TOOLING SYSTEMS PROCESS OPTIMIZATION CONSULTING IN MILLING STATEGIES

SLOTWORX®

... ANY GROOVE – IMPROVE YOUR CHIP-REMOVE

pokolm
PREMIUMTOOLS. WE KNOW HOW.

... ANY GROOVE – IMPROVE YOUR CHIP-REMOVE

SLOTWORX® from S to L offers to you a complete range of square shoulder face milling- and slotting end mills for universal applications: roughing and finishing of steel, aluminium, graphite, plastics as well as hardened materials and, in the meantime, for machining stainless steels also. For face-, groove-, pocket-, side- and shoulder-milling, outstandingly suitable for angular or circular plunging (ramping).

The SLOTWORX®-range is available with threaded shanks, plain shanks and clamping flats, shell type milling cutters and with our patent protected DuoPlug®-system for highest concentricity and maximum rigidity. These threaded shank milling cutter bodies in connection with our dense-antivibration adapters are extremely applicable for finishing operations. Exceptionally precision-manufactured cutter bodies guarantee excellent milling results.

Optimum coolant supply direct to the cutting edges avoids any chip built-up on the insert's cutting face and it ensures maximum process reliability and secure chip removal, also in difficult materials.

Small, but big in capability, the SLOTWORX®-"S" range features itself through exceptional easy cutting. Our SLOTWORX®-"M" range is for all-purpose usage. The SLOTWORX®-"L" range allows for cutting depths a_p up to 14 mm and enables you to generate maximum possible machining rates from your machine capability available. There is always an appropriate tool for every possible machining process in our SLOTWORX®-product-range.

DuoPlug®

Screw-on type

Straight shank

Shell type

Our state-of-the-art helical cutting edges with positive rake angles lead to a constant good edge rigidity, easy cutting and outstanding surface finish for all possible kinds of milling operations, as well as 90° shoulder- or face-milling.

Through our patent-protected incorporated insert-seats, a smaller Torx-screw can be used . This results in less balancing errors and therefore to much smoother running of our **SLOTWORX**®-range. Even in deep cavities you have a possibility to mill 90°-shoulders, accurate and virbration-free with high cutting parameters. Smooth surface finish at the cavity's bottom is possible through inserts with intigrated finishing lands. In fact, cutting depths of a_p = 14 mm are realisable and lead to extended chip volumes and increased velocity of your milling process.

... ANY GROOVE – IMPROVE YOUR CHIP-REMOVE

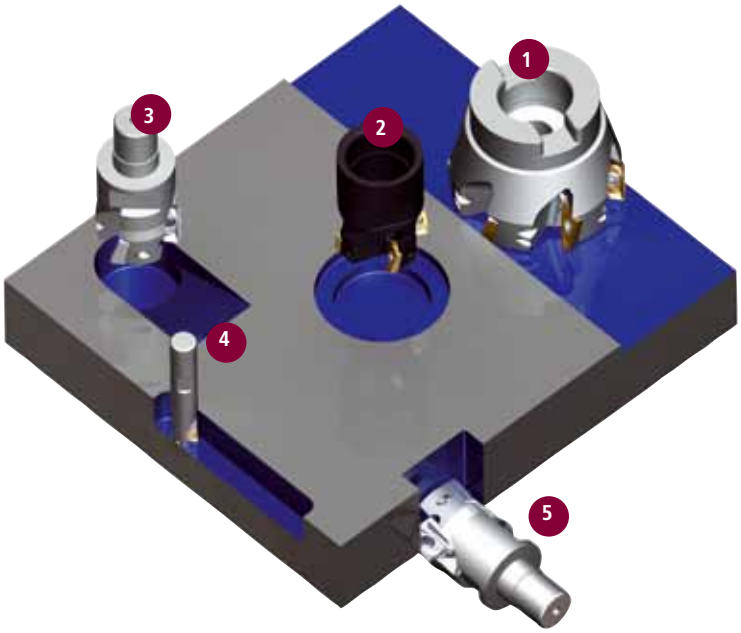
Maximum demands to precision and accuracy are secured by ground and polished indexable inserts. These intigrated finishing lands of our inserts care for outstanding surface finish in face-milling operations. Our high-accuracy indexable inserts however, offer an optimum relation between precision and efficiency. These inserts can also be used for fine finshing operations in minor applications. A distinct increase of tool life is achieved by new carbide substrates and coating technolgy.

size "S"

size "M"

size "L"

APPLICATION SPECTRUM



1. **SLOTWORX®** for face-milling
2. **SLOTWORX®** for circular ramping
3. **SLOTWORX®** for angular ramping
4. **SLOTWORX®** for side- and shoulder milling
5. **SLOTWORX®** for grooving

BRIGHT PROSPECTS...

M40 and PVST are the new features for efficient machining of stainless- acid- and heat-resistant materials. Optimized adapted rake angles and protective lands offer the best possible results for cutting edge stability and cutting capability. Extremely tough and high-temperature-resistant carbide together with our modified AlTiN-coating reduce built-up cutting edges, increase thermal stability and reduce frictional heat at the same time.

M40 PVST

... FOR MILLING STAINLESS-MATERIALS

In case you need further information about our stainless range, you can download our current brochure from our homepage www.pokolm.com or ask by phone / e-mail under ⊖ contacts (see back page) for this brochure.

YOU PROFIT FROM THIS SUMMARY OF ADVANTAGES:

- from face to groove to pocket to side to shoulder-milling
- universal application possibilities: roughing and finishing of steel, aluminium,
- graphite, plastics as well as hardened-and stainless steels
- optimized coolant supply direct to the cutting edges
- new-style surface-finish of inserts for improved machining of aluminium
- these new tools replace up to 3 traditional tool styles:
- APKT, LDLX and ADEW through rigidity, accuracy, vibration-decrease
- and optimized geometries
- integrated finishing lands achieve outstanding surface finish

CONTENT

SQUARE SHOULDER FACE MILLING + SLOTTING CUTTER BODIES

SLOTWORX® | size S

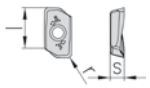
Outstandingly capable for using on high-speed milling machines and smaller machining centres.

- the increased no. of teeth allows for very large feed-rates

Milling cutter bodies / Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
DuoPlug®											
4 16 256 SG	16	6.9	0.8	34.4	1.3	-	M 10	15	4	A, B, C, D, E	
5 20 256 SG	20	6.9	0.8	32.4	1.3	-	M 12	18.5	5	A, B, C, D, E	
	18 500 A > Page 10		06 500 B > Page 10		TV 04-1 C > Page 10		T6 500 D > Page 10			T6 502 E>Page 10	
Screw-on type											
2 10 256	10	6.9	0.8	22.5	0.7	-	M 5	9.5	2	A, B, C, D, E	
3 12 256	12	6.9	0.8	27.5	0.7	-	M 8	11.8	3	A, B, C, D, E	
4 16 256	16	6.9	0.8	27.5	1.3	-	M 8	13.8	4	A, B, C, D, E	
5 20 256	20	6.9	0.8	27.5	1.3	-	M 10	18	5	A, B, C, D, E	
	18 500 A > Page 10		06 500 B > Page 10		TV 04-1 C > Page 10		T6 500 D > Page 10			T6 502 E>Page 10	
Straight shank											
15 10 156	10	6.9	0.8	16.7	0.7	55.6	diam. 10	-	2	A, B, C, D, E	
15 12 156	12	6.9	0.8	17.5	0.7	60.5	diam. 12	-	3	A, B, C, D, E	
40 16 156	16	6.9	0.8	42.5	1.3	90.5	diam. 16	-	4	A, B, C, D, E	
	18 500 A > Page 10		06 500 B > Page 10		TV 04-1 C > Page 10		T6 500 D > Page 10			T6 502 E>Page 10	

internal coolant supply
DuoPlug®
incorporated inserts
clamping flat
NEW latest items !
available as long as stock lasts
on request
stock item, subject to confirmation

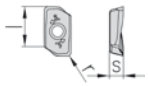
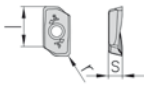
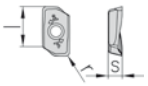
SLOTWORX®-Inserts Size "S", ISO Standard: XOMX 060208

Indexable insert	Catalogue no.	ISO Standard	Carbide Grade	Coating	l	s	r	M
	02 71 840 R08	XOMX 060208	P40	PVML	6.9	2.45	0.8	M 1.8

Cutting Speeds V_c in m/min

Material	Application	Insert radius	l	Application	P40 PVML
Steel		0.8	6.94	roughing	120-250
				finishing	150-300
High-temperature alloys		0.8	6.94	pre-finisching	100-200
Stainless steel		0.8	6.94	pre-finishing	140-220

f_z (feed per tooth) | a_p (depth of cut "doc")

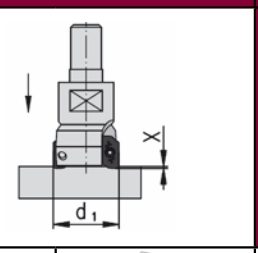
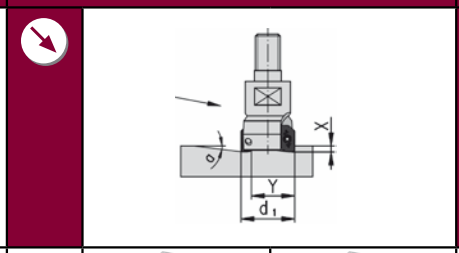
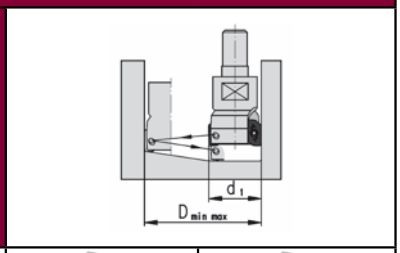
Material	Insert	Insert radius	l	f_z | a_p	P40 PVML
Steel		0.8	6.94	f_z(mm)	0.02-0.17
				a_p(mm)	0.1-2.5
High-temperature alloys		0.8	6.94	f_z(mm)	0.02-0.10
				a_p(mm)	0.1-1.7
Stainless steel		0.8	6.94	f_z(mm)	0.02-0.14
				a_p(mm)	0.1-2.5

Major application — roughing — pre-finishing — finishing

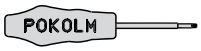
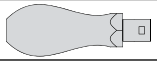
Minor application — roughing — pre-finishing — finishing

EXTENDED OPERATION DATA

SLOTWORX®-S

plunging		ramping		helix	
					
Cutter diam. Ø d_1 mm	X max. mm	α°	y mm	D_{min} mm	D_{max} mm
10	0.7	10	3	13	20
12	0.7	6.5	5	17	24
16	1.3	4	9	25	32
20	1.3	2.5	13	33	40
f_z see operation data table, but reduce value to 30 %		a_p | f_z see operation data table		a_p | f_z see operation data table	

SLOTWORX® Size "S" - Accessories

Accessories	Catalogue No.	Description	Dimensions			
	18 500	Torxscrew M 1.8	M 1.8	L 3.7	T6	
	06 500	Torx Screwdriver T 6	T 6			
	TV 04-1	Torque Screwdriver Vario® S with scale	from 0.4Nm	up to 0.8 Nm	with scale	
	T6 500	Torx interchangeable bit for Torque Vario®	T 6	L 175	max. 0.6 Nm	
	T6 502	Torx MagicSpring compatible bit for Torque Vario®	T 6	L 175	max. 0.6 Nm	

Definitions and Dimensions

a_p depth of cut in [mm]
f_z feed per tooth in [mm]
D_{max} = maximum bore diameter depending on cutter diameter in [mm]
x maximum plunge depth
D_{min} = minimum bore diameter depending on cutter diameter in [mm]
y minimum travel in [mm]
α angle of inclination in [°]

FROM PRACTICE TO PRACTICE

JOB TITLE:

The company PFT – Präzisions-Fertigungstechnik GmbH from Erwitte/Germany manufactures high precision components according to designs and requirements of their customers for more than 10 years; on request from material-purchase, complete operation-cycle up to final assembly. During those operation-cycles, target-settings of tolerance-ranges are checked, measured and recorded on the basis of prooved process-capabilities. This fulfils several requests of their customers. PFT is a supplier for aircraft- and space-as well as automotive-industries. Up to the time of introducing our **SLOTWORX®**-S-tooling, supplementary flats like spanner flats, clearance-flats on devices etc. were machined with solid carbide end mills. These tools often had too long cutting lengths, the customer needed to stock increased quantities in order to recognize regrinding time and he had problems with a reduced product reliability due to very unstable components. For these exceptional obstinate operations, causing intense vibrations, combined with quick chipping of cutting edges due to brittle solid carbide end mills, we have tried our new **SLOTWORX®**-tools. Our new task was: machining joining flats for fastening elements, retaining rings and spanner flats on structural parts. Everywhere, when it was impossible to avoid vibrations through less optimum set-up and/or component's prevailing conditions, tools from our new **SLOTWORX®**-S-range can take advantages of its superiority.

The milling cutter body 4 16 256 (16 mm diam., r=0.8) could be compared easily with a solid carbide end mill, due to the same no. of teeth and equal cutting parameters.

MACHINE	MATERIAL	PROGRAMMING SYSTEM
Hermle C 800 U	1.7225	manual

Clamping flats on a rotationally symetrical component with a nominal width of 32 mm and a required depth of 16 mm have been machined in one cut. The component was clamped on the machine table of the Hermle milling machine, very unstably. Difficulties occurred not through the material itself, but the job title was, to machine this component process-reliable, with no cutting-edge chipping in sufficient surface accuracy, despite of vibrations, activated by inefficient clamping possibilities. The smallest milling cutter body from our **SLOTWORX®**-S-range could realize our expectations. Refurbishing was replaced through simple turning or changing of inserts.

EXAMPLE FROM PRACTICE:

component:	spanner flats
material:	1.7225
arbor:	50 08 750 (M8, SK 40)
cutter body:	4 16 256 (16 mm diam., r = 0.8)
insert:	02 71 840 R08 (P40)
coating:	PVML
overhang:	78.5 mm
$\mathbf{v_c}$ (speed):	180 m/min
$\mathbf{v_f}$ (feed rate):	1,432 mm/min
S (revolutions):	3,580 1/min
$\mathbf{f_z}$ (feed per tooth):	0.1 mm
$\mathbf{a_p}$ (depth of cut):	2.0 mm
$\mathbf{a_e}$ (width of cut):	16.0 mm
chip volume:	45.8 cm^3/min = 2.18 cu.in./min

RESULT:

These spanner flats could be produced with increased process reliability and without interruptions. Vibrations, occuring during milling process have not caused any damage to the cutting edges. Due to the modular threaded shank-interface, this tool can be used also for other operations and machining opportunities. Costs for refurbishing of solid end mills and for increased availablility were avoided.

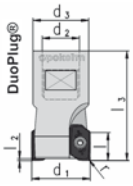
SQUARE SHOULDER FACE MILLING + SLOTTING CUTTER BODIES

SLOTWORX® | size M

This new range is the all-purpose solution for square shoulder face milling and slotting.
Applicable for inserts of line SLOTWORX®-M up to a corner radius of 2 mm.
Modified standard cutters for insert radius >= 3 mm are marked with R+.

DuoPlug®

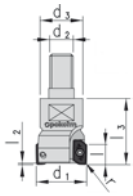
Milling cutter bodies / Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
2 16 267 SG	16	10	0.8-2	38	2.5	-	M 10	15	2	A, B, C, D, E	☑
2 16 267 SG R+	16	10	3|4	38	2.5	-	M 10	15	2	A, B, C, D, E	☑
2 20 267 SG	20	10	0.8-2	40	2.5	-	M 12	18.6	2	A, B, C, D, E	☑
2 20 267 SG R+	20	10	3|4	40	2.5	-	M 12	18.6	2	A, B, C, D, E	☑
3 25 267 SG	25	10	0.8-2	43	2.5	-	M 16	23.5	3	A, B, C, D, E	☑
3 25 267 SG R+	25	10	3|4	43	2.5	-	M 16	21.5	3	A, B, C, D, E	☑



25 505 KP A > Page 16	08 500 P B > Page 16	TV 08-2 C > Page 16	T8 500 P D > Page 16	T8 502 P E>Page 16

Screw-on type

Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
2 16 267	16	10	0.8-2	29	2.5	-	M 8	13.8	2	A, C, D, E, F	☑
2 16 267 R+	16	10	3|4	29	2.5	-	M 8	13.8	2	A, C, D, E, F	☑
2 20 267	20	10	0.8-2	29	2.5	-	M 10	18	2	A, C, D, E, F	☑
2 20 267 R+	20	10	3|4	29	2.5	-	M 10	18	2	A, C, D, E, F	☑
3 20 267	20	10	0.8-2	29	2.5	-	M 10	18	3	A, C, D, E, F	☑ NEW
3 20 267 R+	20	10	3|4	29	2.5	-	M 10	18	3	A, C, D, E, F	☑ NEW
3 25 267	25	10	0.8-2	33	2.5	-	M 12	21	3	A, C, D, E, F	☑
3 25 267 R+	25	10	3|4	33	2.5	-	M 12	21	3	A, C, D, E, F	☑
4 25 267	25	10	0.8-2	33	2.5	-	M 12	21	4	A, C, D, E, F	☑ NEW
4 25 267 R+	25	10	3|4	33	2.5	-	M 12	21	4	A, C, D, E, F	☑ NEW



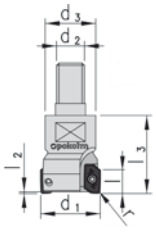
25 505 KP A > Page 16	25 505 P B > Page 16	08 500 P C > Page 16	TV 08-2 D > Page 16	T8 500 P E>Page 16	T8 502 P F>Page 16

NEW latest items ! ⚠ available as long as stock lasts ? on request ☑ stock item, subject to confirmation

Milling cutter bodies

Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features

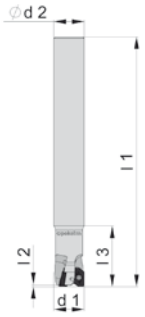
Screw-on type



Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
4 32 267	32	10	0.8-2	43	2.5	-	M 16	29	4	B, C, D, E, F	
4 32 267 R+	32	10	3|4	43	2.5	-	M 16	29	4	B, C, D, E, F	
5 32 267	32	10	0.8-2	43	2.5	-	M 16	29	5	B, C, D, E, F	NEW
5 32 267 R+	32	10	3|4	43	2.5	-	M 16	29	5	B, C, D, E, F	NEW
5 42 267	42	10	0.8-2	43	2.5	-	M 16	29	5	B, C, D, E, F	
5 42 267 R+	42	10	3|4	43	2.5	-	M 16	29	5	B, C, D, E, F	
25 505 KP A > Page 16		25 505 P B > Page 16		08 500 P C > Page 16			TV 08-2 D > Page 16			T8 500 P E>Page 16	T8 502 P F>Page 16

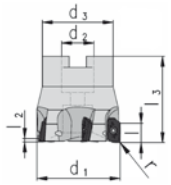
Straight shank

NEW



Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
2 32 16 167 G	16	10	0.8-2	32	2.5	165	diam. 16	-	2	A, B, C, D, E	NEW
2 32 16 167 G R+	16	10	3|4	32	2.5	165	diam. 16	-	2	A, B, C, D, E	NEW
3 40 20 167 G	20	10	0.8-2	40	2.5	165	diam. 20	-	3	A, B, C, D, E	NEW
3 40 20 167 G R+	20	10	3|4	40	2.5	165	diam. 20	-	3	A, B, C, D, E	NEW
3 50 25 167 G	25	10	0.8-2	50	2.5	225	diam. 25	-	3	A, B, C, D, E	NEW
3 50 25 167 G R+	25	10	3|4	50	2.5	225	diam. 25	-	3	A, B, C, D, E	NEW
4 50 25 167 G	25	10	0.8-2	50	2.5	225	diam. 25	-	4	A, B, C, D, E	NEW
4 50 25 167 G R+	25	10	3|4	50	2.5	225	diam. 25	-	4	A, B, C, D, E	NEW
25 505 KP A > Page 16		08 500 P B > Page 16		TV 08-2 C > Page 16			T8 500 P D > Page 16			T8 502 P E>Page 16	

Shell type

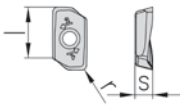
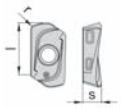


Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
5 42 367	42	10	0.8-2	43	2.5	-	diam. 16	35	5	A, B, C, D, E	
5 42 367 R+	42	10	3|4	43	2.5	-	diam. 16	35	5	A, B, C, D, E	
6 52 367	52	10	0.8-2	53	2.5	-	diam. 22	40	6	A, B, C, D, E	
6 52 367 R+	52	10	3|4	53	2.5	-	diam. 22	40	6	A, B, C, D, E	
25 505 P A > Page 16		08 500 P B > Page 16		TV 08-2 C > Page 16			T8 500 P D > Page 16			T8 502 P E>Page 16	

internal coolant supply | DuoPlug® | incorporated inserts | clamping flat

pokolm PREMIUMTOOLS. WE KNOW HOW.

SLOTWORX®-Inserts size "M", ISO-Standard: XDHT / XDMT 10T3...

Indexable insert	Catalogue no.	ISO Standard	Carbide Grade	Coating	l	s	r	M
	NEW 04 67 837 R08	XDMT 10T308	HSC 05	PVFN	10	3.58	0.8	M 2.5
	NEW 04 67 848 R08	XDMT 10T308	P40	PVGO	10	3.58	0.8	M 2.5
	04 67 820	XDHT 10T310	K10	polished	10	3.58	1	M 2.5
	04 67 837	XDMT 10T310	HSC 05	PVFN	10	3.58	1	M 2.5
	04 67 844	XDHT 10T310	P40	PVGO	10	3.58	1	M 2.5
	04 67 848	XDMT 10T310	P40	PVGO	10	3.58	1	M 2.5
	04 67 860	XDHT 10T310	K10	PVTi	10	3.58	1	M 2.5
	04 67 860 D	XDHT 10T310	K10	PVDiaN	10	3.58	1	M 2.5
	NEW 04 67 894	XDHT 10T310	PCD		10	3.58	1	M 2.5
	04 67 896	XDMT 10T310	M40	PVST	10	3.58	1	M 2.5
	04 67 820 R20	XDHT 10T320	K10	polished	10	3.58	2	M 2.5
	04 67 896 R20	XDMT 10T320	M40	PVST	10	3.58	2	M 2.5
	04 67 820 R30	XDHT 10T330	K10	polished	10	3.58	3	M 2.5
	04 67 896 R30	XDMT 10T330	M40	PVST	10	3.58	3	M 2.5
	04 67 820 R40	XDHT 10T340	K10	polished	10	3.58	4	M 2.5
	04 67 896 R40	XDMT 10T340	M40	PVST	10	3.58	4	M 2.5
	04 67 848 HF	XDMT 10 T3 TR	P40	PVGO	10	3.58	1.4	M 2.5
	04 67 862 HF	XDMT 10 T3 TR	K10	PVGP	10	3.58	1.4	M 2.5

Cutting Speeds V_c in m/min

Material	Application	Insert radius	l	Machining rates	HSC05 PVFN	K10 poliert	K10 PVTi PVDiaN	K10 PVGP	P40 PVGO	M40 PVST	PKD
Steel		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing					100-200		
				finishing					160-250		
High temperature alloys		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing						20-50	
				finishing						30-80	
Stainless steel		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing						80-200	
				finishing						80-230	
Cast iron		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing				140-220	110-150		
				finishing				160-250	120-180		
Non-ferrous materials		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing		200-800	200-800				200-600*
				finishing		200-800	200-800				400-800*
Hardened materials		0.8 | 1 | 1.4 | 2| 3 | 4	10	roughing	35-100			80-150			
				finishing	80-180			100-180			

* for graphite and plastics

f_z (feed per tooth) | a_p (depth of cut "doc")

Material	Insert	Insert radius	l	f_z | a_p	HSC05 PVFN	K10 polished	K10 PVTi PVDiaN	K10 PVGP	P40 PVGO	M40 PVST	PKD
Steel		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)					0.05-0.35		
				a_p(mm)					0.1-9		
High temperature alloys		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)						0.08-0.35	
				a_p(mm)						0.1-9	
Stainless steel		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)						0.08-0.35	
				a_p(mm)						0.1-9	
Cast iron		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)					0.08-0.4		
				a_p(mm)					0.1-9		
Non-ferrous materials		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)		0.08-0.35	0.08-0.35				0.08-0.2*
				a_p(mm)		0.1-9	0.1-9				0.1-4*
Hardened materials		0.8 | 1 | 2 | 3 | 4	10	f_z(mm)	0.08-0.25						
				a_p(mm)	0.1-5						
Steel		1.4	10	f_z(mm)					0.3-1.5		
				a_p(mm)					0.5-3		
Cast iron		1.4	10	f_z(mm)				0.3-1.2			
				a_p(mm)				0.5-3			
Hardened materials		1.4	10	f_z(mm)				0.15-1.0			
				a_p(mm)				0.2-1			

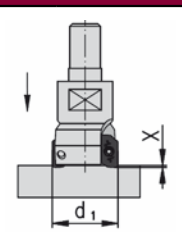
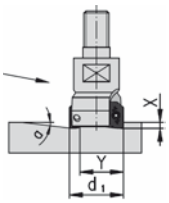
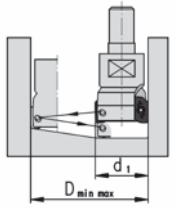
* for graphite and plastics

Major application — roughing — pre-finishing — finishing

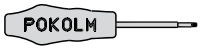
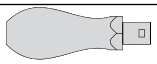
Minor application — roughing — pre-finishing — finishing

EXTENDED OPERATION DATA

SLOTWORX®-M

plunging		ramping		helix	
					
Cutter diam. ⌀ d_1 mm	X max. mm	α°	y mm	D_{min} mm	D_{max} mm
16	2.5	<24.5	5.3	21.3	32
20	2.5	<14.5	9.3	29.3	40
25	2.5	<8	14.3	39.3	50
32	2.5	<5	21.3	53.3	64
42	2.5	<3	31.3	73.3	84
52	2.5	<2.5	41.3	93.3	104
f_z see operation data table, but reduce value to 30 %		a_p I f_z see operation data table		a_p I f_z see operation data table	

SLOTWORX® Size "M" - Accessories

Accessories	Catalogue No.	Description	Dimensions			
	25 505 KP	Torxscrew for SLOTWORX® M ⌀ 16; 20; 25	M 2.5	L 5.3	T8 Plus	
	25 505 KP	Torxscrew for SLOTWORX® M ⌀ 32; 42; 52	M 2.5	L 7.3	T8 Plus	
	08 500 P	Torx Screwdriver I T8 Plus	T 8 IP			
	TV 08-2	Torque Screwdriver Vario® S with scale	from 0.8 Nm	up to 2.0 Nm	with scale	
	T8 500 P	Torx interchangeable bit for Torque Vario®	T 8 IP	L 175	max. 1.3 Nm	
	T8 502 P	Torx MagicSpring compatible bit for Torque Vario®	T 8 IP	L 175	max. 1.3 Nm	

Definitions and Dimensions

a_p depth of cut in [mm]
f_z feed per tooth in [mm]
D_{max} = maximum bore diameter depending on cutter diameter in [mm]
x maximum plunge depth
D_{min} = minimum bore diameter depending on cutter diameter in [mm]
y minimum travel in [mm]
α angle of inclination in [°]

FROM PRACTICE TO PRACTICE

JOB TITLE:

Producing absolutely accurate 90°-walls on holding blocks of injection moulding dies for plastics processing has always been a goal of the company Wonde from the town of Heiligkreuz-Steinach. Only a perfectly prepared holding block guarantees highest possible accuracy and durability for following production processes of all injection moulding dies. On this job, special attention was required for precision and economic efficiency regarding tool costs. Till now, the customer was using a 25 mm diam. multiple flute solid carbide end mill for this job. He was limited through given dimensions for reach and overall length of this end mill. For this particular and for many other applications, our new **SLOTWORX**®-range is the ideal compliment, where a solid carbide end mill reaches its limitation. This is a golden opportunity for our **SLOTWORX**®-style of end mills. Our new range, with precision-ground inserts, is ready to face these challenges – and, it has passed its examination in masterly manner and velocity.

MACHINE	MATERIAL	PROGRAMMING SYSTEM
Deckel Maho DMU 100 P	1.2312	Euklid

This holding block, which had to be machined, had a remaining stock of 1 mm all over, after roughing. This part had been programmed in a z-constant circular-pocket cycle with constant depth setting increments in radial and axial direction. We found a rigid set-up on that DMU 100P milling machine, a high-speed and dynamic 5-axis machining centre with vertical HSK-63A taper connection. All these conditions are ideal qualifications for using Pokolm-**SLOTWORX**®-milling cutters.

EXAMPLE FROM PRACTICE:

component:	holding block
material:	1,2312
arbor:	60 25 A63 S
	(25 mm diam., HSK 63)
extension:	75 16 603
cutter body:	3 25 267 SG
	(25 mm diam., r = 1)
insert:	04 67 844, P40
coating:	PVGO
overhang:	178 mm
v_c (speed):	314 m/min
v_f (feed rate):	2,000 mm/min
S (revolutions):	4,000 1/min
f_z (feed per tooth):	0.25 mm
a_p (depth of cut):	3.0 mm
a_e (width of cut):	0.1 mm

RESULT:

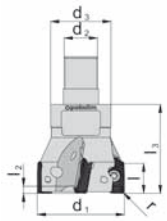
Expected and requested accuracy has been reached immediately to customer's satisfaction. Now, the customer is able to produce his holding blocks with those exceptionally required tool-overhangs of > 100 mm process-reliable and efficient in very short time. This kind of tooling is also avaible now for machining aluminium, and it is the right way for further success of Pokolm-tooling.

SQUARE SHOULDER FACE MILLING + SLOTTING CUTTER BODIES

SLOTWORX® | size L

Universally applicable for maximum cutting depths. These tools stand out for low energy consumption and maximum rigidity. Usable with inserts of the SLOTWORX®-L-range with corner radius up to 3 mm.
Modified standard cutters for insert radius >= 4mm are marked with R+.

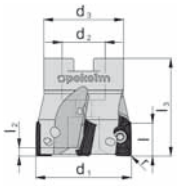
Screw-on type



Milling cutter bodies Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
2 25 268	25	15	1-3	35	3	-	M 12	21	2	A, B, C, D, E	
2 25 268 R+	25	15	4|5	35	3	-	M 12	21	2	A, B, C, D, E	
3 32 268	32	15	1-3	43	3	-	M 16	29	3	A, B, C, D, E	
3 32 268 R+	32	15	4|5	43	3	-	M 16	29	3	A, B, C, D, E	
4 40 268	40	15	1-3	43	3	-	M 16	29	4	A, B, C, D, E	
4 40 268 R+	40	15	4|5	43	3	-	M 16	29	4	A, B, C, D, E	
4 42 268	42	15	1-3	43	3	-	M 16	29	4	A, B, C, D, E	
4 42 268 R+	42	15	4|5	43	3	-	M 16	29	4	A, B, C, D, E	

35 500	15 500	TV 2-8	T15 500	T15 502
A > Page 21	B > Page 21	C > Page 21	D > Page 21	E > Page 21

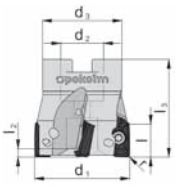
Shell type



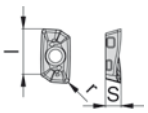
	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
4 40 368	40	15	1-3	43	3	-	diam. 16	35	4	A, B, C, D, E	
4 40 368 R+	40	15	4|5	43	3	-	diam. 16	35	4	A, B, C, D, E	
4 42 368	42	15	1-3	43	3	-	diam. 16	35	4	A, B, C, D, E	
4 42 368 R+	42	15	4|5	43	3	-	diam. 16	35	4	A, B, C, D, E	

35 500	15 500	TV 2-8	T15 500	T15 502
A > Page 21	B > Page 21	C > Page 21	D > Page 21	E > Page 21

NEW latest items ! available as long as stock lasts on request stock item, subject to confirmation

Milling cutter bodies	Catalogue no.	d_1	l	r	l_3	l_2	l_1	d_2	d_3	z	Accessories	Features
Shell type												
	5 50 368	50	15	1-3	53	3	-	diam. 22	40	5	A, B, C, D, E	
	5 50 368 R+	50	15	4|5	53	3	-	diam. 22	40	5	A, B, C, D, E	
	5 52 368	52	15	1-3	53	3	-	diam. 22	40	5	A, B, C, D, E	
	5 52 368 R+	52	15	4|5	53	3	-	diam. 22	40	5	A, B, C, D, E	
	6 63 368	63	15	1-3	53	3	-	diam. 27	48	6	A, B, C, D, E	
	6 63 368 R+	63	15	4|5	53	3	-	diam. 27	48	6	A, B, C, D, E	
	6 66 368	66	15	1-3	53	3	-	diam. 27	48	6	A, B, C, D, E	
	6 66 368 R+	66	15	4|5	53	3	-	diam. 27	48	6	A, B, C, D, E	
	7 80 368	80	15	1-3	53	3	-	diam. 27	60	7	A, B, C, D, E	
	7 80 368 R+	80	15	4|5	53	3	-	diam. 27	60	7	A, B, C, D, E	
	9 100 368	100	15	1-3	53	3	-	diam. 32	70	9	A, B, C, D, E	
	9 100 368 R+	100	15	4|5	53	3	-	diam. 32	70	9	A, B, C, D, E	
	 35 500 A > Page 21		 15 500 B > Page 21		 TV 2-8 C > Page 21			T15 500 D > Page 21			 T15 502 E>Page 21	

SLOTWORX®-Inserts Size "L", ISO Standard: XDMT / XDHT 1552...

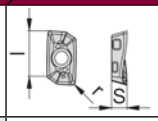
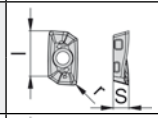
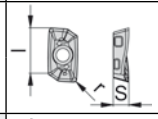
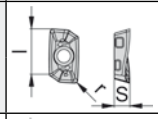
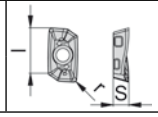
Indexable insert	Catalogue no.	ISO Standard	Carbide Grade	Coating	l	s	r	M
	05 68 848	XDMT 155210	P40	PVGO	15	5.2	1	M 3.5
	05 68 896	XDMT 155210	M40	PVST	15	5.2	1	M 3.5
	05 68 896 R20	XDMT 155220	M40	PVST	15	5.2	2	M 3.5
	05 68 820 R30	XDHT 155230	K10	polished	15	5.2	3	M 3.5
	05 68 896 R30	XDMT 155230	M40	PVST	15	5.2	3	M 3.5
	05 68 820 R40	XDHT 155240	K10	polished	15	5.2	4	M 3.5
	05 68 896 R40	XDMT 155240	M40	PVST	15	5.2	4	M 3.5
	05 68 820 R50	XDHT 155250	K10	polished	15	5.2	5	M 3.5
	05 68 896 R50	XDMT 155250	M40	PVST	15	5.2	5	M 3.5

internal coolant supply DuoPlug® incorporated inserts clamping flat

Cutting Speeds V_c in m/min

Material	Application	Insert radius	l	Machinng rates	P40 PVGO	M40 PVST	K10 polished
Steel		1	15	roughing	110-200		
				finishing			
High-temperature Alloys		1-5	15	roughing		40-80	
				finishing		60-120	
Stainless steel		1-5	15	roughing		80-180	
				finishing		110-250	
Cast iron		1	15	roughing	100-200		
				finishing			
Non-ferrous materials		3-5	15	roughing			200-800
				finishing			200-800

f_z (feed per tooth) | a_p (depth of cut "doc")

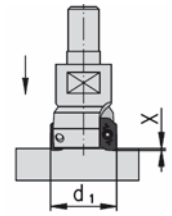
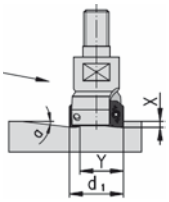
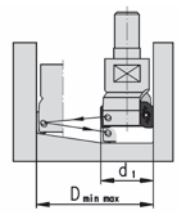
Material	Insert	Insert radius	l	f_z l a_p	P40 PVGO	M40 PVST	K10 polished
Steel		1	15	f_z(mm)	0.1-0.5		
				a_p(mm)	0.2-14		
High-temperature Alloys		1-5	15	f_z(mm)		0.08-0.3	
				a_p(mm)		0.1-14	
Stainless steel		1-5	15	f_z(mm)		0.08-0.5	
				a_p(mm)		0.1-14	
Cast iron		1	15	f_z(mm)	0.1-0.5		
				a_p(mm)	0.2-14		
Non-ferrous materials		3-5	15	f_z(mm)			0.08-0.35
				a_p(mm)			0.1-14

Major application — roughing — pre-finishing — finishing

Minor application — roughing — pre-finishing — finishing

EXTENDED OPERATION DATA

SLOTWORX® L

plunging	ramping	helix
		

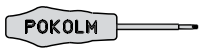
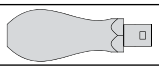
Cutter diam. Ø d_1 mm	X max. mm	α°	y mm	D_{min} mm	D_{max} mm
25	3	< 8.3	17	42	50
32	3	< 5.9	24	56	64
40	3	< 4.4	32	72	80
42	3	< 4.2	34	76	84
50	3	< 3.3	42	92	100
52	3	< 3.2	44	96	104
63	3	< 2.5	55	118	126
66	3	< 2.4	58	124	132
80	3	< 1.9	72	152	160
100	3	< 1.5	92	192	200

f_z see operation data table, but reduce value to 30 %

a_p | f_z see operation data table

a_p | f_z see operation data table

SLOTWORX® Size "L" - Accessories

Accessories	Catalogue No.	Description	Dimensions			
	35 500	Torx Screw M 3.5	M 3.5	L 7.5	T15	
	15 500	Torx Screwdriver T 15	T 15			
	TV 2-8	Torque Screwdriver Vario® S with scale	from 0.4 Nm	up to 1.0 Nm	with scale	
	T15 500	Torx interchangeable bit for Torque Vario®	T 15	L 175	max. 5.5 Nm	
	T15 502	Torx MagicSpring compatible bit for Torque Vario®	T 15	L 175	max. 5.5 Nm	

Definitions and Dimensions

a_p depth of cut in [mm]
f_z feed per tooth in [mm]

D_{max} = maximum bore diameter depending on cutter diameter in [mm]
x maximum plunge depth

D_{min} = minimum bore diameter depending on cutter diameter in [mm]
y minimum travel in [mm]

α angle of inclination in [°]

FROM PRACTICE TO PRACTICE

JOB TITLE

Optimizing of machining a component from Cu-HCP (CW021A) (best selected copper min.99.5 % purity), with a tensile strength of approx. 300 N/mm² only, but a breaking elongation of over 40 %. The metal removal volume for this component was 55 %, for a quantity of 48 pieces. Previously, this component with unmachined dimensions of 258 mm long, 123 mm wide and 211 mm high was machined with a Square Shoulder Face- and Slot Milling Cutter with inserts having 0.8 mm corner radius. But with this tool, maximum cutting depth of a_p = 3 mm could be realized, otherwise the component started vibrating under the enormous cutting pressure. This was a very negative influence to the roughing operation. Although the customer had rated the tool life of the inserts as satisfying, this was not our valuation at all. The no. of components was increasing constantly , and regarding production capacity, a decision had to be made. A solution for better machining possibilities was found by our applications engineers immediately. The new milling cutter body from our **SLOTWORX®**-L range 5 52 368 (52 mm diam., r = 1) should be suitable outstandingly for this application, and it was selected together with our new indexable inserts 05 68 896, specially developed for cutting corrosion- acid- and heat-resistant materials, having sharp, but slightly radiused cutting edges and our special coating with lubrication additives. This special coating avoids chip-built-up of this best selected copper and cares together with a sufficient coolant supply for optimum chip removal.

MACHINE	MATERIAL	MACHINE CONTROL
OKUMA	Cu-HCP	Okuma CNC

This component has been produced countour-parallel in z-constant cycle in climb milling as well as conventional milling. Regarding machining time, the feed rate and thus the chip volume has been increased by 4 times. This results in a reduction of the previous machining time from approx. 30 minutes to slightly more than 6 minutes. Through the special design of the minor cutting edge of these **SLOTWORX®**-L inserts we could achieve very good surface smoothness and minor waviness in the vertical parts of the component, even in cutting depth a_p of 5 mm.

EXAMPLE FROM PRACTICE:

component:	Nut
material:	Cu-HCP, CW021A
arbor:	50 22 710 (⌀ 22, SK 50)
cutter body:	5 52 368 (⌀ 52 / R 1)
insert:	05 48 896, M40
coating:	PVST
overhang:	103 mm
v_c (speed.):	571 m/min
v_f (feed rate):	4,000 mm/min
S (revolutions):	3,500 1/min
f_z (feed per tooth):	0.229 mm
a_p (depth of cut):	5 mm
a_e (width of cut):	32 mm
chip volume:	640 cm³/min
machining time:	06:07 min

RESULT:

Machining time of this component has been reduced from 5 to 1.5 hours. This results – for 48 components and a calculated machine hour rate of 50€/hour – in savings of approx. more than 8000 €. Plus an increased machine availablility of 168 hours, which represents working hours of a complete month anyhow. This time saving can be used for other projects.

NOTES

SLOTWORX®

P-F-SW-EN 1111

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