys	20.1 Wrought Alloys	■	■
			20.2 Sub-Eutectic <12% Si		
			20.3 Super-Eutectic >12% Si		
	22	Composites	22.1 Epoxy based		
			22.2 Polyester based		

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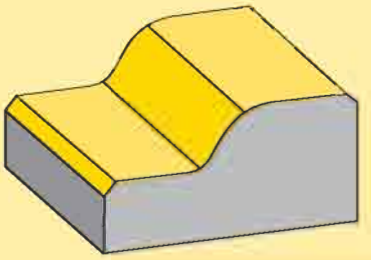
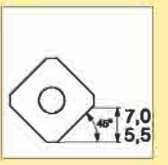
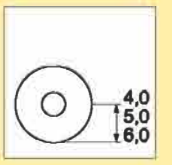
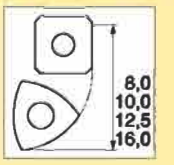
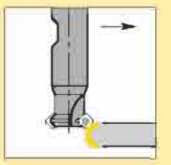
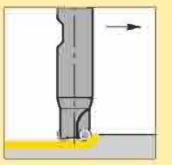
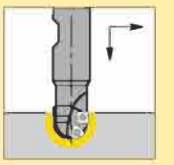
ALMASE SAZ - End Mills

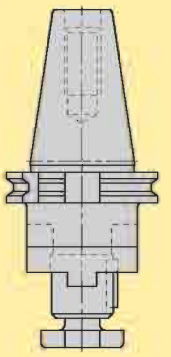
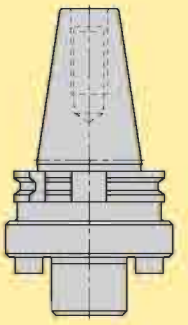
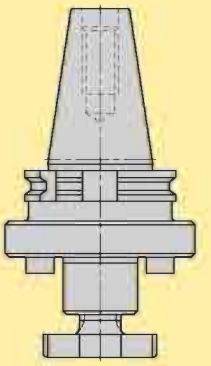
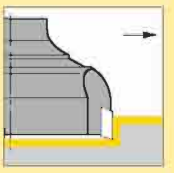
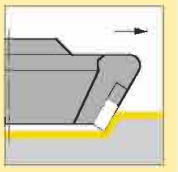
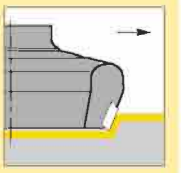
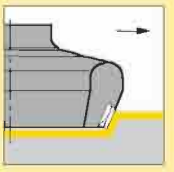
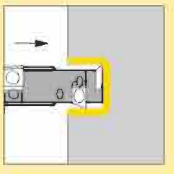


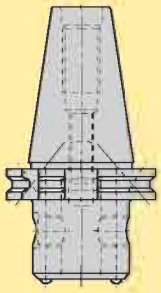
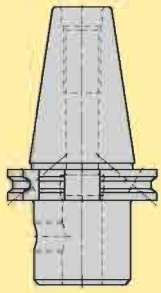
	Chamfer and End Milling	Radius Milling	Ball nose Milling
a_p max			
			
End Mill	4.332 ··	4.303 ··	4.347 ··
Indexable Insert / Solid Carbide End Mill	SPGX 0903 SPGX 12T3	RPHT 0803 RPHT 10T3 RPHT 1204	5104080 SPGX 0602 SPGX 0903
Diameter Range	Ø 16 - 32	Ø 25 - 40	Ø 16 - 32
Page	56	58	60

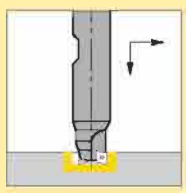
ISO	ALMASE SAZ Material Groups				
P	1				
	2	Unalloyed Carbon Steel		■	■	■
	3				
	4	Alloy Steel				
	5	and		■	■	■
	6	Cast Steel				
	7	High Alloy Steel		■	■	■
	8				
M	9	Stainless, Heat-Resistant	Ferritic / Martensitic	■	■	■
	10	and High Temperature				
	11	Strength Steels	Austenitic			
	12	High Heat-Resistant Alloys	12.1 Ni based 12.2 Co based 12.3 Fe based 12.4 Co, Mo, Nb, Ta, W	■	■	■
K	13	Malleable Cast Iron	13.1 White-heart (GTW) 13.2 Black-heart (GTS)	■	■	■
	14	Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	■	■	■
	15	Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG40 15.2 Perlitic GGG60-GGG80	■	■	■
	16	Chilled Iron				
	17	Titanium and Alloys		■	■	■
	18	High Strength Steels	18.1 Hardened Steel 18.2 Manganese Steel 12 %			
	19	Non-Ferrous Metals	19.1 Lead Alloys 19.2 Copper Alloys 19.3 Magnesium Alloys	■	■	■
	20	Aluminium Alloys	20.1 Wrought Alloys 20.2 Sub-Eutectic <12% Si 20.3 Super-Eutectic >12% Si	■	■	■
	22	Composites	22.1 Epoxy based 22.2 Polyester based			

■ = ideally suitable ◪ = very suitable ◢ = suitable □ = limited

ool adaptors

	Combination extension arbour DIN 6358 for mills with longitudinal or transverse slot.	Adaptor arbour DIN 6357 for mills with internal centring, tool clamping to DIN 2079.	Extension arbour with enlarged bearing surface for mills with trasverse slot.
			
	Ø 40 to 160 	Ø 160 to 315 	Ø 63 to 160 
	Ø 40 to 160 		
	Ø 80 to 200 		
Page	**66 - 67**	**68**	**68**
Steep Taper/ Shank Types	Adaptor Dia d_3	Adaptor Dia d_3	Adaptor Dia d_3
DIN 69871 Form	A	A	A
SK 40	16 - 40	40	22 - 40
45	16 - 40	40	22 - 40
50	16 - 50	40 / 60	22 - 40
MAS 403 BT			
SK 40	16 - 40	40	—
50	16 - 50	60	—
DIN 2080			
SK 40	16 - 40	—	—
50	16 - 50	32 / 40 / 60	—

	Combination chuck Form B and E for tools with shank to DIN 1835 Form B and E and DIN 6535 Form HB and HE	Form B (Weldon) for tools with shank to DIN 1835 Form B and DIN 6535 Form HB
		
Page	73	74
Steep Taper/ Shank Types	Clamping Dia d_1	Clamping Dia d_1
DIN 69871 form	AD and B	AD and B
SK 40	6 - 20	6 - 32
50	6 - 32	6 - 32
MAS 403 BT		
SK 40	—	6 - 32
50	—	6 - 32
DIN 2080		
SK 40	—	6 - 32
50	—	6 - 32



ALMASE SAZ - How to use this catalogue?

Step 1 →

given: Operation (Facing, shoulder milling, slot milling, ...)
workpiece material

unknown: Tool Geometry

solution: Toll selection, see pages 6 to 15

■ = ideally suitable ◪ = very suitable ◢ = suitable □ = limited

Step 2 →

given: Tool Geometry
Workpiece material
Cutting conditions (good - unstable)

unknown: Cutting grade

solution: Table V_c by Material Group

Cutting grade

Step 3 →

given: Workpiece material
Cutting grade
Cutting depth a_p

unknown: Feed per tooth f_z

solution: ( ) Table (fz, a_p) $\Longrightarrow$ f_z
$\Longrightarrow$ F_1, F_2

f_z , F1 , F2

Step 4 →

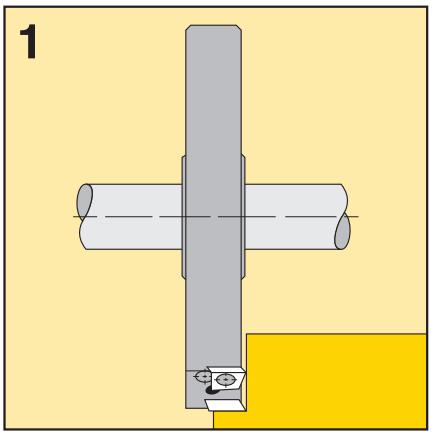
given: Workpiece material
Cutting grade
Feed per tooth fz
correction factors F_1 , F_2

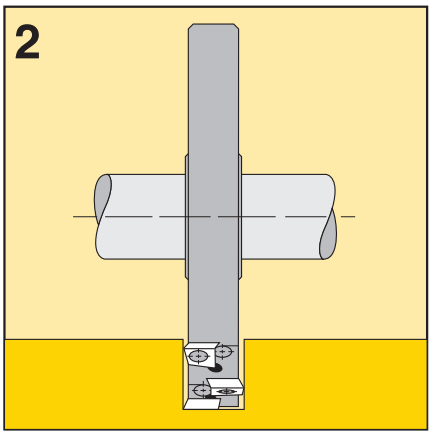
unknown: Cutting speed $V_{c\ prog}$

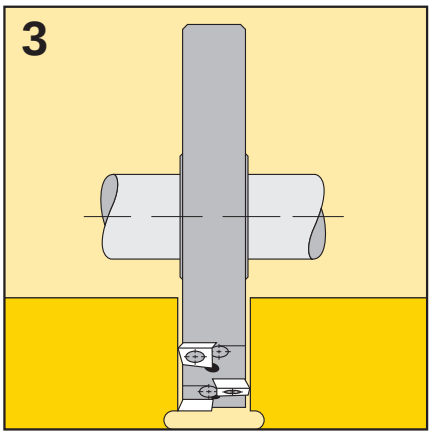
solution: Table V_c by material group $\Longrightarrow$ Vc

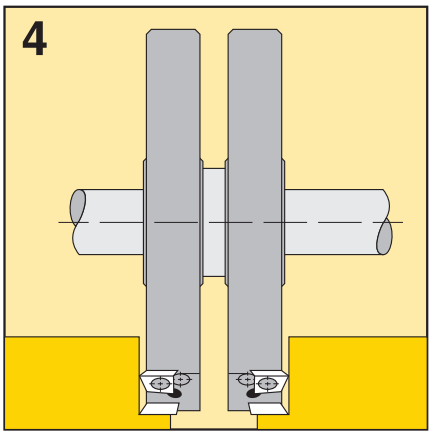
$V_{c\ prog} = V_c * F_1 * F_2$

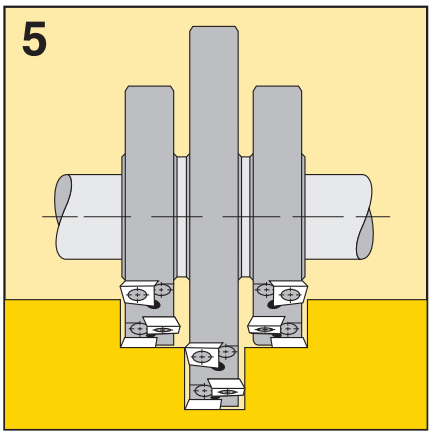
ALMASE SAZ - Applications for Disc Milling Cutters

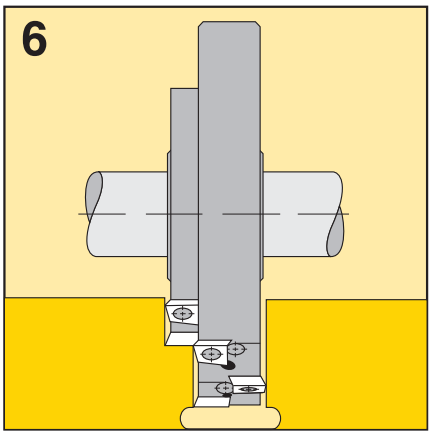


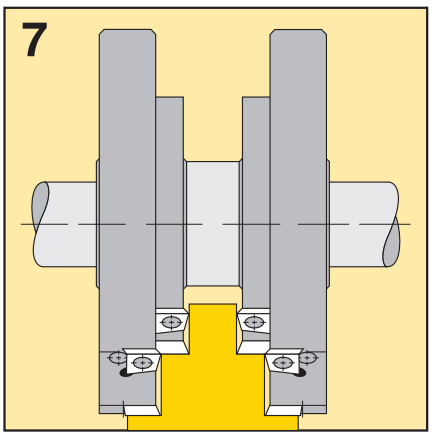


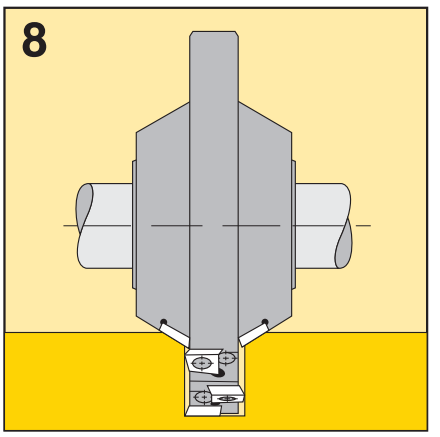


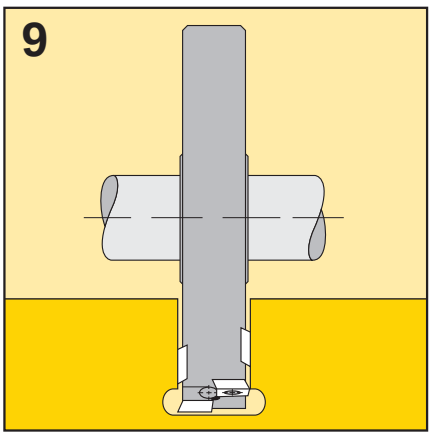


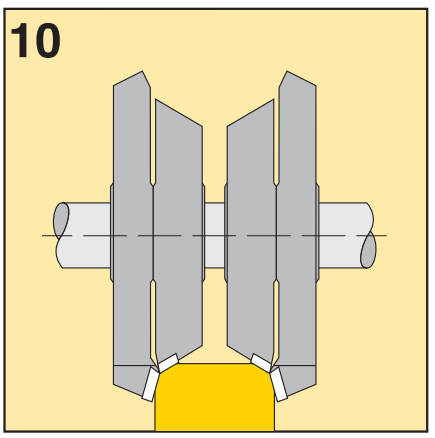




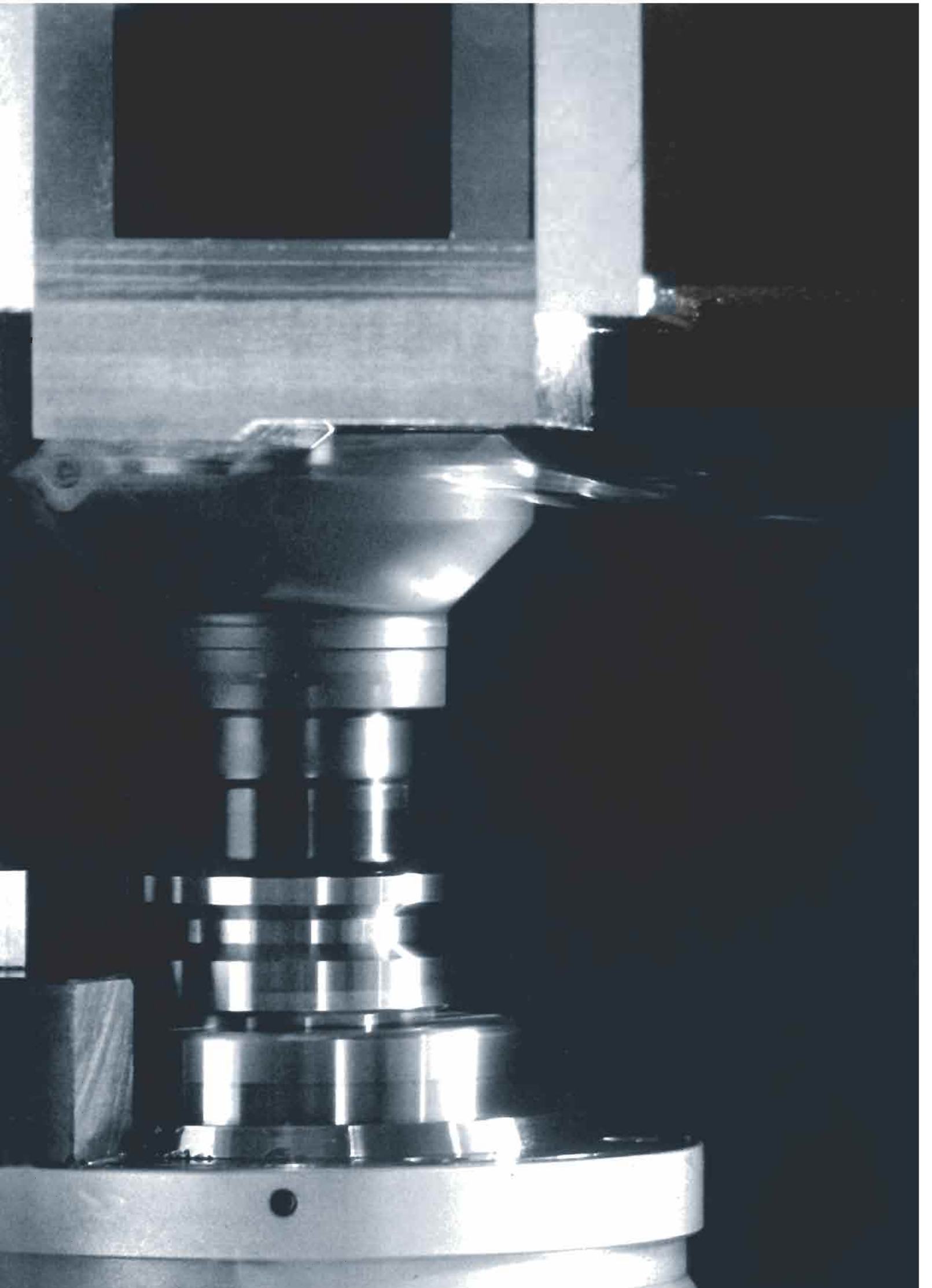








1. 2-edged cutting (half-side and face)
2. 3-edged cutting (full side and face)
3. Double- sided cutting
4. 2- sided cutting (gang milling)
5. 3-sided cutting (gang milling)
6. Double- sided cutting and 2- sided cutting (gang milling)
7. 2- sided cutting (gang milling)
8. 3- sided cutting and angle milling (gang milling)
9. Double- sided cutting with finishing cut (wiper inserts)
10. Angle milling (gang milling)



ALMASE SAZ Factory

ALMASE SAZ Face Mill

Page 19 to 28

45° Face Mill	screw clamping 50 - 200 mm diameter, insert SE.X
45° Face Mill	wedge clamping and cassette 50 - 160 mm diameter, insert SE.N
75° Face Mill	wedge clamping and cassette 80 - 315 mm diameter, insert SP..
75° Face Mill	wedge clamping and cassette 125 - 315 mm diameter, inser SN..
75° Face Mill	wedge clamping and cassette 125 - 315 mm diameter, ceramic insert SNGN
Face Mill	finger clamping 50 - 125 mm diameter, ceramic insert RNGN

ALMASE SAZ Shoulder Mill

Page 29 to 32

90° Shoulder Mill	screw clamping 50 - 125 mm diameter, insert APFX
90° Shoulder Mill	wedge clamping and cassette 80 - 250 mm diameter, insert TPKN

ALMASE SAZ Roughing Mill

Page 35 to 36

Roughing Mill	32 - 63 mm diameter inserts L..X and S..X Steep taper DIN 69871 A and DIN 2080.

ALMASE SAZ Disc Mill

Page 39 to 40

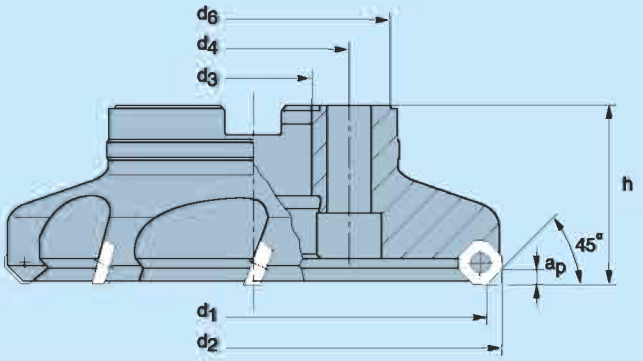
Slitting Mill	80 - 250 mm diameter width 4 - 14 mm 3 and 4 cutting edge insert

ALMASE SAZ - Face Mill

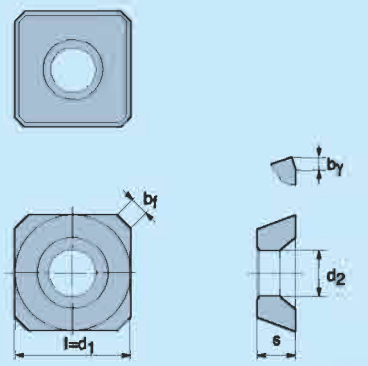
Approach angle 45°

Indexable Insert

- Screw clamping for SE . X Inserts
- High positive rake angle



SE. X..



Ø d_1	RIGHT CODE	d_2	d_3 H7	d_4	d_6	h	a_{pmax}	z	Weight kg	Insert	Clamping screw	Screw driver	Tx	M_{An}** Nm
50	4·00504 R 550	62	22	–	47	40	6	4	0,40	SE.X 1204AF.N	192·880	170·026	20	6
63	4·00605 R 550	75	22	–	52	40		5	0,60					
80	4·00805 R 550	91	27	–	55	50		5	0,90					
100	4·01006 R 550	112	32	–	81	50		6	1,60					
125	4·01207 R 550	136	40	–	91	63		7	2,70					
160	4·01608 R 550	172	40	66,1	100			8	3,80					
200	4·02010 R 550	212	60	101,6	130			10	5,60					

Insert RIGHT CODE		$1 = d_1$	d_2	s	b_γ	b_f
SEAX1204AF N	CG4	12,7	5,7	4,76	0,05	1,8
	HT5					
SEKX1204AFSN	P2F	12,7	5,7	4,76	0,1	1,8
	PVA					
	HT2					
	HT5					
SEKX1204AFEN	KM1	12,7	5,7	4,76	–	1,8
SEKX1204AFFN	HT2	12,7	5,7	4,76	–	1,8

** M_{An} = Clamping torque of clamping screw in Nm.
Left machining upon request.

Availability as current price list.
Ordering example:
1 off **4·00504 R 550**
10 off **SEAX1204AF N CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_C by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/mm²	PVA P2F	160 - 200
2			CG4	180 - 200
			HT5 HT2	300 - 400
3		$\sigma >$ 600 N/mm²	PVA P2F	140 - 180
			CG4	150 - 200
			HT5 HT2	280 - 380
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/mm²	PVA P2F	140 - 180
5			CG4	150 - 200
			HT5 HT2	280 - 380
6		$\sigma >$ 900 N/mm²	PVA P2F	110 - 150
			CG4	130 - 180
			HT5 HT2	200 - 300
7	High Alloy Steel	$\sigma \leq$ 1000 N/mm²	PVA P2F	110 - 150
			CG4	130 - 180
			HT5 HT2	190 - 290
8		$\sigma >$ 1000 N/mm²	PVA P2F	70 - 100
			CG4	80 - 120
			HT5 HT2	180 - 280
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	100 - 150
10			CG4	120 - 180
11		Austenitic	PVA	50 - 190 *
			CG4	60 - 210 *
			KM1	20 - 60
12	High Heat-Resistant Alloys			
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4	100 - 160
17	Titanium and Alloys		HT2	200 - 300
19	Non-Ferrous Metals		KM1	20 - 70
20	Aluminium Alloys		KM1	100 - 350
			KM1	300 - 800

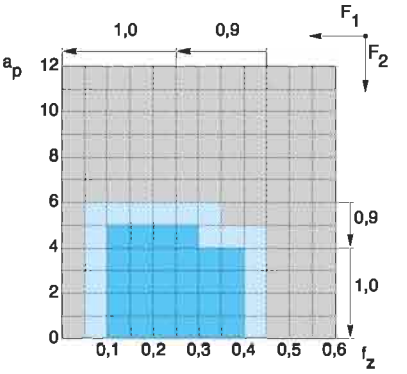
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

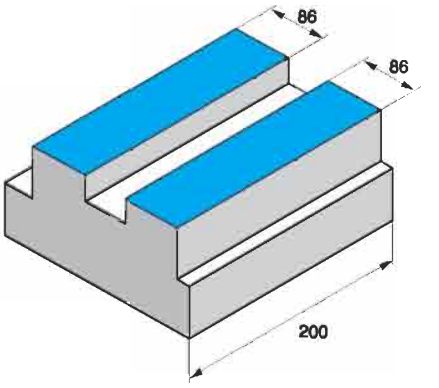
Indexable insert: SE.X 1204



Optimum range | Possible range

Machining Example

Workpiece:	Lower part C45 W (cutting Group 3)
Tool:	Face Mill 100 mm dia. 4-01006 R 550
Indexable insert:	SEKX 1204 AFSN
Cutting material:	HT5
Depth of cut a_p:	3 mm
Feed per tooth f_Z:	0,18 mm
Cutting speed v_c:	330 m/min
	(330 m/min x 1,0 x 1,0)
Feed rate v_f:	1134 mm/min

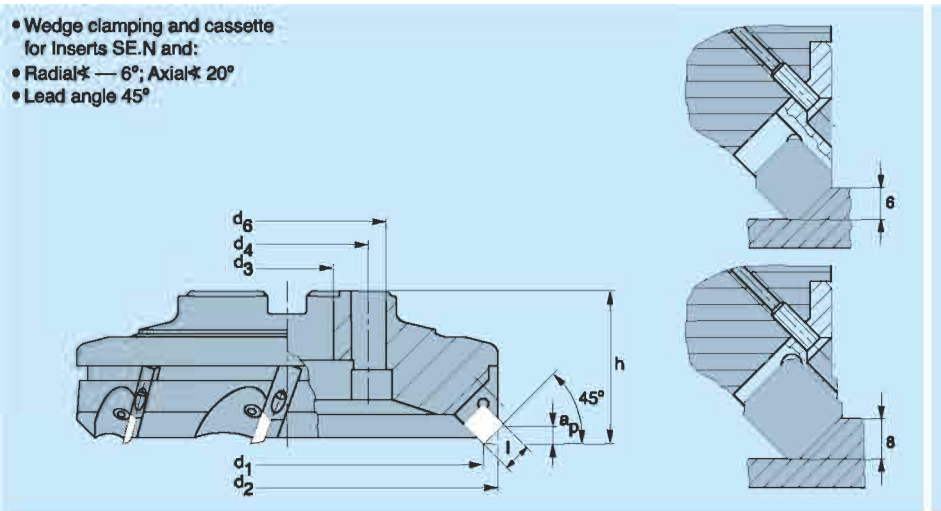


ALMASE SAZ - Face Mill

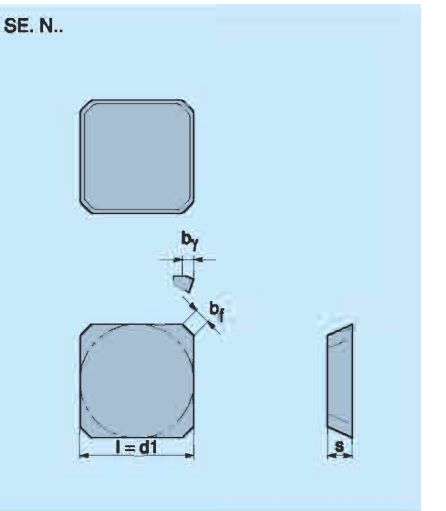
Approach angle 45°

Indexable Insert

- Wedge clamping and cassette for Inserts SE.N and:
- Radial* — 6°; Axial* 20°
- Lead angle 45°



SE. N..



Ø d_1	RIGHT CODE	d_2	d_3 H7	d_4	d_6	h	a_p max	z	Weight kg	Insert	Cassette Complete	Cl. Wedge Complete	Screw driver	Tx	M_{An}** Nm
50	**4-00504 R 551**	66	16	–	60	48	6	4	0,90	**SE.N 1203AF.N**	**430-077**	**460-831**	**170-026**	20	6
63	**4-00605 R 551**	78	22	–	72	40		5	1,00						
80	**4-00806 R 551**	94	27	–	88	50		6	1,80						
100	**4-01006 R 551**	114	32	–	80	50		6	2,30						
125	**4-01207 R 551**	138	40	–	90	63		7	4,20						
160	**4-01607 R 551**	173		66,7	100			7	6,40						
160	**4-01610 R 551**	173		66,7	100			10	6,20						
63	**4-00605 R 556**	78	22	–	72	40	8	5	1,20	**SE.N 1504AF.N**	**430-079**				
80	**4-00806 R 556**	94	27	–	88	50		6	2,00						
100	**4-01006 R 556**	114	32	–	80	50		6	2,50						
125	**4-01207 R 556**	138	40	–	90	63		7	4,40						
160	**4-01607 R 556**	173		66,7	100			7	6,60						
160	**4-01610 R 556**	173		66,7	100			10	6,40						

Insert CODE		$1 = d_1$	s	b_γ	b_f
SEAN 1203AF N	CG4	12,7	3,18	0,05	1,8
	PVA				
	KM1				
	KMF				
	HT5				
SEAN 1203AFTN	CF2	12,7	3,18	0,15	1,8
	P2F				
SEKN 1203AF N	P2F	12,7	3,18	0,1	1,8
	PVA				
	KM1				
SEKN 1203AFTN	CF2	12,7	3,18	0,15	1,8
	CG4				
	P2F				
	GX				
	NC1				
	HT2				
	HT5				
SEKN 1203AFFN	HT2	12,7	3,18	–	1,8
SEKN 1504AF N	KM1	15,87	4,76	0,1	1,8
SEKN 1504AFSN	HT5	15,87	4,76	0,1	1,8
SEKN 1504AFTN	CF2	15,87	4,76	0,15	1,8
	CG4				
	P2F				
	PVA				

** M_{An} = Clamping torque of clamping screw in Nm.
Mills can be equipped with alternative insert sizes by changing the cassette.
Larger diameters upon request.

Availability as current price list.
Ordering example:
1 off **4-00504 R 551**
10 off **SEAN1203AF N CG4**

Guidelines for cutting speed V_C by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq 600$ N/ mm^2	PVA GX P2F	160 - 200
2			CG4 CF2	180 - 220
			HT5 HT2	300 - 400
3		$\sigma > 600$ N/ mm^2	PVA GX P2F	140 - 180
			CG4 CF2	150 - 200
			HT5 HT2	280 - 380
4	Alloy Steel and Cast Steel	$\sigma \leq 900$ N/ mm^2	PVA GX P2F	140 - 180
5			CG4 CF2	150 - 200
			HT5 HT2	280 - 380
6		$\sigma > 900$ N/ mm^2	PVA GX P2F	110 - 150
			CG4 CF2	130 - 180
			HT5 HT2	200 - 300
7	High Alloy Steel	$\sigma \leq 1000$ N/ mm^2	PVA GX P2F	110 - 150
			CG4 CF2	130 - 180
			HT5 HT2	190 - 290
8		$\sigma > 1000$ N/ mm^2	PVA GX P2F	70 - 100
			CG4 CF2	80 - 120
			HT5 HT2	180 - 280
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	100 - 150
10			CG4	120 - 180
11		Austenitic	PVA KMF	50 - 200 *
			CG4	60 - 210 *
12	High Heat-Resistant Alloys		KMF KM1	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4	140 - 180
			NC1	300 - 600
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4	120 - 160
			NC1	300 - 500
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4	100 - 140
			NC1	250 - 400
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4	100 - 160
			HT2	200 - 300
17	Titanium and Alloys		KMF KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

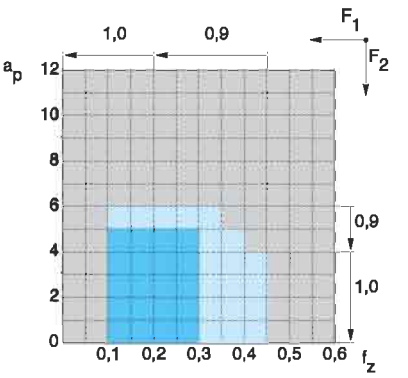
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

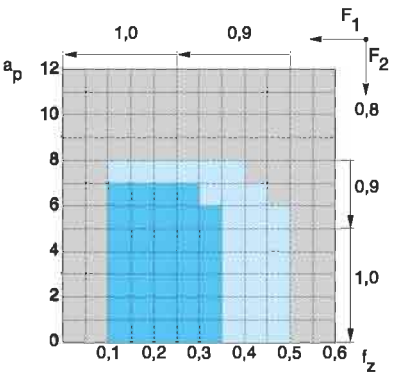
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: SE.N 1203



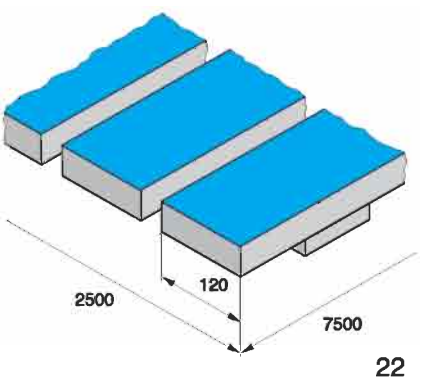
Indexable insert: SE.N 1504



Optimum range | Possible range

Machining Example

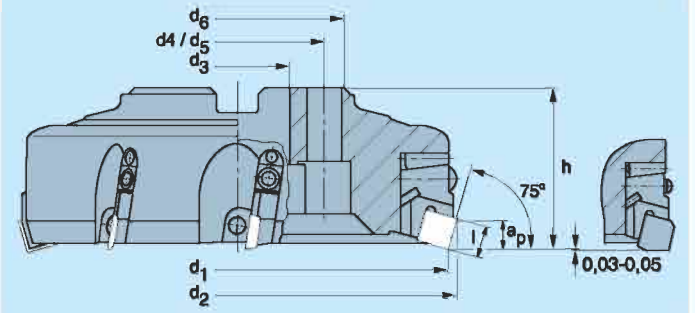
Workpiece:	Mounting plate ST 37 (Cutting Group 1)
Tool:	Face Mill 160 mm dia. 4.01610 R 551
Indexable insert:	SEKN 1203 AFTN
Cutting material:	HT5
Depth of cut a_p:	3 mm
Feed per tooth f_z:	0,18 mm
Cutting speed v_c:	350 m/min
	(350 m/min x 1,0 x 1,0)
Feed rate v_f:	1253 mm/min



ALMASE SAZ - Face Mill

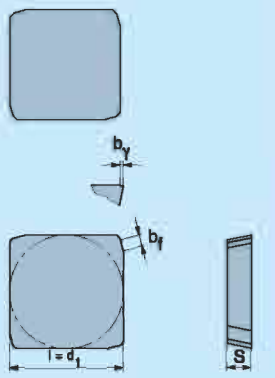
Approach angle 75°

- Wedge clamping and cassette with SP.. Inserts
- Positive rake angle

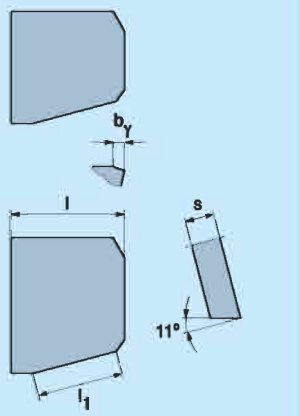


Indexable Insert

SPKN..



Wiper Insert



Ø d_1	RIGHT CODE	d_2	d_3 H7	d_4	d_5	d_6	h	a_{pmax}	z	Weight kg	Insert	Wiper Insert	Cassette Complete	Clamping Wedge Complete	Adjusting Wedge Complete	Screw driver	M_{An}** Nm
80	4·00806 R 151	86	27	–	–	62	50	9	6	1,60	SPKN 1203 ED R	SPEX 1203 ED R	430·049	460·548	460·546	170·025[1]	5
100	4·01008 R 151	106	32	–	–	80	50		8	2,10							
125	4·01206 R 151	131	40	–	–	90	63		6	4,40							
125	4·01208 R 151	131		–	–	90			8	4,00							
160	4·01608 R 151	166		–	–	100			8	8,07							
160	4·01610 R 151	166		66,7	–	100			10	6,20							
200	4·02010 R 151	206	60	101,6	–	130			10	13,10							
200	4·02012 R 151	206			–	130			12	10,50							
250	4·02512 R 151	256			–	130			12	18,60							
250	4·02516 R 151	256			–	130			16	14,20							
315	4·03116 R 151	321			177,8	225	80		16	35							
315	4·03120 R 151	321			177,8	225	80		20	31,00							
125	4·01206 R 156	132	40	–	–	90	63	11	6	4,20	SPKN 1504 ED R	SPEX 1504 ED R	430·051				
125	4·01208 R 156	132		–	–	90			8	4,20							
160	4·01608 R 156	167		66,7	–	100			8	8,20							
160	4·01610 R 156	167		66,7	–	100			10	6,40							
200	4·02010 R 156	207	60	101,6	–	130			10	13,03							
200	4·02012 R 156	207			–				12	10,70							
250	4·02512 R 156	257			–				12	18,60							
250	4·02516 R 156	257			–				16	14,40							
315	4·03116 R 156	322			177,8	225	80		16	35,00							
315	4·03120 R 156	322			177,8	225	80		20	31,20							

Insert

RIGHT CODE		1 = d_1	s	l_1	b_f	b_γ
SPKN 1203 ED R	CF2	12,7	3,18	–	1,4	0,3
	CF3					
	CG4					
	P2F					
	GX					
	KM1					
	HT2					
SPKN 1203 EDTR	NC1	12,7	3,18	–	1,4	0,1
	HT2					
	HT5					
SPKN 1504 ED R	CF2	15,87	4,76	–	1,4	0,3
	CF3					
	CG4					
	P2F					
	GX					
	KM1					

Wiper Insert

RIGHT CODE		1 = d_1	s	l_1	b_f	b_γ
SPEX 1203 ED R	KM1	12,7	3,18	10	–	0,3
SPEX 1504 ED R	KM1	15,87	4,76	10	–	0,3

1) Torx size Tx = 15

** M_{An} = Clamping torque of clamping screw in Nm.

Mills can be equipped with alternative insert sizes by changing the cassette.

Larger diameters upon request.

Availability as current price list.

Ordering example:

1 off **4·00806 R 151**

10 off **SPKN1203 ED R CG4**

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)		Cutting Speed v_c [m/min]	
1	Unalloyed Steel	$\sigma \le 600$ N/ mm²	GX	P2F	150	190
2			CG4	CF2	170	210
			HT5	HT2	280	380
3		$\sigma > 600$ N/ mm²	GX	P2F	130	170
			CG4	CF2	140	190
			HT5	HT2	260	360
4	Alloy Steel and Cast Steel	$\sigma \le 900$ N/ mm²	GX	P2F	130	170
5			CG4	CF2	140	190
			HT5	HT2	280	360
6		$\sigma > 900$ N/ mm²	GX	P2F	100	140
			CG4	CF2	120	170
			HT5	HT2	180	280
7	High Alloy Steel	$\sigma \le 1000$ N/ mm²	GX	P2F	100	140
			CG4	CF2	120	170
			HT5	HT2	170	270
8		$\sigma > 1000$ N/ mm²	GX	P2F	60	90
			CG4	CF2	70	110
			HT5	HT2	160	260
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	GX		80	120
10			CG4		110	140
11		Austenitic	GX		50	190 *
			CG4		50	200 *
12	High Heat-Resistant Alloys		KM1		20	60
13	Malleable Cast Iron	GTW/ GTS	KM1		80	120
			CG4	CF3	100	140
			NC1		200	350
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1		120	160
			CG4	CF3	140	160
			NC1		300	600
		14.2 GG25 - GG30 180 < HB < 220	KM1		100	140
			CG4	CF3	120	160
			NC1		300	500
		14.3 GG35 - GG40 HB > 220	KM1		80	120
			CG4	CF3	100	140
			NC1		250	400
15	Spheroidal Graphite Cast Iron	(GGG)	KM1		80	140
			CG4	CF3	100	160
			HT2	NC1	200	300
17	Titanium and Alloys		KM1		20	70
19	Non-Ferrous Metals		KM1		100	350
20	Aluminium Alloys		KM1		300	800

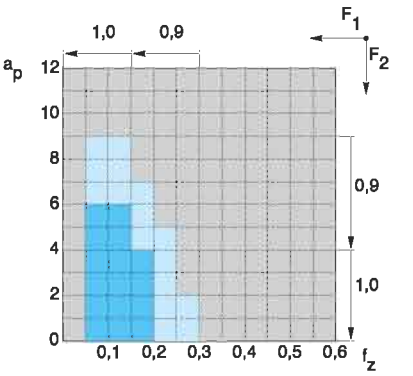
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

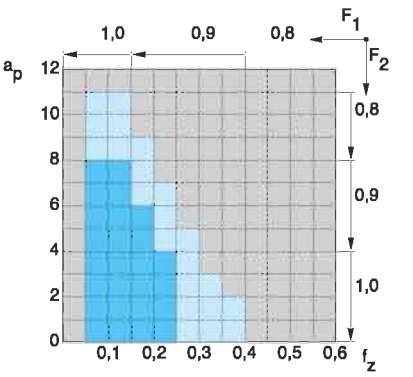
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: SPKN 1203



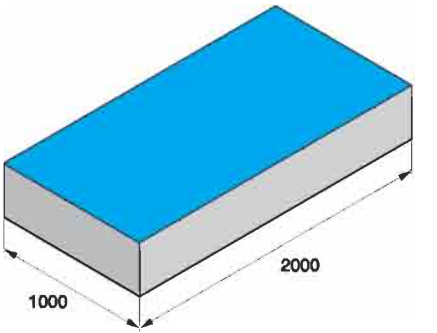
Indexable insert: SPKN 1504



Optimum range | Possible range

Machining Example

Workpiece:	Sidepiece St 50-2 (Cutting Group 2)
Tool:	Face Mill 315 mm dia. 4·03120 R 151
Indexable insert:	SPKN 1203 EDTR
Cutting material:	HT5
Depth of cut a_p:	3 mm
Feed per tooth f_z:	0,18 mm
Cutting speed v_c:	297 m/min
	(330 m/min x 0,9 x 1,0)
Feed rate v_f:	1080 mm/min



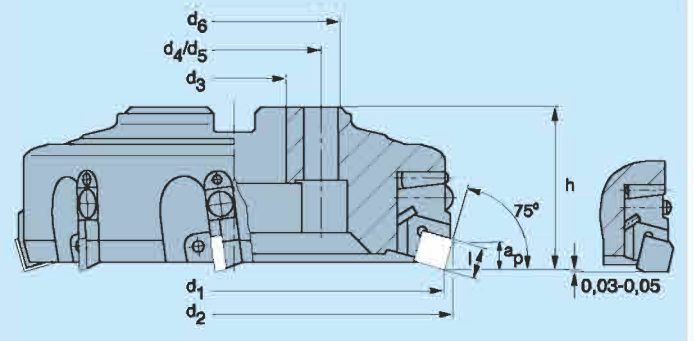
ALMASE SAZ - Face Mill

Approach angle 75°

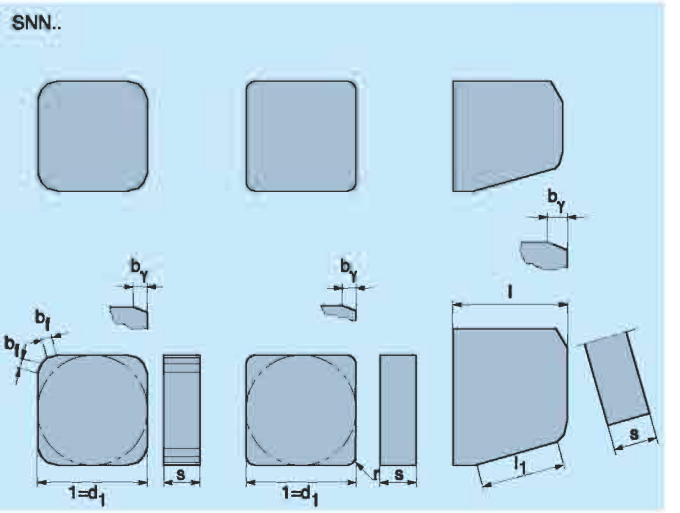
Indexable Insert

Wiper Insert

- Wedge clamping and cassette with SN.. Inserts
- Negative rake angle



SNN..



Ø d_1	RIGHT CODE	d_2	d_3 H7	d_4	d_5	d_6	h	a_{pmax}	z	Weight kg	Insert	Wiper Insert	Cassette Complete	Clamping Wedge Complete	Adjusting Wedge Complete	Screw driver	M_{An}** Nm
125	4-01206 R 252	131	40	–	–	90	63		6	4,32	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —	430-053	460-550	460-546	170-025[1]	5
125	4-01208 R 252	131		–	–	90		9	8	4,00	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
160	4-01608 R 252	166		66,7	–	100			8	7,75	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
160	4-01610 R 252	166		66,7	–	100			10	6,20	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
200	4-02010 R 252	206	60	101,6	–	130			10	12,9	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
200	4-02012 R 252	206			–				12	10,50	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
250	4-02512 R 252	256			–				12	18,20	SNKN 1204 EN .N	SNEX 1204 EN .N —					
250	4-02516 R 252	256			–				16	14,20	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
315	4-03116 R 252	321			177,8	225	80		16	35,00	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					
315	4-03120 R 252	321			177,8	225	80		20	31,00	SNKN 1204 EN .N SNGN 1204..	SNEX 1204 EN .N —					

Insert

RIGHT CODE		$1 = d_1$	s	b_γ	r	b_f
SNKN 1204 EN N	CF3 CG4 P2F KM1	12,7	4,76	–	–	1,4
SNKN 1204 ENTN	NC1	12,7	4,76	0,1	–	1,4
SNGN 120408	MC2 NC1	12,7	4,76	0,2	0,8	–
SNGN 120412	MC2 NC1	12,7	4,76	0,2	1,2	–
SNGN 120416	MC2 NC1	12,7	4,76	0,2	1,6	–

Wiper Insert (designed for Insert SNKN)

RIGHT CODE		$1 = d_1$	s	l_1	b_γ
SNEX 1204 EN N	KM1	12,7	4,76	10	–
SNEX 1204 ENTN	MC2 NCI	12,7	4,76	10	0,05

1) Torx size Tx = 15

** M_{An} = Clamping torque of clamping screw in Nm.

Larger diameters upon request.

Availability as current price list.

Ordering example:

1 off **4-01208 R252**

10 off **SNKN 1204 EN N CG4**

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◄ ► Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq 600$ N/ mm^2	P2F	150 - 190
2			CG4	170 - 210
3		$\sigma > 600$ N/ mm^2	P2F	130 - 170
			CG4	140 - 190
4	Alloy Steel and Cast Steel	$\sigma \leq 900$ N/ mm^2	P2F	130 - 170
5			CG4	140 - 190
6		$\sigma > 900$ N/ mm^2	P2F	100 - 140
			CG4	120 - 170
7	High Alloy Steel	$\sigma \leq 1000$ N/ mm^2	P2F	100 - 140
			CG4	120 - 170
8		$\sigma > 1000$ N/ mm^2	P2F	60 - 90
			CG4	70 - 110
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic		
10			CG4	110 - 140
11		Austenitic	CG4	50 - 200 *
12	High Heat-Resistant Alloys		KM1	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4 CF3	100 - 140
			NC1 MC2	200 - 350
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4 CF3	140 - 180
			NC1 MC2	300 - 600
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4 CF3	120 - 160
			NC1 MC2	300 - 500
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4 CF3	100 - 140
			NC1 MC2	250 - 400
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4 CF3	100 - 160
			NC1 MC2	200 - 300
17	Titanium and Alloys		KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

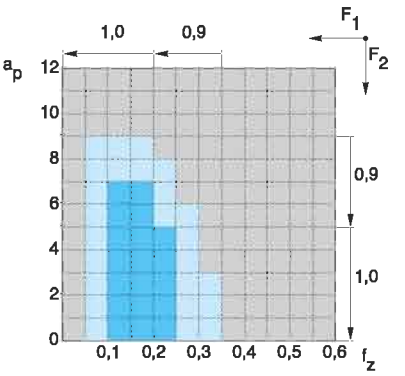
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

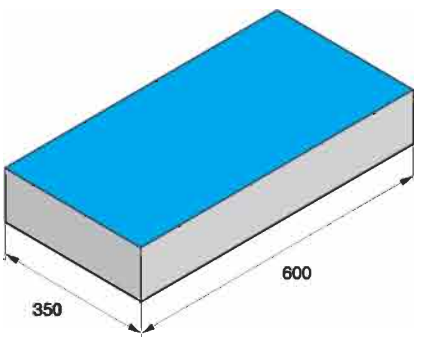
Indexable insert: SN.N 1204



Optimum range | Possible range

Machining Example

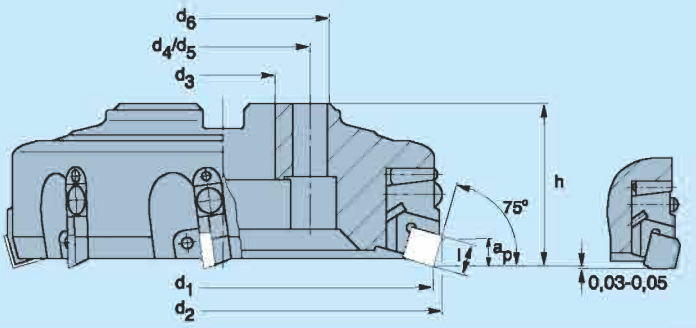
Workpiece:	Clamping Plate GG25 (Cutting Group 14,2)
Tool:	Face Mill 200 mm dia. 4.02012 R 252
Indexable insert:	SNKN 1204 ENTN
Cutting material:	NC1
Depth of cut a_p:	6 mm
Feed per tooth f_Z:	0,25 mm
Cutting speed v_c:	325 m/min
	(400 m/min x 0,9 x 0,9)
Feed rate v_f:	1550 mm/min



ALMASE SAZ - Face Mill

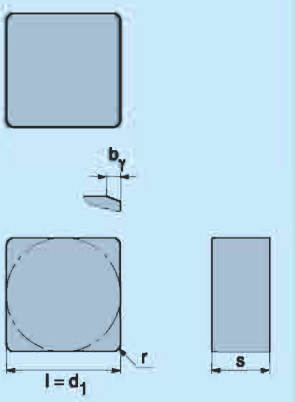
Approach angle 75°

- Wedge clamping and cassette with Ceramic Insert SNGN
- Negative rake angle



Insert

SNGN..



Ø d_1	RIGHT CODE	d_2	d_3 H7	d_4	d_5	d_6	h	a_{pmax}	z	Weight kg	Insert	Cassette Complete	Clamping Wedge Complete	Adjusting Wedge Complete	Screw driver	Tx	M_{An}** Nm
125	4·01206 R 253	131	40	–	–	90	63	9	6	4,25	SNGN 1207 ...	430·072	460·550	460·546	170·025	15	5
125	4·01208 R 253	131		–	–	90			8	4,00							
160	4·01608 R 253	166		66,7	–	100			8	6,55							
160	4·01610 R 253	166		66,7	–	100			10	10,50							
200	4·02010 R 253	206	60	101,6	–	130			12	12,90							
200	4·02012 R 253	206			–					10,50							
250	4·02512 R 253	256			–					18,20							
250	4·02516 R 253	256			–				16	14,20							
315	4·03116 R 253	321			177,8	225	80		16	35,00							
315	4·03120 R 253	321			177,8	225	80		20	31,00							

Insert

CODE		$l = d_1$	s	b_γ	r
SNGN 120704	MC2	12,7	7,94	0,2	0,4
SNGN 120708	MC2	12,7	7,94	0,2	0,8
SNGN 120712	MC2	12,7	7,94	0,2	1,2
SNGN 120716	MC2	12,7	7,94	0,2	1,6
SNGN 120720	MC2	12,7	7,94	0,2	2,0

** M_{An} = Clamping torque of clamping screw in Nm.
Larger diameters upon request.

Availability as current price list.
Ordering example:
1 off **4·01208 R 253**
10 off **SNGN120704 MC2**

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
13	Malleable Cast Iron	GTW/ GTS		
			MC2	200 -
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180		
			MC2	300 - 600
		14.2 GG25 - GG30 180 < HB < 220		
			MC2	300 - 500
		14.3 GG35 - GG40 HB > 220		
			MC2	250 - 400
15	Spheroidal Graphite Cast Iron	(GGG)		
			MC2	200 - 300

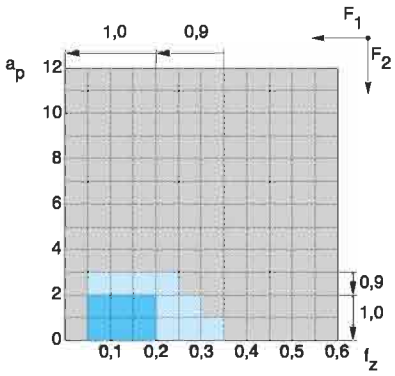
Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

Optimum range | Possible range

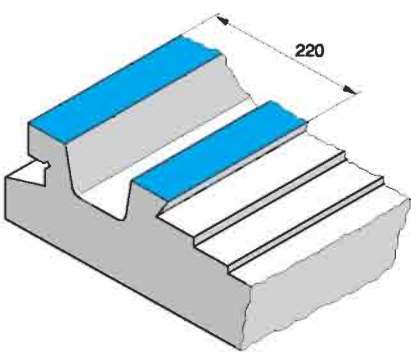
Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: SNGN 1207



Machining Example

Workpiece:	Lathe Bed CG25 (Cutting Group 14,2)
Tool:	Face Mill 250 mm dia. 4-02516 R 253
Indexable insert:	SNGN 120712
Cutting material:	MC2
Depth of cut a_p:	2 mm
Feed per tooth f_Z:	0,20 mm
Cutting speed v_c:	400 m/min (400 m/min x 1,0 x 1,0)
Feed rate v_f:	1630 mm/min

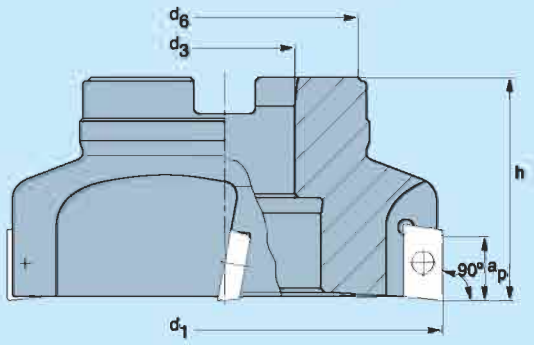


ALMASE SAZ - Shoulder Mill

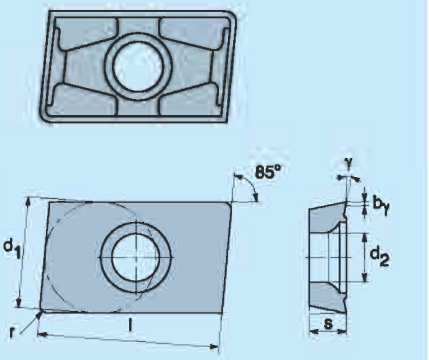
Approach angle 90°

Indexable Insert

- Screw clamping for Inserts APFX
- positive rake angle



APFX..



Ø d_1	RIGHT CODE	d_3 H7	d_6	h	a_{emax}	z	Weight kg	Insert	Clamping screw	Screw driver	Tx	M_{An}** Nm
50	4·00505 R 340	22	42	40	15	5	0,40	APFX 1604PD .R	191·916	170·025	15	4
63	4·00605 R 340	22	42	40		5	0,60					
80	4·00807 R 340	27	50	50		7	0,85					
100	4·01007 R 340	32	60	50		7	1,70					
125	4·01209 R 340	40	80	63		9	2,90					
160	4·01610 R 340	40	80	63		10	4,00					
25-40	see page 86											

	Insert [1] RIGHT CODE		l	s	r	d_1	d_2	b_γ	γ
	APFX 1604PD R	CF2	16,4	4,76	0,8	9,52	4,4	0,1	–
		CF3							
		CD2							
		P2F							
		GX							
		KM1							
	APFX 1604PD1R[1]	CG4	16,4	4,76	0,8	9,52	4,4	–	–
		P2F							
	APFX 1604PD2 R	CG4	16,4	4,76	0,8	9,52	4,4	0,1	10°
		P2F							
		PVA							
		KM1							
		KMF							
		HT5							
	APFX 1604PD8 R	CG4	16,4	4,76	0,8	9,52	4,4	–	15°
		P2F							
		PVA							

Characteristics and Applications

Type	Chip breaker form	Rake angle γ	Cutting edge	Range of application
...R		0°	Chip breaker, robust type	Standard type for steel and cast iron for rough and medium machining
...1R		0°	No Chip breaker, sharp edge	As type R, also suitable for finishing
...2R		10°	Chip breaker, Positive geometry	Standard type for steel and cast iron for medium machining
...8R		15°	Positive rake angle, sharp edge	Non-ferrous metals (Aluminium and Aluminium alloys) and stainless and acid-resistant steels. Under extremely unstable conditions (workpiece/machine) also suitable for general steel machining

1) For finishing

** M_{An} = Clamping torque of clamping screw in Nm.

Availability as current price list.

Ordering example:

1 off **4·00505 R 340**

10 off **APFX1804PD R CF2**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_C by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]	
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA GX P2F	150 - 190	
2			CG4 CD2 CF2	170 - 210	
			HT5 HT2	280 - 380	
3		$\sigma >$ 600 N/ mm^2	PVA GX P2F	130 - 170	
			CG4 CD2 CF2	140 - 190	
			HT5 HT2	260 - 360	
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA GX P2F	130 - 170	
5			CG4 CD2 CF2	140 - 190	
			HT5 HT2	280 - 360	
6		$\sigma >$ 900 N/ mm^2	PVA GX P2F	100 - 140	
			CG4 CD2 CF2	120 - 170	
			HT5 HT2	180 - 280	
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA GX P2F	100 - 140	
			CG4 CD2 CF2	120 - 170	
			HT5 HT2	170 - 270	
8		$\sigma >$ 1000 N/ mm^2	PVA GX P2F	60 - 90	
			CG4 CD2 CF2	70 - 110	
			HT5 HT2	160 - 260	
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	80 - 120	
10			CG4	110 - 140	
11		Austenitic	PVA KMF	50 - 190	*
			CG4	50 - 200	*
12	High Heat-Resistant Alloys		KMF	20 - 60	
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120	
			CG4 CF3	100 - 140	
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160	
			CG4 CF3	140 - 180	
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140	
			CG4 CF3	120 - 160	
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120	
			CG4 CF3	100 - 140	
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140	
			CG4 CF3	100 - 160	
17			HT5	200 - 300	
19	Titanium and Alloys		KMF KM1	20 - 70	
20	Non-Ferrous Metals		KM1	100 - 350	
	Aluminium Alloys		KM1	300 - 800	

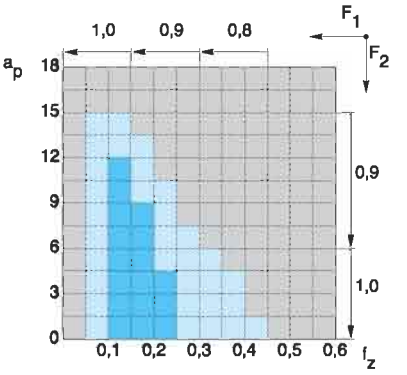
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

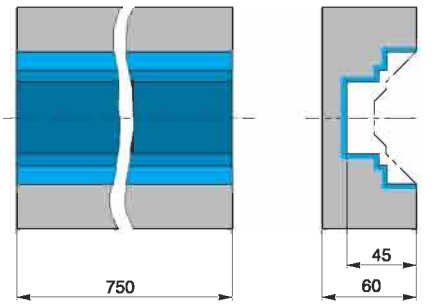
Indexable insert: APFX 1604



Optimum range | Possible range

Machining Example

Workpiece:	Cam Groove in Breechblock 100 MnCrW4 (cutting Group 6)
Tool:	Shoulder Mill 80 mm dia. 4-00805 R 340
Indexable insert:	APFX 1604 PD2R
Cutting material:	HT5
Depth of cut a_p:	6 mm
Feed per tooth f_z:	0,14 mm
Cutting speed v_c:	230 m/min
	(230 m/min x 1,0 x 1,0)
Feed rate v_f:	641 mm/min

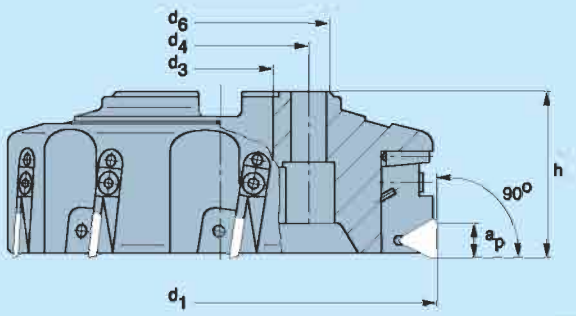


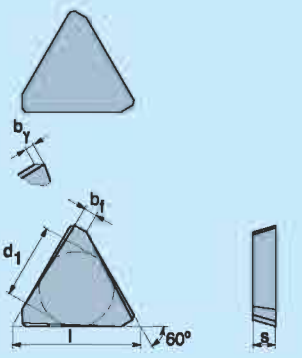
ALMASE SAZ - Shoulder Mill

Approach angle 90°

Indexable Insert

- Wedge clamping and cassette for TPKN Inserts
- Positive rake angle





Ø d_1	RIGHT CODE	d_3 H7	d_4	d_6	h	a_{pmax}	z	Weight kg	Insert	Cassette Complete	Clamping Wedge Complete	Adjusting Wedge Complete	Screw driver	Tx	M_{An}** Nm
80	**4-00806 R 371**	27	–	62	50	15	6	1,30	**TPKN 1603 PD R**	**430-057**	**460-548**	**460-547**	**170-025**	15	5
100	**4-01008 R 371**	32	–	80	50		8	1,80							
125	**4-01207 R 371**	40	–	90	63		7	3,40							
160	**4-01609 R 371**	40	66,7	100			9	5,70							
200	**4-02011 R 371**	60	101,6	130			11	8,90							
250	**4-02515 R 371**	60	101,6	130			15	12,50							
80	**4-00806 R 376**	27	–	62	50	20	6	1,40	**TPKN 2204 PD R**	**430-059**					
100	**4-01008 R 376**	32	–	80	50		8	1,90							
125	**4-01207 R 376**	40	–	90	63		7	3,50							
180	**4-01809 R 376**	40	66,7	100			9	5,80							
200	**4-02011 R 376**	60	101,6	130			11	9,00							
250	**4-02515 R 376**	60	101,6	130			15	12,60							

Insert RIGHT CODE		l	d_1	s	b_γ	b_f
TPKN 1603 PD R	CG4 P2F KM1	16,5	9,52	3,18	0,3	1,0
TPKN 1603 PDTR	NC1 HT2 HT5	16,5	9,52	3,18	0,05	1,0
TPKN 1603 PDSR	HT5	16,5	9,52	3,18	0,1	1,0
TPKN 2204 PD R	CF2 CG4 P2F GX KM1 HT2	22,0	12,7	4,76	0,4	1,4
TPKN 2204 PDTR	HT2 HT5	22,0	12,7	4,76	0,1	1,2

** M_{An} = Clamping torque of clamping screw in Nm.
Mills can be equipped with alternative insert sizes by changing the cassette.

Larger diameters upon request.

Availability as current price list.
Ordering example:
1 off **4-00806 R 371**
10 off **TPKN1603PD R CG4**

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (◀ Toughness / Wear Res. ▶)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	GX P2F	150 - 190
2			CG4 CF2	170 - 210
			HT5 HT2	280 - 360
3		$\sigma >$ 600 N/ mm^2	GX P2F	130 - 170
			CG4 CF2	140 - 190
			HT5 HT2	260 - 360
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	GX P2F	130 - 170
5			CG4 CF2	140 - 190
			HT5 HT2	280 - 360
6		$\sigma >$ 900 N/ mm^2	GX P2F	100 - 140
			CG4 CF2	120 - 170
			HT5 HT2	180 - 280
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	GX P2F	100 - 140
			CG4 CF2	120 - 170
			HT5 HT2	170 - 270
8		$\sigma >$ 1000 N/ mm^2	GX P2F	60 - 90
			CG4 CF2	70 - 110
			HT5 HT2	160 - 260
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	GX	80 - 120
10			CG4	110 - 140
11		Austenitic	GX	50 - 190 *
			CG4	50 - 200 *
12	High Heat-Resistant Alloys		KM1	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4	100 - 140
			NC1	200 - 350
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4	140 - 180
			NC1	300 - 600
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4	120 - 160
			NC1	300 - 500
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4	100 - 140
			NC1	250 - 400
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4	100 - 160
			HT2 NC1	200 - 300
17	Titanium and Alloys		KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

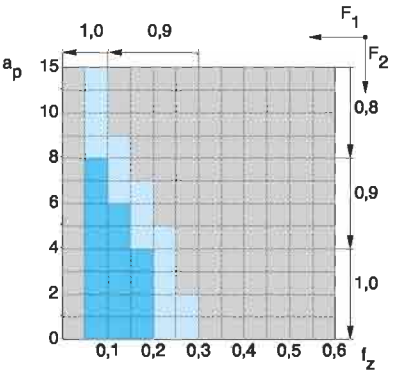
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

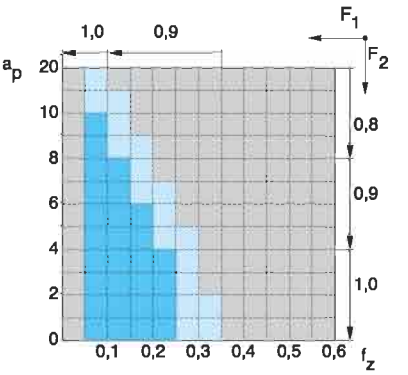
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: TPKN 1603



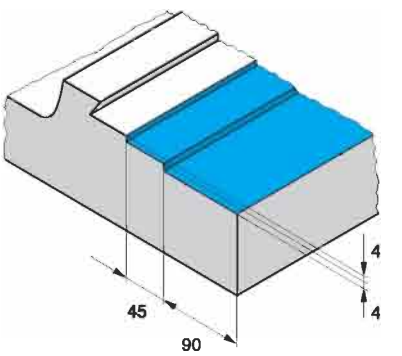
Indexable insert: TPKN 2204



Optimum range | Possible range

Machining Example

Workpiece:	Lathe Bed GG25 (Cutting Group 14.2)
Tool:	Shoulder Mill 125 mm dia. 4·01207 R 371
Indexable insert:	TPKN 1603 PDTR
Cutting material:	NC1
Depth of cut a_p:	4 mm
Feed per tooth f_z:	0,15 mm
Cutting speed v_c:	360 m/min (400 m/min x 0,9 x 1,0)
Feed rate v_f:	963 mm/min

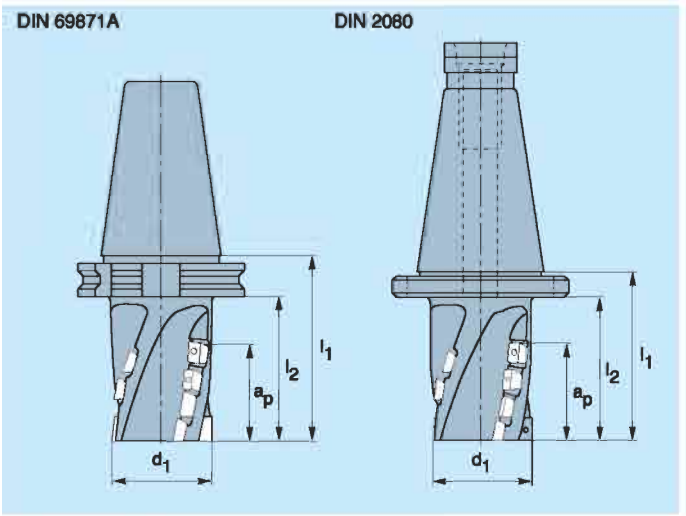


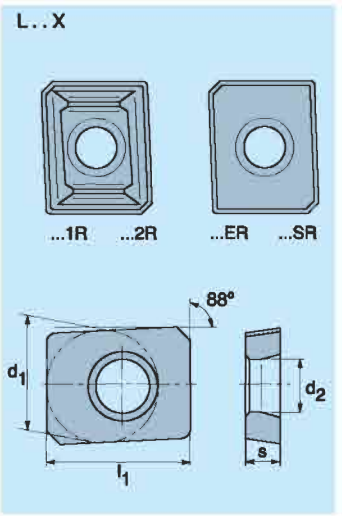
ALMASE SAZ - Hardness Comparison Table

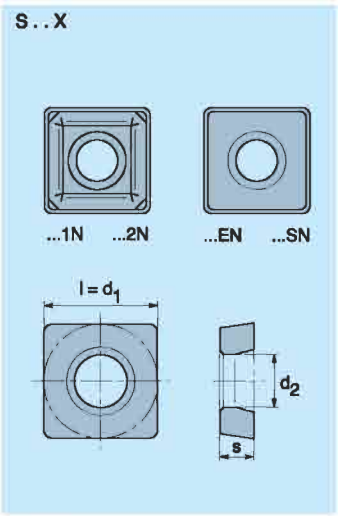
Tensile strength	Brinell hardness	Vickers hardness	Rockwell A hardness	Rockwell B hardness	Rockwell C hardness	Shore hardness	Tensile strength	Brinell hardness	Vickers hardness	Rockwell A hardness	Rockwell B hardness	Rockwell C hardness	Shore hardness
N/mm²	HB	HV	HRA	HRB	HRC	SHC	N/mm²	HB	HV	HRA	HRB	HRC	SHC
255	76.0	80					1190	352	370	69.2		37.7	47
270	80.7	85		41.0			1220	361	380	69.8		38.8	48
285	86	90		48.0			1255	371	390	70.3		39.8	49
320	95	100		56.2			1290	380	400	70.8		40.8	50
350	105	110		62.3			1320	390	410	71.4		41.8	51
385	114	120		66.7			1350	399	420	71.8		42.7	53
415	124	130		71.2			1385	409	430	72.3		43.6	54
450	133	140		75.0			1420	418	440	73		44.5	55
480	143	150		78.7			1455	428	450	73.3		45.3	56
510	152	160		81.7			1485	437	460	73.6		46.1	57
545	162	170		85.0			1520	447	470	74.1		46.9	58
575	171	180		87.1			1555	456	480	74.5		47.7	59
610	181	190		89.5			1595	466	490	74.9		48.4	60
640	190	200		91.5			1630	475	500	75.3		49.1	61
675	199	210		93.5			1665	485	510	75.7		49.8	62
705	209	220		95.0		28	1700	494	520	76.1		50.5	63
740	219	230		96.7		29	1740	504	530	76.4		51.1	64
770	228	240	60.7	98.1	20.3	30	1775	513	540	76.7		51.7	65
800	238	250	61.6	99.5	22.2	31	1810	523	550	77		52.3	66
820	242	255	62.0		23.1	34	1845	532	560	77.4		53.0	68
850	252	265	62.7	101	24.8	35	1880	542	570	77.8		53.6	69
880	261	275	63.5	102	26.4	37	1920	551	580	78		54.1	70
900	266	280	63.8	104	27.1	38	1955	561	590	78.4		54.7	71
930	276	290	64.5	105	28.5	39	1995	570	600	78.6		55.2	72
950	280	295	64.8		29.2	40	2030	580	610	78.9		55.7	73
995	295	310	65.8		31.0	41	2070	589	620	79.2		56.3	74
1030	304	320	66.4		32.2	42	2100	600	630	79.5		56.8	75
1060	314	330	67.0		33.3	43	2145	608	640	79.8		57.3	75
1095	323	340	67.6		34.4	44	2180	618	650	80		57.8	76
1125	333	350	68.1		35.5	45	2450		700	81.3		59.3	79
1155	342	360	68.7		36.6	46	3290		940	85.6		68	

ALMASE SAZ - Roughing Mill

Indexable Insert







DIN 69871 A

Ø d_1	RIGHT CODE	a_{pmax}	l_1	l_2	Weight kg	Steep taper DIN 69871 A	U / S*	z	Insert	z	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
32	4-36832 R 404	42	90	70,9	1,40	40	1 / 2	1	LD . X1503 . . .	5	SD . X0903 . . .	192-881	170-025	15	4
40	4-36840 R 404	48	95	75,9	1,60	40	2 / 4	2	LD . X1503 . . .	12	SD . X0903 . . .	192-881	170.025	15	4
50	4-36850 R 504	57	110	90,9	3,80	50	↓	↓	LP . X1504 . . .	10	SP . X1204 . . .	192-880	170.026	20	6
63	4-36863 R 504	66	115	95,9	4,50	50	↓	↓	LP . X1504 . . .	12	SP . X1204 . . .	192-880	170.026	20	6

DIN 2080

Ø d_1	RIGHT CODE	a_{pmax}	l_1	l_2	Weight kg	Steep taper DIN 69871 A	U / S*	z	Insert	z	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
32	4-39800 R 004	42	90	78,4	1,50	40	1 / 2	1	LD . X1503 . . .	5	SD . X0903 . . .	192-881	170-025	15	4
40	4-39800 R 005	48	95	83,4	1,70	40	2 / 4	2	LD . X1503 . . .	12	SD . X0903 . . .	192-881	170.025	15	4
50	4-39800 R 006	57	110	84,8	3,90	50	↓	↓	LP . X1504 . . .	10	SP . X1204 . . .	192-880	170.026	20	6
63	4-39800 R 007	66	115	89,8	4,60	50	↓	↓	LP . X1504 . . .	12	SP . X1204 . . .	192-880	170.026	20	6

Insert RIGHT CODE		l_1	s	d_1	d_2	Insert CODE		$l=d_1$	s	d_2	Quality
LDNX1503081R	CG4 P2F PVA	15	3,18	9,52	4,5	SDNX0903081N	CG4 P2F PVA	9,52	3,18	4,5	
LDNX1503082R	KM1	15	3,18	9,52	4,5	SDNX0903082N	KM1	9,52	3,18	4,5	As sintered
LPNX1504AP1R	CG4 P2F PVA	15,88	4,76	12,7	5,7	SPNX1204081N	CG4 P2F PVA	12,7	4,76	5,7	with chip breaker
LPNX1504AP2R	KM1	15,88	4,76	12,7	5,7	SPNX1204082N	KM1	12,7	4,76	5,7	
LDHX1503081R	CG4 P2F PVA HT5	15	3,18	9,52	4,5	SDHX0903081N	CG4 P2F PVA HT5	9,52	3,18	4,5	
LDHX1503082R	KM1	15	3,18	9,52	4,5	SDHX0903082N	KM1	9,52	3,18	4,5	Peripheral ground
LPHX1504AP1R	CG4 P2F PVA HT5	15,88	4,76	12,7	5,7	SPHX1204081N	CG4 P2F PVA HT5	12,7	4,76	5,7	with chip breaker
LPHX1504AP2R	KM1	15,88	4,76	12,7	5,7	SPHX1204082N	KM1	12,7	4,76	5,7	
LDNX150308ER	KM1	15	3,18	9,52	4,5	SDNX090308EN	KM1	9,52	3,18	4,5	
LDNX150308SR	P2F PVA	15	3,18	9,52	4,5	SDNX090308SN	P2F PVA	9,52	3,18	4,5	
LPNX1504APER	KM1	15,88	4,76	12,7	5,7	SPNX120408EN	KM1	12,7	4,76	5,7	As sintered
LPNX1504APSR	P2F PVA	15,88	4,76	12,7	5,7	SPNX120408SN	P2F PVA	12,7	4,76	5,7	without chip breaker

U/S = Effective cutting edges at periphery (U) and face (S)

** M_{An} = Clamping torque of clamping screw in Nm.

Availability as current price list.

Ordering example:

1 off **4-36832 R 404**

10 off **LDNX 1503081R** CG4

10 off **SDNX 0903081N** CG4

Table 1

Guidelines for cutting speed V_c by Material Group

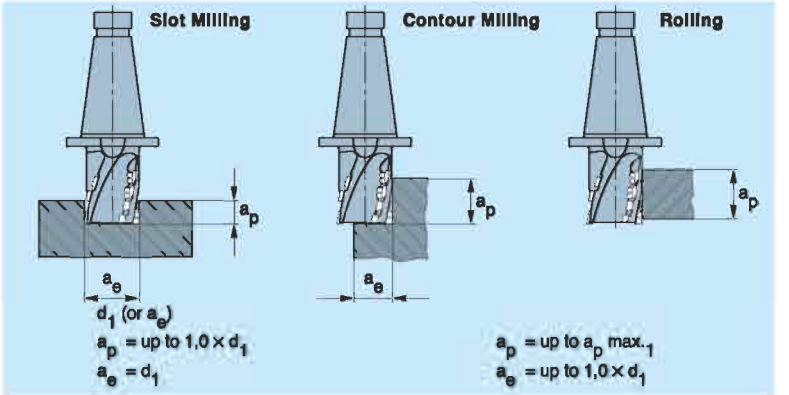
ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material	Cutting Speed v_c [m/min]	Average Chip Tickness h_m (mm)
			◀ Toughness — Wear Res. ▶		
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	140 - 170	0,1
2			CG4	160 - 190	
			HT5	160 - 210	
3		$\sigma >$ 600 N/ mm^2	PVA P2F	120 - 150	
			CG4	130 - 170	
			HT5	130 - 190	
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	120 - 150	
5			CG4	130 - 170	
			HT5	130 - 190	
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120	
			CG4	110 - 150	
			HT5	110 - 170	
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120	0,07
			CG4	110 - 150	
			HT5	110 - 170	
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	50 - 80	
			CG4	60 - 100	
			HT5	60 - 110	
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	80 - 120	0,1
10			CG4	100 - 170	
11		Austenitic	PVA	50 - 180 *	
			CG4	60 - 200 *	
12	High Heat-Resistant Alloys		KM1	20 - 60	
13	Malleable Cast Iron	GTW/ GTS	KM1	60 - 100	
			CG4	80 - 120	
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	100 - 140	
			CG4	120 - 160	
		14.2 GG25 - GG30 180 < HB < 220	KM1	80 - 120	
			CG4	100 - 140	
		14.3 GG35 - GG40 HB > 220	KM1	60 - 100	
			CG4	80 - 120	
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	60 - 120	
			CG4	80 - 140	
17	Titanium and Alloys		KM1	20 - 70	
19	Non-Ferrous Metals		KM1	100 - 350	
20	Aluminium Alloys		KM1	300 - 800	

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c$ (from Table 1) × F(from Table 3)

How to select possible depth of cut a_p and width of cut a_e



Feed per tooth dependent on width of cut a_e and average chip thickness h_m (from Table 1)

Table 2/1

d_1	Ø 32		Ø 40	
h_m	0,07	0,10	0,07	0,10
a_e	f_z			
10	0,13	0,19	0,15	0,21
20	0,10	0,15	0,11	0,16
32	0,10	0,15	0,10	0,14
40			0,10	0,14
50				
63				

Table 2/2

d_1	Ø 50		Ø 63	
h_m	0,07	0,10	0,07	0,10
a_e	f_z			
10	0,16	0,23	0,18	0,26
20	0,12	0,17	0,13	0,19
32	0,10	0,15	0,11	0,16
40	0,10	0,14	0,10	0,15
50	0,10	0,14	0,10	0,14
63			0,10	0,14

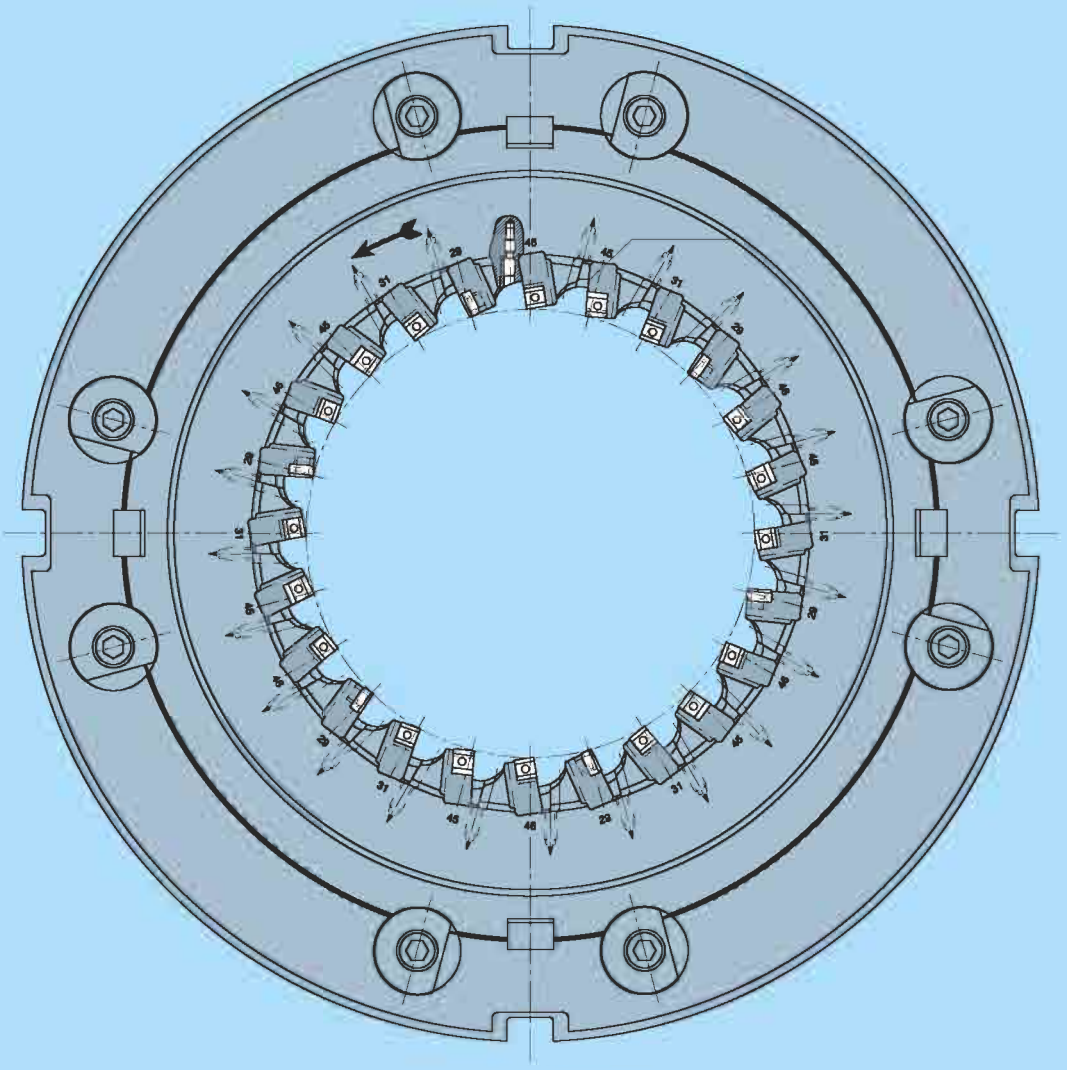
Correction factor for selected cutting speed v_c (from Table 1) for depth of cut a_p

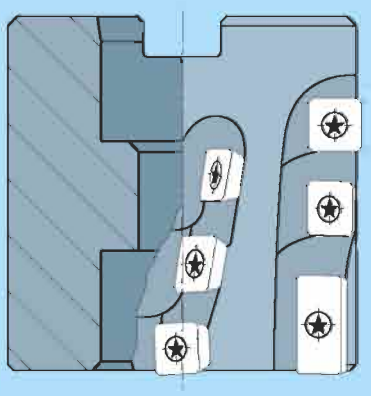
Table 3

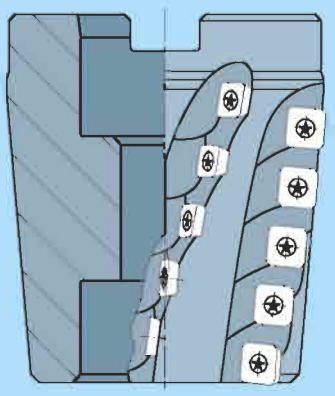
a_p	Correction Factor F
1,25 × d_1	0,7
1,0 × d_1	0,8
0,75 × d_1	0,9
0,5 × d_1	1,0
0,25 × d_1	1,1

ALMASE SAZ - Special Tools

- Internal Mill (Vortex Mill)
  for machining of main and lift bearing trunnions.
- Cassettes with cutting edge arranged tangentially set on a diameter.





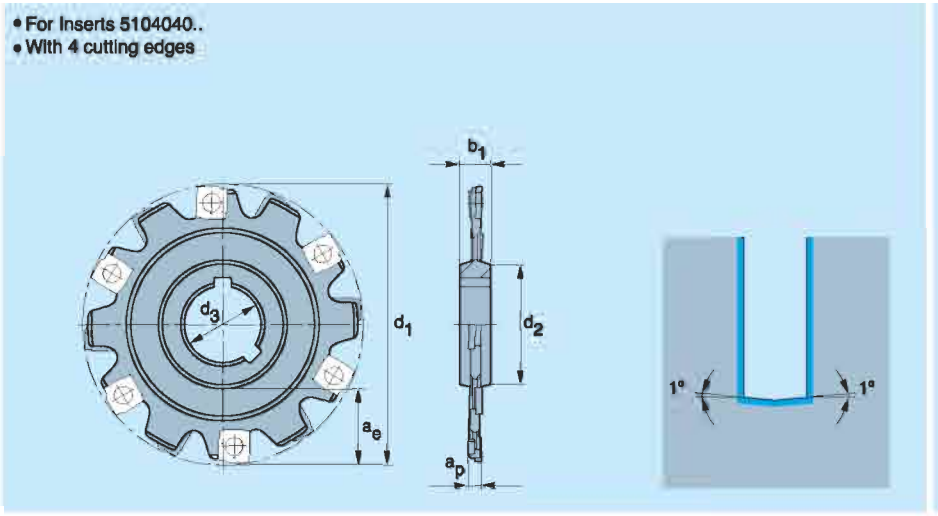


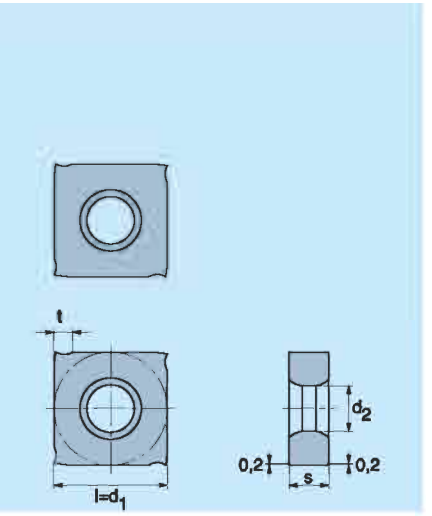
ALMASE SAZ - Disc Mill

Slitting Mill

Indexable Insert

- For Inserts 5104040..
- With 4 cutting edges





Ø d_1	RIGHT CODE	d_2	d_3 H7	b_1	a_{pmax}	a_{emax}	eff. Cutting Edges	Weight kg	z	Insert	Clamping Screw	Screw driver	Tx	M_{An}** Nm
80	4·96082-204	45	27	12	4	15	5	0,30	10	5104040..8E	192·529	170·023	7	1
	4·96082-206				6		4	0,30	8	5104040..0E	192·531	170·025	15	3
	4·96082-208				8		2	0,30	6	5104040..0E	192·531	170·025	15	3
100	4·96102-204				4	25	6	0,40	12	5104040..8E	192·529	170·023	7	1
	4·96102-205				5		6	0,40	12	5104040..9E	192·530	170·023	7	1
	4·96102-206				6		5	0,40	10	5104040..0E	192·531	170·025	15	3
	4·96102-207				7		3	0,40	9	5104040..0E				
	4·96102-208				8		3	0,40	9	5104040..0E				
	4·96102-210				10		5	0,70	10	5104040..1E	192·532			
125	4·96124-204	58	40		4	30	7	0,50	14	5104040..8E	192·529	170·023	7	1
	4·96124-205				5		7	0,60	14	5104040..9E	192·530	170·023	7	1
	4·96124-206				6		6	0,60	12	5104040..0E	192·531	170·025	15	3
	4·96124-208				8		4	0,70		5104040..0E	192·531			
	4·96124-210				10		6	0,80		5104040..1E	192·532			
	4·96124-212				12		4	0,90		5104040..1E	192·532			
160	4·96164-204	68			4	44	9	0,90	18	5104040..8E	192·529	170·023	7	1
	4·96184-205				5		9	0,90	18	5104040..9E	192·530	170·023	7	1
	4·96164-206				6		8	1,10	16	5104040..0E	192·531	170·025	15	3
	4·96164-208				8		5	1,20	15	5104040..0E	192·531			
	4·96184-210				10		8	1,40	16	5104040..1E	192·532			
	4·96164-212				12		5	1,80	15	5104040..1E	192·532			
	4·96164-214			14	14		5	1,80	15	5104040..1E	192·532			
200	4·96205-206	72	50	12	6	62	9	1,60	18	5104040..0E	192·531			
	4·96205-208				8		6	1,80		5104040..0E	192·531			
	4·96205-210				10		9	1,90		5104040..1E	192·532			
	4·96205-212				12		6	2,30		5104040..1E	192·532			
	4·96205-214			14	14		6	2,30		5104040..1E	192·532			
250	4·96255-206			12	6	86	12	4,20	24	5104040..0E	192·531			
	4·96255-208				8		8	4,50		5104040..0E	192·531			
	4·96255-210				10		12	4,80		5104040..1E	192·532			
	4·96255-212				12		8	5,00		5104040..1E	192·532			
	4·96255-214			14	14		8	5,20		5104040..1E	192·532			

Insert CODE		$l = d_1$	s	d_2	t
5104040378E	CF2	11,0	2,3	4,4	2,3
	CD2				
	CG4				
	P2F				
	KM1				
5104040379E	CF2	11,0	2,7	4,4	
	CD2				
	CG4				
	P2F				
	KM1				
5104040380E	CF2	12,7	3,2	5,0	
	CD2				
	CG4				
	P2F				
	KM1				
5104040381E	CF2	12,7	5,4	5,0	
	CD2				
	CG4				
	P2F				
	KM1				

Insert CODE		$l = d_1$	s	d_2	t
5104040428E	CD4	11,0	2,3	4,4	3,2
	CG4				
	PVA				
5104040429E	CD4	11,0	2,7	4,4	
	CG4				
	PVA				
5104040430E	CD4	12,7	3,2	5,0	
	CG4				
	PVA				
5104040431E	CD4	12,7	5,4	5,0	
	CG4				
	PVA				
5104040438E	KM1	11,0	2,3	4,4	
5104040439E	KM1	11,0	2,7	4,4	
5104040440E	KM1	12,7	3,2	5,0	
5104040441E	KM1	12,7	5,4	5,0	

** M_{An} = Clamping torque of clamping screw in Nm.

Larger diameters upon request.

Availability as current price list.

Ordering example:

1 off **4·96082-204**

10 off **5104040378E CG4**

Table 1
Guidelines for cutting speed V_c by Material Group

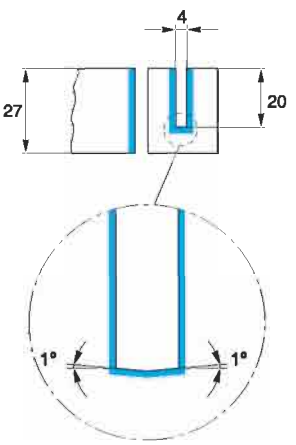
ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material ◀ Toughness	Cutting Speed v_c [m/min] Wear Res. ▶	Average Chip Tickness h_m (mm)
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	140 - 200	0,10
2			CG4 CD4 CD2 CF2	180 - 220	
3		$\sigma >$ 600 N/ mm^2	PVA P2F	140 - 180	
			CG4 CD4 CD2 CF2	150 - 200	
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	140 - 180	
5			CG4 CD4 CD2 CF2	150 - 200	
6		$\sigma >$ 900 N/ mm^2	PVA P2F	110 - 150	
			CG4 CD4 CD2 CF2	130 - 180	
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	110 - 150	
			CG4 CD4 CD2 CF2	130 - 180	
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100	0,07
			CG4 CD4 CD2 CF2	80 - 120	
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	100 - 150	
10			CG4 CD4	120 - 180	
11		Austenitic	PVA	50 - 200 *	
			CG4 CD4	60 - 210 *	
12	High Heat-Resistant Alloys		KM1	20 - 60	
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120	
			CG4	100 - 140	
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160	0,10
			CG4	140 - 180	
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140	
			CG4	120 - 160	
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120	
			CG4	100 - 140	
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140	
			CG4	100 - 160	
17	Titanium and Alloys		KM1	20 - 70	
19	Non-Ferrous Metals		KM1	100 - 350	
20	Aluminium Alloys		KM1	300 - 800	

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

Machining Example

Workpiece:	Clamping Piece C45W (Cutting Gr. 3)
Tool:	Slitting Mill 125 mm dia. 4mm wide 4-96124.204
Indexable insert:	5104040428E
Cutting material:	CG4
Width of cut a_p:	4mm
Slot depth a_e:	20 mm (Slot Milling) 27 mm (Slitting)
Feed per tooth f_z:	0,26 mm 0,22 mm
Cutting speed v_c:	160 m/min
Feed rate v_f:	740 m/min 630 m/min

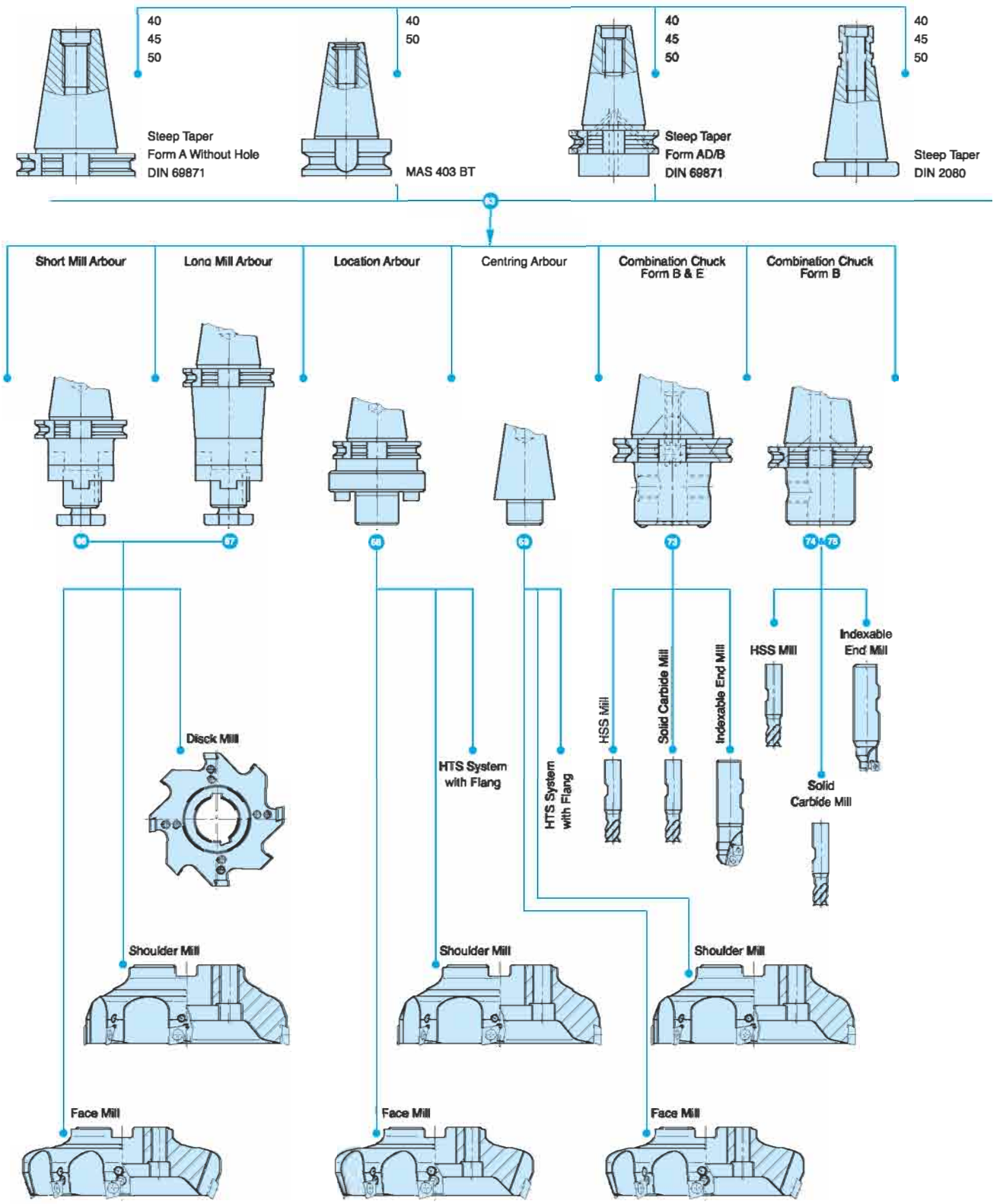


Feed per tooth f_z for slot depth a_e of the mill dia. and the average chip thickness h_m (from Table 1)

Table 2

d_1	Ø 80 mm		Ø 100 mm		Ø 125 mm		Ø 160 mm		Ø 200 mm		Ø 250 mm	
h_m	0,07	0,10	0,07	0,10	0,07	0,10	0,07	0,10	0,07	0,10	0,07	0,10
a_e	f_z											
10	0,20	0,29	0,23	0,32	0,25	0,36	0,28	0,40	0,32	0,45	0,35	0,50
20	0,15	0,21	0,16	0,23	0,18	0,26	0,20	0,29	0,23	0,32	0,25	0,36
30			0,14	0,19	0,15	0,21	0,17	0,24	0,19	0,27	0,21	0,29
40							0,15	0,21	0,16	0,23	0,18	0,26
50							0,13	0,19	0,15	0,21	0,16	0,23
60									0,14	0,19	0,15	0,21
70									0,13	0,18	0,14	0,20
80											0,13	0,19
90											0,12	0,18

ALMASE SAZ - Tool Tree



● Page number

ALMASE SAZ - Indexable Insert End Mills

ALMASE SAZ Slot Mill

Page 46 to 51

Slot Mill, long edge	25 - 40 mm diameter
Single row	Insert APFX
Slot Mill, Short edge	12 - 40 mm diameter
Single row	Insert CCGX
Slot Mill, long edge	20 - 25 mm diameter
multi-row	Insert CCGX

ALMASE SAZ Pocket Mills

Page 52 to 55

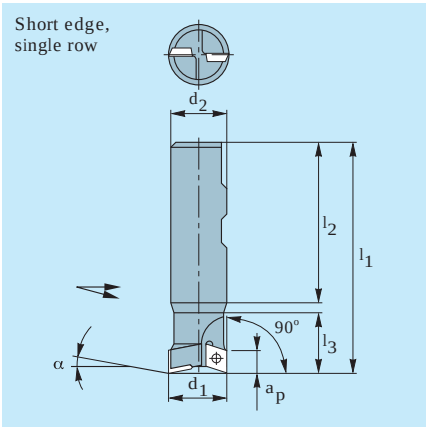
Pocket Mill	12 - 40 mm diameter
	Insert C .GX
	XCGX
	SPGX
	APFX
Pocket Mill	18 - 26 mm diameter
	Insert SPGX

ALMASE SAZ Chamfer and Radius Mill

Page 56 to 61

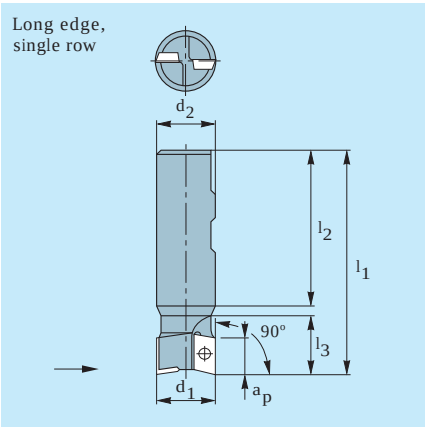
Chamfer Mill 45°	16 - 32 mm diameter
	Insert SPGX
Radius Mill	25 - 40 mm diameter
	Insert RPHT
Copy Mill	16 - 32 mm diameter
	Insert 510...
	SPGX

Slot Mill (page 88)



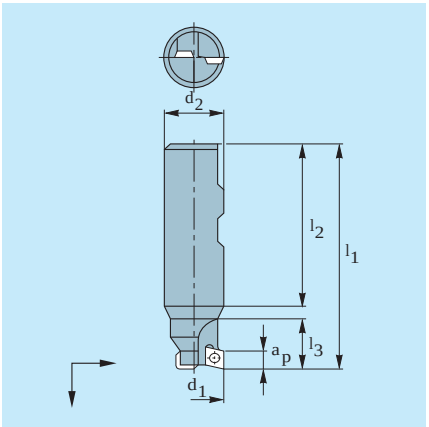
4·30025 R 250 25 mm dia.
Insert CCGX09T308R
Cutting material: CG4
v_c: 125 m/min (125 m/min x 1 x 1)
f_z: 0,10 mm
a_p: 3 mm
v_f: 318 mm/min
n: 1592 rev./min

Slot Mill (page 86)



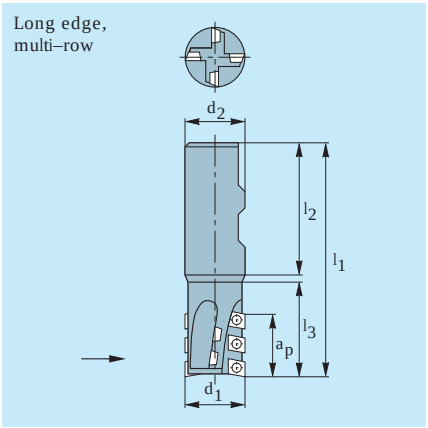
4·30125 R 250 25 mm dia.
Insert APFX1604PD2R
Cutting material: CG4
v_c: 113 m/min (125 m/min x 1,0 x 0,9)
f_z: 0,10 mm
a_p: 9 mm
v_f: 288 mm/min
n: 1439 rev./min

Pocket Mill (page 92)



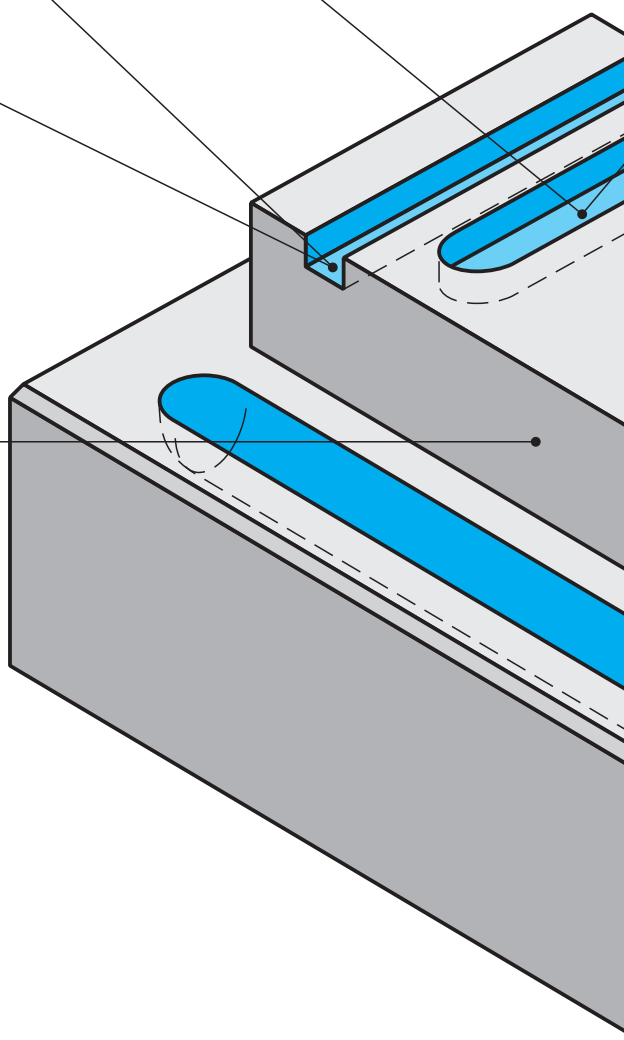
4·31416 R 200 16 mm dia.
Insert XCGX060204R
SPGX0602AP
Cutting material: CG4
v_c: 113 m/min (125 m/min x 1,0 x 0,9)
f_z: 0,10 mm
a_p: 4 mm
v_f: 225 mm/min
n: 2248 rev./min

Slot Mill (page 90)



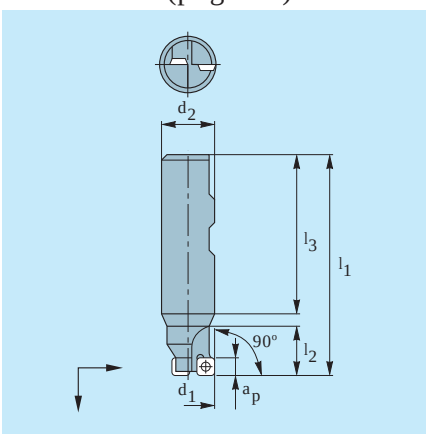
4·32025 R 250 25 mm dia.
Insert CCGX060304TR
Cutting material: CG4
v_c: 100 m/min (110 m/min x 0,9)
f_z: 0,15 mm
a_p: 20 mm
a_e: 4 mm
v_f: 382 mm/min
n: 1273 rev./min

Sealing–Ring Groove Mill (page 102)



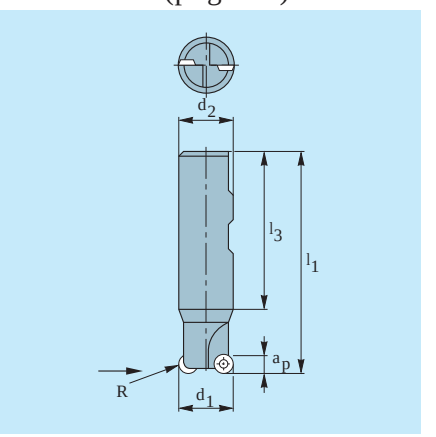
ALMASE SAZ - Indexable Insert End Mills – Machining Examples

Pocket Mill (page 94)



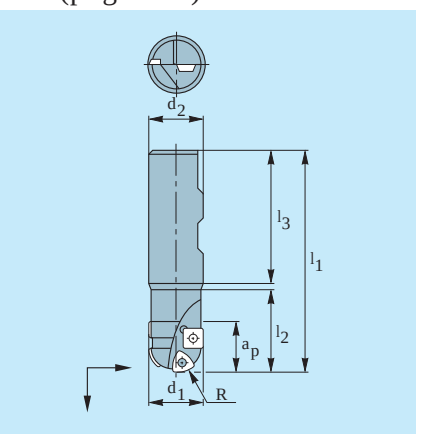
4·31226 R 250	26 mm dia.
Insert	SPGX0903AP
Cutting material:	CG4
v_c:	113 m/min (125 m/min x 1 x 0,9)
f_z:	0,10 mm
a_p:	6 mm
v_f:	138 mm/min
n:	1383 rev./min

Radius Mill (page 98)



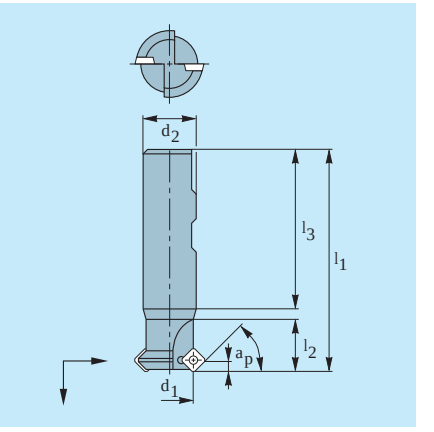
4·30332 R 250	⌀32 mm dia.
Insert	RPHT10T3MOEN
Cutting material:	CG4
v_c:	113 m/min (125 m/min x 1,0 x 0,9)
f_z:	0,15 mm
a_p:	4 mm
v_f:	506 mm/min
n:	1124 rev./min

Mill (page 100)



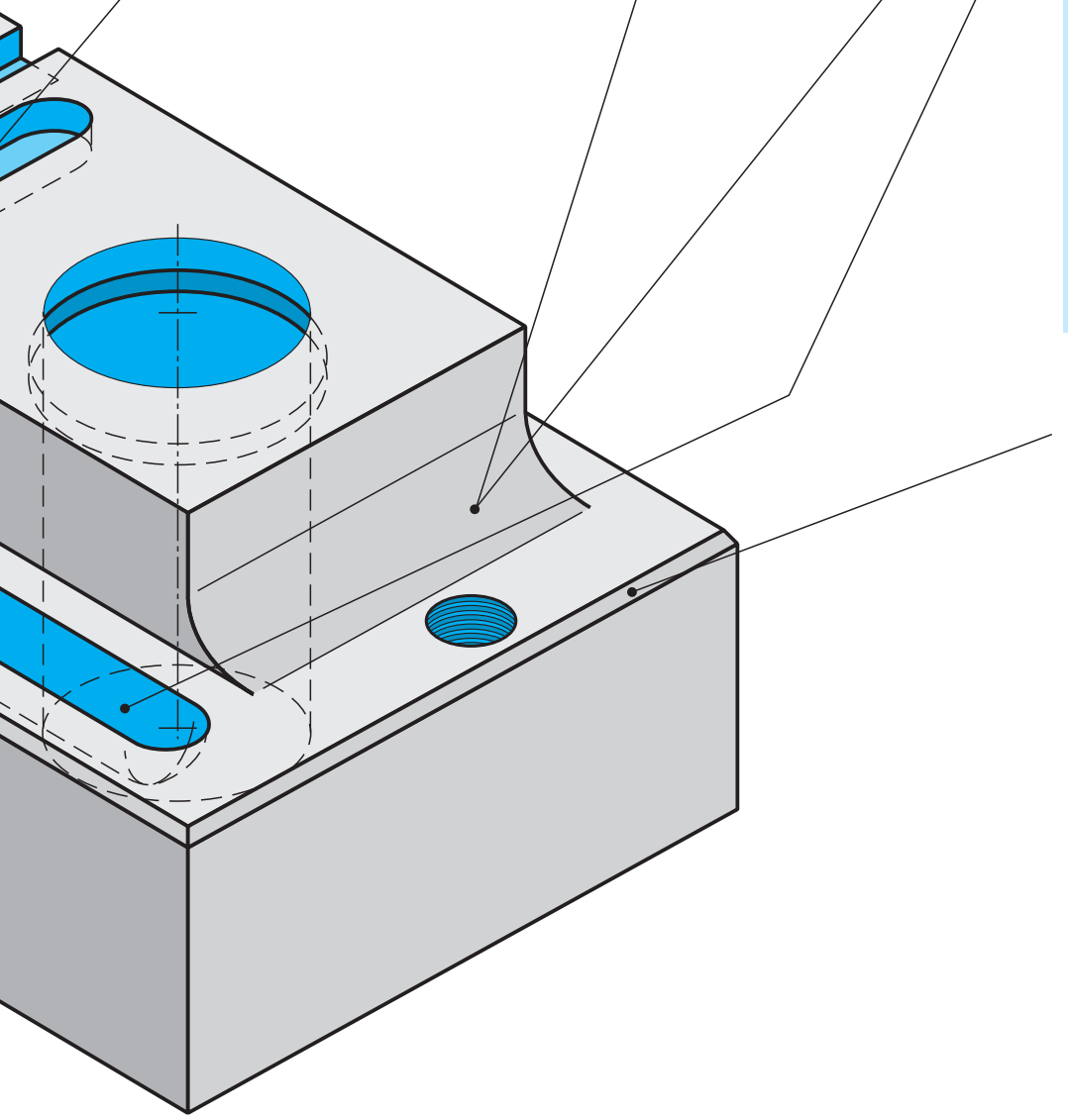
4·34725 R 250	25 mm dia.
Insert	5104080024E
	SPGX0903AP
Cutting material:	CG4
v_c:	113 m/min (125 m/min x 1,0 x 0,9)
f_z:	0,15 mm
a_p:	15 mm
v_f:	216 mm/min
n:	1439 rev./min

Chamfer Mill (page 96)



4·33225 R 250	25 mm dia.
Insert	SPGX0903AP
Cutting material:	CG4
v_c:	188 m/min (125 m/min x 1,5)
f_z:	0,26 mm
a_p:	5 mm
v_f:	1867 mm/min
n:	2394 rev./min

Thread Mill (page 104)

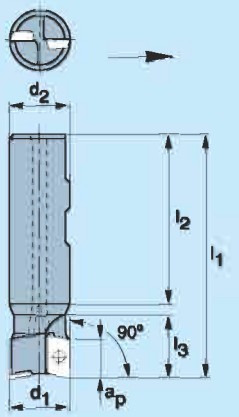


ALMASE SAZ - Indexable Insert – End Mill

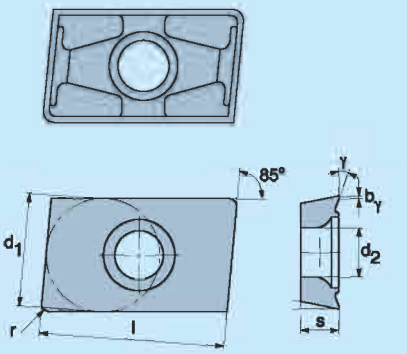
Slot Mill

Indexable Insert

• Long edge – single row with coolant channel



APFX..



Cylindrical Shank DIN 1835-B

Ø d_1	RIGHT CODE	d_{2h6}	l_1	l_2	l_3	a_{pmax}	z	Insert	Clamping screw	Screw driver	Tx	M_{An}** Nm
25	**4-30125 R 250**	25	100	70	29	15	2	APFX 1604PD R	**191-916**	**170-025**	15	4
32	**4-30132 R 320**	32	110	75	34		**3**					
40	**4-30140 R 320**	32	115	70	44		4					
25	**4-30125 R 256**	25	100	70	29		**2**					
32	**4-30132 R 326**	32	110	75	34		**3**					
40	**4-30140 R 326**	32	115	70	44		**4**					

Insert

RIGHT CODE		l	s	r	d_1	d_2	b_γ	γ
APFX 1604PD R	CF2	16,4	4,76	0,8	9,52	4,4	0,1	–
	CF3							
	CD2							
	P2F							
	GX							
	KM1							
APFX 1604PD1R[1)]	**CG4**	16,4	4,76	0,8	9,52	4,4	–	–
	P2F							
APFX 1604PD2 R	**CG4**	16,4	4,76	0,8	9,52	4,4	0,1	10°
	P2F							
	PVA							
	KM1							
	KMF							
	HT5							
APFX 1604PD8 R	**CG4**	16,4	4,76	0,8	9,52	4,4	–	15°
	P2F							
	PVA							
	KM1							
	HT2							
	HT5							

1) For finishing

** M_{An} = clamping torque of clamping screw in Nm.

Availability as current price list.

Ordering example:
1 off **4-30125 R 250**
10 off **APFX1604PD R CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA GX P2F	130 - 160
2			CG4 CD2 CF2	150 - 180
			HT5 HT2	160 - 250
3		$\sigma >$ 600 N/ mm^2	PVA GX P2F	110 - 140
			CG4 CD2 CF2	130 - 160
			HT5 HT2	140 - 220
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA GX P2F	110 - 140
5			CG4 CD2 CF2	130 - 160
			HT5 HT2	140 - 220
6		$\sigma >$ 900 N/ mm^2	PVA GX P2F	90 - 120
			CG4 CD2 CF2	110 - 140
			HT5 HT2	120 - 180
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA GX P2F	90 - 120
			CG4 CD2 CF2	110 - 140
			HT5 HT2	120 - 180
8		$\sigma >$ 1000 N/ mm^2	PVA GX P2F	70 - 100
			CG4 CD2 CF2	90 - 120
			HT5 HT2	100 - 160
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4	100 - 180
			PVA KMF	50 - 190 *
11		Austenitic	CG4	60 - 210 *
12	High Heat-Resistant Alloys		KMF	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4 CF3	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4 CF3	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4 CF3	120 - 160
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4 CF3	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4 CF3	100 - 160
			HT5	140 - 220
17	Titanium and Alloys		KMF KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

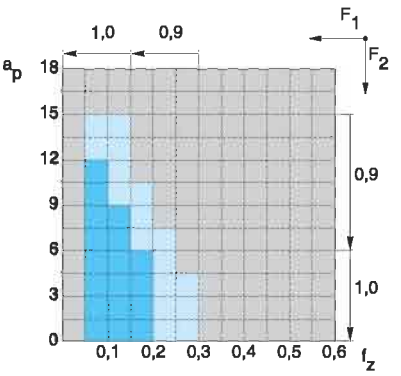
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\,prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: APFX 1604



Optimum range | Possible range

Characteristics and Applications

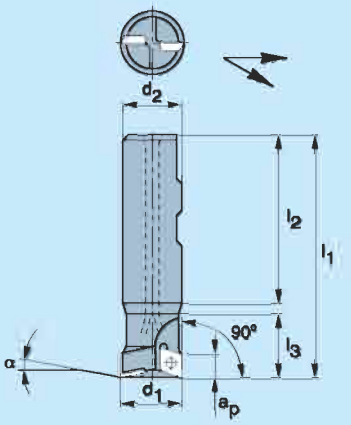
Type	Chip breaker form	Rake angle γ	Cutting edge	Range of application
...R		0°	Chip breaker, robust type	Standard type for steel and cast iron for rough and medium machining
...1R		0°	No Chip breaker, sharp edge	As type R, also suitable for finishing
...2R		10°	Chip breaker, Positive geometry	Standard type for steel and cast iron for medium machining
...8R		15°	Positive rake angle, sharp edge	Non-ferrous metals (Aluminium and Aluminium alloys) and stainless and acid-resistant steels. Under extremely unstable conditions (workpiece/machine) also suitable for general steel machining

ALMASE SAZ - Indexable Insert – End Mill

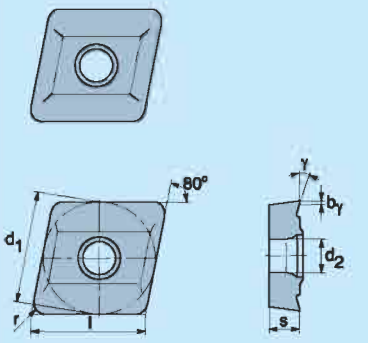
Slot Mill (also for ramping)

Indexable Insert

• Short edge – single row with coolant channel



CCGX..



Cylindrical Shank DIN 1835 From B

Ø d_1	RIGHT CODE	d_{2h6}	l_1	l_2	l_3	a_{pmax}	α°	z	Insert	Clamping screw	Screw driver	Tx	M_{An}** Nm
12	**4·30012 R 160**	16	80	55	16	5,5	9	1	**CCGX 060....**	**192·416**	**170·023**	**7**	1
16	**4·30016 R 200**	20	90	60	21	↓	6	2	↓	↓	↓	↓	↓
20	**4·30020 R 250**	25	105	75	25	↓	5	3	↓	↓	↓	↓	↓
25	**4·30025 R 250**	25	110	80	29	8,5	6	2	**CCGX 09....**	**191·924**	**170·024**	**9**	2
32	**4·30032 R 320**	32	125	85	39	↓	5	3	↓	↓	↓	↓	↓
40	**4·30040 R 320**	32	125	85	39	↓	3	4	↓	↓	↓	↓	↓

Insert

CODE		l	s	r	d_1	d_2	b_γ	γ
CCGX 060204 N	CF2	6,4	2,38	0,4	6,35	2,5	0,15	–
	CG4							
	P2F							
	PVA							
	KM1							
	HT5							
CCGX 060302 1R	CD4	6,64	3,18	0,2	6,54	2,5	–	12 °
	CG4							
	KMF							
	HT5							
CCGX 060302 2R	CD4	6,64	3,18	0,2	6,54	2,5	–	30°
	CG4							
	KM1							
CCGX 09T308 1R	CF2	9,7	3,97	0,8	9,52	3,5	0,2	–
	CG4							
	P2F							
	PVA							
	KM1							
	HT5							
CCGX 090504 1R	CD4	10	5,56	0,4	9,92	3,5	–	12 °
	CG4							
	KMF							
	HT5							
CCGX 090504 2R	CD4	10	5,56	0,4	9,92	3,5	–	30°
	CG4							
	KM1							

** M_{An} = clamping torque of clamping screw in Nm.

Availability as current price list.
Ordering example:
1 off **4·30012 R 160**
10 off **CCGX060204 N CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	130 - 160
2			CG4 CD4 CF2	150 - 180
			HT5	160 - 250
3		$\sigma >$ 600 N/ mm^2	PVA P2F	110 - 140
			CG4 CD4 CF2	130 - 160
			HT5	140 - 220
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	110 - 140
5			CG4 CD4 CF2	130 - 160
			HT5	140 - 220
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120
			CG4 CD4 CF2	110 - 140
			HT5	120 - 180
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120
			CG4 CD4 CF2	110 - 140
			HT5	120 - 180
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100
			CG4 CD4 CF2	90 - 120
			HT5	100 - 160
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4 CD4	100 - 180
			PVA KMF	50 - 190 *
11		Austenitic	CG4 CD4	60 - 210 *
12	High Heat-Resistant Alloys		KMF	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4	100 - 160
			HT5	140 - 220
17	Titanium and Alloys		KMF KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

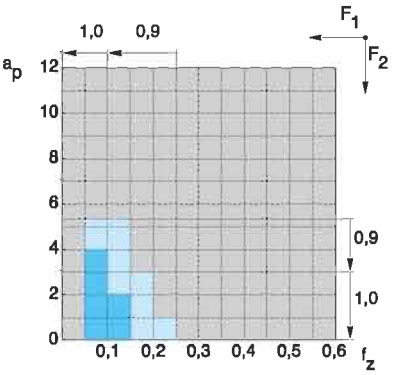
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

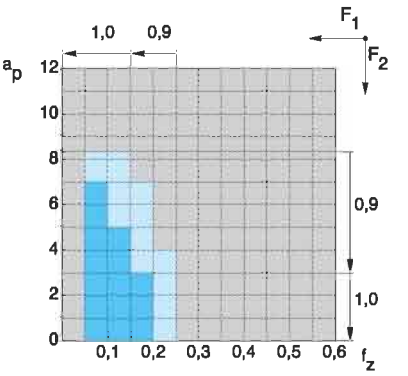
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: CCGX06



Indexable insert: CCGX09



Optimum range | Possible range

Inserts can be applied as follows and interchanged accordingly.

Standard Inserts	Standard Insert, thick version	Angle γ	Dimensions x
CCGX060204N	CCGX0603021R	12°	0,5 mm
	CCGX0603022R	30°	0,5 mm
CCGX09T308R	CCGX0905041R	12°	1,0 mm
	CCGX0905042R	30°	1,0 mm

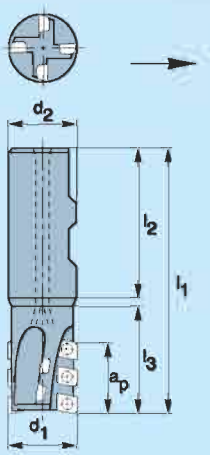
Note: Using standard thick version inserts increases the mill diameter d_1 by the dimensions x above the size given in the catalogue.

ALMASE SAZ - Indexable Insert – End Mill

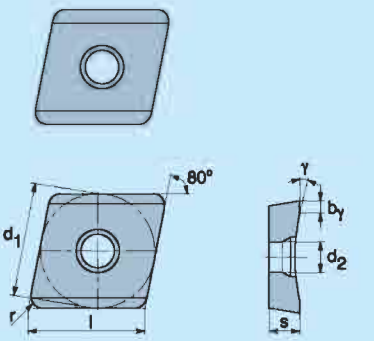
Slot Mill

Indexable Insert

• Long edge – multi–row with coolant channel



CCGX..TR



Cylindrical Shank DIN 1835-B

∅ d_1	RIGHT CODE	d_{2h6}	l_1	l_2	l_3	a_{pmax}	z	Qty. of inserts per type	Insert	Clamping Bolt	Screw Driver	Tx	M_{An}** Nm
20	**4·32020 R 250**	25	100	57	35	25			**CCGX 060304TR**	**192·432**	**170·028**	8	1,5
25	**4·32025 R 250**	25	105	↓	40	↓			↓	↓	↓	↓	↓

Insert

RIGHT CODE		l	s	r	d_1	d_2	b_γ	γ
CCGX 060304TR	CD2	6,4	3,18	0,4	6,35	2,85	0,25	4 °
	CD4							
	CG4							
	P2F							
	GX							
	PVA							
	KM1							
	HT5							

** M_{An} = clamping torque of clamping screw in Nm.

Availability as current price list.
Ordering example:
1 off **4·32020 R 250**
10 off **CCGX 060304TR CG4**

Table 1
Guidelines for cutting speed V_C by Material Group

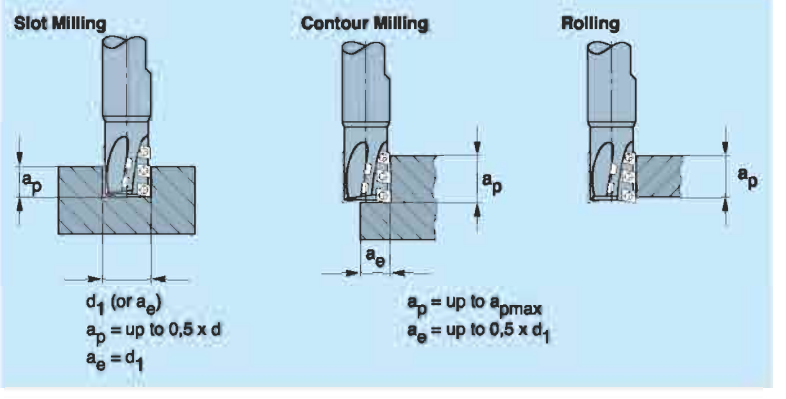
ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (◀ Toughness / Wear Res. ▶)	Cutting Speed v_c [m/min]	Average Chip Tickness h_m (mm)
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA GX P2F	120 - 150	0,07
2			CG4 CD4 CD2	140 - 170	
			HT5	150 - 220	
3		$\sigma >$ 600 N/ mm^2	PVA GX P2F	100 - 130	
			CG4 CD4 CD2	110 - 150	
			HT5	130 - 200	
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA GX P2F	100 - 130	
5			CG4 CD4 CD2	110 - 150	
			HT5	130 - 200	
6		$\sigma >$ 900 N/ mm^2	PVA GX P2F	70 - 100	
			CG4 CD4 CD2	90 - 130	
			HT5	100 - 160	
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA GX P2F	70 - 100	0,04
			CG4 CD4 CD2	90 - 130	
			HT5	100 - 160	
8		$\sigma >$ 1000 N/ mm^2	PVA GX P2F	60 - 90	
			CG4 CD4 CD2	70 - 100	
			HT5	80 - 140	
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	60 - 100	
10			CG4 CD4	80 - 150	
		Austenitic	PVA	40 - 160 *	
11			CG4 CD4	50 - 180 *	
12	High Heat-Resistant Alloys		KM1	20 - 50	
13	Malleable Cast Iron	GTW/ GTS	KM1	60 - 100	
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	100 - 140	0,07
		14.2 GG25 - GG30 180 < HB < 220	KM1	80 - 120	
		14.3 GG35 - GG40 HB > 220	KM1	60 - 100	
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	60 - 120	
			HT5	120 - 200	
17	Titanium and Alloys		KM1	20 - 70	
19	Non-Ferrous Metals		KM1	100 - 350	
20	Aluminium Alloys		KM1	300 - 800	

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c$ (from Table 1) × F(from Table 3)

How to select possible depth of cut a_p and width of cut a_e



Feed per tooth f_z dependent on width of cut a_e and average chip thickness h_m (from Table 1)

Table 2

d_1	Ø 20		Ø 25	
h_m	0,04	0,07	0,04	0,07
a_e	f_z			
2	0,13	0,23	0,14	0,25
4	0,09	0,16	0,10	0,18
6	0,08	0,14	0,09	0,15
8	0,07	0,12	0,08	0,13
10	0,06	0,11	0,07	0,12
12	0,06	0,10	0,07	0,11
15	0,06	0,10	0,06	0,10
20	0,06	0,10	0,06	0,10
25			0,06	0,10

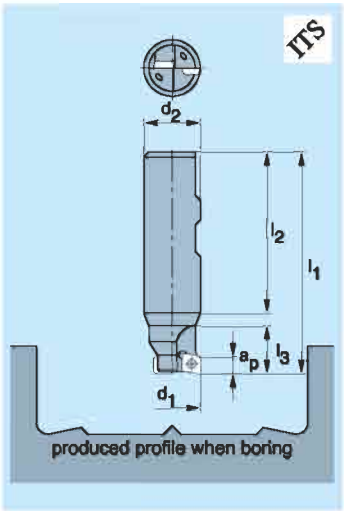
Correction factor for selected cutting speed v_c for depth of cut a_p

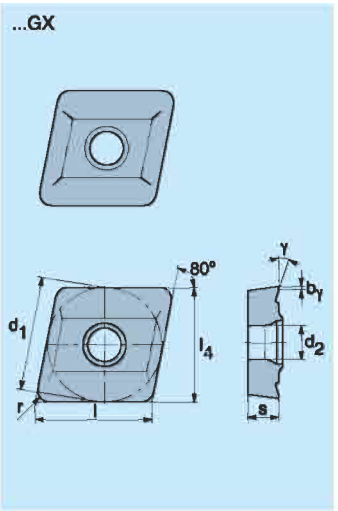
Table 3

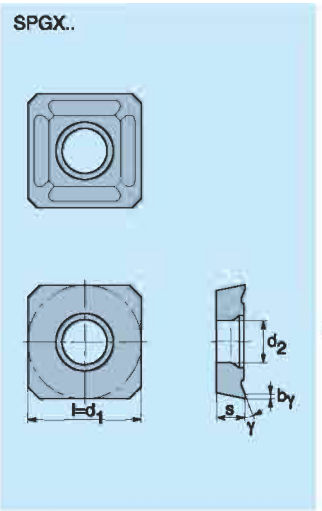
a_p	Correction Factor F
1,25 x d_1	0,7
1,0 x d_1	0,8
0,75 x d_1	0,9
0,5 x d_1	1,0
0,25 x d_1	1,1

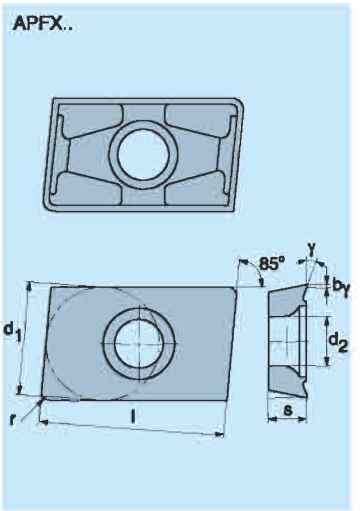
ALMASE SAZ - Indexable Insert - End Mill

Pocket Mill Indexable Insert









Cylindrical Shank DIN 1835-B

Ø d_1		d_{2h6}	l_1	l_2	l_3	$a_{p\,max}$	Periph z	Centre z	Effective z	$z_{per\ type}$	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
12	**4-31012 R 160**	16	80	55	16	5,5	1	–	1	1	**COGX 06T104 R**	**192-667**	**170-023**	7	1
15	**4-31415 R 200**	20	95	65	20			1			**XCGX 060204 R**	**192-416**			
											SPGX 0602AP				
16	**4-31416 R 200**		95	65	21						**XCGX 060204 R**				
											SPGX 0602AP				
18	**4-31418 R 200**		100	70	21						**CCGX 060204 N**				
											SPGX 0602AP				
20	**4-31420 R 200**		120	80	39						**CCGX 060204 N**				
											SPGX 0602AP				
25	**4-31425 R 250**	25	130	85	44	8,5					**CCGX 09T308 R**	**191-924**	**170-024**	9	2
											SPGX 0903AP	**191-924**	**170-024**	9	2
32	**4-31432 R 320**	32				11,5					**CCGX 120412R**	191-848	170-025	15	3
											SPGX 12T3AP	191-848			3
32	**4-31132 R 320**	32				15					**APFX 1604PD R**	**191-916**			4
											SPGX 12T3AP	**191-848**			3
40	**4-31440 R 320**	32	135		49	11,5					**CCGX 120412 R**				
											SPGX 12T3AP				
40	**4-31140 R 320**	32	135		49	15	2	2	2	2	**APFX 1604PD R**	**191-916**			4
										2	**SPGX 0903AP**	**191-924**	**170-024**	9	2

Insert

CODE		l	s	r	d_1	d_2	b_γ
CCGX 060204 N	CF2	6,4	2,38	0,4	6,35	2,5	0,15
	CG4						
	P2F						
	PVA						
	KM1						
	HT5						
CCGX 09T308 R	CF2	9,7	3,97	0,8	9,52	3,5	0,2
	CG4						
	P2F						
	PVA						
	KM1						
	HT5						
CCGX 120412 R	CF2	12,9	4,76	1,2	12,7	3,9	0,15
	CG4						
	P2F						
	PVA						
	KM1						
COGX 06T104 R	CF2	6,4	1,98	0,4	6,35	2,5	0,1
	CG4						
	P2F						
	PVA						
	KM1						

RIGHT CODE		l	l_4	s	r	d_1	d_2	b_γ
XCGX 060204 R	CF2	6,4	5,65	2,38	0,4	6,35	2,5	0,1
	CG4							
	P2F							
	PVA							
	KM1							

Insert

CODE		$l = d_1$	s	d_2	b_γ	γ
SPGX 0602AP	CF2	6,35	2,38	2,5	0,1	12°
	CG4					
	P2F					
	PVA					
	KMF					
SPGX 0903AP	CF2	9,52	3,18	3,4	0,2	18°
	CG4					
	P2F					
	PVA					
	KMF					
SPGX 12T3AP	CG4	12,7	3,97	3,9	0,25	18°
	P2F					
	PVA					
	KMF					

RIGHT CODE		l	s	r	d_1	d_2	b_γ	γ
APFX 1604PD R	CF2	16,4	4,76	0,8	9,52	4,4	0,1	–
	CF3							
	CD2							
	P2F / GX / KM1							
APFX 1604PD1 R[1]	CG4	16,4	4,76	0,8	9,52	4,4	–	–
	P2F							
APFX 1604PD2 R	CG4	16,4	4,76	0,8	9,52	4,4	0,1	10°
	P2F							
	PVA							
	KM1 / KMF /HT5							

Note: see page 66 for Furtherin formation

1) For finishing

** M_{An} = Clamping torque of clamping screw in Nm.

Availability as current price list.

Ordering example:

1 off **4-31012 R 160**

10 off **COGX 06T104 R CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_C by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]	
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA GX P2F	130 - 160	
2			CG4 CD2 CF2	150 - 180	
			HT5	160 - 250	
3		$\sigma >$ 600 N/ mm^2	PVA GX P2F	110 - 140	
			CG4 CD2 CF2	130 - 160	
			HT5	140 - 220	
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA GX P2F	110 - 140	
5			CG4 CD2 CF2	130 - 160	
			HT5	140 - 220	
6		$\sigma >$ 900 N/ mm^2	PVA GX P2F	90 - 120	
			CG4 CD2 CF2	110 - 140	
			HT5	120 - 180	
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA GX P2F	90 - 120	
			CG4 CD2 CF2	110 - 140	
			HT5	120 - 180	
8		$\sigma >$ 1000 N/ mm^2	PVA GX P2F	70 - 100	
			CG4 CD2 CF2	90 - 120	
			HT5	100 - 160	
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140	
10			CG4	100 - 180	
			PVA KMF	50 - 190	*)
11		Austenitic	CG4	60 - 210	*)
12	High Heat-Resistant Alloys		KMF KM1	20 - 60	
13	Malleable Cast Iron	GTW/ GTS	KMF KM1	80 - 120	
			CG4 CF3	100 - 140	
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KMF KM1	120 - 160	
			CG4 CF3	140 - 180	
		14.2 GG25 - GG30 180 < HB < 220	KMF KM1	100 - 140	
			CG4 CF3	120 - 160	
		14.3 GG35 - GG40 HB > 220	KMF KM1	80 - 120	
			CG4 CF3	100 - 140	
15	Spheroidal Graphite Cast Iron	(GGG)	KMF KM1	80 - 140	
			CG4 CF3	100 - 160	
			HT2	140 - 220	
17	Titanium and Alloys		KMF KM1	20 - 70	
19	Non-Ferrous Metals		KMF KM1	100 - 350	
20	Aluminium Alloys		KMF KM1	300 - 800	

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

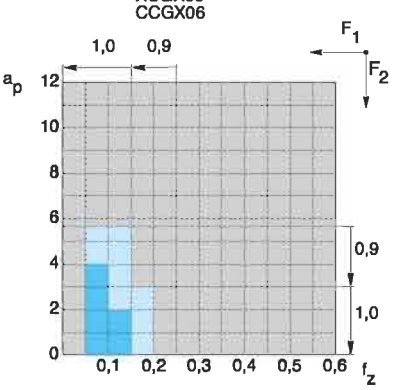
Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

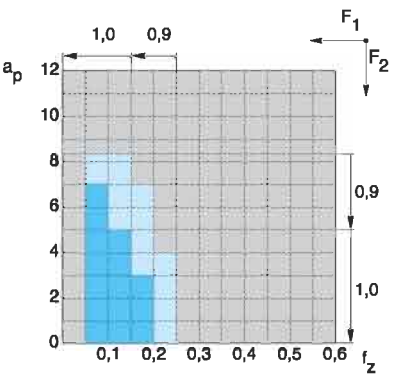
Optimum range | Possible range

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

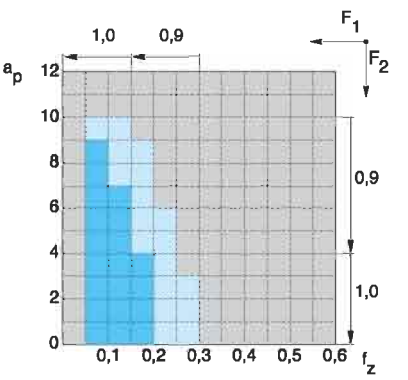
Indexable insert: COGX06 XCGX06 CCGX06



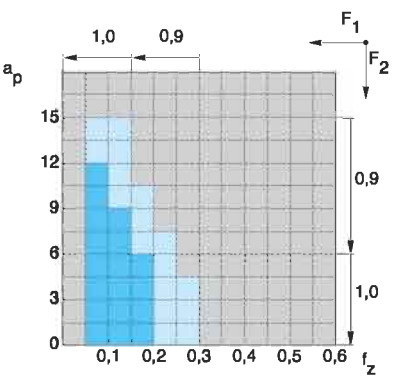
Indexable insert: CCGX09



Indexable insert: CCGX12



Indexable insert: APFX16



Standard values for feed when sinking:

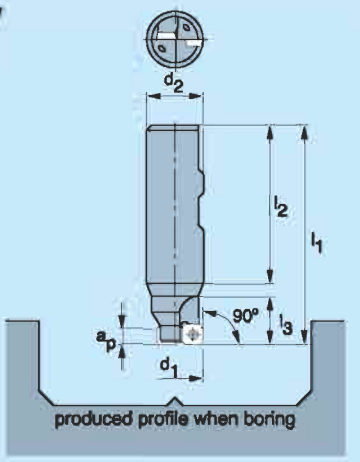
d_1 up to 20mm : f = 0,10mm/rev.
d_1 above 20mm : f = 0,20mm/rev.

ALMASE SAZ - Indexable Insert - End Mill

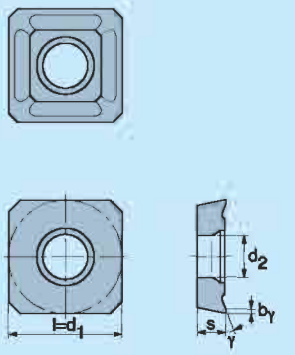
Pocket Mill

Indexable Insert

• Long edge – multi–row with coolant channel



CPGX..



Cylindrical Shank DIN 1835-B

Ø d_1	RIGHT CODE	d_{2h6}	l_1	l_2	l_3	a_{pmax}	Periph z	Centre Effective z	z	$z_{per\ type}$	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
18	**4-31218 R 200**	20	110	75	26	5	1	1	1	2	**SPGX 0602AP**	**192-416**	**170-023**	7	1
20	**4-31220 R 200**	20	120	80	39	5	↓	↓	↓	↓	**SPGX 0602AP**	**192-416**	**170-023**	7	1
25	**4-31226 R 250**	25	130	90	39	8	↓	↓	↓	↓	**SPGX 0903AP**	**191-924**	**170-024**	9	2

Insert

CODE		$l=d_1$	s	d_2	b_γ	γ
SPGX 0602AP	CF2	6.35	2.38	2.5	0.1	12°
	CG4					
	P2F					
	PVA					
	KMF					
SPGX 0903AP	CF2	9.52	3.18	3.4	0.2	18°
	CG4					
	P2F					
	PVA					
	KMF					

** M_{An} = clamping torque of clamping screw in Nm.

Availability as current price list.
Ordering example:
1 off **4-31218 R 200**
10 off **SPGX 0602AP CG4**

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	130 - 160
2			CG4 CF2	150 - 180
3		$\sigma >$ 600 N/ mm^2	PVA P2F	110 - 140
			CG4 CF2	130 - 160
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	110 - 140
5			CG4 CF2	130 - 160
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120
			CG4 CF2	110 - 140
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120
			CG4 CF2	110 - 140
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100
			CG4 CF2	90 - 120
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4	100 - 180
11		Austenitic	PVA KMF	50 - 190 *
			CG4	60 - 210 *
12	High Heat-Resistant Alloys		KMF	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KMF	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KMF	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KMF	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KMF	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KMF	80 - 140
			CG4	100 - 160
17	Titanium and Alloys		KMF	20 - 70
19	Non-Ferrous Metals		KMF	100 - 350
20	Aluminium Alloys		KMF	300 - 800

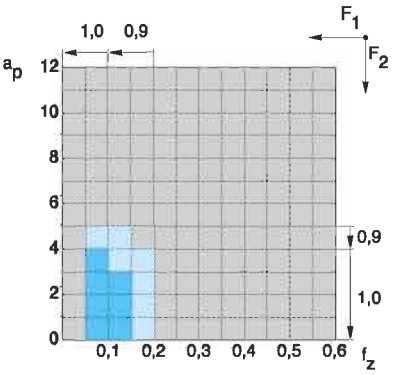
*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

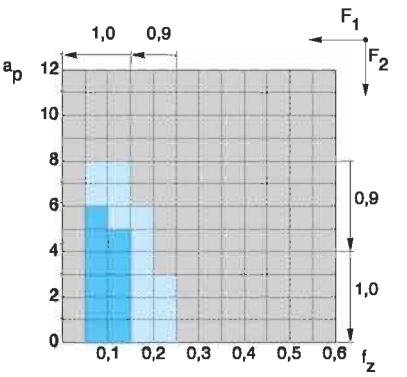
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

Indexable insert: SPGX 0602



Indexable insert: SPGX 0903



Optimum range | Possible range

Standard values for feed when sinking:

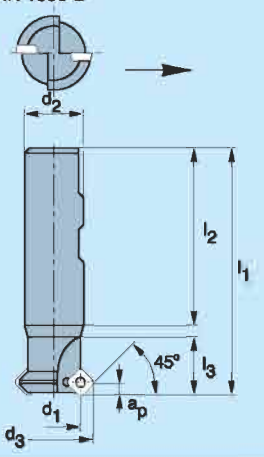
d_1 up to 20mm : f = 0,10mm/rev.
d_1 above 20mm : f = 0,20mm/rev.

ALMASE SAZ - Indexable Insert - End Mill

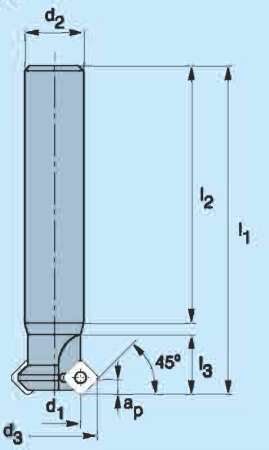
Chamfer and End Mill

Indexable Insert

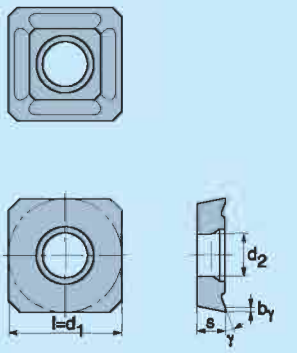
• With coolant channel
Shank DIN 1835-B



Shank DIN 1835-A



SPGX..



Cylindrical Shank DIN 1835-B

Ø d_1	RIGHT CODE	d_{2h6}	d_3	l_1	l_2	l_3	a_p max	z	Qty. of Inserts per Type	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
16	**4·33216 R 200**	20	26,3	110	75	28	5,5	2	2	**SPGX 0903AP**	**191·924**	**170·024**	9	2
15	**4·33225 R 250**	25	35,3	110	75	34	5,5	3	3	**SPGX 0903AP**	**191·924**	**170·024**	9	2

Cylindrical Shank DIN 1835-A [1)]

Ø d_1	RIGHT CODE	d_{2h6}	d_3	l_1	l_2	l_3	a_p max	z	Qty. of Inserts per Type Insert	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
25	**4·33225 R 000**	25	35,3	250	215	34	5,5	3	3	**SPGX 0903AP**	**191·924**	**170·024**	9	2
32	**4·33232 R 000**	25	45,8	250	215	34	7,0	3	3	**SPGX 12T3AP**	**191·848**	**170·025**	15	3

Insert

CODE		$l=d_1$	s	d_2	b_γ	γ
SPGX 0903AP	CF2	9,52	3,18	3,4	0,2	18°
	CG4					
	P2F					
	PVA					
	KMF					
	HT5					
SPGX 12T3AP	CG4	12,7	3,97	3,9	0,25	18°
	P2F					
	PVA					
	KMF					
	HT5					

1) Extended shanks can be shortened as required.
** M_{An} =Clamping torque of clamping screw in Nm.

Availability as current price list.
Ordering example:
1 off **4·33216 R 200**
10 off **SPGX 0903AP CG4**

Table 1

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (◀ Toughness … Wear Res. ▶)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	130 - 160
2			CG4 CF2	150 - 180
			HT5	160 - 250
3		$\sigma >$ 600 N/ mm^2	PVA P2F	110 - 140
			CG4 CF2	130 - 160
			HT5	140 - 220
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	110 - 140
5			CG4 CF2	130 - 160
			HT5	140 - 220
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120
			CG4 CF2	110 - 140
			HT5	120 - 180
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120
			CG4 CF2	110 - 140
			HT5	120 - 180
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100
			CG4 CF2	90 - 120
			HT5	100 - 160
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4	100 - 180
			PVA KMF	50 - 190 *
11		Austenitic	CG4	60 - 210 *
12	High Heat-Resistant Alloys		KMF	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KMF	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KMF	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KMF	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KMF	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KMF	80 - 140
			CG4	100 - 160
			HT5	140 - 220
17	Titanium and Alloys		KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

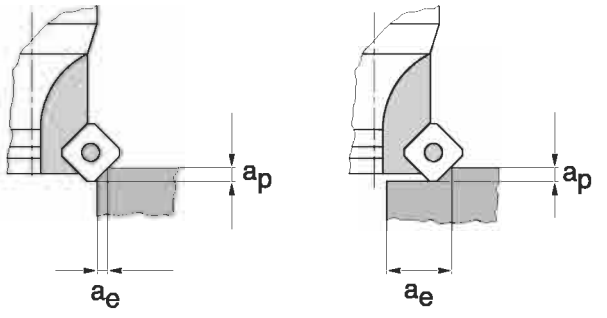
$v_{c\ prog.} = v_c$ (from Table 1) × F(from Table 2)

Feed per tooth f_z and correction factor for selected cutting speed v_c for width of cut a_p and depth of cut a_p

Table 2

d_1	Ø 16	Ø 25	Ø 32	Chamferg.		Facing	
a_e	f_z			Correction Factor			
				a_p	F	a_p	F
1	0,46	0,57	0,64	1	2,1	1	2,1
3	0,27	0,33	0,38	3	1,8	1	2,0
						3	1,8
5	0,21	0,26	0,29	5	1,5	1	1,9
						3	1,7
						5	1,5
7	0,19	0,23	0,25	7	1,2	1	1,8
						3	1,6
						5	1,4
						7	1,2
10	0,17	0,20	0,22			1	1,7
						3	1,5
						5	1,3
						7	1,1
16	0,16	0,17	0,18			1	1,6
						3	1,4
						5	1,2
						7	0,9
20		0,16	0,17			1	1,5
						3	1,2
						5	1,0
						7	0,8
25		0,15	0,16			1	1,4
						3	1,1
						5	0,9
						7	0,7
32			0,15			1	1,3
						3	1,0
						5	0,8
						7	0,6

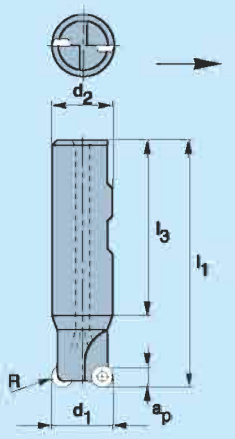
Width of cut a_e for Chamfer and End Mill



ALMASE SAZ - Indexable Insert - End Mill

Radius Mill

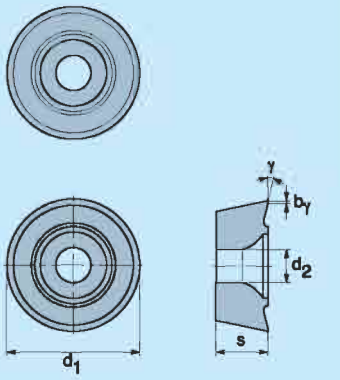
• with coolant channel



ITS

Insert

RPHT..



Cylindrical Shank DIN 1835-B

∅ d_1	RIGHT CODE	R	d_{2h6}	l_1	l_3	a_{pmax}	z	Qty. of Inserts per Type	Insert	Clamping Screw	Screw Driver	Tx	M_{An}** Nm
25	**4.30325 R 200**	4	20	100	75	4	2	2	**PRHT0803MOEN**	**191·924**	**170·024**	9	2
32	**4.30332 R 250**	5	25	105	75	5	3	3	**PRHT10T3MOEN**	**191·725**	**170·025**	15	4
40	**4.30340 R 320**	6	32	110	70	6	↓	↓	**PRHT1204MOEN**	↓	↓	↓	↓

Insert

CODE		s	d_1	d_2	b_γ	γ
RPHT 0803MOEN	CG4	3,18	8	3,4	0,1	16°
	P2F					
	PVA					
	KM1					
RPHT 10T3MOEN	CG4	3,97	10	4,4	0,15	16°
	P2F					
	PVA					
	KM1					
RPHT 1204MOEN	CG4	4,76	12	4,4	0,2	20°
	P2F					
	PVA					
	KM1					

** M_{An} = Clamping torque of clamping screw in Nm.

Availability as current price list.
Ordering example:
1 off **4·30325 R 200**
10 off **RPHT0803MOEN CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_c by Material Group

ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	130 - 160
2			CG4	150 - 180
3		$\sigma >$ 600 N/ mm^2	PVA P2F	110 - 140
			CG4	130 - 160
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	110 - 140
5			CG4	130 - 160
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120
			CG4	110 - 140
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120
			CG4	110 - 140
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100
			CG4	90 - 120
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4	100 - 180
11		Austenitic	PVA	50 - 190 *)
			CG4	60 - 210 *)
12	High Heat-Resistant Alloys		KM1	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KM1	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KM1	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KM1	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KM1	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KM1	80 - 140
			CG4	100 - 160
17	Titanium and Alloys		KM1	20 - 70
19	Non-Ferrous Metals		KM1	100 - 350
20	Aluminium Alloys		KM1	300 - 800

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

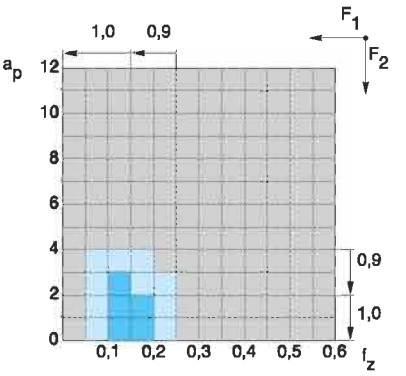
Coated Carbide | Uncoated Carbide | Ceramic | Cermet

$v_{c\ prog.} = v_c \times F_1 \times F_2$

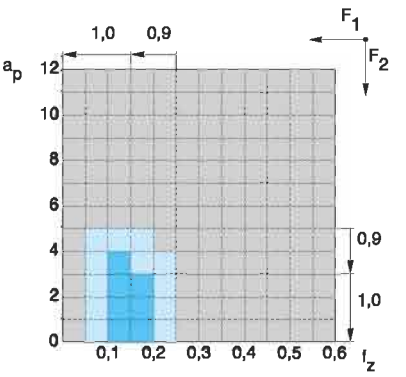
Optimum range | Possible range

Correction factor for selected cutting speed v_c for depth of cut a_p and feed per tooth f_z

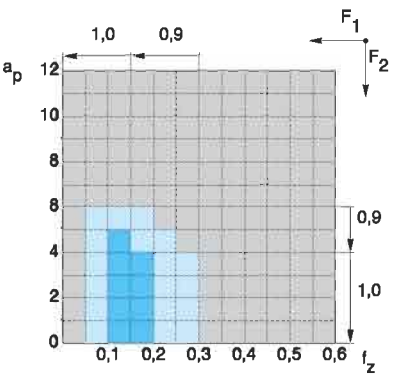
Indexable insert: RPHT 0803



Indexable insert: RPHT 10T3



Indexable insert: RPHT 1204

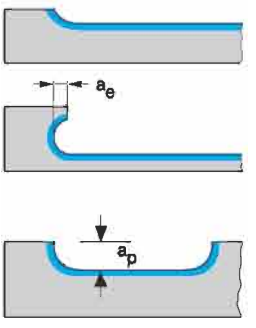


Machining Example

1. Face Milling
   R4 - R5 - R6

2. Shoulder Relief Milling
   4-30325 R 200: a_e = 2,5 mm
   4-30332 R 250: a_e = 3,5 mm
   4-30340 R 320: a_e = 4,0 mm

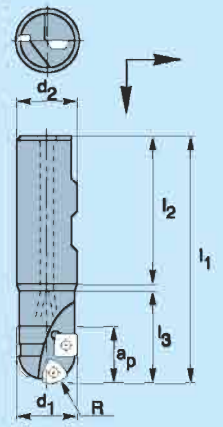
3. Open Slot Milling



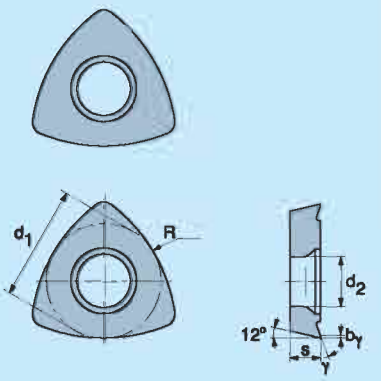
ALMASE SAZ - Indexable Insert - End Mill

Boll Nose Mill :nsert

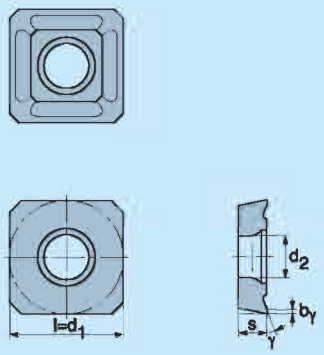
• with coolant channel



51040800..E



SPGX..



Cylindrical Shank DIN 1835-B

	RIGHT CODE	R	d_2	l_1	l_2	l_3	a_{pmax}	eff. z	Qty. of Inserts per Type	Insert	Clamping Screw	Screw driver	Tx	M_{An}** Nm
16	4-34716 R 200	8	20	100	65	30	17	1	2	51040800..E SPGX 0602AP	192-416	170-023	7	1
20	4-34720 R 250	10	25	125	85	34	19			51040800..E SPGX 0602AP	192-432 192-416	170-028 170-023	8 7	
25	4-34725 R 250	12,5	25	130	90	–	27			51040800..E SPGX 0903AP	191-924	170-024	9	2
32	4-34732 R 320	16	32	130	85	–	30			51040800..E SPGX 0903AP	191-848 191-924	170-025 170-024	15 9	3 2

Insert CODE		R	s	d_1	d_2	bγ	γ
5104080012E	CF2	8	2,38	5,5	2,5	–	–
	P2F						
	KM1						
5104080022E	CD4	8	2,38	5,5	2,5	0,1	15°
	CG4						
	P2F						
	PVA						
	KMF						
5104080013E	CF2	10	2,78	7,06	2,85	–	–
	P2F						
	KM1						
5104080023E	CD4	10	2,78	7,06	2,85	0,1	15°
	CG4						
	P2F						
	PVA						
	KMF						
5104080014E	CF2	12,5	3,18	8,5	3,4	–	–
	P2F						
	KM1						
5104080024E	CD4	12,5	3,18	8,5	3,4	0,1	15°
	CG4						
	P2F						
	PVA						
	KMF						
5104080015E	CF2	16	3,97	11,18	4,4	–	–
	P2F						
	KM1						
5104080025E	CD4	16	3,97	11,18	4,4	0,1	15°
	CG4						
	P2F						
	PVA						
	KMF						

Insert CODE		$l = d_1$	s	d_2	bγ	γ
SPGX 0602AP	CF2	6,35	2,38	2,5	0,1	12°
	CG4					
	P2F					
	PVA					
	KMF					
SPGX 0903AP	CF2	9,52	3,18	3,4	0,2	18°
	CG4					
	P2F					
	PVA					
	KMF					

** M_{An} = Clamping torque of clamping screw in Nm.

Availability as current price list.

Ordering example:

1 off **4-34716 R 200**

10 off **5104080022E CG4**

10 off **SPGX 0602AP CG4**

ALMASE SAZ - Guidelines and Examples

Guidelines for cutting speed V_C by Material Group

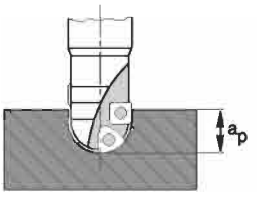
ALMASE - SAZ Group	Material	UTS Hardness Material Structure	Cutting Material (Toughness ◀ ▶ Wear Res.)	Cutting Speed v_c [m/min]
1	Unalloyed Steel	$\sigma \leq$ 600 N/ mm^2	PVA P2F	130 - 160
2			CG4 CD4 CF2	150 - 180
3		$\sigma >$ 600 N/ mm^2	PVA P2F	110 - 140
			CG4 CD4 CF2	130 - 160
4	Alloy Steel and Cast Steel	$\sigma \leq$ 900 N/ mm^2	PVA P2F	110 - 140
5			CG4 CD4 CF2	130 - 160
6		$\sigma >$ 900 N/ mm^2	PVA P2F	90 - 120
			CG4 CD4 CF2	110 - 140
7	High Alloy Steel	$\sigma \leq$ 1000 N/ mm^2	PVA P2F	90 - 120
			CG4 CD4 CF2	110 - 140
8		$\sigma >$ 1000 N/ mm^2	PVA P2F	70 - 100
			CG4 CD4 CF2	90 - 120
9	Stainless, Heat-Resistant and High Temperature Strength Steels	Ferritic / Martensitic	PVA	70 - 140
10			CG4 CD4	100 - 180
11		Austenitic	PVA KMF	50 - 190 *
			CG4 CD4	60 - 210 *
12	High Heat-Resistant Alloys		KMF	20 - 60
13	Malleable Cast Iron	GTW/ GTS	KMF KM1	80 - 120
			CG4	100 - 140
14	Grey Cast Iron	14.1 GG10 - GG20 HB < 180	KMF KM1	120 - 160
			CG4	140 - 180
		14.2 GG25 - GG30 180 < HB < 220	KMF KM1	100 - 140
			CG4	120 - 160
		14.3 GG35 - GG40 HB > 220	KMF KM1	80 - 120
			CG4	100 - 140
15	Spheroidal Graphite Cast Iron	(GGG)	KMF KM1	80 - 140
			CG4	100 - 160
17	Titanium and Alloys		KMF KM1	20 - 70
19	Non-Ferrous Metals		KMF KM1	100 - 350
20	Aluminium Alloys		KMF KM1	300 - 800

*) - low cutting speed: with cooling lubricant
- high cutting speed: without cooling lubricant

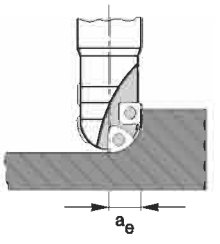
$v_{c\ prog.} = v_c \times F_1 \times F_2$

Coated Carbide | Uncoated Carbide | Ceramic | Cermet

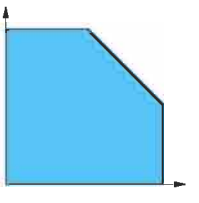
Full Profile Milling



Copy Milling

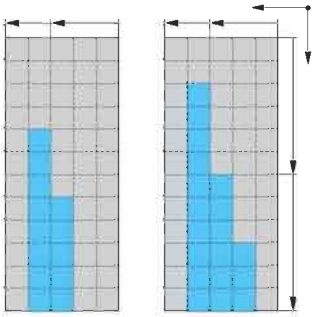


Application Limits When Full Profile, and Copy Milling

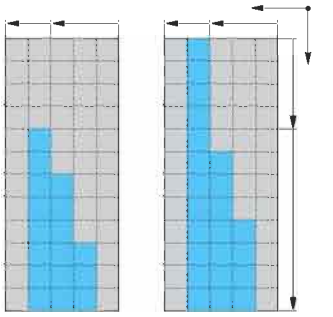


For large a_e: low f_z
for small a_e: high f_z

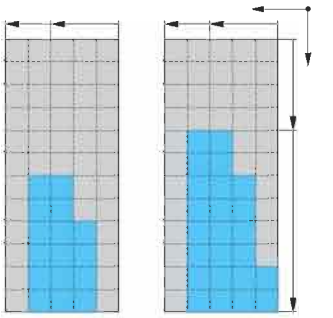
Full Profile Milling: R8 and R10



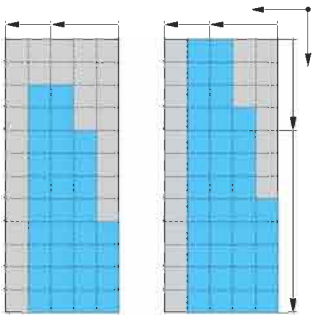
Full Pr. Milling: R12,5 and R16



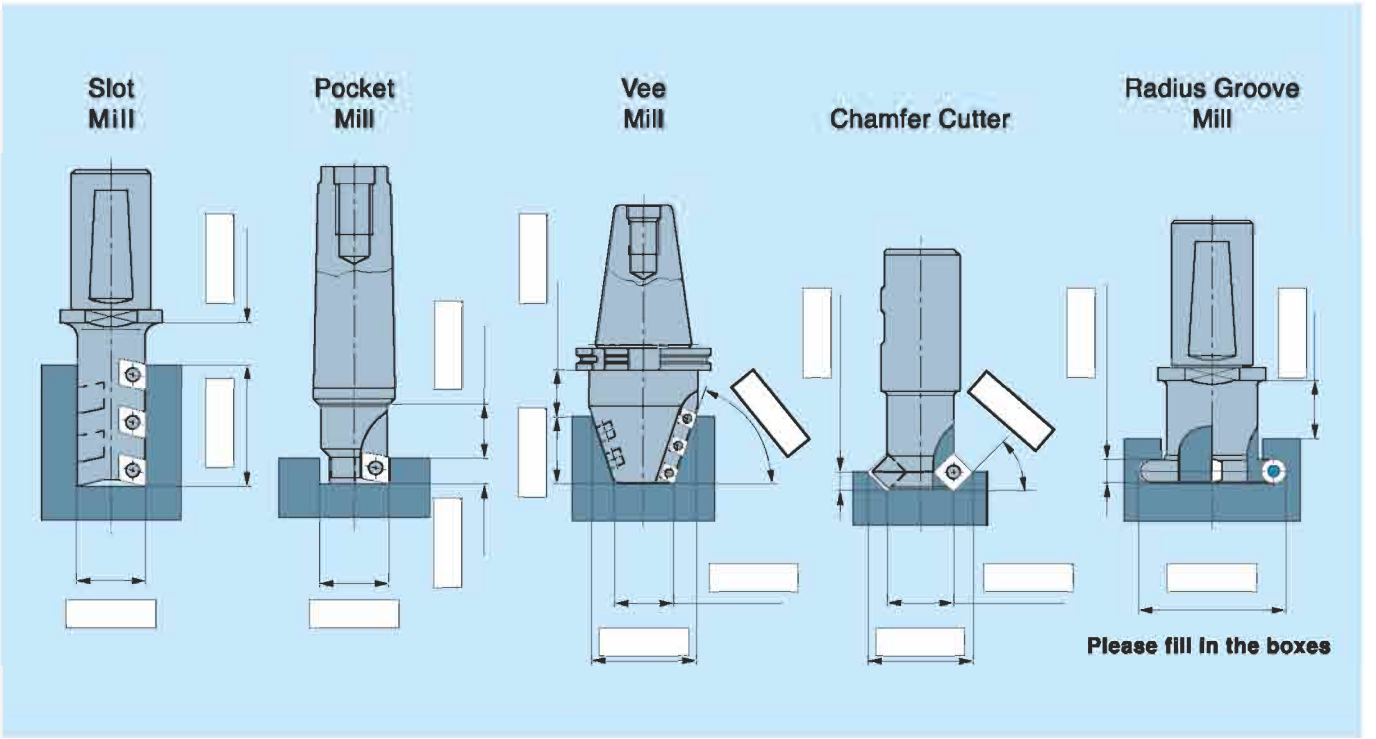
Copy Milling: R8 and R10



Copy Milling: R12,5 and R16



Order Form for ALMASE SAZ End Mill



Insert type _____ Radius / chamfer at steep taper _____ mm

Tool shank type

Cylindrical shank	∅ mm	18 ☐	20 ☐	25 ☐	32 ☐	40 ☐	50 ☐
Weldon (DIN 1835-B)	∅ mm	20 ☐	25 ☐	32 ☐	40 ☐	50 ☐	
Whistle Notch (DIN 1835-E/F)	∅ mm	20 ☐	25 ☐	32 ☐	40 ☐		
Steep taper DIN 69871	size, form	30 ☐	40 ☐	45 ☐	50 ☐	A ☐	B ☐
Morse taper DIN 228-A	size, form	2 ☐	3 ☐	4 ☐	5 ☐		
FCM	Nominal size ∅ mm	25 ☐	32 ☐	40 ☐	50 ☐	63 ☐	80 ☐
Granlund	∅ mm	10 ☐	14 ☐	22 ☐			
Wohlhaupter	Nominal size ∅ mm	25 ☐	32 ☐	40 ☐	50 ☐	63 ☐	
Miscellaneous	∅ mm	_____					

Coolant system internal ☐ external ☐

Tool type RIGHT rotation ☐ LEFT rotation ☐

Material to be machined _____

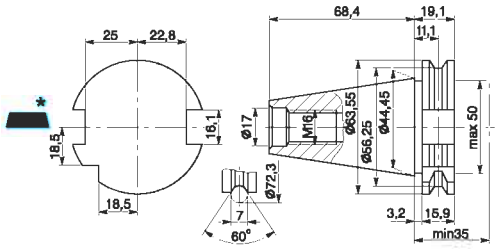
_____

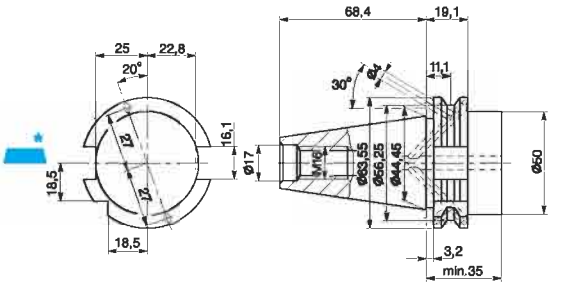
Machine Type / Model _____

ALMASE SAZ - Design Specifications Taper

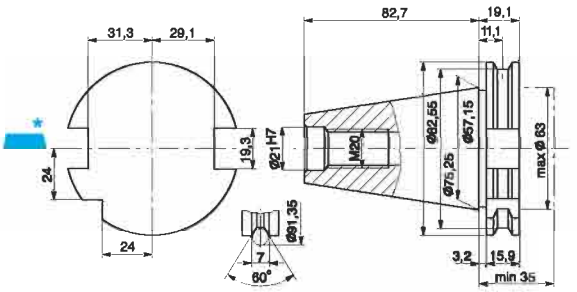
DIN 69871 Form A, without through-hole . DIN 69871 Form AD, with through-hole for central coolant ducts . DIN 69871 Form B, with coolant ducts through collar

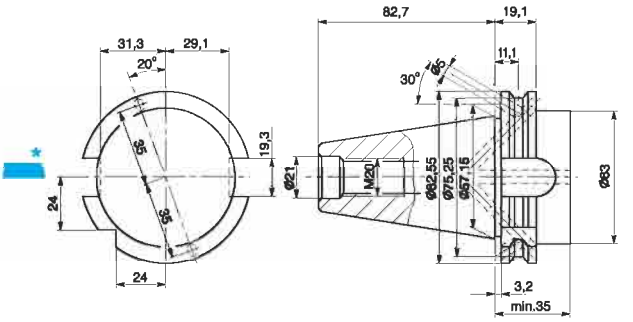
Steep Taper size 40



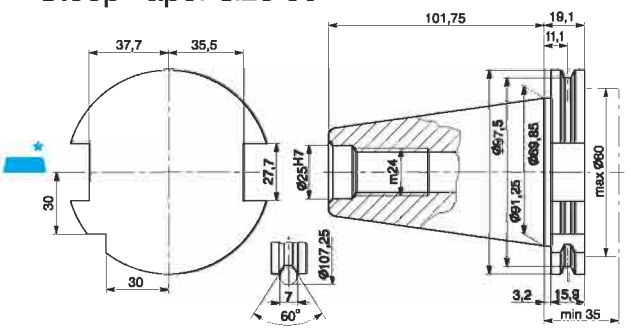


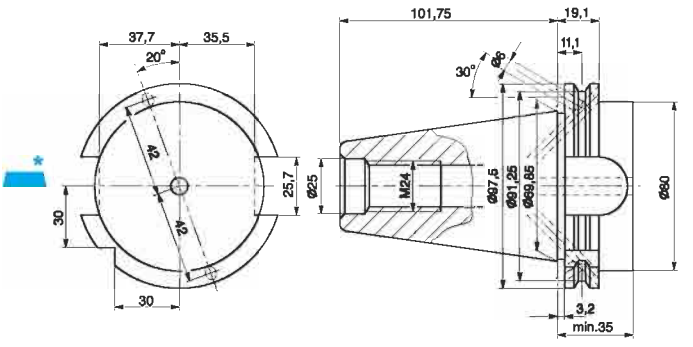
Steep Taper size 45



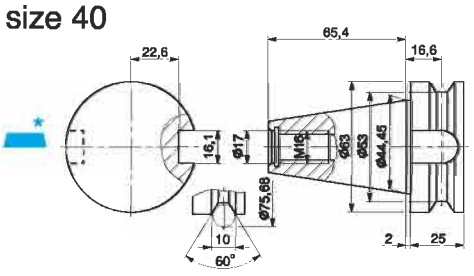


Steep Taper size 50

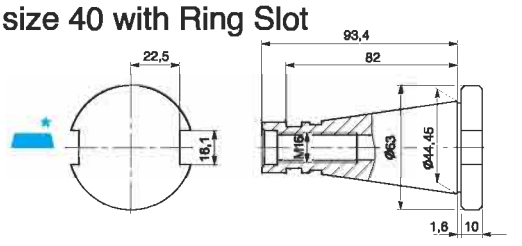




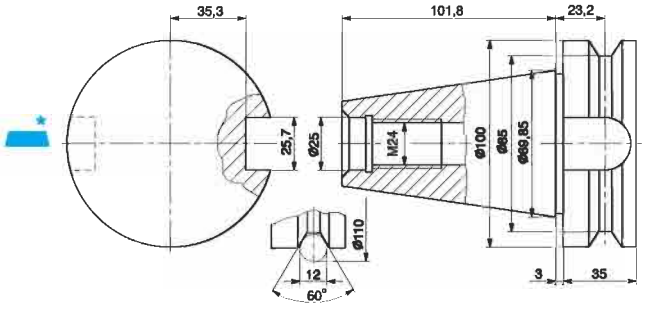
MAS 403 BT
Taper size 40



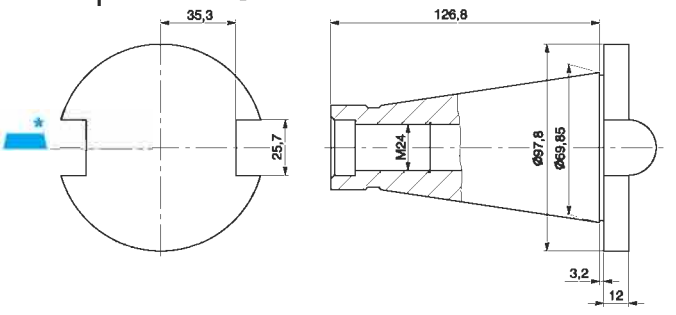
DIN 2080
Taper size 40 with Ring Slot



Taper size 50



Taper size 50



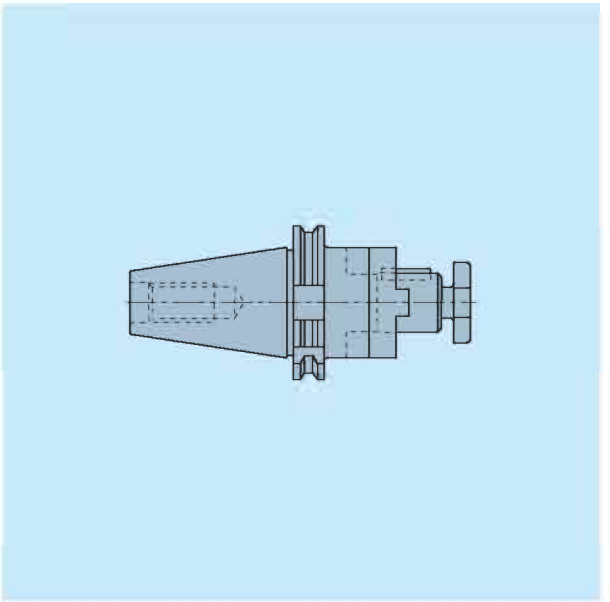
Further steep taper types upon request.
Material:
Alloyed case-hardened steel with a core UTS after case-hardening of at least 800 N/mm^2.

Hardness HV 670±40HV 30 (HRC 56-60).
Depth of Hardness EhT = 0.5 mm min.
Taper Angle - Tolerance Quality AT3 to DIN 2080.

* Cutting edge position for single edged tools.

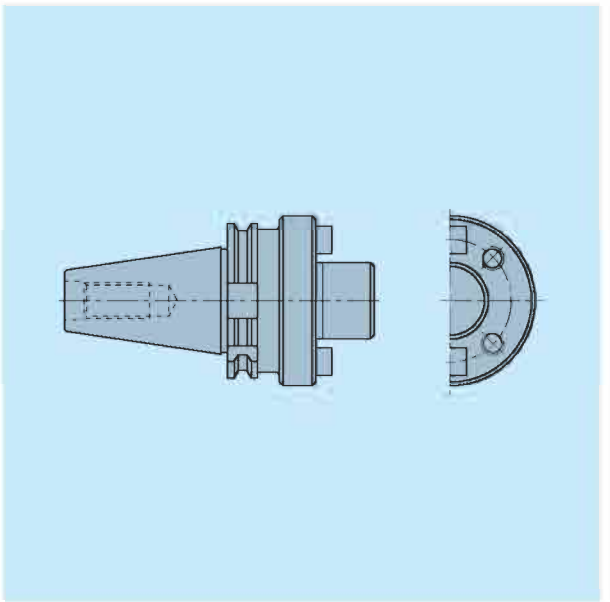
General Recommendations for Use

Functional Clamping for Rotating Tools



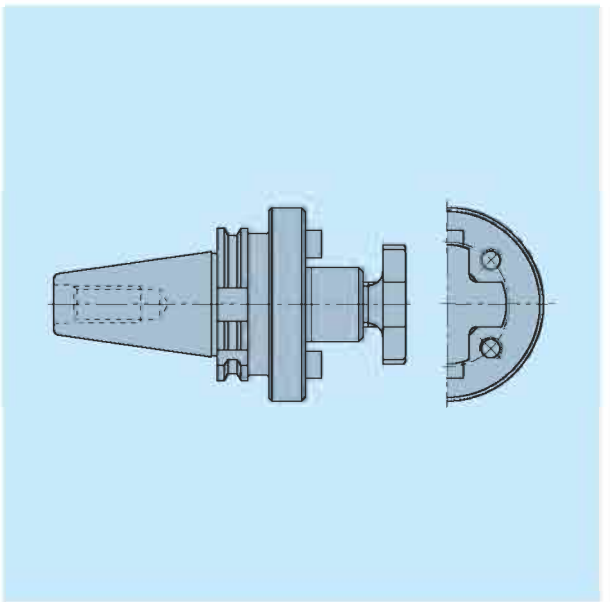
Combination extension arbour adapting Face, Shoulder and Circular Mills with transverse slot and Disc Mills with longitudinal slot:

Adaptor type to DIN 138. Tool clamping with draw–on screw.



Adaptor arbour for Face and Shoulder Mills with transverse slot and internal centring:

Tool clamping type to DIN 2079. Tool clamping over bolthole pitch circle. Extension arbour with spindle contact face upon request.

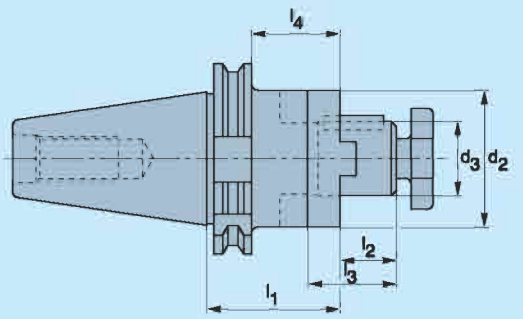


Extension arbour with enlarged bearing surface for Face and Shoulder Mills with transverse slot:

Tool clamping with draw-on screw or bolthole pitch circle at 40 mm adaptor diameter.

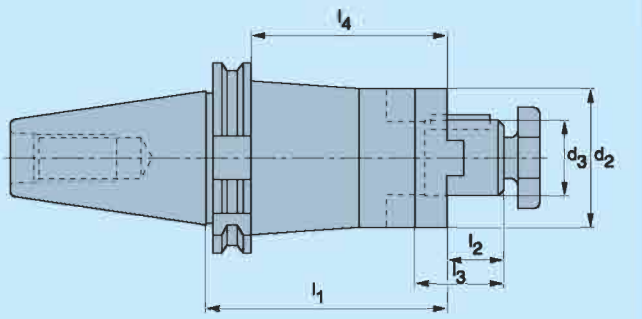
Combin.Shell End Mill Arbour DIN 6358, short

- For mills with longitudinal or transverse slot
  Fig. as per DIN 69871



Combin.Shell End Mill Arbour DIN 6358, long

- For mills with longitudinal or transverse slot
  Fig. as per DIN 69871



Taper size	CODE	d_3	d_2	l_2	l_3	l_1	l_4	Weight (kg)	Drive Ring DIN 6366	Draw-on Screw DIN 6367	Wrench DIN 6368
	DIN 69871 Form A short										
40	**5·36040-140316**	16	32	17	27	55	35,9	1,3	**192·491**	**190·747**	**170·036**
	5·36040-140322	22	40	19	31	↓	↓	1,4	**192·492**	**190·855**	**170·037**
	5·36040-140327	27	48	21	33	↓	↓	1,6	**192·493**	**191·041**	**170·038**
	5·36040-140332	32	58	24	38	60	40,9	1,9	**192·494**	**190·977**	**170·039**
	5·36040-140340	40	70	27	41	60	40,9	2,3	**192·495**	**191·040**	**170·040**
50	**5·36050-140316**	16	32	17	27	55	35,9	3,1	**192·491**	**190·747**	**170·036**
	5·36050-140322	22	40	19	31	↓	↓	3,2	**192·492**	**190·855**	**170·037**
	5·36050-140327	27	48	21	33	↓	↓	3,5	**192·493**	**191·041**	**170·038**
	5·36050-140332	32	58	24	38	↓	↓	3,9	**192·494**	**190·977**	**170·039**
	5·36050-140340	40	70	27	41	↓	↓	4,4	**192·495**	**191·040**	**170·040**
	5·36050-140350	50	90	30	46	70	50,9	5,9	**192·496**	**191·522**	**170·041**
	long										
40	**5·36040-143316**	16	32	17	27	100	80,9	1,3	**192·491**	**190·747**	**170·036**
	5·36040-143322	22	40	19	31	↓	↓	1,4	**192·492**	**190·855**	**170·037**
	5·36040-143327	27	48	21	33	↓	↓	1,6	**192·493**	**191·041**	**170·038**
	5·36040-143332	32	58	24	38	↓	↓	1,9	**192·494**	**190·977**	**170·039**
	5·36040-143340	40	70	27	41	↓	↓	2,3	**192·495**	**191·040**	**170·040**
50	**5·36050-143316**	16	32	17	27	100	80,9	3,1	**192·491**	**190·747**	**170·036**
	5·36050-143322	22	40	19	31	↓	↓	3,2	**192·492**	**190·855**	**170·037**
	5·36050-143327	27	48	21	33	↓	↓	3,5	**192·493**	**191·041**	**170·038**
	5·36050-143332	32	58	24	38	↓	↓	3,9	**192·494**	**190·977**	**170·039**
	5·36050-143340	40	70	27	41	↓	↓	4,4	**192·495**	**191·040**	**170·040**
	5·36050-140350	50	90	30	46	↓	↓	5,9	**192·496**	**191·522**	**170·041**

Face and shoulder mills with transverse slot

Locating Dia. d_3	Cutting Dia. d_1	Height h
16	40	40
↓	45	↓
↓	50	↓
22	63	↓
27	80	50
32	100	50
40	125	63
40	160	63
Disc mill with longitudinal slot		
27	80	
32	100	
40	125	
40	160	
50	160	
50	200	

Design specifications of steep taper see page 110.
Milling Arbour Rings to Din 2084 upon reqest.

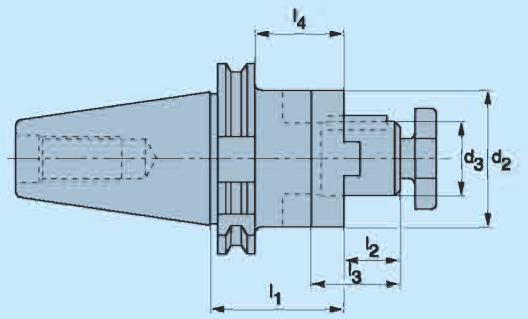
Supply range:
Combination Shell End Mill with draw – on screws, key and drive ring, without wrench, pull–studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5·36040 –140316**

ALMASE SAZ - Milling Arbour

Combination Shell End Mill Arbour DIN 6358, short

- For mills with longitudinal or transverse slot
  Fig. as per DIN 69871



Taper size	CODE	d_3	d_2	l_2	l_3	l_1	l_4	Weight (kg)	Drive Ring DIN 6366	Draw-on Screw DIN 6367	Wrench DIN 6368
	MAS 403 BT short										
40	**5-36040-310316**	16	32	17	27	55	28,0	1,3	192-491	190-747	170-036
	5-36040-310322	22	40	19	31	↓	↓	1,5	192-492	190-855	170-037
	5-36040-310327	27	48	21	33	↓	↓	1,7	192-493	191-041	170-038
	5-36040-310332	32	58	24	38	60	33,0	2,0	192-494	190-977	170-039
	5-36040-310340	40	70	27	41	60	33,0	2,4	192-495	191-040	170-040
50	**5-36050-310316**	16	32	17	27	70	32,0	3,1	192-491	190-747	170-036
	5-36050-310322	22	40	19	31	↓	↓	3,2	192-492	190-855	170-037
	5-36050-310327	27	48	21	33	↓	↓	3,5	192-493	191-041	170-038
	5-36050-310332	32	58	24	38	↓	↓	3,9	192-494	190-977	170-039
	5-36050-310340	40	70	27	41	↓	↓	4,4	192-495	191-040	170-040
	5-36050-310350	50	90	30	46	↓	↓	5,9	192-496	191-522	170-041
	DIN 2080 with ring slot kurz										
40	**5-36040-240316**	16	32	17	27	52	40,4	1,2	192-491	190-747	170-036
	5-36040-240322	22	40	19	31	↓	↓	1,4	192-492	190-855	170-037
	5-36040-240327	27	48	21	33	↓	↓	1,6	192-493	191-041	170-038
	5-36040-240332	32	58	24	38	↓	↓	1,9	192-494	190-977	170-039
	5-36040-240340	40	70	27	41	↓	↓	2,5	192-495	191-040	170-040
	DIN 2080 kurz										
50	**5-36050-250316**	16	32	17	27	55	39,8	3,0	192-491	190-747	170-036
	5-36050-250322	22	40	19	31	↓	↓	3,1	192-492	190-855	170-037
	5-36050-250327	27	48	21	33	↓	↓	3,4	192-493	191-041	170-038
	5-36050-250332	32	58	24	38	↓	↓	3,7	192-494	190-977	170-039
	5-36050-250340	40	70	27	41	↓	↓	4,3	192-495	191-040	170-040
	5-36050-250350	50	90	30	46	↓	↓	5,3	192-496	191-522	170-041

Face and shoulder mills with transverse slot

Locating Dia. d_3	Cutting Dia. d_1	Height h
16	40	40
↓	45	↓
↓	50	↓
22	63	↓
27	80	50
32	100	50
40	125	63
40	160	63
Disc mill with longitudinal slot		
27	80	
32	100	
40	125	
40	160	
50	160	
50	200	

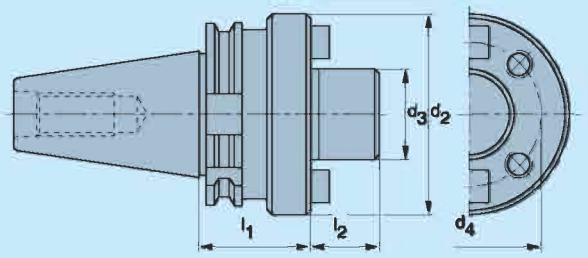
Supply range:
Combination Shell End Mill with draw – on screws, key and drive ring, without wrench, pull–studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5-36040 – 310316**

Design specifications of steep taper see page 110.

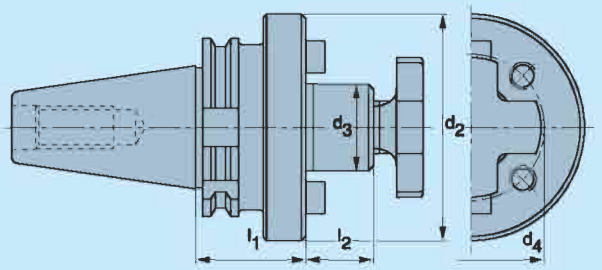
Location Arbour DIN 6357

- For mills with internal centring
  Tool clamping to DIN 2079
  Fig. as per DIN 69871



Shell End Mill Arbour

- For mills with transverse slot
  Design with enlarged contact face
  Fig. as per DIN 69871



Taper size	Location Arbour CODE	d_3	d_2	d_4	l_1	l_2	Weight (kg)
	DIN 69871 Form A						
40	**5·36040-140405**	40	89,3	66,7	60	30	2,5
50	**5·36050-140405**	↓	↓	↓		40	5,5
	5·36050-140407	60	129,1	101,6		40	8,3
	MAS 403 BT						
40	**5·36040-310405**	40	89,3	66,7	60	30	2,5
50	5·36050-310407	60	129,1	101,6	90	40	5,5
	DIN 2080						
50	**5·36050-250408**	32	89,3	66,7	71	30	3,5
	5·36050-250405	40	89,3	66,7	71	30	3,5
	5·36050-250407	60	129,1	101,6	80	40	5,0

Taper size	Shell End Mill Arbour with enlarged Contact Face CODE	d_3	d_2	d_4	l_1	l_2	Weight (kg)	Draw-on Screw DIN 6367	Wrench DIN 6368
	DIN 69871 Form A								
40	**5·36040-142322**	22	50	–	19	35	1,1	**190·855**	**170·037**
	5·36040-142327	27	50	–	21	35	1,2	**190·041**	**170·038**
	5·36040-142332	32	78	–	24	50	1,9	**190·977**	**170·039**
	5·36040-142340	40	89	66,7	27	50	2,2	**190·040**	**170·040**
50	**5·36050-142322**	22	50	–	19	35	3,0	**190·855**	**170·037**
	5·36050-142327	27	50	–	21	35	3,2	**190·041**	**170·038**
	5·36050-142332	32	78	–	24	50	3,5	**190·977**	**170·039**
	5·36050-142340	40	89	66,7	27	50	4,0	**190·040**	**170·040**

Face and shoulder mills with transverse slot

Locating Dia. d_3	Cutting Dia. d_1	Reference Circle Dia. d_4	Height h
22	63	–	40
27	80	–	50
32	100	–	50
40	125	–	63
40	160	66,7	↓
60	200	101,6	
↓	250	↓	
	315		

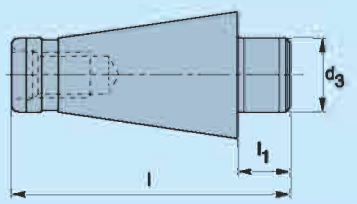
Supply range:
Shell End Mill DIN 6357 with screwed drive blocks.
Locating arbour with enlarged contact face, draw – on screws, without wrench.
Pull–studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5·36040 –140405**

Design specifications of steep taper see page 110.

ALMASE SAZ - Centring Arbour DIN 6356

• For mills with internal centring of face and shoulder mills



Taper size	CODE	d_3	l	l_1
	DIN 2080			
50	**5·30405-317**	60	166	40
60	**5·30406-318**	60	246	40

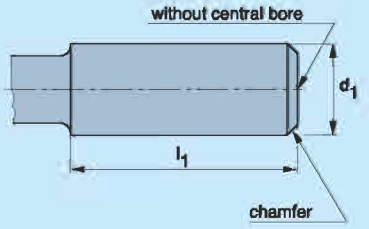
Face and shoulder mills

Locating Dia. d_3	Cutting Dia. d_1	Reference Circle Dia. d_4	Height h
60	200	101,6	63
↓	250	↓	63
	315		80
	400		↓
	500	177,8	
↓	600	177,8	↓

Supply range:
Centering Arbour
Availability as current price list.
Ordering example:
1 off **5·30405 -317**

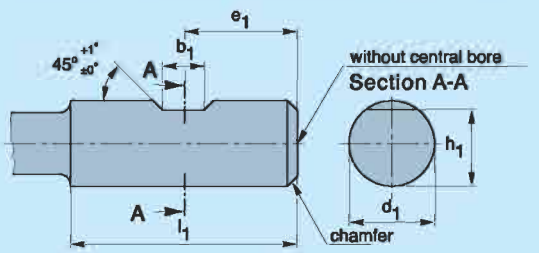
Cylindrical shank to DIN 6535 with / cylindrical

Form HA - cylindrical



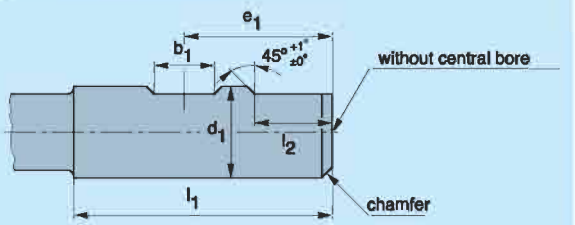
Form HB - with one clamping flat (Weldon)

Clamping flat with d_1 = from 6 to 20 mm



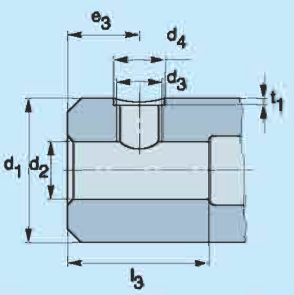
with two clamping flats (Weldon)

d_1 = 25 and 32 mm

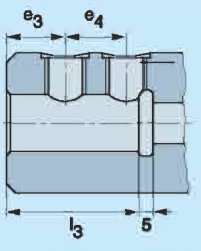


Clamping chuck for cylindrical shanks Form B and Form HB with clamping flat

For d_1 = 6 to 20 mm



For d_1 = 25 and 32 mm



Dimensions
Milling cutters with cylindrical shanks to DIN 6535 / Form HA and HB

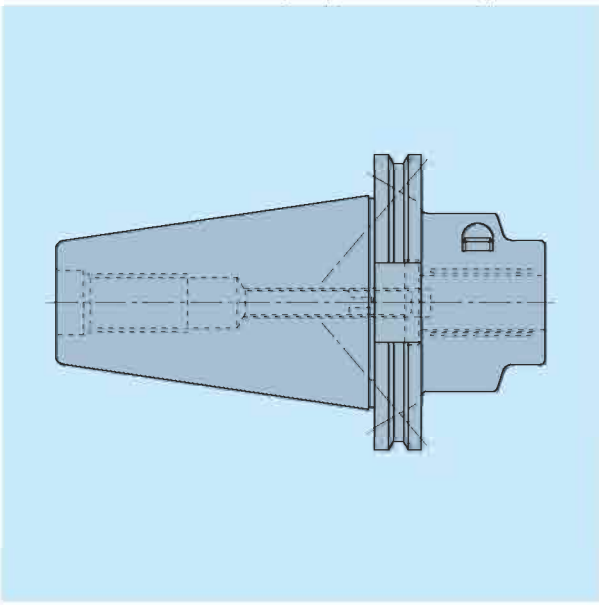
	cylindrical	with clamping flat				
d_{1h6}	l_1	b_1	h_{1h11}	l_1	l_2	e_1
6	36	4,2	5,1	36	–	18,0
8	36	5,5	6,9	36	–	18,0
10	40	7,0	8,5	40	–	20,0
12	45	8,0	10,4	45	–	22,5
14	45	8,0	12,7	45	–	22,5
16	48	10,0	14,2	48	–	24,0
18	48	10,0	16,2	48	–	24,0
20	50	11,0	18,2	50	–	25,0
25	56	12,0	23,0	56	17	32,0
32	60	14,0	30,0	60	19	35,0

Dimensions
Clamping chuck for cylindrical shanks to DIN 1835 Part 2 / Form B

d_1H5	d_2	d_3	d_4	e_3	e_4	l_1	l_3
6	25	M6	8	18,0	–	1,0	35
8	28	M8	10	18,0	–	1,3	35
10	35	M10	12	20,0	–	1,5	39
12	42	M12	14	22,5	–	1,6	44
14	44	M12	14	22,5	–	1,6	44
16	48	M14	16	24,0	–	1,7	47
18	50	M14	16	24,0	–	1,7	47
20	52	M16	18	25,0	–	2,1	49
25	65	M18x2	20	24,0	25	2,1	54
32	72	M20x2	22	24,0	28	2,2	58

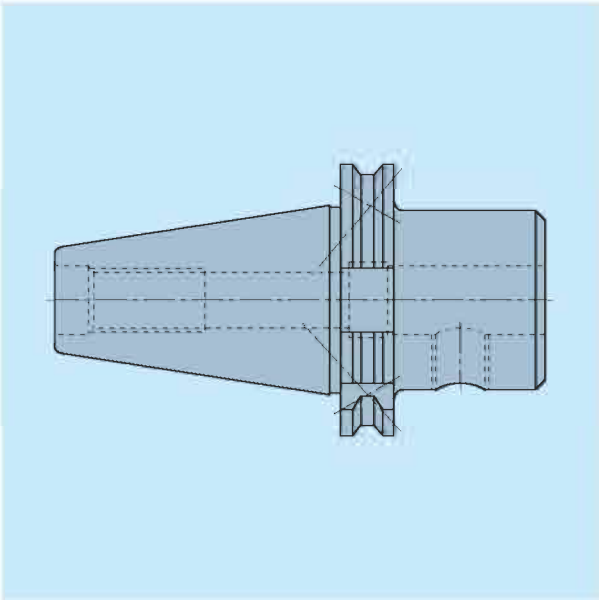
Recommended clamping torques for tools with solid carbide shanks

Clamping Screw	Clamping Torque
M 6	5 Nm
M 8	10 Nm
M 10	16 Nm
M 12	28 Nm
M 14	42 Nm
M 16	50 Nm
M 18	60 Nm
M 20	60 Nm



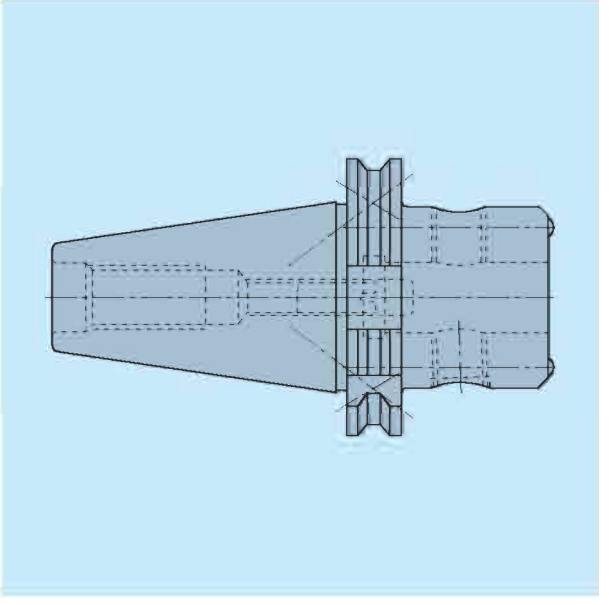
Hydraulic Clamping Chuck:
Optimum clamping of tool shank.
Maximum precison reduces tool wear.

Compact design:
High stiffness is ideally suitable for boring, milling and reaming.
Pre-balanced module minimises out–of–balance forces.



Combination chuck to DIN 1835 Form B and E with spherical nozzles:

For clamping tools with shanks to DIN 6535 Form HB, or DIN 1835 Forms B.

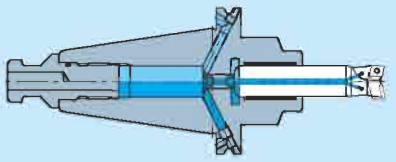


Combination chuck to DIN 1835 Form B and E with spherical nozzles:

For clamping tools with shanks to DIN 6535 Forms HB and HE, or DIN 1835 Forms B and E with axially adjustable stop screws.

Internal cooling ducts for hydraulic expansion chuck:

DIN 69871
Form B*:



DIN 69871
Form AD**:

Fig 1

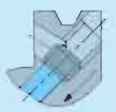


Fig 2

Variants with coolant nozzles for chucks with taper shank to DIN 69871
For use with tools having internal cooling ducts

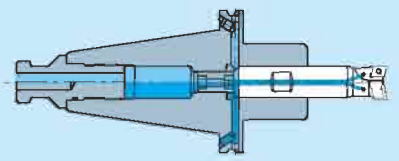
Compact design:

Coolant ducts for supply to DIN 69871 Form B, see Fig 1.

Possible variant for coolant ducts to DIN 69871 Form AD - locking of stop screws- see Fig 2.

Internal cooling ducts for clamping chuck DIN 1835 Form B:

DIN 69871
Form AD**:



DIN 69871
Form AD**:

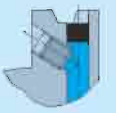


Fig 3

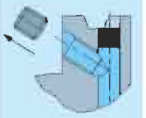


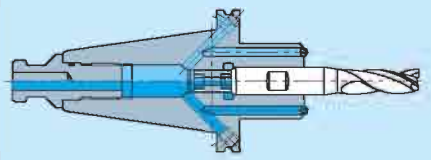
Fig 4

Clamping chuck to DIN 1835 Form B:
Coolant ducts for supply to DIN 69871 Form AD - see Fig 3.

Possible variant for coolant ducts to DIN 69871 Form B - removal of sealing screws on collar - see Fig 4.

Internal cooling ducts for combination chuck DIN 1835 Form B/E with spherical nozzles:

DIN 69871
Form B*:



DIN 69871
Form AD**:

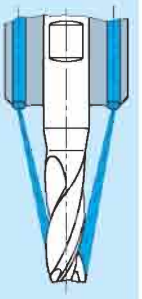


Fig 5

Use with tools having external cooling

Combination chuck to DIN 1835, Forms B and E with spherical nozzles:
Coolant ducts for supply to DIN 69871 Form B, see Fig 1.

Possible variant for coolant ducts to DIN 69871 Form AD - locking of stop screws- see Fig 2.

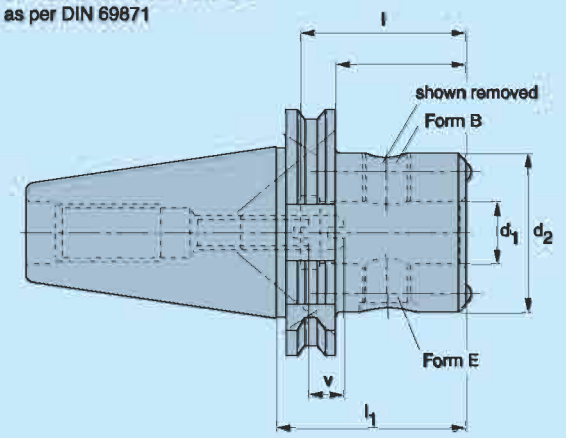
Spherical nozzles open - coolant supply via adjustable nozzles see Fig 5.

* Pull studs to DIN 69872, Form B, coolant supply Form B
** Pull studs to DIN 69872, Form A, coolant supply Form AD

ALMASE SAZ - Clamping Chuck DIN 1835

Combination Chuck (Forms B and E)

- For tools with shank to DIN 1835 Forms B and E and DIN 6535 Forms HB and HE
  Fig. as per DIN 69871



Taper size	CODE	d_1H5	d_2	l_1	l_4	l_{max}	V	Weight (kg)	Clamping Screw	Plastic Screw	Spherical Nozzle	Stop Screw
	Cooling central or via nozzles											
	DIN 69871 Form B and AD											
40	**5-36040-161206**	6	25	50	30,9	36	8	1,0	**191-675**	**192-775**	**280-060**	**571-060***
	5-36040-161208	8	28	↓	↓	36	10	1,0	**191-676**	**192-776**	↓	**571-061***
	5-36040-161210	10	35	↓	↓	40	↓	1,1	**191-677**	**192-777**	↓	**571-062***
	5-36040-161212	12	42	63	43,9	45	↓	1,3	**191-678**	**192-778**	↓	**571-063***
	5-36040-161214	14	44	↓	↓	45	↓	1,3	**191-678**	**192-778**	↓	**571-063***
	5-36040-161216	16	48	↓	↓	48	12	1,4	**191-679**	**192-779**	↓	**571-064***
	5-36040-161218	18	50	↓	↓	48	↓	↓	**191-679**	**192-779**	↓	**571-064***
	5-36040-161220	20	52	↓	↓	50	↓	↓	**191-680**	**192-780**	↓	**571-065***
50	**5-36050-161206**	6	25	50	30,9	36	8	2,9	**191-675**	**192-775**	**280-060**	**571-060***
	5-36050-161208	8	28	↓	↓	↓	10	2,9	**191-676**	**192-776**	↓	**571-061***
	5-36050-161210	10	35	↓	↓	↓	↓	3,0	**191-677**	**192-777**	↓	**571-062***
	5-36050-161212	12	42	63	43,9	↓	↓	3,2	**191-678**	**192-778**	↓	**571-063***
	5-36050-161214	14	44	↓	↓	↓	↓	3,2	**191-678**	**192-778**	↓	**571-063***
	5-36050-161216	16	48	↓	↓	48	12	3,3	**191-679**	**192-779**	↓	**571-064***
	5-36050-161218	18	50	↓	↓	48	↓	3,3	**191-679**	**192-779**	↓	**571-064***
	5-36050-161220	20	52	↓	↓	50	↓	3,2	**191-680**	**192-780**	↓	**571-065***
	5-36050-161225	25	65	100	80,9	55	16	3,9	**191-681**	**192-898**	↓	**571-086***
	5-36050-161232	32	72	100	80,9	60	16	4,6	**191-682**	**192-899**	↓	**571-066***

Chuck with clamping screw(s) (steel) mounted for clamping Form E (2° Whistle Notch). For clamping Form B (Weldon) plastic screw(s) must be replaced by clamping screw(s) (steel).
*) with axial bore
Design specifications of steep taper see page 110.
DIN 2080 and MAS 403 BT upon request.

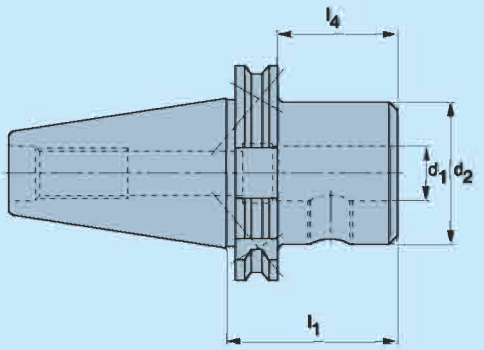
Supply range:
Clamping chuck with clamping screw, plastic screw, nozzle and stop screw.
Pull–studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5-36040 –161206**

ALMASE SAZ - DIN 1835 Clamping Chuck

Form B Weldon

- For tools with shank to DIN 1835 Form B and DIN 6535 Forms HB Fig. as per DIN 69871



Taper size	CODE	d_1H5	d_2	l_1	l_4	Weight (kg)	Clamping Screw
	DIN 69871 Form B and AD						
40	**5-36040-151106**	**6**	**25**	**50**	**30,9**	**0,9**	**191-675**
	5-36040-151108	8	28			0,9	**191-676**
	5-36040-151110	**10**	**35**			**1,0**	**191-677**
	5-36040-151112	**12**	**42**			**1,1**	**191-678**
	5-36040-151114	**14**	**44**	↓	↓	**1,3**	**191-678**
	5-36040-151116	16	48	63	43,9		**191-679**
	5-36040-151118	**18**	**50**	↓	↓	↓	**191-679**
	5-36040-151120	20	52	↓	↓	↓	**191-680**
	5-36040-151125	**25**	**65**	**100**	**80,9**	**2,4**	**191-681**
	5-36040-151132	32	72	100	80,9	2,5	**191-682**
50	**5-36050-151106**	**6**	**25**	**63**	**43,9**	**2,7**	**191-675**
	5-36050-151108	8	28			2,7	**191-676**
	5-36050-151110	**10**	**35**			**2,8**	**191-677**
	5-36050-151112	**12**	**42**			**2,9**	**191-678**
	5-36050-151114	**14**	**44**			**2,9**	**191-678**
	5-36050-151116	**16**	**48**			**3,0**	**191-679**
	5-36050-151118	**18**	**50**			**3,0**	**191-679**
	5-36050-151120	20	52	↓	↓	3,1	**191-680**
	5-36050-151125	**25**	**65**	**80**	**60,9**	**3,8**	**191-681**
	5-36050-151132	32	72	100	80,9	4,6	**191-681**

Design specifications of steep taper see page 110.
d_1 = 25 and 32 with 2 clamping screws.

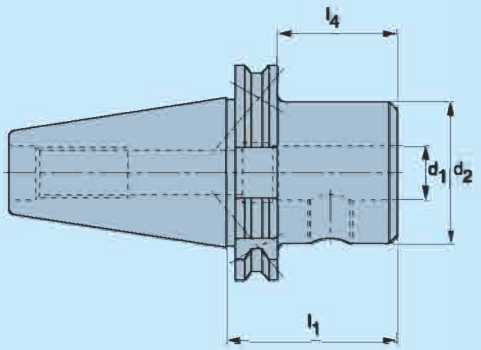
Supply range:
Clamping chuck with clamping screw.
Pull–studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5-36040 –151106**

ALMASE SAZ - DIN 1835 Clamping Chuck

Form B Weldon

- For tools with shank to DIN 1835 Form B and DIN 6535 Form HB Fig. as per DIN 69871



Taper size	CODE	d_1 H5	d_2	l_1	l_4	Weight (kg)	Clamping Screw
	MAS 403 BT						
40	**5-36040-311106**	**6**	**25**	**50**	**23**	**1,1**	**191-675**
	5-36040-311108	**8**	**28**	**50**	**23**	**1,1**	**191-676**
	5-36040-311110	**10**	**35**	**63**	**36**	**1,2**	**191-677**
	5-36040-311112	**12**	**42**	↓	↓	**1,3**	**191-678**
	5-36040-311114	**14**	**44**			**1,3**	**191-678**
	5-36040-311116	16	48			1,4	**191-679**
	5-36040-311118	**18**	**50**			↓	**191-679**
	5-36040-311120	20	52	↓	↓	↓	**191-680**
	5-36040-311125	**25**	**65**	**90**	**63**	**2,4**	**191-681**
	5-36040-311132	32	72	100	73	2,5	**191-682**
50	**5-36050-311106**	**6**	**25**	**63**	**25**	**2,8**	**191-675**
	5-36050-311108	8	28	63	25	2,9	**191-676**
	5-36050-311110	**10**	**35**	**75**	**37**	**3,6**	**191-677**
	5-36050-311112	12	42	↓	↓	3,6	**191-678**
	5-36050-311114	**14**	**44**			**3,8**	**191-678**
	5-36050-311116	16	48			3,8	**191-679**
	5-36050-311118	**18**	**50**			**4,0**	**191-679**
	5-36050-311120	**20**	**52**	↓	↓	**4,5**	**191-680**
	5-36050-311125	**25**	**65**	**100**	**62**	**4,9**	**191-681**
	5-36050-311132	32	72	105	62	5,2	**191-682**
	DIN 2080 with Ring Slot						
40	**5-36040-241106**	**6**	**25**	**50**	**38,4**	**0,8**	**191-675**
	5-36040-241108	8	28	↓	↓	0,9	**191-676**
	5-36040-241110	**10**	**35**			**1,0**	**191-677**
	5-36040-241112	12	42			1,1	**191-678**
	5-36040-241114	**14**	**44**	↓	↓	**1,1**	**191-678**
	5-36040-241116	16	48	63	51,4	1,3	**191-679**
	5-36040-241118	**18**	**50**	**63**	**51,4**	**1,3**	**191-679**
	5-36040-241120	20	52	90	78,4	1,4	**191-680**
	5-36040-241125	**25**	**65**	**90**	**78,4**	**2,2**	**191-681**
	5-36040-241132	32	72	100	88,4	2,7	**191-682**
	DIN 2080						
50	**5-36050-251106**	**6**	**25**	**63**	**47,8**	**27**	**191-675**
	5-36050-251108	**8**	**28**	↓	↓	**28**	**191-676**
	5-36050-251110	**10**	**35**			**30**	**191-677**
	5-36050-251112	12	42			32	**191-678**
	5-36050-251114	**14**	**44**			↓	**191-678**
	5-36050-251116	16	48				**191-679**
	5-36050-251118	**18**	**50**				**191-679**
	5-36050-251120	20	52	↓	↓	39	**191-680**
	5-36050-251125	**25**	**65**	**80**	**64,8**	**39**	**191-681**
	5-36050-251132	32	72	80	64,8	42	**191-682**

Supply range:
Clamping chuck with clamping screw.
Pull studs supplied seperately.

Availability as current price list.
Ordering example:
1 off **5-36040 –311116**

Design specifications of steep taper see page 110.
d_1 = 25 and 32 with 2 clamping screws.

ALMASE SAZ - Appearance of Wear during Milling

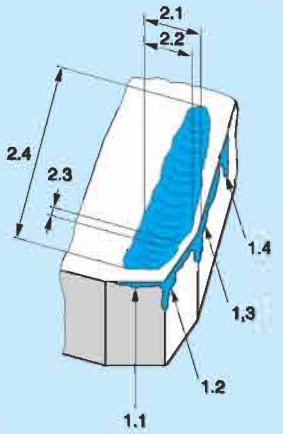


Fig. 1

Type of Wear
- Flank and crater wear
- Comb cracking and splintering
- Edge build-up
- Plastic deformation

Flank and crater Wear Range

1. Flank Wear
1.1 Angle chamfer/secondary cut
1.2 Angle chamfer/main cut
1.3 Main cut (average depth of cut)
1.4 Depth of cut notch

2. Crater Wear
2.1 Crater width to cutting edge
2.2 Crater width
2.3 Crater depth
2.4 Crater lenght

Fig. 2

Fig. 3

Flank and Crater Wear (Figs. 1, 2 and 3)

The normal criterion is the flank wear. As with crater wear, it is caused mainly by abrasion. Excessive flank wear produces poorer surface finish, increases cutting forces, and can lead to insert breakage. The magnitude of flank and crater wear depends on carbide grade, cutting speed, feed f_z and period of contact of milling cutter.

Fig. 4

Transverse cracks (Fig. 4)

Transverse cracks are signs of fatigue of the cutting material.
They are substantially caused by impact and shock stress. In this connection the entry of the cutting edge is very important.

Fig. 5

Comb Cracking and Splinterings (Figs. 5 and 6)

Comb cracking arises due to thermal shocks on the cutter during milling. Excessive contact time can transform comb cracking into splintering of the cutting edge. Formation of comb cracks on the edge depends on cutting speed, carbide grade, cutting geometry, and feed f_z.

Fig. 6

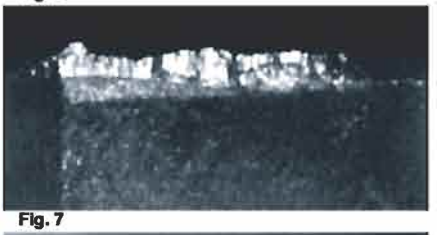


Fig. 7

Edge Build-up (Fig.7)

Edge build-up occurs because of welding of workpiece material to the main cutting edge. It reduces surface quality and extends work times. Edge build-up occurs mainly at lower cutting speeds and depends on the workpiece/cutting material combination as well as on cutting geometry.

Fig. 8

Plastic Deformation (Fig.8)

Plastic deformation arises when the rigidity of the cutting material is so greatly reduced by elevated cutting temperatures that the cutting forces deform the edge.

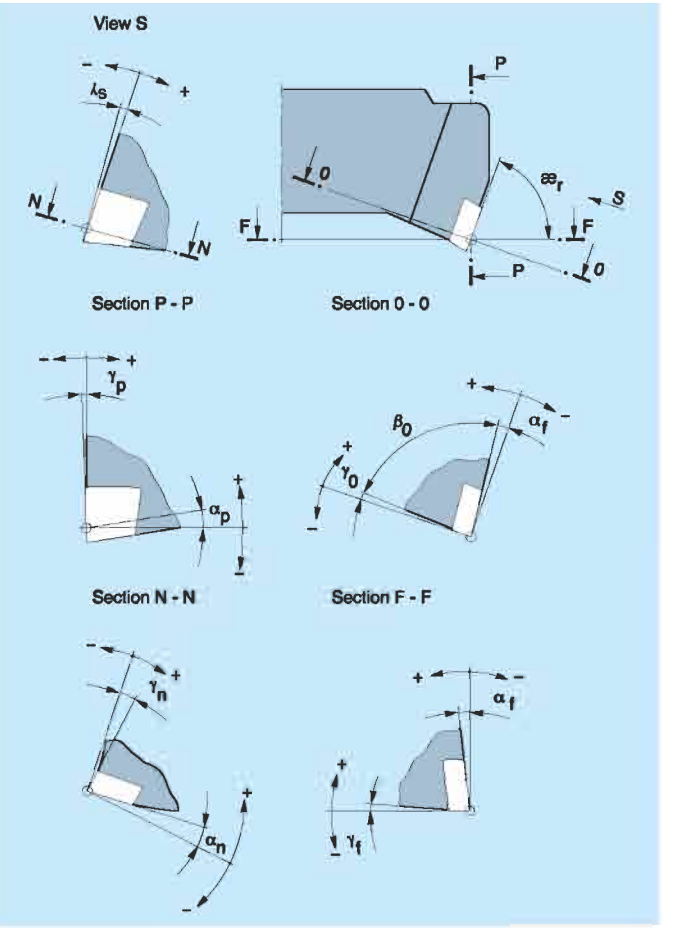
ALMASE SAZ - Trouble Shooting

Problem	Possible Reasons	Actions
Insert breakage	• Extensive wear • Wrong insert position • Wrong insert mounting • Too brittle cutting grade • Unsuitable cutting edge geometry • Cutting edge overload • Unfavourable positioning of mill and workpiece • "Curled" chips	• Earlier insert change • Remachining of insert/insert exchange • Correct insert mounting • Select tougher cutting grade • select geometry with higher stability • Reduce chip thickness • Improve positioning of mill and workpiece • Horizontal spindle: upward milling Vertical spindle: remove chips
Splintering of cutting edge	• Too brittle cutting grade • Unsuitable cutting edge geometry • Unfavourabale positioning of mill and workpiece • Vibrations/Chatter	• Select tougher cutting grade • Select geometry with higher stability • Improve positioning of mill and workpiece • Avoid
Vibrations/ chatter	• Unfavourable rigidity of machine • workpiece, clamping, tool • Unfavourable positioning of mill and workpiece • Too many teeth in cut • Unfavourable tooth contact • Unfavourabale cutting edge geometry • Cantilever length too long	• Improve • Improve positioning of mill and workpiece • Use mill with wider tooth pitch • Select mill with unequal tooth pitch • Change speed (Resonance!) • Select rather positive geometry • Increase feed per tooth • Cantilever length as short as possible
Chip jam	• Chip space too small	• Use mill with wider tooth pitch • Use mill with k= 45° • Change chip thickness
Edge built-up	• Temperature of chip-cutting edge contact zone too low	• Increase cutting speed • Select coated carbide
Sticking chips	• Temperature of chip-cutting edge contact zone too low	• Increase cutting speed • Select coated carbide • Improve positioning mill - workpiece
Comb crackings	• Insufficient resistance to heat alternations	• Reduce cutting speed
Transverse cracks	• Insufficient resistance to heat alternations	• Reduce feed per tooth • Select tougher grade
Wear notch	• Hard marginal zone	• Select grade with higher wear resistance • Select smaller approach angle
Extensive flank wear	• Extensive wear	• Select grade with higher wear resistance • Climb milling • Reduce cutting speed
Formation of burrs	• Edge sharpness too low • Cutting force too high • Unfavourable direction of cutting force	• Select sharper cutting edges • Select rather positive geometry • Select smaller approach angle
Workpiece breakage	• Edge sharpness too low • Cutting force too high • Unfavourable direction of cutting force • Brittle workpiece material	• Select sharper cutting edges • Select rather positive geometry • Select smaller approach angle • Change positioning mill - workpiece • Climb milling • Before milling, chamfering of tooth exit
Surface finish	• Cutting edge with corner radius • plane running errors • Feed per rev. too high • Tumbling error of mill on spindle	• Use insert with face chamfer • Plane running errors eliminate/ to reduce • Reduce • Use of wiper insert • Correct mounting of mill • Cleaning of cutting area • Re-machining of spindle nose/head
Recutting	• Cutting force too high	• Reduce chip thickness • Use smaller mill • Select smaller approach angle • Earlier insert change

ALMASE SAZ - Tool Geometries

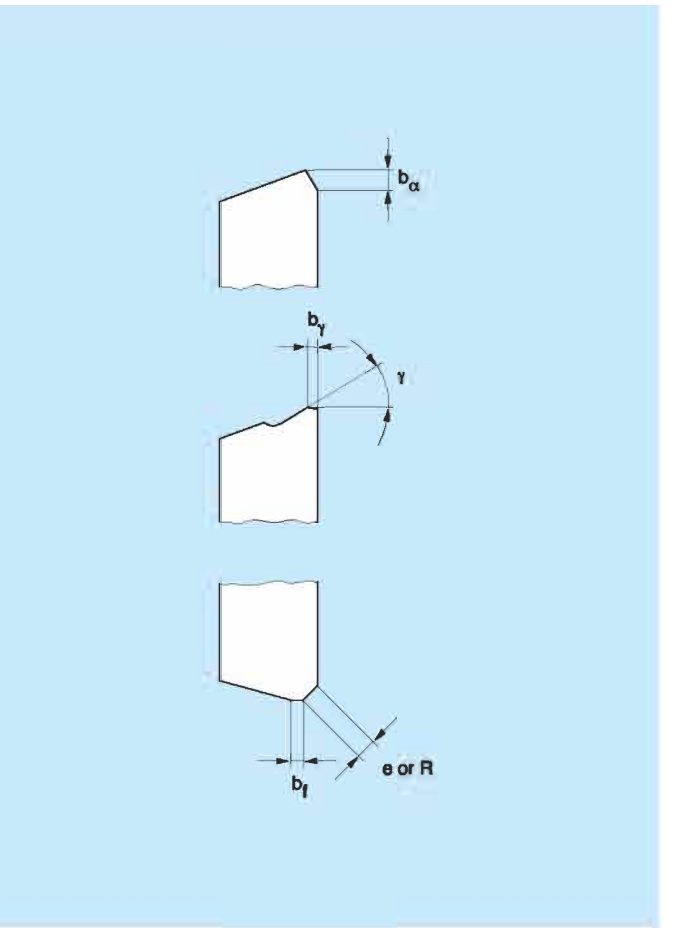
At the mill

Clearance angle	α_0
Flank clearance angle (radial clearance angle)	α_f
Rear clearance angle (axial clearance angle)	α_p
Normal clearance angle (axial clearance angle)	α_n
Rake angle	γ_0
Flank rake angle (radial rake angle)	γ_f
Rear rake angle (axial rake angle)	γ_p
Normal rake angle (effective rake angle)	γ_n
Lead angle	$æ_r$
Inclination angle	λ_s
Wedge angle	β_0



At the cutting edge

Face chamfer	b_f
Corner chamfer	e
Corner radius	R
Rake angle of cutting edge	γ
True rake chamfer	b_γ
Side rake chamfer	b_α



Slot depth, width of contact (radial)	a_e		mm
Depth of cut (axial)	a_p		mm
Feed per revolution	$f = \frac{V_f}{n}$		mm/rev.
Feed per tooth (Cutting edge)	$f_z = \frac{V_f}{z \times n}$		mm/tooth
Cutting speed	$v_c = \frac{d \times \pi \times n}{1000}$		m/min
Max. cutting speed for unbalanced tools	$v_{c\,max} =$	1000	m/min
Feed rate	$v_f = f_z \times z \times n$		mm/min
Revolutions per minute (RPM)	$n = \frac{v_c \times 1000}{d \times \pi}$		min-1
Effective No. (Qty.) of teeth	$z = \frac{v_f}{f_z \times n}$		
Average chip thickness	$h_m = f_z \times \sqrt{\frac{a_e}{d_1}}$		mm
Tightening torque of clamping screw	M_{An}		Nm
Drive power (estimated)	$P_e = \frac{a_e \times a_p \times v_f}{1000 \times Q}$		kW

	Material Groups		Q (cm³/kW/min)
A	1 2 Unalloyed Steel and Cast Steel 3		20 – 28
A	4 Low Alloy 5 Steel 6 and Cast Steel		18 – 26
A	7 High Alloy 8 Steel and Cast Steel		14 – 20
A	9 Stainless 10 Steel	ferritic / Martensitic	14 – 20
R	11 Stainless Steel and Cast Steel	austenitic	14 – 20
S	12 Heat-resistant Alloys		14 – 20
F	13 Malleable Cast Iron	13.1 White (GTW) 13.2 Black (GTS)	28 – 34
F	14 Grey Cast Iron	14.1 GG10-GG20 14.2 GG25-GG30 14.3 GG35-GG40	35 – 50
F	15 Spheroidal Graphite Cast Iron	15.1 Ferritic GGG35-GGG55 15.2 Pearlitic GGG60-GGG80	30 – 40
H	16 Chilled Iron		30 – 40
S	17 Titanium and Titanium Alloys		12 – 16
H	18 Hardened Steel	18.1 Hardened Steel 18.2 Manganese Steel 12 %	12 – 16
N	19 Non-Ferrous Metals		40 – 50
N	20 Aluminium Alloys		70 – 90
N	22 Composites		60 – 70

Note:

Feed per tooth f_z and cutting depth a_p should be set relative to machine power available.

Code for Indexable Inserts DIN 4987 part 1 and 2

S	P	K	N	12

1. Insert shape

- **H** hexagon 120°
- **O** octagon 135°
- **P** pentagon 108°
- **S** square 90°
- **T** triangular 60°
- **C** rhomboid 80°
- **D** rhomboid 55°
- **E** rhomboid 75°
- **M** rhomboid 86°
- **V** rhomboid 35°
- **W** trigon 80° with enlarged corner angles
- **L** rectangular 90°
- **A** rhomboid 85°
- **B** rhomboid 82°
- **K** rhomboid 55°
- **R** round –
- **X** Special design

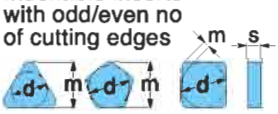
2. Clearance angle

- **A** 3°
- **B** 5°
- **C** 7°
- **D** 15°
- **E** 20°
- **F** 25°
- **G** 30°
- **N** 0°
- **P** 11°
- **O** Indicated for other clearance angles requiring descriptions.

3. Tolerance class

Indexable inserts with parallel lands

Indexable inserts with odd/even no of cutting edges



Basic shape: H, O, P, S, T, C, E, M, W, R
Tolerance for "m"

Inscrib. cicle "d"	Tolerance class: A, F, J, C, H, K E, G, L	Tolerance value: ±0,005 ±0,013 ±0,025
3.9-10	M,N	±0,08
10-15		±0,13
15-20		±0,15
20-26		±0,18
26-32		±0,20
3.9-10	U	±0,13
10-15		±0,20
15-20		±0,27
20-26		±0,38
26-32		±0,38

Tolerance for "d"

	A, C, E, G F, H	±0,025 ±0,013
3.9-10	J, K, L M, N	±0,05
10-15		±0,08
15-20		±0,10
20-26		±0,13
26-32		±0,15
3.9-10	U	±0,08
10-15		±0,13
15-20		±0,18
20-26		±0,25
26-32		±0,25

Basic shape: L, A, B, K
Tolerance for "m"

	A, F, J C, H, K E, G, L	±0,005 ±0,013 ±0,025
	M, N, U	No Toler. value given by DIN

Tolerance for "d"

	A, C, E, G F, H	±0,025 ±0,013
	J, K, L M, N, U	No Toler. value given by DIN

Basic shape: D, V
Tolerance for "m"

	A, F, J C, H, K E, G, L	±0,005 ±0,013 ±0,025
3.9-10	M, N	±0,11
10-15		±0,15
15-20		±0,18

Tolerance for "d"

	A, C, E, G F, H	±0,025 ±0,013
3.9-10	M, N	±0,05
10-15		±0,08
15-20		±0,10

all Basic shapes
Tolerance for "s"

	A, C, E, F H, J, K, L N U	±0,025 ±0,025 ±0,025 ±0,13
Thickn."s" up to 2.38 above2.38	G, M	±0,05 ±0,13

4. Insert features

- **N**
- **R**
- **F**
- **A**
- **M**
- **G**
- **W**
- **T**
- **Q**
- **U**
- **B**
- **H**
- **C**
- **J**
- **X** Special design

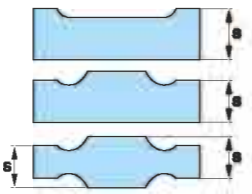
5. Size of indexable inserts

- **H**
- **O**
- **P**
- **S**
- **T**
- **C**
- **D**
- **E**
- **M**
- **V**
- **W**
- **L**
- **A**
- **B**
- **K**
- **R**

Integers to be preceded by a 0 if size requires only one code number.

03	E	D	(T)	R	3

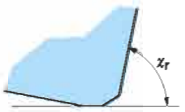
6. Insert thickness



	s
01	1,59
T1	1,98
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
M5	5,0

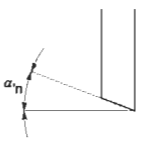
7. Cutting corner

Milling



Code letter for the setting angle

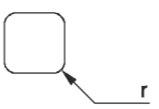
	χ_r
A	45°
D	60°
E	75°
F	85°
P	90°
Z	other setting angles



Code letter for normal clearance angle of the parallel land

	α_n
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
Z	other normal clearance angles

Corner radius



	r
00	sharp cutting edge
02	0,2 mm
04	0,4 mm
08	0,8 mm
12	1,2 mm
16	1,6 mm
24	2,4 mm
32	3,2 mm

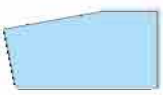
for round inserts

00	inscr. circle inch
M0	inscribed circle metric

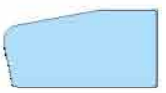
8. Cutting edge

F sharp

E rounded

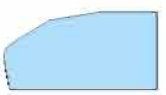


T chamf. cutting edges



S chamfered and rounded

K double-chamfered



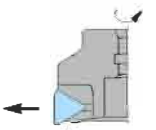
P double-chamfered and rounded

Position 8 and 9 are optional.
ALMASE-SAZ will place here the chip breaker from if requireed (Symbol 10).

9. Cutt

Milling

N RIGHT-hand and LEFT-hand cutting



L LEFT-hand cutting

R RIGHT-hand cutting

Turning

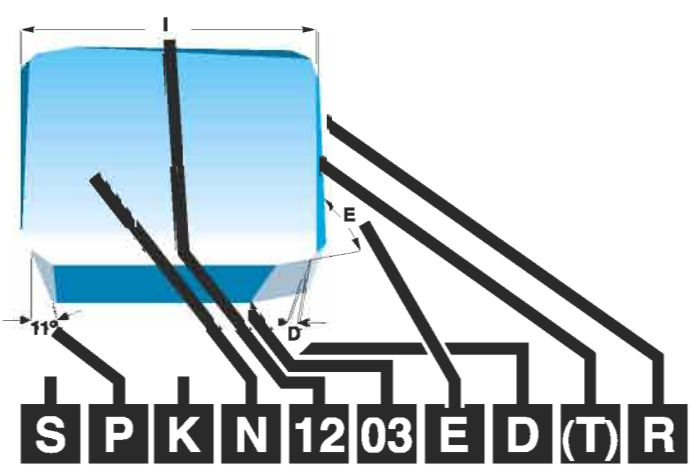
10. Manufacturer's type designation

Chip breacker design milling

0
1
2
3
4
5
6
7
8
9
LF
MF

Others

J	polished chip flow surfaces
P	chip flow surface partially chamfered
W	wiper insert
4W	4 finishing insert
Z	protection against torsion
1	finishing



ALMASE SAZ - Indexable Inserts – Summary

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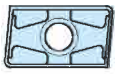
29 - 31 - 52		APFX	1604PD R	●	●	●			●	●		●		
			1R					○	●					
			2R					●	●		●	●		●
			8R					○	●		●	●		
48 - 52		CCGX	060204 N	●				○	●		●	●		
			03021R				●	○						●
			2R				●	○				●		
			09T308 R	●				○	●		●	●		
			0905041R				●	○						●
			2R				●	○				●		
			120412 R	●				○	●		●	●		
50		CCGX	060304TR			●	●	○	●	●	●	●		
52		COGX	06T104 R	●				○	●		●	●		
35		LDHX	1503081R					○	●		●			
			2R									●		
		LDNX	1503081R					●	●		●			
			2R									●		
35		LDNX	150308ER									●		
			SR						●		●			
35		LPHX	1504AP1R					○	●		●			
			2R									●		
		LPNX	1504AP1R					●	●		●			
			2R									●		
58		RPHT	0803MOEN					○	●		●	●		
			10T3MOEN					○	●		●	●		
			1204MOEN					○	●		●	●		
35		SDHX	0903081N					○	●		●			
			2N									●		
		SDNX	0903081N					●	●		●			
			2N									●		

● = stocked ○ = non-stocked without symbol = upon request

ALMASE SAZ - Indexable Inserts – summary

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			SN						●		●			
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			AFTN	●					●					
19		SEAX	1204AF N					●						
21		SEKN	1203AF N						●		●	●		
			AFTN	●				●	●	●				
			AFFN											
			1204AFSN					●						
			AFFN											
			1504AF N									●		
			AFSN											
			AFTN	●				●	●		●			
19		SEKX	1204AFSN						●		●			
			AFEN									●		
			AFFN											
25		SNEX	1204EN N									●		
			ENTN											
25		SNGN	120408											
			12											
			16											
27			120704											
			08											
			12											
			16											
			20											
25		SNKN	1204EN N		●			○	●			●		
			ENTN											
			1504EN N											
25		SNMN	1204AZ											
84		SNUN	120408						●	●		●		
			12											
			16											
23		SPEX	1203ED R									●		
			1504ED R									●		
52 - 54		SPGX	0602AP	●				○	●		●			●
56 - 60			0903AP	●				○	●		●			●
			12T3AP					○	●		●			●
			2007AZTN											
35		SPHX	1204081N					○	●		●			
			2N									●		

ALMASE SAZ - Indexable Inserts – Summary

Page	Insert			Coated CF2	CF3	CD2	CD4	CG4	Uncoated P2F	GX	PVA	KM1	K20	KMF
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			ED R	●	●			●	●	●		●		
			EDTR											
			1504ED R	●	●			●	●	●		●		
			1504EDTL											
35		SPNX	1204081N					●	●		●			
			2N									●		
35		SPNX	120408EN									●		
			SN						●		●			
31		TPKN	1603PD R					●	●			●		
			PDTR											
			PDSR									●		
			1603PP L											●
			1603PP R											
			2204PD R	●				●	●	●		●		
			2204PDSR											
			PDTR											
85		TPUN	160308						●	●		●		
52		XCGX	060204 R	●				○	●		●	●		
39		5104040	378E	●		●		○	●			●		
			379E	●		●		○	●			●		
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			429E				●	○			●			
			430E				●	○			●			
			431E				●	○			●			
			438E					○				●		
			439E					○				●		
			440E					○				●		
			441E					○				●		
60		5104080	012E	●					●			●		
			013E	●					●			●		
			014E	●					●			●		
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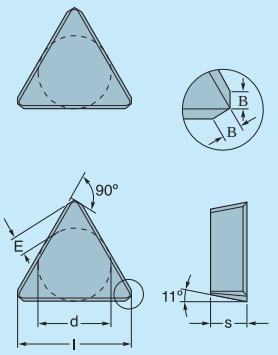
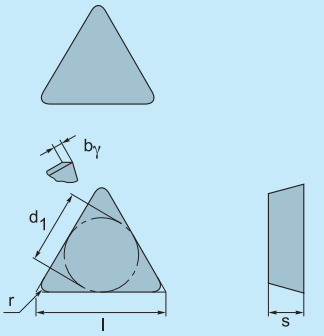
● = stocked ○ = non-stocked without symbol = upon request

TPAN
TPCN



TPGN
TPUN



Insert									
ISO-CODE	**ALMASE SAZ CODE**	grade	l_a	d_1=IC	s	m	b_s	r_ε	r
TPAN 1603PPN			16.5	9.525	3.175	2.45	1.2	–	–
TPAN 1603PPTN									
TPCN 1603PPN			16.5	9.525	3.18	2.45	1.2	–	–
TPGN 110204									
TPGN 110208									
TPGN 110304			11	6.35	3.18	9.128	–	–	0.2
TPGN 110308			11.0	6.35		8.731	–	–	0.8
TPGN 160302			16.5	9.525		14.089	–	–	0.2
TPGN 160304						13.391	–	–	0.4
TPGN 160308						13.494	–	–	0.8
TPGN 160312						13.097	–	–	1.2
TPGN 160316						12.70	–	–	1.6
TPGN 220404									
TPGN 220408			22.0	12.7	4.76	18.256		–	0.8
TPGN 220412			22.0	12.7	4.76	17.859		–	1.2
TPGN 220416									
TPGN 220424									
TPUN 110208			10.9	6.35	2.38		–	–	0.8
TPUN 110304			11.0		3.18	9.128	–	–	0.4
TPUN 110308			11.0			8.731	–	–	0.8
TPUN 160308		P2F KC2	16.5	9.525		13.494	–	–	0.8
		GX							
		KM1							
TPUN 160312			16.5	9.525		13.097	–	–	1.2
TPUN 220404			22.0	12.7	4.76		–	–	0.8
TPUN 220408						18.256	–	–	0.8
TPUN 220412						17.859			1.2

ALMASE SAZ - Spare Parts

Name	Page No.	Code	Insert	Holder
Screw Driver 				
	39	170.023	5104040..8E	4.96...-204
	39	170.023	5104040..9E	4.96...-205
	48	170.023	CCGX 060..	4.300..R...
	52	170.023	CCGX 060204N	4.31...R200
	52	170.023	COGX 06T104R	4.31...R160
	52	170.023	XCGX 060204R	4.31...R200
	52	170.023	SPGX 0602AP	4.31...R200
	54	170.023	SPGX 0602AP	4.31...R200
	60	170.023	51040800..E	4.3....R200
	60	170.023	SPGX 0602AP	4.3....R200
	48	170.024	CCGX 09....	4.300..R...
	52	170.024	CCGX 09T308R	4.314..R250
	52	170.024	SPGX 0903AP	4.31...R...
	54	170.024	SPGX 0903AP	4.31226 R 250
	56	170.024	SPGX 0903AP	4.332..R...
	58	170.024	RPHT 0803MOEN	4.30325 R 200
	60	170.024	51040800..E	4.34725 R 250
	23	170.025	SPEX 1203EDR	4.0.... R 151
	23	170.025	SPKN 1203EDR	4.0.... R 151
	23	170.025	SPEX 1504EDR	4.0.... R 156
	23	170.025	SPKN 1504EDR	4.0.... R 156
	25	170.025	SNEX 1204EN.N	4.0.... R 252
	25	170.025	SNKN 1204EN.N	4.0.... R 252
	25	170.025	SNGN 1204..	4.0.... R 252
	27	170.025	SNGN 1207..	4.0.... R 253
	29	170.025	APFX 1604PDR	4.0.... R 340
	31	170.025	TPKN 1603PDR	4.0.... R 371
	31	170.025	TPKN 2204 PDR	4.0.... R 376
	35	170.025	LD.X 1503...	4.368.. R 404
	35	170.025	SD.X 0903...	4.368.. R 404
	39	170.025	5104040..OE	4.96...-20.
	46	170.025	APFX 1604 PDR	4.301..R...
	52	170.025	CCGX 120412 R	4.31... R 320
	52	170.025	SPGX 12T3AP	4.31... R 320
	52	170.025	APFX 1604 PDR	4.31... R 320
	52	170.025	SPGX 12T3 AP	4.31... R 320
	56	170.025	SPGX 12T3 AP	4.33232 R 000
	58	170.025	RPHT 10T3 MOEN	4.30332 R 250
	58	170.025	RPHT 1204 MOEN	4.30340 R 320
	60	170.025	SPGX 0903 AP	4.347.. R ...
	60	170.025	51040800..E	4.34732 R 320
	19	170.026	SE.X 1204 AF.N	4.0.... R 550
	21	170.026	SE.N 1203 AF.N	4.0.... R 55
	35	170.026	SP.X 1204...	4.368.. R 504
	35	170.026	LP.X 1504...	4.368.. R 504
	35	170.026	SP.X 1204...	4.39800 R 00.
	35	170.026	LP.X 1504...	4.39800 R 00.
	50	170.028	CCGX 060304 TR	4.3202. R 250
	60	170.026	51040800 ..E	4.34720 R 250
wrench				
	66	170.036	-	5.360..-...316
	67	170.036	-	5.360..-...316
	66	170.037	-	5.360..-...322
	67	170.037	-	5.360..-...322
	68	170.037	-	5.360..-...322
	66	170.038	-	5.360..-...327
	67	170.038	-	5.360..-...327
	68	170.038	-	5.360..-...327
	66	170.039	-	5.360..-...332
	67	170.039	-	5.360..-...332
	68	170.039	-	5.360..-...332
	66	170.040	-	5.360..-...340
	67	170.040	-	5.360..-...340
	68	170.040	-	5.360..-...340
	66	170.041	-	5.36050-...350
	67	170.041	-	5.36050-...350
Draw- On Screw				
	68	190.040	-	5.360..-142340
	68	190.041	-	5.360..-142327
	66	190.747	-	5.360..-...316
	67	190.747	-	5.360..-...316
	66	190.855	-	5.360..-...322
	67	190.855	-	5.360..-...322
	68	190.855	-	5.360..-...322
	66	190.977	-	5.360..-...332
	67	190.977	-	5.360..-...332
	68	190.977	-	5.360..-...332
	66	191.040	-	5.360..-...340

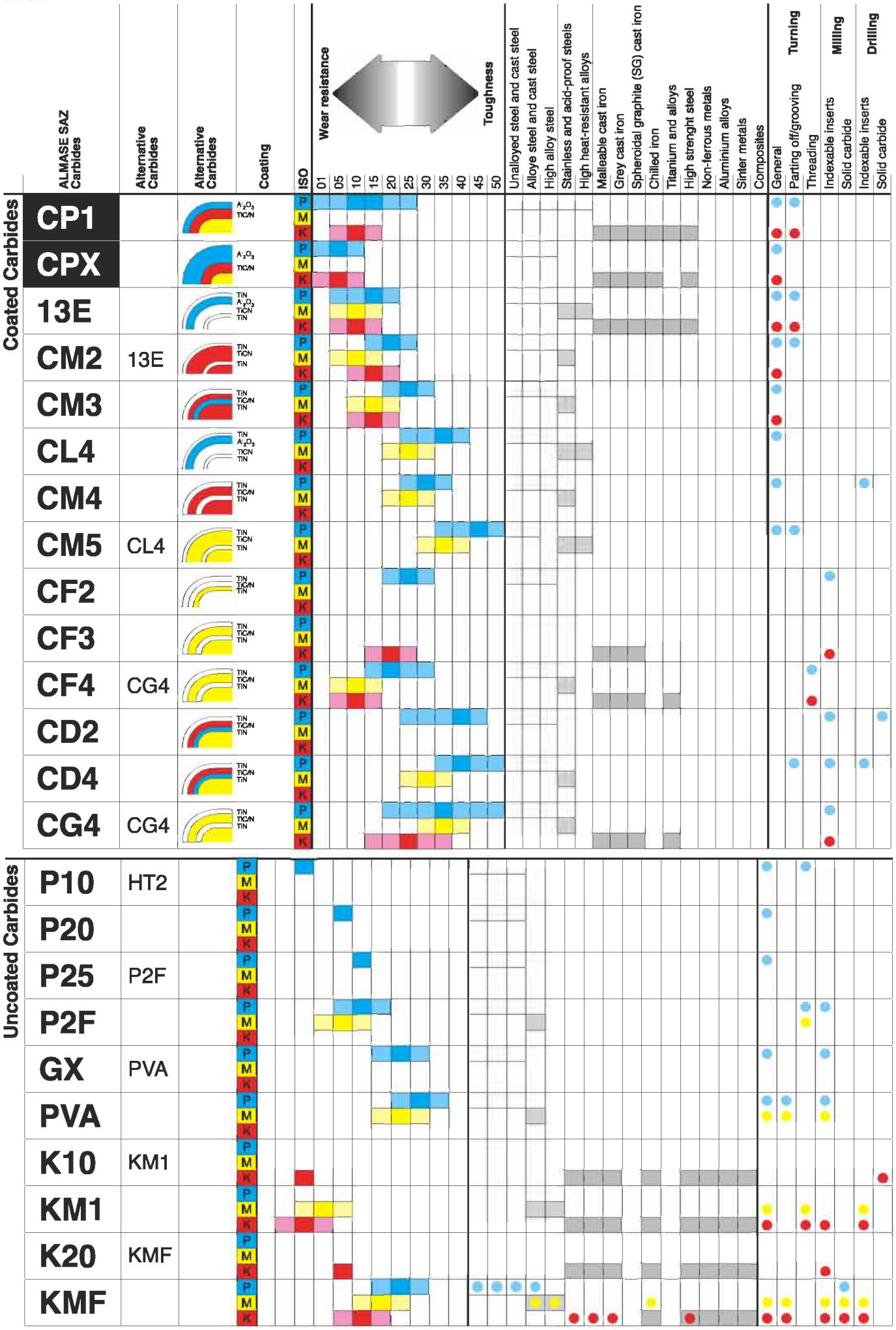
ALMASE SAZ - Spare Parts

Name	Page No.	Code	Insert	Holder
Draw- On Screw				
	67	191.040	-	5.360..-...340
	66	191.041	-	5.360..-...327
	67	191.041	-	5.360..-...327
	66	191.522	-	5.36050-...350
	67	191.522	-	5.36050-...350
Clamping Screw 				
	73	191.675	-	5.360..-161206
	74	191.675	-	5.360..-151106
	75	191.675	-	5.360..-241106
	75	191.675	-	5.360..-251106
	75	191.675	-	5.360..-311106
	73	191.676	-	5.360..-161208
	74	191.676	-	5.360..-151108
	75	191.676	-	5.360..-241108
	75	191.676	-	5.360..-251108
	75	191.676	-	5.360..-311108
	73	191.677	-	5.360..-161210
	74	191.677	-	5.360..-151110
	75	191.677	-	5.360..-241110
	75	191.677	-	5.360..-251110
	75	191.677	-	5.360..-311110
	73	191.678	-	5.360..-1612..
	74	191.678	-	5.360..-1512..
	75	191.678	-	5.360..-2411..
	75	191.678	-	3.360..-2511..
	75	191.678	-	5.360..-3111..
	73	191.679	-	5.360..-1612..
	74	191.679	-	5.360..-1511..
	75	191.679	-	5.360..-2411..
	75	191.679	-	5.360..-2511..
	75	191.679	-	5.360..-3111..
	73	191.680	-	5.360..-161220
	74	191.680	-	5.360..-151120
	75	191.680	-	5.360..-241120
	75	191.680	-	5.360..-251120
	75	191.680	-	5.360..-311120
	73	191.681	-	5.360..-161225
	74	191.681	-	5.360..-151125
	75	191.681	-	5.360..-241125
	75	191.681	-	5.360..-251125
	75	191.681	-	5.360..-311125
	73	191.682	-	5.360..-161232
	74	191.682	-	5.360..-151132
	75	191.682	-	5.360..-241132
	75	191.682	-	5.360..-251132
	75	191.682	-	5.360..-311132
	58	191.725	RPHT 10 TC MOEN	4.303.. R ...
	52	191.848	CCGX 12041 2R	4.31... R 320
	52	191.848	SPGX 12TCAP	4.31... R 320
	56	191.848	SPGX 12TCAP	4.33... R ...
	60	191.848	51040800..E	4.31... R 320
	29	191.916	APFX 1604 PDR	4.0... R 340
	46	191.916	APFX 1604 PDR	4.301.. R...
	52	191.916	APFX 1604 PDR	4.31...R 320
	52	191.924	CCGX 09....	4.300 .. R...
	64	191.924	CCGX 09 T 308 R	4.31...R 250
	52	191.924	SPGX 0903 AP	4.31...R 250
	54	191.924	SPGX 0903 AP	4.31...R 250
	56	191.924	SPGX 0903 AP	4.332..R...
	58	191.924	RPHT 0803 MOEN	4.30325 R 200
	60	191.924	51040800..E	4.34...R 250
	60	191.924	SPGX 0903 AP	4.31...R 250
Clamping Screw 				
	46	192.416	CCGX 060...	4.300.. R...
	52	192.416	XCGX 060204 R	4.31... R 200
	52	192.416	SPGX 0602 AP	4.31... R 200
	52	192.416	CCGX 060204 N	4.31... R 200
	54	192.416	SPGX 0602 AP	4.31... R 200
	60	192.416	SPGX 0602 AP	4.34... R 2..
	60	192.416	51040800.. E	4.34... R 2..
	90	192.432	CCGX 0600304 TR	4.3202.R 250
	60	192.432	51040800.. E	4.34... R 250
Drive Ring				
	66	192.491	-	5.360..-...316
	67	192.491	-	5.360..-...316
	66	192.492	-	5.360..-...322
	67	192.492	-	5.360..-...322
	66	192.493	-	5.360..-...327

ALMASE SAZ - Spare Parts

Name	Page No.	Code	Insert	Holder
Drive Ring				
	67	192.493	-	5.360..-...327
	66	192.494	-	5.360..-...332
	67	192.494	-	5.360..-...332
	66	192.495	-	5.360..-...340
	67	192.495	-	5.360..-...340
	66	192.496	-	5.360..-..0350
	67	192.496	-	5.360..-..0350
Clamping Screw 				
	39	192.529	5104040..8 E	4.96...-204
	39	192.530	5104040..9 E	4.96...-205
	39	192.531	5104040..0 E	4.96...-20.
	39	192.532	5104040..1 E	4.96...-21.
	52	192.667	COGX 06 T 104 R	4.31... R 610
Plastic Screw 				
	73	192.775	-	5.360..-161206
	73	192.776	-	5.360..-161208
	73	192.777	-	5.360..-161210
	73	192.778	-	5.360..-161212
	73	192.778	-	5.360..-161214
	73	192.779	-	5.360..-161216
	73	192.779	-	5.360..-161218
	73	192.780	-	5.360..-161220
Clamping Screw 				
	19	192.880	SE.X 1204 AF.N	4.0....-R 550
	35	192.880	LP.X 1504 ...	4.368... R 504
	35	192.880	SP.X 1204 ...	4.368... R 504
	35	192.881	SD.X 0903 ...	4.3.... R ...
	35	192.881	LD.X 1503 ...	4.3.... R ...
Plastic Screw 				
	73	192.898	-	5.360..-161225
	73	192.899	-	5.360..-161232
Spherical Nozzle				
	73	280.060	-	5.36040 - 1612..
	73	280.060	-	5.36045 - 1612..
	73	280.060	-	5.36050 - 1612..
Cassette Complete 				
	23	430.049	SPEX 1203 EDR	4.0.... R 151
	23	430.049	SPKN 1203 EDR	4.0.... R 151
	23	430.051	SPEX 1504 EDR	4.0.... R 156
	23	430.051	SPKN 1504 EDR	4.0.... R 156
	25	430.053	SNEX 1204 EN.N	4.0.... R 252
	25	430.053	SNKN 1204 EN.N	4.0.... R 252
	25	430.053	SNGN 1204 ...	4.0.... R 252
	31	430.057	TRKN 1603 PDR	4.0.... R 371
	31	430.059	TPKN 2204 PDR	4.0.... R 376
	27	430.072	SNGN 1207 ...	4.0.... R 253
	23	430.077	SE.N 1203 AF.N	4.0.... R 551
	21	430.079	SE.N 1504 AF.N	4.0.... R 556
Adjusting Wedge Complete 				
	23	460.546	SPKN 1203 EDR	4.0.... R 151
	23	460.546	SPEX 1203 EDR	4.0.... R 151
	23	460.546	SPKN 1504 EDR	4.0.... R 156
	23	460.546	SPEX 1504 EDR	4.0.... R 156
	25	460.546	SNKN 1204 EN.N	4.0.... R 252
	25	460.546	SNEX 1204 EN.N	4.0.... R 252
	25	460.546	SNGN 1204 ...	4.0.... R 252
	27	460.546	SNGN 1207 ...	4.0.... R 253
	31	460.547	TPKN 1603 PDR	4.0.... R 371
	31	460.547	TPKN 2204 PDR	4.0.... R 376
Clamping Wedge Complete 				
	23	460.548	SPKN 1203 EDR	4.0.... R 151
	23	460.548	SPEX 1203 EDR	4.0.... R 151
	23	460.548	SPKN 1504 EDR	4.0.... R 156
	23	460.548	SPEX 1504 EDR	4.0.... R 156
	31	460.548	TPKN 1603 PDR	4.0.... R 371
	31	460.548	TPKN 2204 PDR	4.0.... R 376
	25	460.550	SNKN 1204 EN.N	4.0.... R 252
	25	460.550	SNEX 1204 EN.N	4.0.... R 252
	25	460.550	SNGN 1204 ...	4.0.... R 252
	25	460.550	SNGN 1207 ...	4.0.... R 253
	21	460.831	SE.N 1203 AF.N	4.0.... R 551
	21	460.831	SE.N 1504 AF.N	4.0.... R 556
	39	470.202	TPAN 1103 PP	4.95003-...
Stop Screw				
	73	571.060	5.6200 R 00.	5.360...-161206
	73	571.061	5.6200 R 00.	5.360...-161208
	73	571.062	5.6200 R 00.	5.360...-161210
	73	571.063	5.6200 R 00.	5.360...-161212
	73	571.063	5.6200 R 00.	5.360...-161214
	73	571.064	5.6200 R 00.	5.360...-161216
	73	571.064	5.6200 R 00.	5.360...-161218
	73	571.065	5.6200 R 00.	5.360...-161220
	73	571.066	5.6200 R 00.	5.360...-161225
	73	571.066	5.6200 R 00.	5.360...-161232

ALMASE SAZ CUTTING GRADE TABLE



Uncoated Carbides

ALMASE SAZ Carbides	Alternative Carbides	Coating	ISO	01	05	10	15	20	25	30	35	40	45	50	Unalloyed steel and cast steel	Alloye steel and cast steel	High alloy steel	Stainless and acid-proof steels	High heat-resistant alloys	Malleable cast iron	Grey cast iron	Spheroidal graphite (SG) cast iron	Chilled iron	Titanium and alloys	High strenght steel	Non-ferrous metals	Aluminium alloys	Sinter metals	Composites	Turning: General	Turning: Parting off/grooving	Turning: Threading	Milling: Indexable inserts	Milling: Solid carbide	Drilling: Indexable inserts	Drilling: Solid carbide
P10	HT2		P			■																								●		●				
			M																																	
			K																																	
P20			P					■																						●						
			M																																	
			K																																	
P25	P2F		P						■																					●						
			M																																	
			K																																	
P2F			P					■	■	■																						●	●			
			M				■	■	■									▒														●				
			K																																	
GX	PVA		P							■	■	■																		●			●			
			M																																	
			K																																	
PVA			P								■	■	■																	●	●		●			
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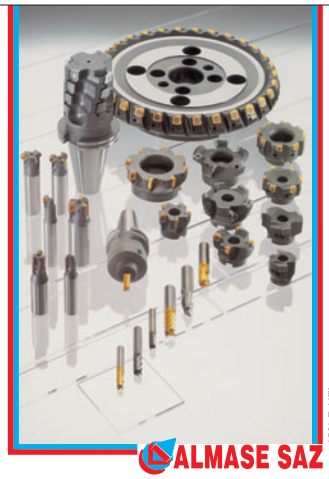
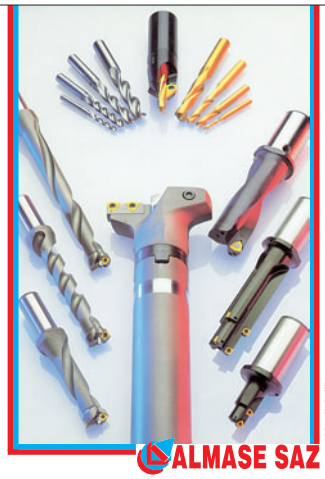
			K																																	
K10	KM1		P																																	
			M																																	
			K			■														▒	▒	▒		▒		▒	▒	▒	▒							●
KM1			P																																	
			M			■	■	■										▒	▒											●		●			●	
			K		■	■	■													▒	▒	▒		▒		▒	▒	▒	▒	●		●	●		●	
K20	KMF		P																																	
			M																																	
			K					■												▒	▒	▒		▒		▒	▒	▒	▒				●			
KMF			P							■	■	■			●	●	●	●																●		
			M						■	■	■							●	●					●						●	●		●	●	●	
			K					■	■	■										●	●	●		▒		●	▒	▒	▒	●	●		●	●	●	

Wear resistance ⟷ Toughness

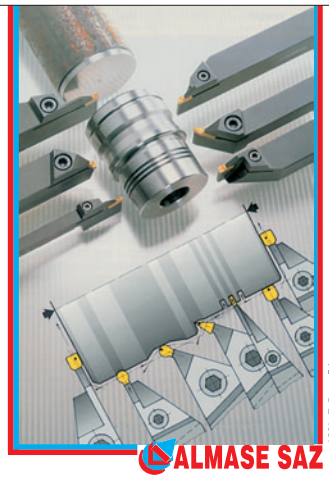


1501 E Milling



1601 E Drilling

1701 E Tool system / adaptors



1201 E Partoff / groove

1301 E Threading

6101 E Wear parts

4101 E Mining

2101 E Rock Tools

ALMASE SAZ

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