Product information PI 61

Horizontal-axis turret

Series **0.5.180.0xx**

2015-08-31

SAUTER

SAUTER®

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NOTE:!

The information contained in this Product Information is in conformity with knowledge at
the point of printing. We reserve the right to perform modifications within the framework of continuous further development.

Series 0.5.180.0xx

Description
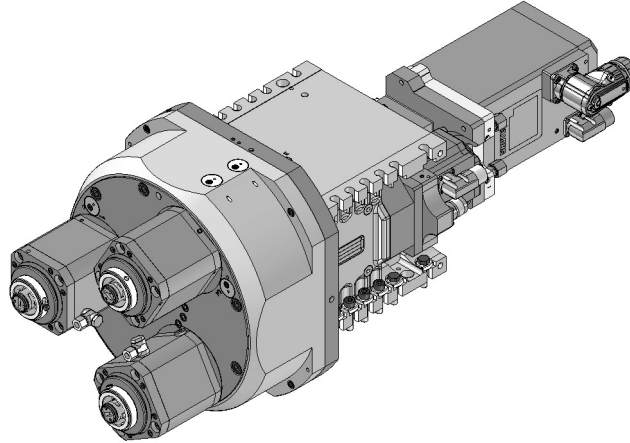
Horizontal-axis turret are particularly suitable for

➢ Processing stations in transfer lines and rotary transfer machines

➢ High-speed machining with tool speeds up to 12000 min-1 and more

➢ Machining processes with the shortest chip-to-chip times.

Features

➢ Bi-directional turret with tools drive with proven two-motor technology

➢ Compact design for small mounting space.

➢ Indexing drive with small SAUTER high-synchronous motors or commercial servomotors.

➢ All grown tools are powered at the same time during the swing. Speed up and slow down time for the motor and coupling is not applicable.

➢ High load torque

➢ Safe locking of the rotary head means of hydraulically operated 3-part Hirth serration.

➢ Quickly change the flanged driven tools

➢ Protection of all tool spindles from chips and cooling lubricant by means of blocking sealing air-assisted labyrinth seals.

➢ cooling lubricant-supply

⇨ internally by the tool spindle in the working position

⇨ internally by the tool spindle at the same time in all positions (Option)

➢ Symmetrical Body Shape with double foot shape for universal installation
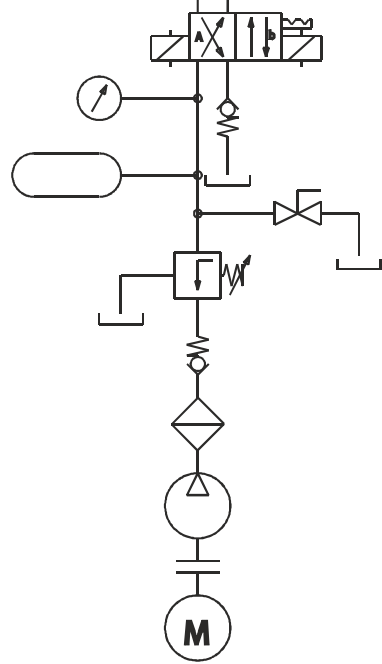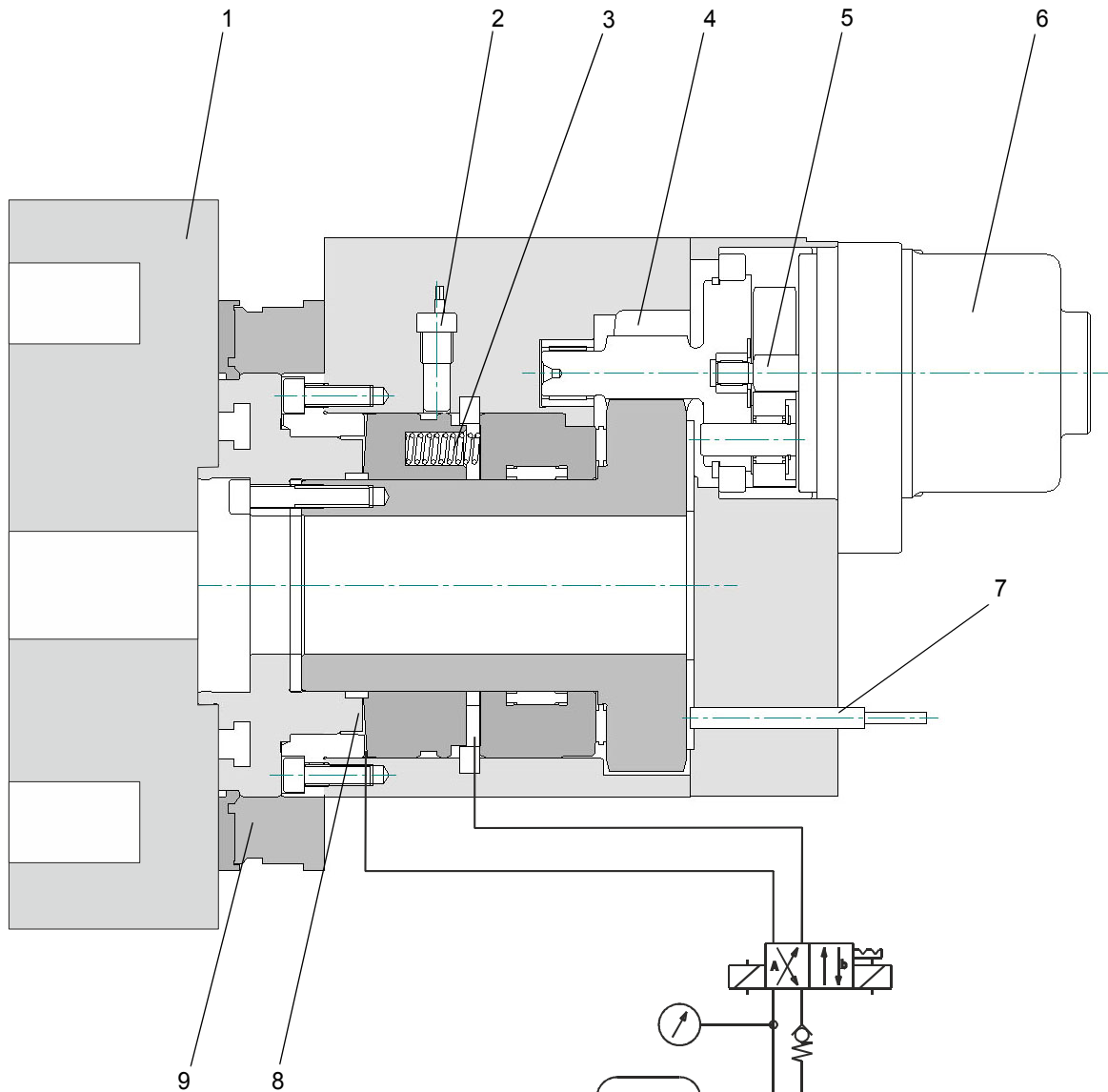
1 Tool disk

2 Electrical loocking control

3 Spring

4 Spur gear

5 Planetary gearbox

6 SAUTER motor for indexing drive

7 Reference switch (optional)

8 Hirth-type gearing

9 cooling lubricant valve

Technische Daten

Series		
Disk-type tool turret 0.5.440.xxx		
Number of switching positions		
Admissible tangential load (turret locked)[1]		kNm
Admissible mass moment of inertia of tools[1][2] with tool disk and holder		kgm^2
Admissible out of balance (load moment) due to tooling		Nm
Gear ratio swivel drive		i
Rotate tool disk:[3]		s
Rotate tool disk:[4]		
• incl. acceleration and braking	Standard load stage	s
	High load stage	s
• without acceleration and braking	Standard load stage	s
	High load stage	s
Turret unlock/lock -hydraulic		s
Adm. switching frequency[3] (median switching angle ϕm =90°)		
Operating pressure		
Hydraulic ± 10%		bar
Cooling lubricant		
• Standard		bar
• Medium pressure valve		bar
• High-pressure cooling lubricant device on additional Rotary Feed-Through		bar
Fluid absorption volume Turret unlock/lock		cm3
Mass Turret (incl. drive motor)[5] Tooling (max)		kg kg
Adm. ambient temperature		°C

1) Higher values on request
2) Switching times on request
3) The swivel times are determined with an average load.
   Further details on request..
4) The swivel times are determined with an average load.
   Further details on request..
5) At design standard housing
6) Ensure compliance with the required filter fineness for the tools used.
   For example spindle heads with internal cooling lubricant supply.
7) On request

Baugröße				
12	**12**			
3	3			
0,8	0,8			
1,2	1,2			
16	16			
45	45			
0,10 0,6	0,10			
0,06 0,11	0,06			
0,11	0,11			
25	25			
50	50			

- 5 - 25 (filtering <100µm[6])
- 5 - 50 (filtering < 50µm)[6) 7)]
- 150 (filtering ≤ 25µm)[6) 7)]

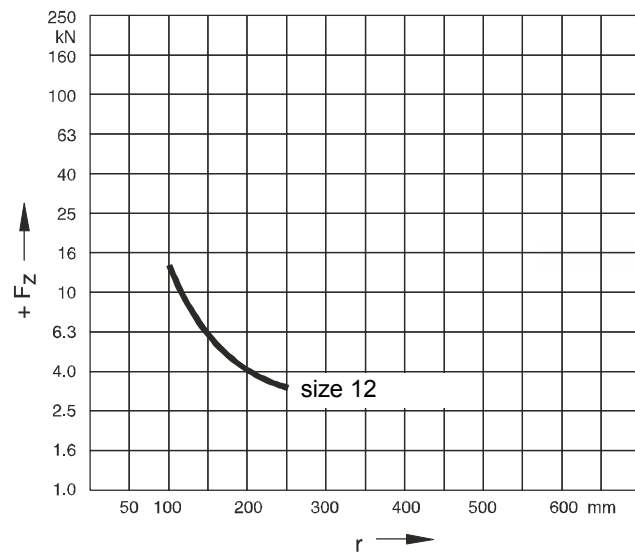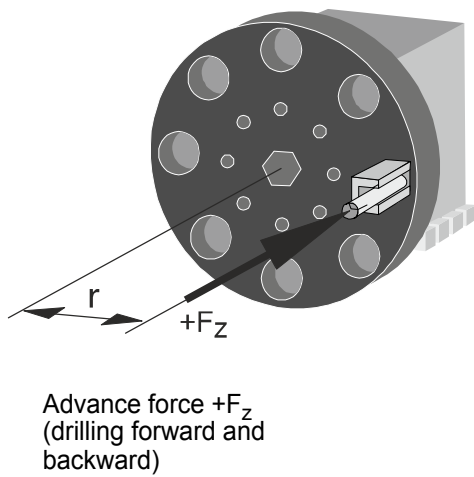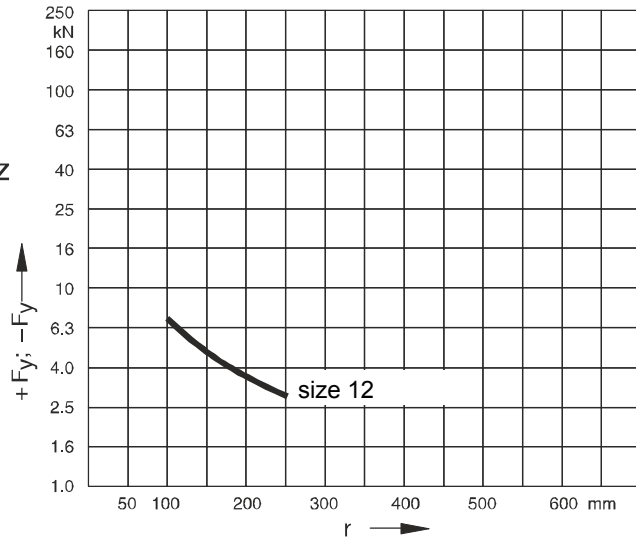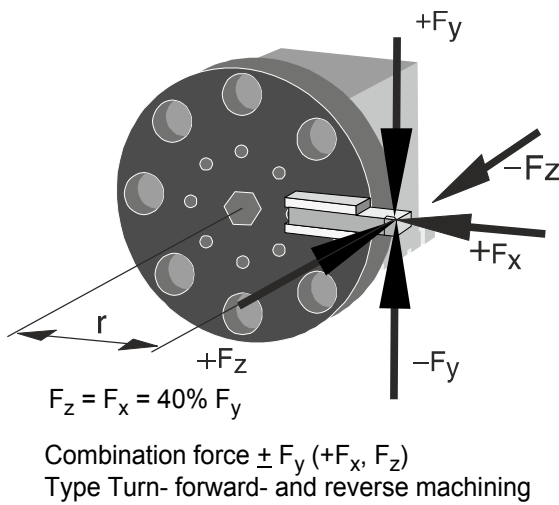|				
15	15			
164	108			
40	40			
10 ... 40	10 ... 40			

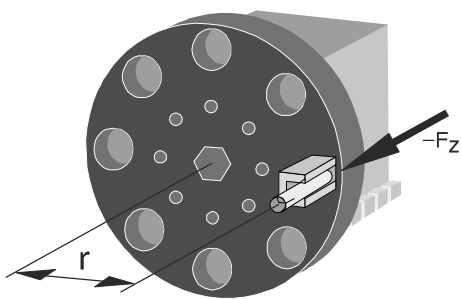| Recommended motors degree of protection to IP 67	J kgm2	Zul. Motordreh- min^{-1}	swiveling times for 30°-step without acceleration and braking Size of turret 12
SAUTER with encoders[1)]	0,0003	4500	0,05

1) controlled via machine controll system

Admissible Loads

Note

➢ The diagrams refer to static loads.

➢ In case of impact load (interrupted cutting), significantly lower values must be reckoned with.

$F_z = F_x = 40\% F_y$

Combination force $\pm F_y$ ($+F_x$, F_z)
Type Turn- forward- and reverse machining

Advance force $+F_z$
(drilling forward and backward)

-Fz = Fx = 40% Fy

Advance force -F$_z$
(drilling forward and
shunt load +F$_x$)
leading edge is the basis for dimension a
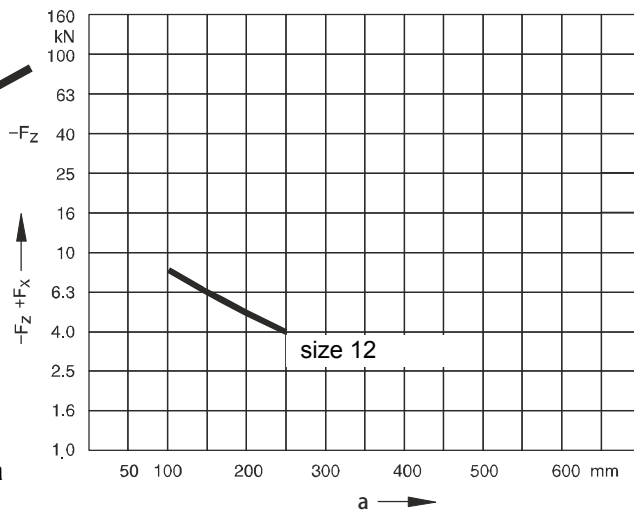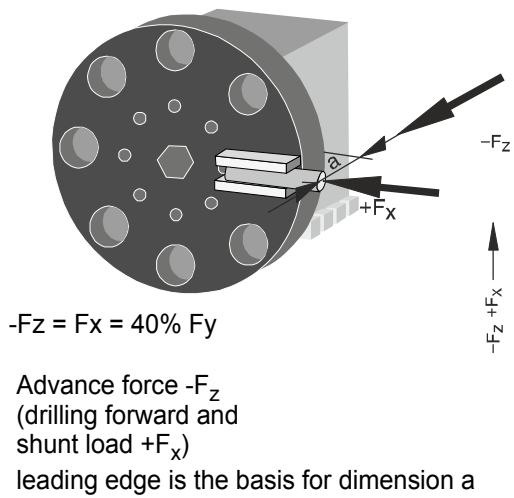
Advance force -F$_z$
(drilling forward)
(Only with L- and block-shape)
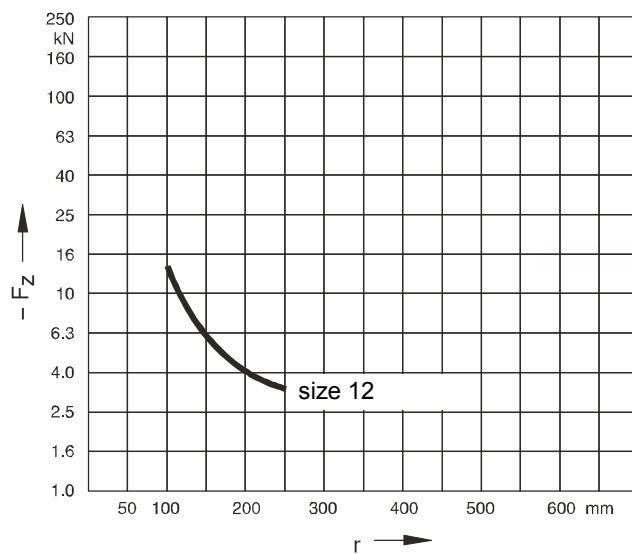
Dimension
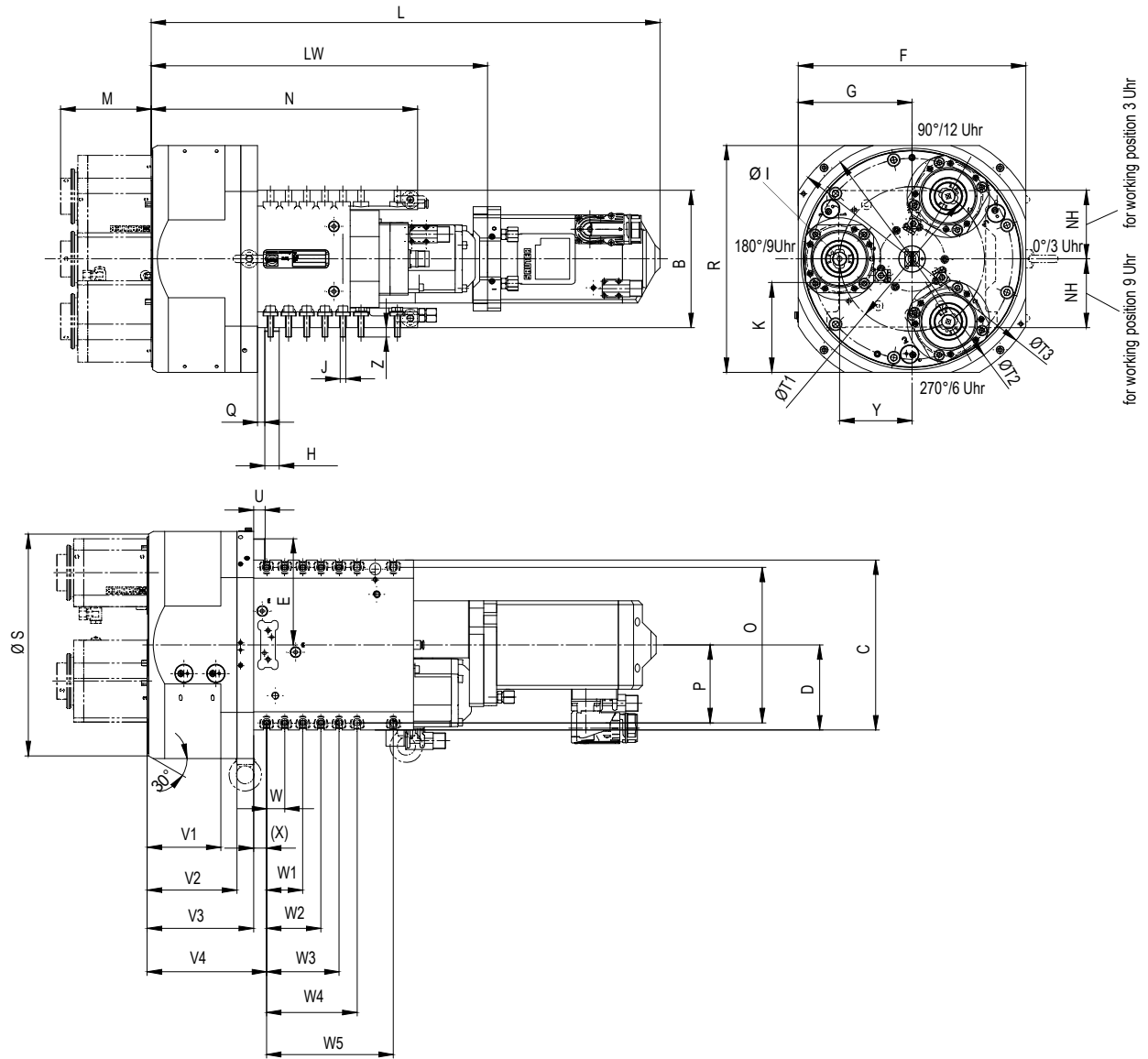
Series	Size									
Based turret0.5.440.xxx	**12**					**12**				
NH	95 +0,2					95 +0,2				
B	190					190				
C	235					235				
D	117,5					117,5				
E	147					147				
F	314					220				
G	157					110				
H	20 $^{-0,01}_{-0,02}$					20 $^{-0,01}_{-0,02}$				
J	M8					M8				
K	157					95				
L **SAUTER Synchronous Motor** **1.8.100.012-145177**	703					703				
LW										
M	125					94,5				
N	368					368				
O	215					215				
P	107,5					107,5				
Q	10					10				
R	314					190				
Ø S	306,6					180				
Ø T	Ø T1 200	Ø T2 332		Ø T3 365		Ø T1 100	Ø T2 240		Ø T3 260	
U	16					16				
V	V1 102	V2 124	V3 147	V4 165		V1 102	V2 124	V3 147	V4 165	
W	W 25	W1 50	W2 75	W3 100	W4 125	W5 175	W 25	W1 50	W2 75	W3 100	W4 125	W5 175
X	(18)					(18)				
Y	100					50				
Z	13 (other lengths on request)					13 (other lengths on request)				
Ø I (tool holder bore)	45					35				

Precision
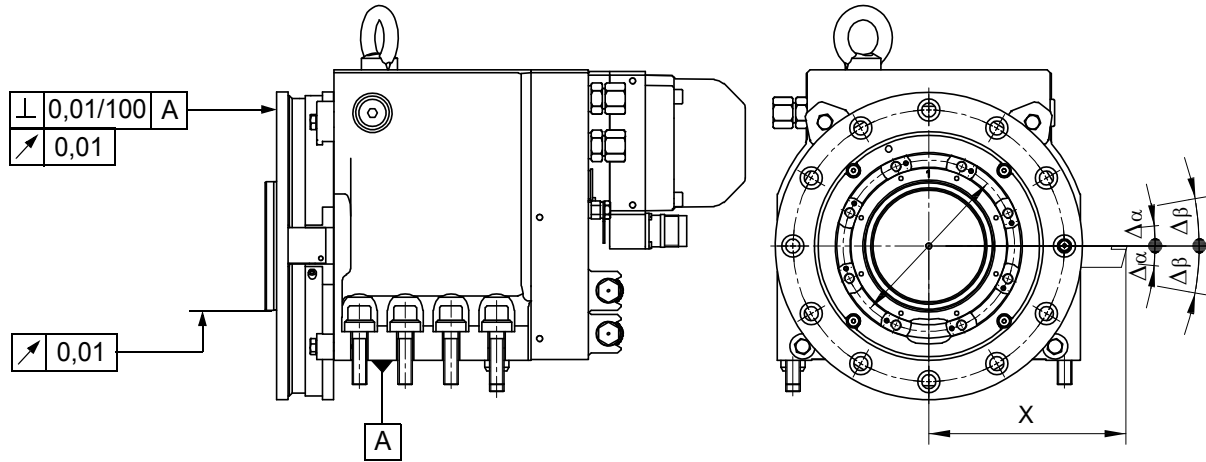
Repeating accuracy
(Multiple move to a switching position from the same direction)

$$\Lambda\alpha = \pm\ 1,6\text{``} \equiv \pm 0,8 \ \text{x} \ \frac{X[mm]}{100[mm]}[\mu m]$$

Indexing precision
(Multiple move to a switching position from different direction)

$$\Lambda\beta = \pm\ 4\text{``} \equiv \pm 2 \ \text{x} \ \frac{X[mm]}{100[mm]}[\mu m]$$

Fluid Rotary Feed-Through

All turrets are deliverable with central fluid rotary feed-through:

| „uncontrolled" version | – fluid supply in **all** switching positions
e.g.for sealing air, for gripper actuation, and similar actions |

| „controlled" version | – fluid supply in **one** switching positions
e.g.for KSS, for automatic tool changes, and similar actions |

A maximum of three supply lines are routed through the centre of the turret.
Operating pressure Padm = 100 bar (standard).

Tool drive   13
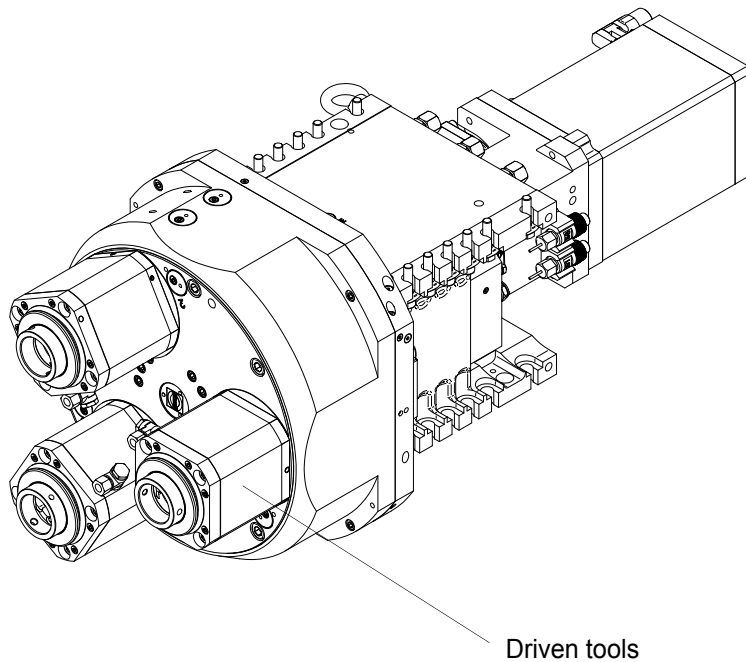
Description

These turrets consist of the following:

➢   Basic turret series 0.5.440.xxx and

➢   Tool drive central for axial spindle heads for forward and reverse machining.

Note

SAUTER-driven tools series 0.5.934.xxx required.
With or without spindle locking system

Driven tools

The tool drive motor drives the hollow shaft directly to the turret
central drive shaft mounted gearbox

In this system, the tool turret disk is an integral part of the turret.

Performance Data for the Tool Coupling

The gearbox is designed for the performance data indicated below for the tool coupling.
The actually available performance data depend on:

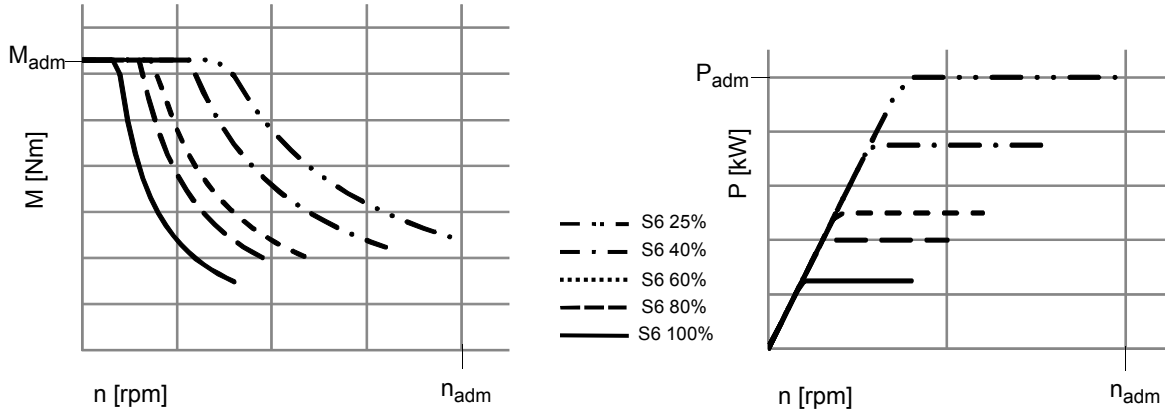| Series	Size	
Disk-type tool turret 0.5.180.xxx	**12**	**12**
tool holder bore	Ø 45	Ø 35
Gearbox performance data		
Adm. drive rating[1] P_{zul} kW	20	10
Adm. torque[2] M_{zul} Nm	50	50
Adm. rpm[1][3] n_{zul} min^{-1}	8000	12000
Gear ratio $i = n_1 / n_2$	1,23	0,793
Recommended drive motors degree of protection to IP 67		
SAUTER synchronous motor	0.8.100.012	

1) The values are reference values for short-term operation. Higher rpm generate more heat and noise..
2) Torque limitation on the motor converter required! The torque values apply to smooth machining
(such as drilling, thread cutting). In the case of machining with severe shock loads
(e.g. face milling and similar operations) it is necessary to reduce the motor drive torque by 50% or more!
3) Higher rpm on request

Note: Determine the duty cycle (DC), see page 15

Admissible duty cycle (DC)

Tool drive

Performance Diagram

M [Nm] vs n [rpm], M_{adm}, n_{adm}

- ─ ·· ─ S6 25%
- ─ · ─ S6 40%
- ········ S6 60%
- ─ ─ ─ S6 80%
- ────── S6 100%

P [kW] vs n [rpm], P_{adm}, n_{adm}

Admissible duty cycle of the tool drive during short-time operation (reference values)

The actual efficiency (DC) also depends on where the turret is installed and on the operating conditions!

Admissible duty cycle [DC] (5 min)		100%	80%	60%	40%	25%
Admissible drive rating	$\dfrac{P_c}{P_{zul}}$					
and		25%	40%	50%	75%	100%
admissible relative rpm	$\dfrac{n_c}{n_{zul}}$					

P_c = Required cutting performance [kW]
n_c = Required cutting rpm [min-1]
P_{zul} = Admissible drive rating [kW]
n_{zul} = Admissible rpm [min-1]

Example calculation:

Witch speed n_c and witch power P_c with 40% DC are supported on a tool drive, size 12?
The following values are valid for disk-type tool turrets, size 12:
P_{adm} = 10 kW, n_{adm} = 8000 min^{-1}

Values are valid for 40% DC (5min) according to the table on this page: $\quad \dfrac{n_c}{n_{zul}} = 75\%$ und $\dfrac{n_c}{n_{zul}} = 75\%$

$$P_c = P_{zul} \times \frac{P_c}{P_{zul}} = 20\ kW \times 75\% = 15\ kW$$

und

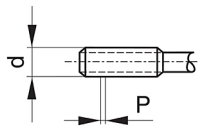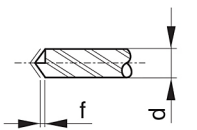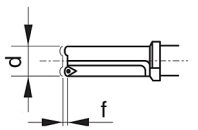$$n_c = n_{zul} \times \frac{n_c}{n_{zul}} = 8000\ min^{-1} \times 75\% = 6000\ min^{-1}$$

In this example the tool drive can be operated with Pc =15 kW and nc = 6000 min-1 for 2 minutes and then it must rest for 3 minutes.

Processing (examples)

➤ The performance of the tool turrets during cutting are most of all limited by the following factors:

- Performance of the selected driving motor
- Degree of uniformity of the cutting forces
- Tool length
- Bearing of the tool spindles
- Size of the tool holding fixture

➤ The cutting values listed below are possible maximum loads at approx. 40% DC within a load group with different performance requirements.

Processing (examples)		
Tappimg	Boring HSS-twist drills	Boring Hard alloy short hole drills
d x P [mm] x [mm]	d x f [mm] x [mm/rotation]	d x f [mm] x [mm/rotation]

| Tool turret dimension		0.5.180.0xx	12
Motor used Siemens		0.8.100.012	.. 101
m_{max} **40 % DC**		Nm	50
Materiel of the work piece: ST 60, tensile strength $R_m \le 600$ N/mm^2			
Tapping		d x P	M 10 x 1,5
Drilling with twist drill		d x f	12 x 0,2
Drilling with HM short hole drills		d x f	25 x 0,1
Milling with milling head		d x e x f_z	40 x 2,5 x 0,16
Materiel of the work piece: Aluminium alloy, hardness ≤ 1000 HB			
Tapping		d x P	M 20 x 2,5
Drilling with twist drill		d x f	25 x 0,16
Milling with milling head[1]		d x e x f_z	40 x 2,5 x 0,25

1) Tool length: "short"

Take care in the case of processing involving shock loads. Possible great reduction (50% or more!) of the max. possible cutting values required!
When milling use hob cutters with as many teeth as possible for uniform cutting forces.

Driven Tools

Series 0.5.934.xxx

Description
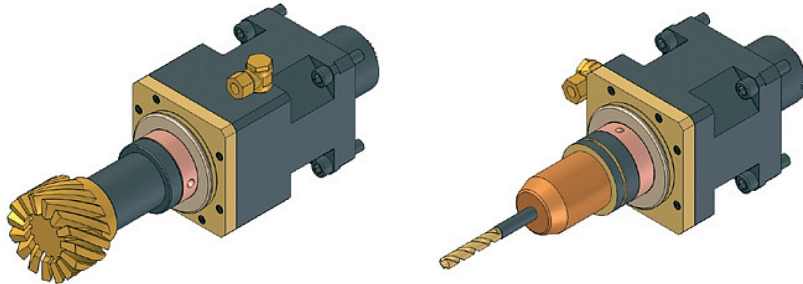
Specification

➢ Bearing in precision spindle bearings in -O- or tandem-O-arrangement medium initial tension

➢ Permanent grease lubrication

➢ Non-wearing labyrinth seal with sealing air support

➢ Cooling lubricant supply
   ⇨ externally through the driven tool housing or
   ⇨ internally through the tool spindle

➢ Spindle twisting safety device (pat.) in uncoupled state

➢ Very true and well balanced running

➢ Tool holding fixture in the spindle:

➢ for HSK Mapal clamping system

Options

➢ Special tool locations

➢ Spindle bearings (selection):
   ⇨ for high speed running
   ⇨ for high load
   ⇨ for special demands

➢ Further options on request:
   ⇨ driven tools with ratio ±1
   ⇨ Multi-spindle drilling heads

SAUTER

Driven Tool 0°

Selection

Dimension Horizontal-axis turret	Tool holding fixture[1]	Bearing arrangement	Order-No.
0.5.180.012	HSK 32-C	< 0 >	0.5.934.103 -124066
	HSK 40-C	< 0 >	0.5.934.103 -124868
	HSK 50-C	<< 0 >	0.5.959.104 -145371
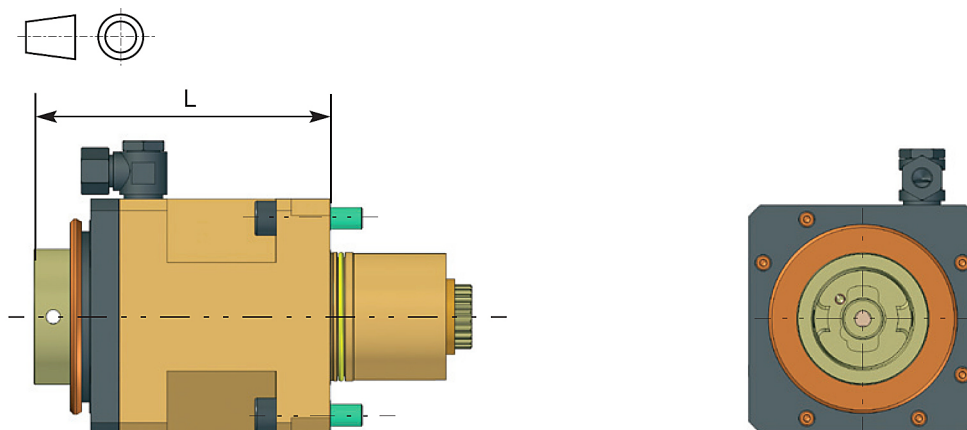
| Speed	Mass moment of inertia		Wight of driven tool	Dimensions
n_{zul}[2]	Spindle	driven tool[3]	m	L
[min^{-1}]	[10^{-4} kgm^2]	[kgm^2]	[kg]	[mm]
15000	2,6	0,05	3	76,5
15000	2,8	0,05	3	76,5
10000	8,5	0,15	6,5	125

Application recommendation

Bearing arrangement << 0 > - at higher loads

1) For Mapal, type KS..-07 clamping units
2) High speed only for short term operation ($\leq$ 10 % DC - 5 min.)
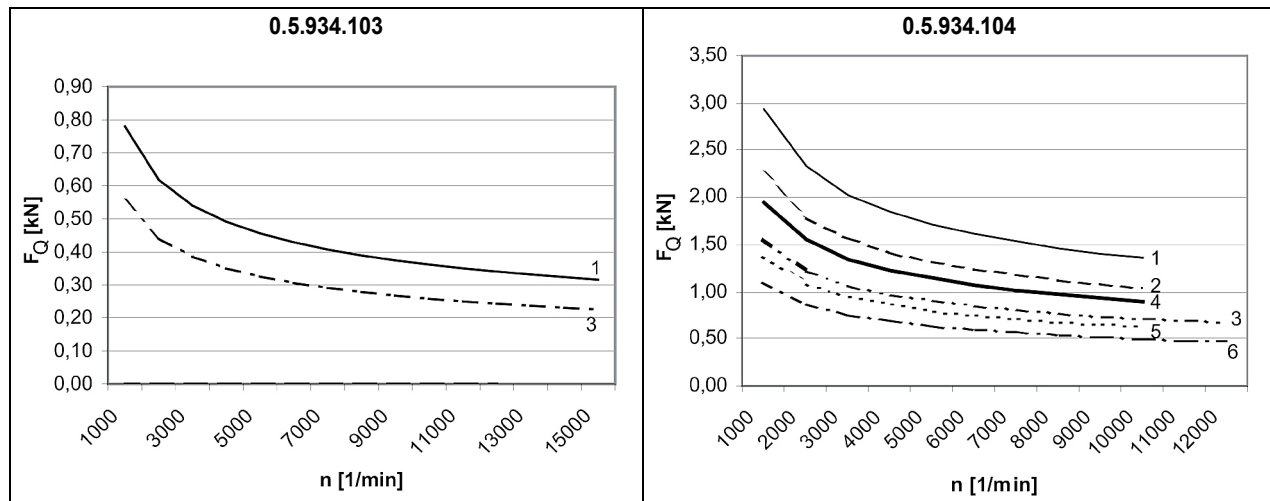3) Relating to tool turret slewing axis

Admissible load

Admissible axial force when boring

Characte-ristic line no.	Bearing arrangement	Nominal bearing life L_h [h]
1	Standard	4000
2	Tandem	4000
3	Standard	8000
4	Tandem	8000

F_{ax}

0.5.934.103

F_{ax} [kN] vs n [1/min]

0.5.934.104

F_{ax} [kN] vs n [1/min]
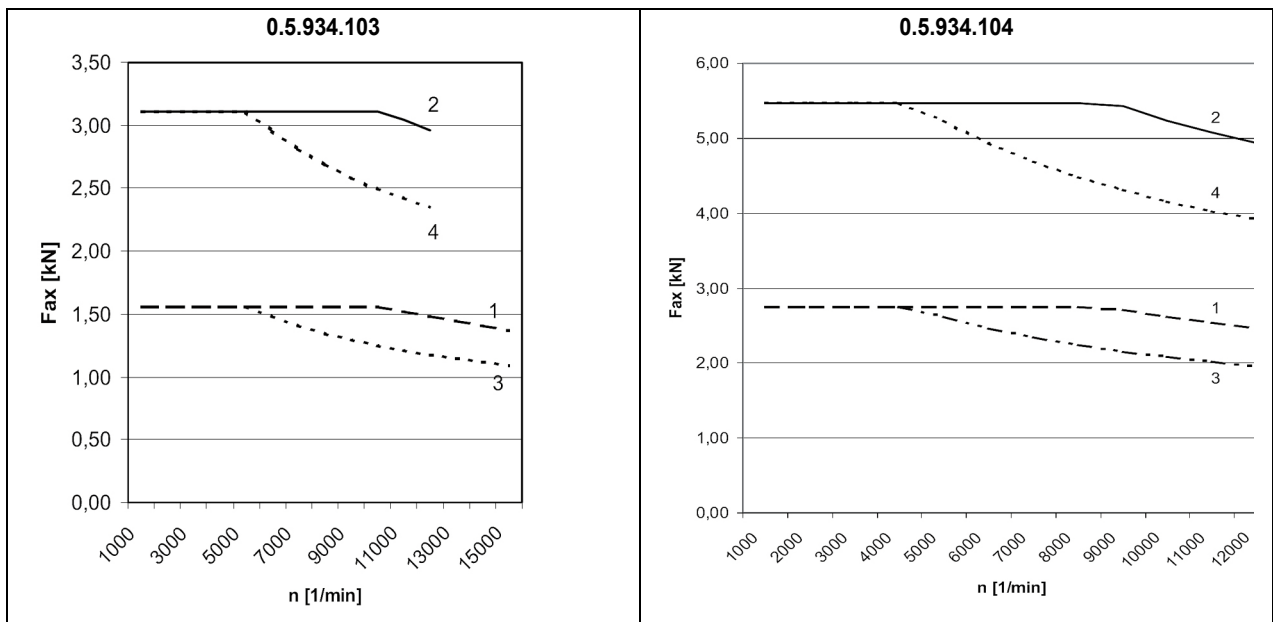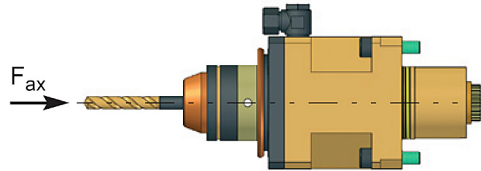
lateral force during milling

Characte-ristic line no.	Bearing arrange-ment	Bearing distance	L [mm]	
			0.5.934.xxx	
			103	104
1	Tandem	Long		
2	Tandem	Standard	60	80
3	Standard	Standard		
4	Tandem	Long		
5	Tandem	Standard	120	160
6	Standard	Standard		

Precision

Spindle with HSK tool holding fixture
bearing quality P2 $\stackrel{\wedge}{=}$ ABEC 9

Driven Tool 0°

test mandrel
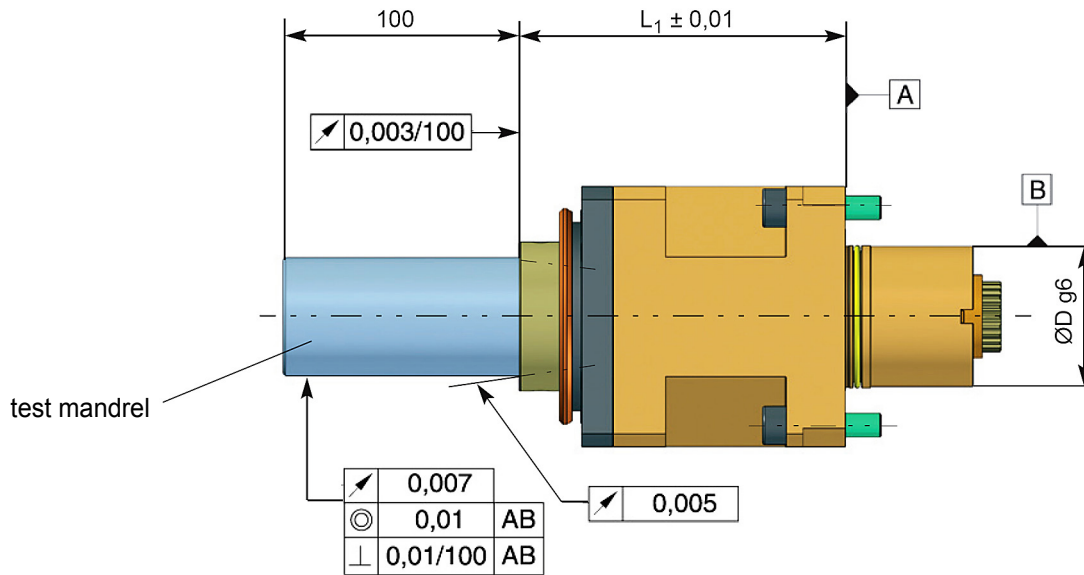
sauter ®

Ordering details

FAX ++49 (0) 7123-926-190

☎ ++49 (0) 7123-926-0

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✉ Sauter Feinmechanik GmbH
Postfach 1551
D-72545 Metzingen
Germany

Company: _____

Street: _____

Postcode, City: _____

Name: _____

Phone: _____

Fax: _____

e-mail: _____

SAUTER-Driven Tools 0.5.934.1xx							
Ordering details	**Possible versions**	**Your selection**					
Size:	03/04/06/08	03 ☐		04 ☐	06 ☐		08 ☐
Tool holder:	HSK 32	☐		—	—		—
	HSK 40	☐		☐	—		—
	HSK 50			☐	☐		—
	HSK 63	—		—	☐		☐
	HSK 80	—		—	—		☐
	including Mapal clamping unit						
	Special	☐		☐	☐		☐
		....					
Bearing distance / bearing assembly:	Standard <0>	☐					
	Standard/Tandem <0>	☐					
	Standard/Special	☐					
	Long/Tandem	☐					—
	Long/Special	☐					—
Use features:	drilling ☐	n_{max} = ...					
	milling ☐	M_d = ...					
	other ☐	....					
Special requirements: ✎		Sketch enclosed		yes ☐		no ☐	
Number:		....					