Product information PI 46

Motor spindle with swiveling unit

Series: **0.5.052.0xxx**

2016-09-27

SAUTER

Index of contents

NOTE

The information contained in this Product Information is in conformity with knowledge at the point of printing. We expressly reserve the right to make changes which occur in the course of continuous further development.

Description

The motor spindle with swiveling unit for B-axis

is suited for

- ➢ milling work
- ➢ complete machining in turning machining centres
- ➢ turning operations with static tools in conjunction with a quick-running rotary table in milling work centers
- ➢ shock machining with static tools

Features

swiveling capability

- ➢ The motor spindle (3) can be swiveled about the Y-axis. The complete machining of demanding workpiece geometries is possible, including the C-axis of the machine main spindle.

  → *Fig. Motor spindle with swiveling unit, page 5*

important advantages

- ➢ Compect assambly

  ➪ short travelling distance

- ➢ Variable construction

  ➪ at customers wish adaptable.

- ➢ Rigid, anti-twist positioning with hydraulically operated three-part Hirth gear in the motor spindle (3) and swiveling unit (2).

  • Rigid, anti-twist positioning
  Recommended for higher loading e.g. turning operations Graduation 5°

  → *Motor spindle, page 6*

  → *swiveling unit, page 8*

life expenctancy

- ➢ service life grease lubrication
- ➢ high service life

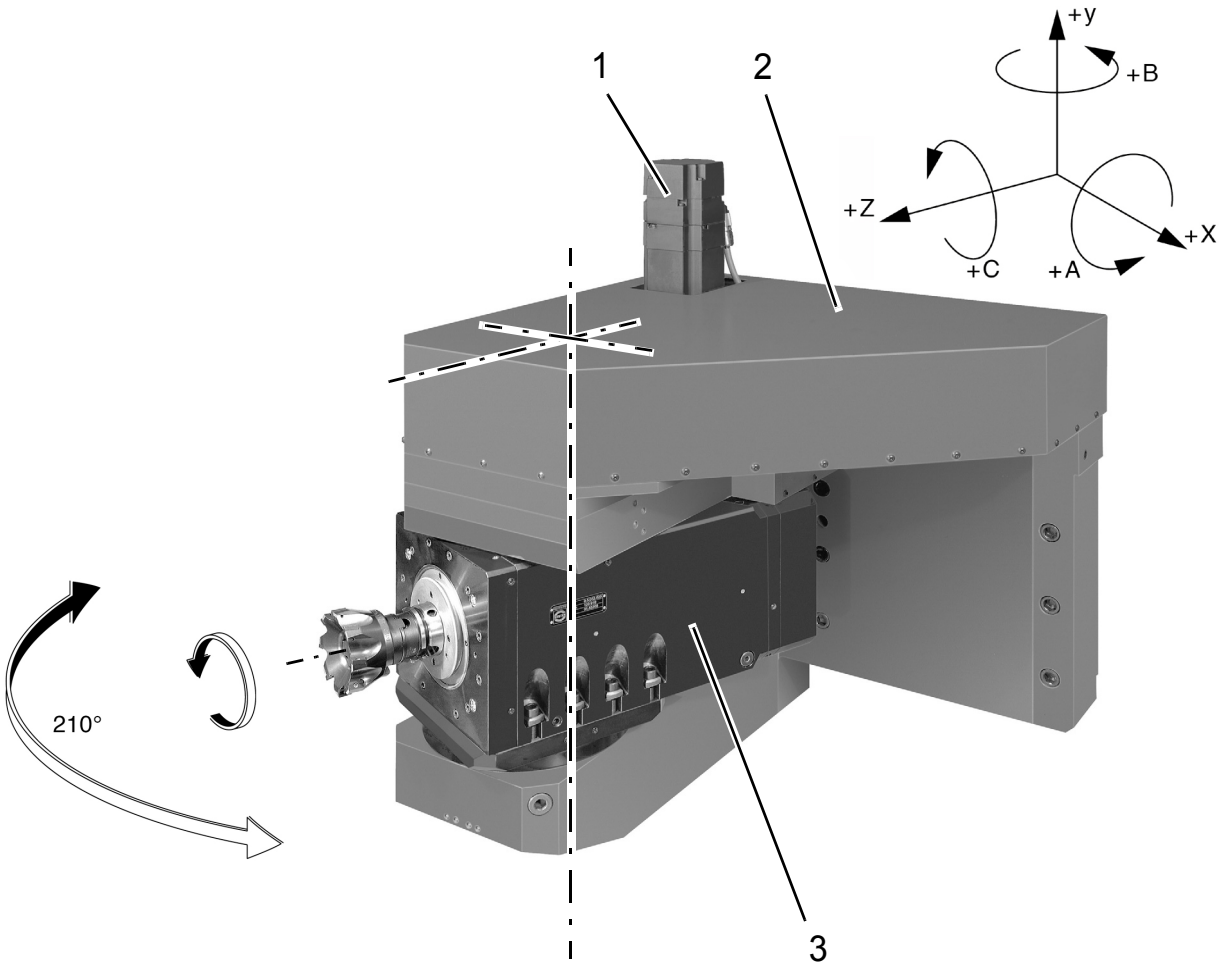


Fig. Motor spindle with swiveling unit

1 Motor for swiveling unit[1)]
2 Swiveling unit
3 Motor spindle
4 Tool[2)]

1) Drive for B-axis
2) clockwise rotation; tool rotating or stationary (turning machining))

Motor spindle

Description

Rigid, anti-twist positioning.

➢ Usually, machining forces are considerably higher when carrying out turning operations with static tools. The motor spindle is fixed with the Hirth gear (6) for machining with static tools.

➪ Rigid, anti-twist positioning

➪ Graduation 7,5°

➪ The front spindle bearings (5) are relieved.
The machining forces are absorbed by the housing (8).

Tool holding system

➢ Modular tool holding system (3)

→ *Ordering information, page 23*

➢ The tool tension occurs with plate feathers (12) solving hydraulically (11).
The process is super vised by means of signal transducer (10).

➪ The tool clamping system is reliable and monitored.

Cleanliness during tool changing / Protection class

➢ The taper or polygon seating (2) is cleaned with compressed air through the spindle during tool changing (1, 7).
The arrangement of the tools is supervisible (pressure drop).

➢ Protection of the tool spindle against swarf and cooling lubricant by means of sealing air assisted labyrinth seals

➪ Trouble-free tool changing

Cooling lubricant feed

➢ Cooling lubricant can be applied separately, both internally and externally:

- externally through the housing (14)
- internally through the spindle (9)

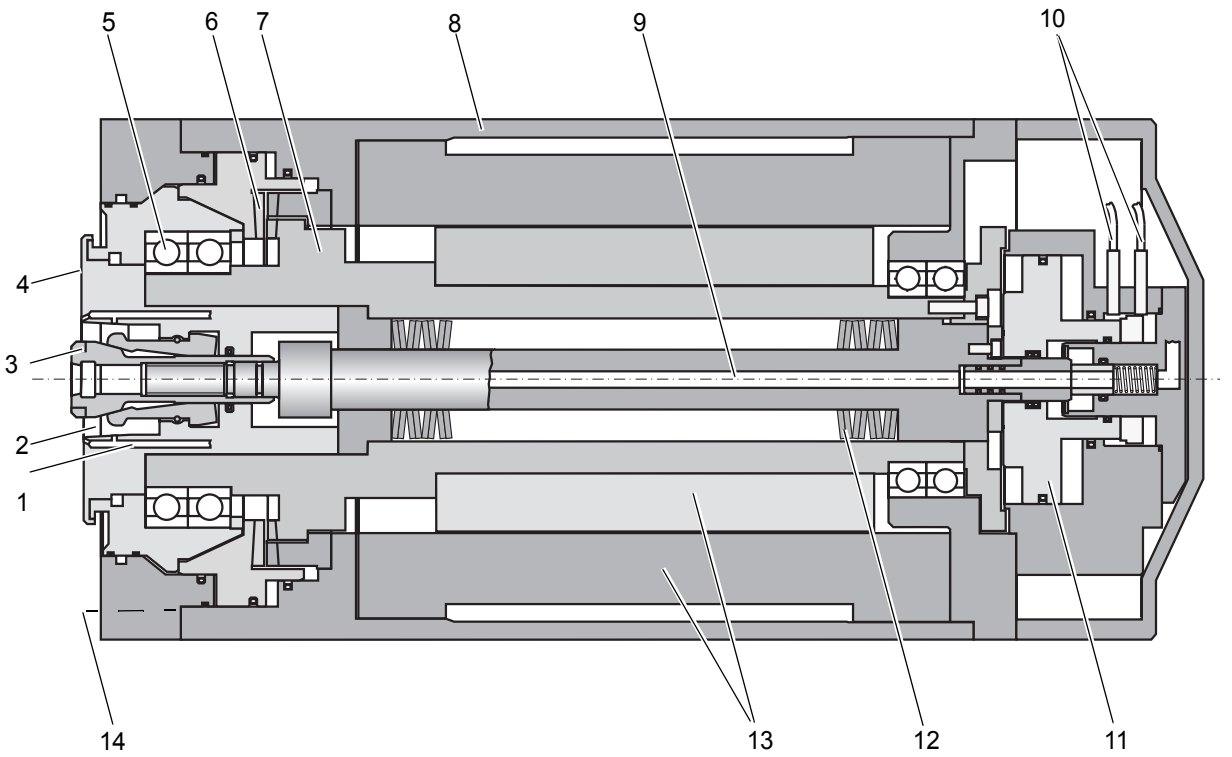


Fig. Motor spindle

1 Blowing air outlet port for cleanliness during tool change
2 Taper or polygon seat (at customer's request)
3 Tool holder (modular)
4 Level arrangement for tool
5 Spindle bearing, front
6 Hirth gear, three-part
7 Spindle[1)]
8 Housing
9 Cooling lubricant rotating duct
10 Signal transducer for tool clamping (limit switch)
11 Hydraulic piston
12 Plate springs
13 (built-in) motor
14 External cooling lubricant connection

1) Tool rotating or stationary (turning operations)

Swiveling unit

Description

Rigid, anti-twist positioning

➢ The machining forces are generally considerably higher when carrying out turning operations with static tools. For this, the motor spindle is clamped to the swiveling unit with the three-part Hirth gear.

⇨ Rigid, anti-twist positioning

⇨ Dispartment 5°

Swiveling unit rotation

➢ Drive

- Servomotor (5), position-controlled,
- Toothed belt (4) and pre-stressed gear (3) additional
- Direct-acting angle measuring system (1).

⇨ Accurate machining results

Delivery of utilities etc.

➢ Cooling lubricant, blowing air, hydraulic oil and electricity are fed through the rotating spigot (2) to the motor spindle.

⇨ Lowest susceptibility to damage, no troublesome pipework in the working space.

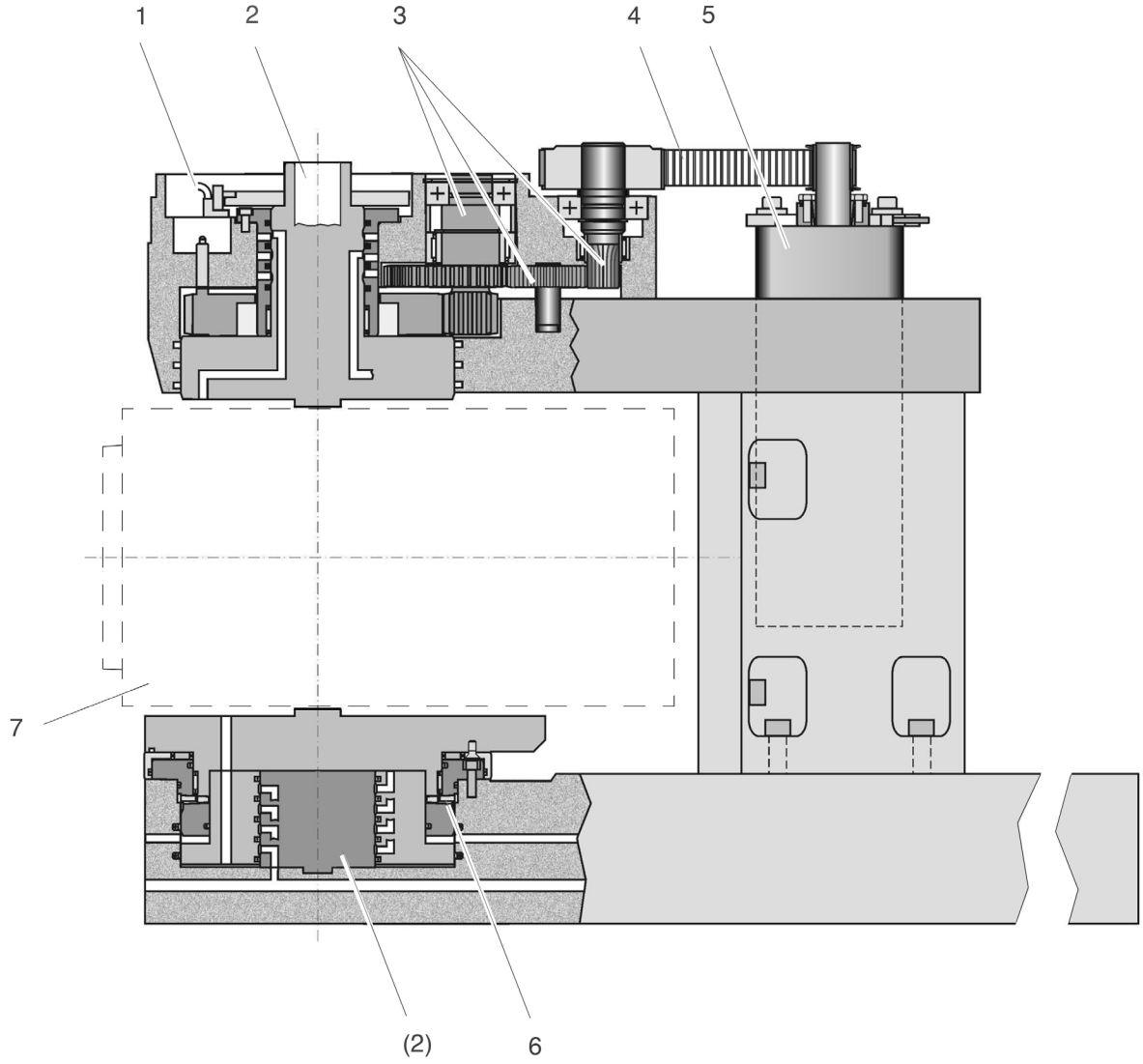


Fig. Swiveling unit

1 Angel measuring system
2 Pivot pin
3 Gear train
4 Toothed belt
5 Servomotor
6 Hirth gear, three-part
7 Motor spindle

Technical Data

Motor spindle with swiveling unit 0.5.052.025

Motor spindle with swiveling unit 0.5.052.025		
Hydraulic system	→ *Hydraulic diagram, motor spindle with swiveling unit HP-495*	
Operating pressure	bar	50 ± 10%
Required oil flow	l/min	4
Clearing motor spindle	cm^3	22
Indexing motor spindle	cm^3	33
Release tool	cm^3	67
Clearing swiveling unit	cm^3	32
Indexing swiveling unit	cm^3	32
Cooling lubricant, perm. operating pressure		
central	bar	80
external	bar	25
Filter mesh	µm	≤ 25
Blowing air, sealing air	→ *Pneumatic diagram, motor spindle with swiveling unit PP-018*	
Operating pressure	bar	2 - 6
Elektrical supply	→ *Wiring diagram motor spindle with swiveling EPB-1143*	
Control voltage	DC	24
Mass (standard version)	kg	ca. 380
Perm. ambient temperature	C°	+10 ... +40
Possible cultivation situation	→ *application examples, page 22*	

Motor spindle 0.5.042.063				
Max. tool mass	kg	20	20	20
Power 40% duty cycle [1]		13,5 kW / 3500 min^{-1}	31 kW / 3500 min^{-1}	47 kW / 3500 min^{-1}
Power 100% duty cycle [1]		10 kW / 3500 min^{-1}	24,2 kW / 3500 min^{-1}	36,6 kW / 3500 min^{-1}
Perm. torque [1]	Nm	50	103	165
Perm. torque 40% ED [1]	Nm	36	85	128
Perm. torque 100% ED [1]	Nm	28	66	100
Perm. speed	min^{-1}	7000		
Motor		SIEMENS 1FE1091 - 6WN10	SIEMENS 1FE1092 - 6WN10	SIEMENS 1FE1093 - 6WN10
Tool system[2]		HSK 40 SAUTER Capto C4	HSK 50 SAUTER Capto C5	HSK 63 SAUTER Capto C6 KM63
Spindle cooling	dm^3 /min	8		

1) Other performance characteristics on request
2) Other tool systems on request
3) Duty cycle (DC) see daiagram

Swiveling unit 0.9.250.025		
Indexing		
Graduation	degrees	5
Perm. tangential loading M_B indexed	Nm	3600
Graduation accuracy	mm/100mm	±0,002
Repeat accuracy	mm/100mm	±0,0008
Interpolation		
max. tangential loading M_I	Nm	400
Drive		
Overall transmission ratio i		120
Perm. output torque	Nm	1300
Perm. output speed	min^{-1}	30
Motor		SIEMENS 1F604 ... max. 11Nm
Measuring system		Heidenhain ERN 180 5000^{I} $1V_{ss}$

20	20
35,3kW / 4000 min^{-1}	26kW / 2500 min^{-1}
35,3kW / 4500 min^{-1}	26kW / 3300 min^{-1}
135	120
102	103
75	75
10000 3)	12000 3)
SIEMENS 1FE 093 - 4WH11	SIEMENS 1FE1 093 - 4WN11
HSK 63 SAUTER Capto C4/C5/C6	HSK 63 SAUTER Capto C4/C5/C6
8	

Duty cycle (DC)

(cycle 10 min)

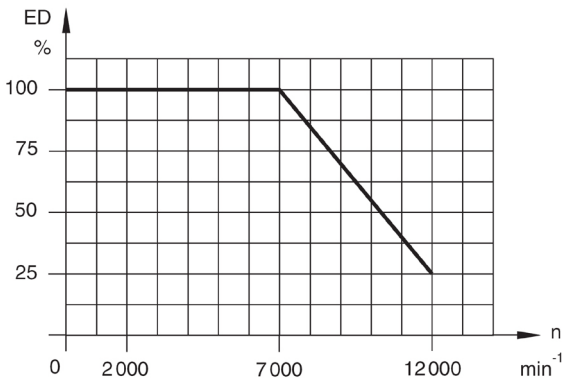


Fig. Diagramm (DC)

Technical Data

Motor spindle with swiveling unit 0.5.052.032

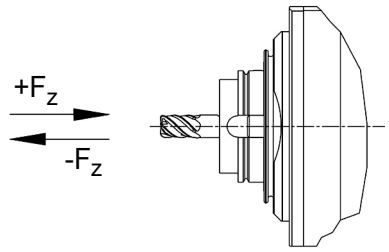
Motor spindle with swiveling unit 0.5.052.032		
Hydraulic system	→	*Hydraulic diagram, motor spindle with swiveling unit HP-540*
Operating pressure	bar	70 ± 10%
Required oil flow	l/min	6
Clearing motor spindle	cm^3	22
Indexing motor spindle	cm^3	55
Release tool	cm^3	74
Clear swiveling unit	cm^3	42
Index swiveling unit	cm^3	42
Cooling lubricant, perm. operating pressure		
Central	bar	80
External	bar	25
Filter mesh	µm	≤ 25
Blowing air, sealing air	→	*Pneumatic diagram, motor spindle with swiveling unit PP-018*
Operating pressure	bar	2 - 6
Elektrical supply	→	*Wiring diagram motor spindle with swiveling EPB-1279*
Control voltage	DC	24
Mass (standard version)	kg	ca. 1100
Perm. ambient temperature	C°	+10 ... +40
Possible cultivation situation	→	*application examples, page 22*

Motor spindle 0.5.042.100		
Max. tool mass	kg	30
Power 40% duty cycle [1)]		36kW / 900 min^{-1}
Power 100% duty cycle [1)]		28,3kW / 900 min^{-1}
Perm. torque [1)]	Nm	500
Perm. torque 40% ED [1)]	Nm	384
Perm. torque 100% ED [1)]	Nm	300
Perm. speed [1)]	min^{-1}	5500
Motor		SIEMENS 1FE1 116-6WT 11
Tool system		HSK 100 / SAUTER Capto C8X / KM80
Spindle cooling	dm^3 /min	8

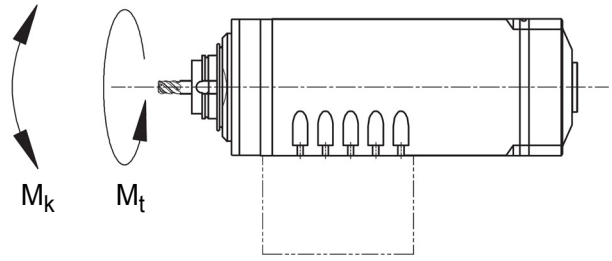
1) Other performance characteristics on request

swiveling unit 0.9.250.032		
Indexing		
Graduatio	degrees	5
Perm. tangential loading M_B indexed	Nm	7200
Graduation accuracy	mm/ 100mm	±0,002
Repeat accuracy	mm/ 100mm	±0,0008
Interpolation		
max. tangential loading M_I	Nm	800
Drive		
Overall transmission ratio i		120
Perm. output torque	Nm	2400
Perm. output speed	min^{-1}	25
Motor		SIEMENS 1FT7084 ... max. 20Nm
Measuring system		Heidenhain ERN 180 5000^I $1V_{ss}$

Motorspindle 0.5.052.025

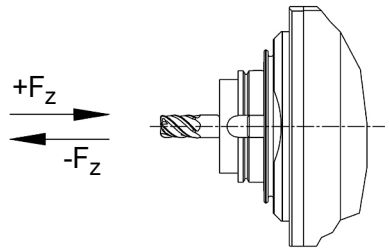


Forces			
Turnig	± F_z	16000	N
Drilling	+ F_z	7100	N
Milling	- F_z	1000	N

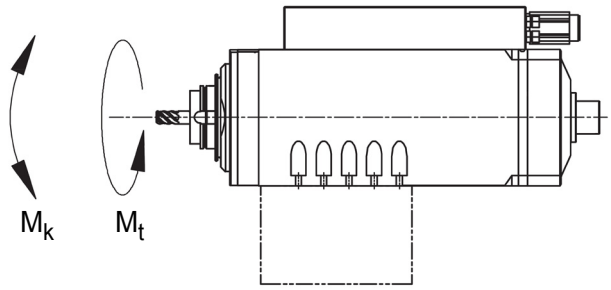


		Tool location / clamping system					
		SAUTER Capto C4	**SAUTER Capto C5**	**SAUTER Capto C6**	**HSK 63 A**	**KM 63**	
Torsional moment	M_t	580	1000	1200	1200	1200	Nm
Breakdown torque	M_k	300	600	900	525	700	Nm

Motorspindle 0.5.052.032



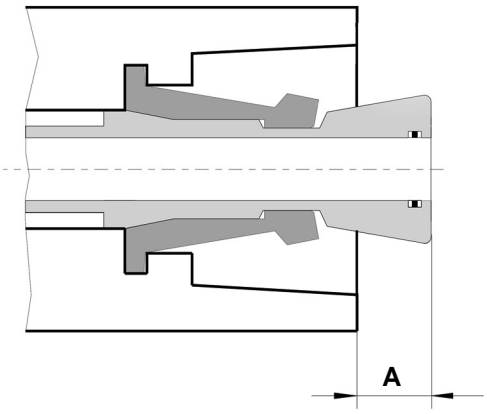
Forces			
Turning	± F_z	30000	N
Drilling	+ F_z	12500	N
Milling	- F_z	2000	N

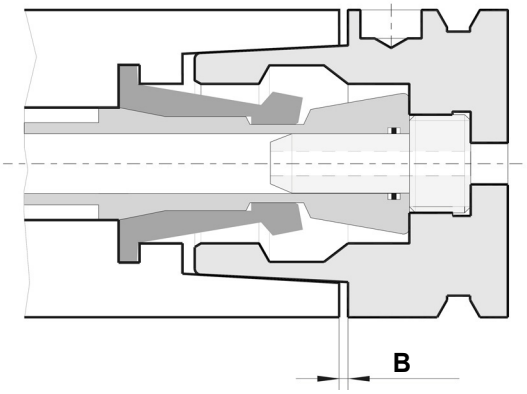


		Tool location / clamping system			
		HSK 100 A	SAUTER Capto C8X	KM 80	
Torsional moment	M_t	6000	4000	3800	Nm
Breakdown torque	M_k	1150	1300	1250	Nm

Tool tension

Dimensions **A** and **B** has to be complied with in order to ensure the correct tension of the tool.





Tension-clamp system	Dimension A [mm]	Dimension B [mm]	Clamping force [kN]
HSK - A 40	8,3 ± 0,1	0,3 ± 0,2-01	10,5 - 12
HSK - A 50	10,3 ± 0,1	0,3 ± 0,2-01	20 - 24
HSK - A 63	10,3 ± 0,1	0,3 ± 0,2-01	27 - 30
HSK - A 100	12,9 ±0,1	0,4 ± 0,2-01	54 - 60
HSK - A 125	12,9 ± 0,1	0,4 ± 0,2-01	54 - 60
BERG CAPTO C6	10,5 ± 0,05	0,5 ± 0,2	24,7 - 33

Tension-clamp system	Dimension A [mm]	Dimension B [mm]	Clamping force [kN]
SAUTER CAPTO C 4	8,4 ± 0,1	0,6 ± 0,25	22 - 30
SAUTER CAPTO C 5	9,3 ± 0,1	0,7 ± 0,25	22 - 30
SAUTER CAPTO C 6	10,3 ± 0,1	0,7 ± 0,25	24,7 - 33
SAUTER CAPTO C 8X	19,3 ±0,1	0,7 ± 0,25	41 - 55

Machining examples

Tool loading

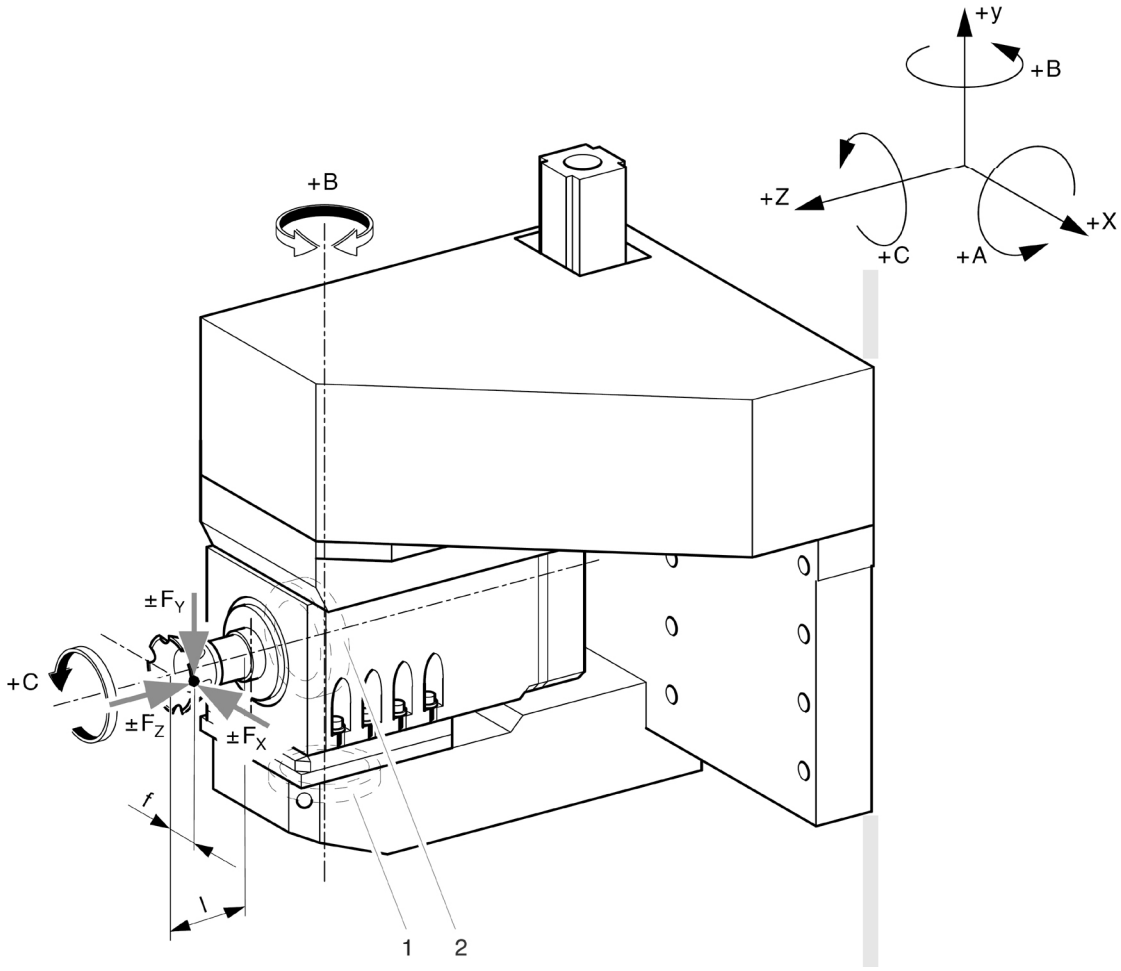


Fig. Tool loading

1 Hirth gear in swiveling unit
2 Hirth gear in motor spindle

Toolsystem 0.5.052.025

Tool system	HSK 40 / SAUTER Capto C4	HSK 50 / SAUTER Capto C5	HSK 63 / SAUTER Capto C6
Tool stationary (C-axis locked → | ←)			
Turning B-axis locked → | ←	Material: 50CrV4 f =27, l =55 v_c =230 f_n =0,4 a_p =8	Material: 50CrV4 f =35, l =60 v_c =230 f_n =0,5 a_p =8	Material: 50CrV4 f =45, l =65 v_c =230 f_n =0,6 a_p =8
Centric drilling B-axis locked → | ←	Material: 50CrV4 U-drill ø32 n =1700 v_f =510	Material: 50CrV4 U-drill ø50 n =1100 v_f =330	Material: 50CrV4 U-drill ø63 n =900 v_f =230
Interpolativ drilling B-axis not locked ← | →	Material: 50CrV4 f =27, l =55 v_c =230 f_n =0,15 a_p =3	Material: 50CrV4 f =35, l =60 v_c =230 f_n =0,15 a_p =3	Material: 50CrV4 f =45, l =65 v_c =230 f_n =0,15 a_p =3
Tool rotating (B-axis free running ← | →)			
Milling B-axis locked → | ←	Cutter: 16MnCr5 Fräser ø32 , l =80 Slot 32 x 5 n =2000 v_f =800	Material: 16MnCr5 Cutter ø50 , l =100 Slot 32 x 5 n =2000 v_f =800	Material: 16MnCr5 Cutter ø63 , l =100 Slot 32 x 5 n =2000 v_f =800
Off-center drilling B-axis locked → | ←	Material: 16MnCr5 U-drill ø32 n =1700 v_f =510	Material: 16MnCr5 U-drill ø32 n =1700 v_f =510	Material: 16MnCr5 U-drill ø32 n =1700 v_f =510
Free-form milling B-axis not locked ← | →	Material: 16MnCr5; Cutter ø10, finish-machining n =7000 v_f ≥800		

Key:	
v_c = Cutting speed	m/min
v_f = Feed speed	mm/min
n = Speed	min^{-1}
f_n = Feet/Revolution	mm/U
a_p = Depth of cut	mm
f, l = Tool sizes (see page 19)	mm
50CrV4: Tempering steel Material No. 1.8159 R_m ~900N/mm^2	
16MnCr5: Case hardening steel Material No. 1.7131 R_m ~600N/mm^2	

Tool system 0.5.052.032

Tool system	HSK 100 / SAUTER Capto C8X
Tool stationary (C-axis locked → | ←)	
Turning B-axis locked → | ←	Material: 50CrV4 f =58, l =90 v_c =230 f_n =1 a_p =10
Centric drilling B-axis locked → | ←	Material: 50CrV4 U-drill ø75 n =800 v_f =200
Interpolativ drilling B-axis not locked ← | →	Material: 50CrV4 f =56, l =90 v_c =230 f_n =0,15 a_p =4
Tool rotating (B-axis free running ← | →)	
Milling B-axis locked → | ←	Material: 16MnCr5 Cutter ø32 , l =80 Nut 84 x 5 n =750 v_f =450
Off-center drilling B-axis locked → | ←	Material: 16MnCr5 U-drill ø40 n =1500 v_f =300
Free-form milling B-axis not locked ← | →	Material: 16MnCr5; Cutter ø10, finish-machining n =7000 v_f ≥800

Key:	
v_c = Cutting speed	m/min
v_f = Feed speed	mm/min
n = Speed	min^{-1}
f_n = Feet/Revolution	mm/U
a_p = Depth of cut	mm
f, l = Tool sizes (see page 19)	mm
50CrV4: Tempering steel Material No. 1.8159 R_m ~900N/mm^2	
16MnCr5: Case hardening steel Material No. 1.7131 R_m ~600N/mm^2	

Application examples

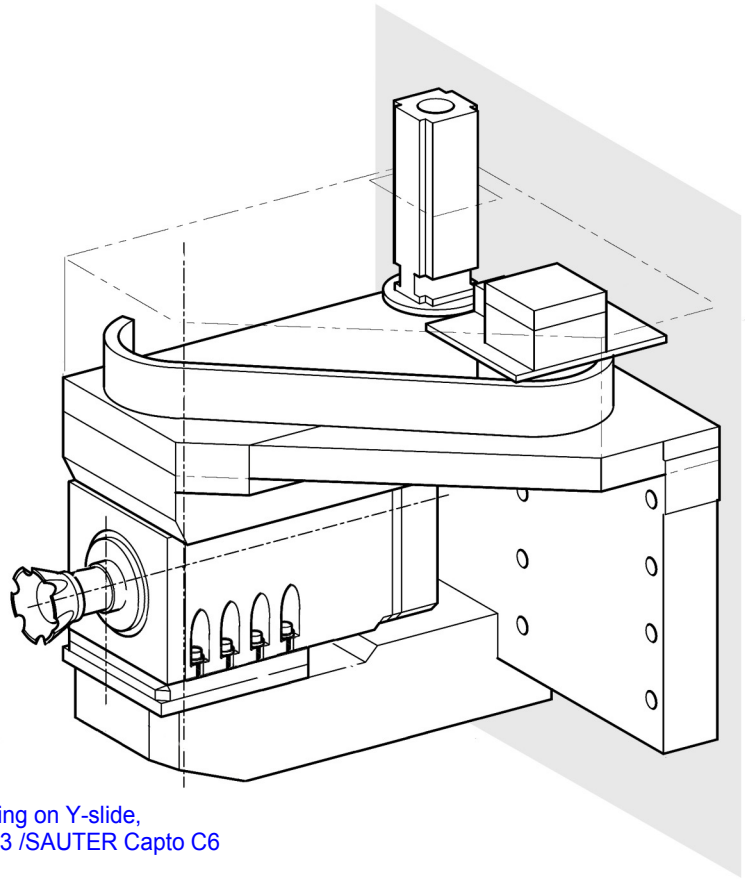


Fig. Design example, fixing on Y-slide,
Tool system HSK 63 /SAUTER Capto C6

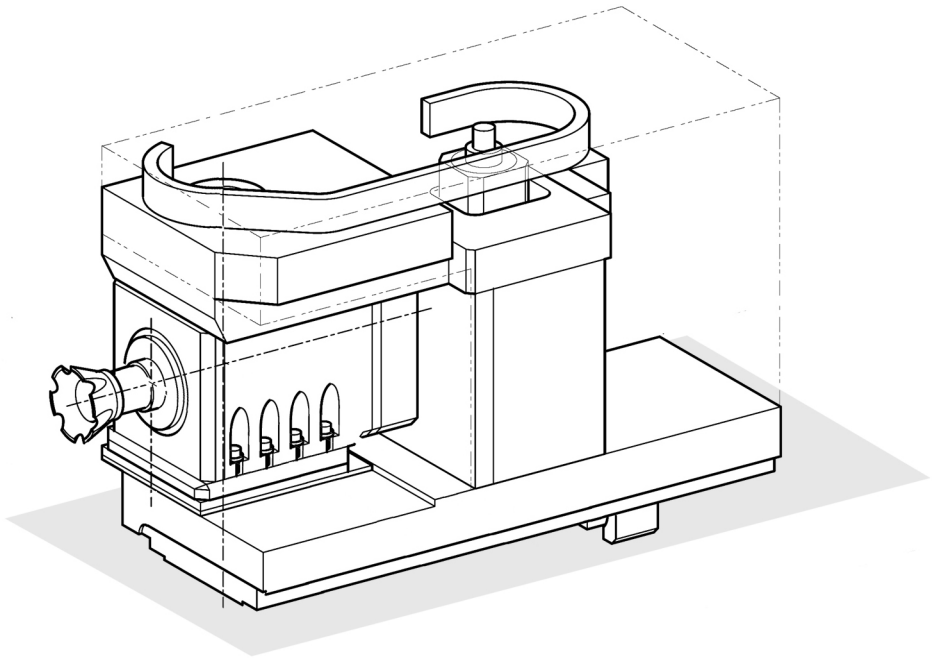


Fig. Design example, fixing with X-slide,
Tool system HSK 63 / SAUTER Capto C4

Ordering information

++49 (0) 7123-926-190

++49 (0) 7123-926-0

info@sauter-feinmechanik.com

Sauter Feinmechanik GmbH
Postfach 1551
D-72545 Metzingen
Germany

Company: _____

Street: _____

Postal Code: _____
City: _____

Name: _____

Tel.: _____

Fax: _____

SAUTER-Motor spindle with swiveling 0.5.052.0xx

Ordering information	Possible alternatives	Your choise	
Installed position:	Fixed to Y-slide	☐	
	Fixed to X-slide	☐	
	Sketch attached	☐	
Tool holder:	HSK 40	☐	
	HSK 50	☐	
	HSK 63	☐	
	SAUTER Capto C4	☐	
	SAUTER Capto C5	☐	
	SAUTER Capto C6	☐	
	SAUTER Capto C8X	☐	
Characteristics of application:	Drilling ☐	n_{max} = ...	min^{-1}
	Milling ☐	M_d = ...	Nm
	other ☐	✎	
Special requirements: ✎		Sketch attached ☐	
Quantity;		. . . . .	