

PI 21.3 e – Product Information

Disk-type tool turret

without tool drive

Series 0.5.460.xxx

with tool drive

Series 0.5.456.xxx

0.5.450.xxx

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Please request: **Project Planning Guide PA 21.3**

NOTE:

The information contained in this Product Information is in conformity with the knowledge at the point of printing. Subject to modifications which occur within the framework of continuous further development.

Disk-type tool turret series 0.5.460.xxx

These turrets are suitable for use on high-capacity turning machines for **forward** as well as equipollent **reverse** machining. They are equipped with all of the features and functions of modern high-performance and high-capacity tool turrets. Their robust design and short switching times mean they are also very well suited for heavy-duty use in series manufacture.

Turret series without tool drive – 0.5.**460**.xxx
with axial tool drive – 0.5.**456**.xxx
with radial tool drive – 0.5.**450**.xxx

Features:

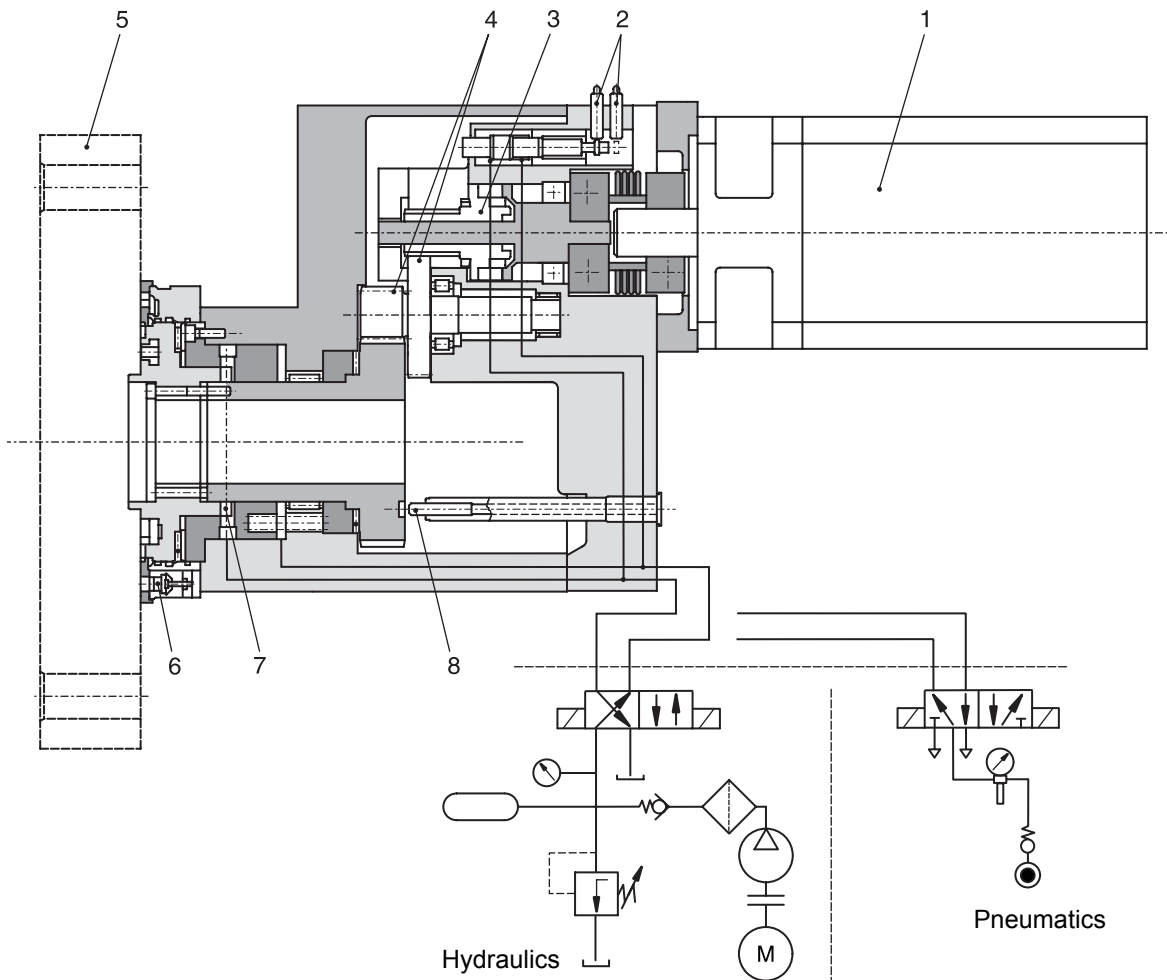
- **Single Motor Technology**
The turret and the tool drive share one motor; this means lower investment costs and higher level of reliability
- For equal high-performance **forward** and **reverse** machining
- Drive with standard servo or spindle motors for fast bidirectional positioning
- High degree of stability due to high locking forces
- Locking device uses special triple generating crown gear (pat.)
- Not affected by collisions due to safety clutch and annular slot for the disk tool
- Directly controllable with machine controller
- Connection with centralised lubricating system to ensure extremely high service and usage life
- Can be installed in any position
- Stable housing with large fastening surface ensuring high stiffness
- High thermal stability

Options:

- Housing available as block, right and left design as well as L-shaped
- Central rotary feed-through for fluid-actuated tools and a high-pressure cooling lubrication device
- Attachment of transfer elements for switching sensors in tool disk
- Attachment of sensors to monitor cutting force
- **Turrets with Y-axis slide units**
- Software package for operating the system with a Siemens control Type 840-D

Turret without tool drive:

for **hydraulic operation** – turret type 0.5.460.**4xx**
for **pneumatic operation** – turret type 0.5.460.**5xx**



- 1 Drive motor
- 2 Electrical locking control
- 3 Safety clutch for turret drive
- 4 Spur gear
- 5 Tool disk
- 6 Cooling lubricant valve
- 7 Hirth-type gearing
- 8 Reference switches

Series		
Disk-type tool turret 0.5.460.xxx		
Number of switching positions		
Admissible tangential load (turret locked) ^{4.)}		kNm
Adm. mass moment of inertia of tools ^{1.)} (tool disk and holder)	Standard load stage	kgm ²
	High load load stage	kgm ²
Adm. out-of-balance due to tooling	Standard load stage	Nm
	High load load stage	Nm
Indexing times ^{2.)}		
Rotate tool disk		
<ul style="list-style-type: none"> incl. acceleration and braking per partial step 	Standard load stage	s
	High load load stage	s
<ul style="list-style-type: none"> without acceleration and braking per additional partial step 	Standard load stage	s
	High load load stage	s
Turret unlock or lock		
<ul style="list-style-type: none"> hydraulic pneumatic 		s s
Adm. indexing frequency ^{2.)} (median switching angle $\varphi_m=90^\circ$)		min ⁻¹
Operating pressure		
Hydraulics ± 10 %		bar
Pneumatics ± 15 %		bar
Cooling lubricant		
<ul style="list-style-type: none"> with medium pressure valve with central high-pressure cooling lubricant device 		bar bar
Fluid absorption volume		
Turret unlock/lock		cm ³
Mass		
Turret (incl. standard housing, without tool disk, without motor)	m	kg
Tool disk and tooling (max.)	m _{adm}	kg
Adm. ambient temperature		
		°C

1.) Indexing times available

2.) Conditions:

- Drive with Siemens servo motors and driving torques in accordance with the table on page 6.
- Fluid supply sufficiently large
- Turret up to operating temperature
- without controller-related non-productive time
- Attention! Increased indexing times with
 - higher mass moment of inertia of tool disk and toolholders
 - higher mass moment of inertia of other motors
 - lower driving torque

Size											
12			16			20			25		
8 ^{1.)}	12	16 ^{1.)}	8 ^{1.)}	12	16 ^{1.)}	8 ^{1.)}	12	16 ^{1.)}	8 ^{1.)}	12	16 ^{1.)}
0.7 [0.8]			1.3 [1.8]			3.2 [3.6]			6.3 [7.2]		
0.8 1.6			1.8 4.0			3.2 6.3			8 16		
12 16			25 32			40 63			80 125		
0.12 0.15			0.14 0.18			0.16 0.21			0.20 0.26		
0.04 0.08			0.04 0.08			0.05 0.1			0.08 0.16		
0.10/0.10 0.10/0.05			0.10/0.10 0.12/0.05			0.12/0.12 0.14/0.06			0.14/0.14 0.18/0.08		
25			20			16			12.5		
50 7			50 7			50 7			50 7		
5 ... 25 100			Filtering $\leq 100 \mu\text{m}$ ^{3.)} Filtering $\leq 25 \mu\text{m}$ ^{3.)}								
15			30			45			65		
55 40			100 80			125 160			200 250		
+ 10 ... +40											

3.) Comply with the fineness of the filter required for the utilised tools, e.g. spindle heads with internal cooling lubricant supply.

4.) Values in square brackets apply to hydraulic locking

Technical data of turret drive

Series	Size							
	12		16		20		25	
Disk-type tool turret 0.5.460.xxx								
Number of indexing positions	8/16	12	8/16	12	8/16	12	8/16	12
Rated speed turret drive min ⁻¹	2.)	1200	2.)	1200	2.)	1000	2.)	750
Driving torque ^{1.)} Nm	2.)	25	2.)	40	2.)	63	2.)	100
Gear ratio n ₁ /n _{Rev}	16	12	16	12	16	12	16	12

1.) Torque limitation on the motor converter!

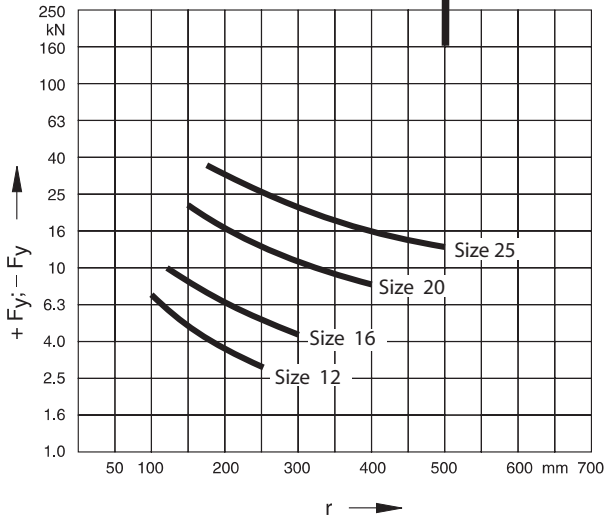
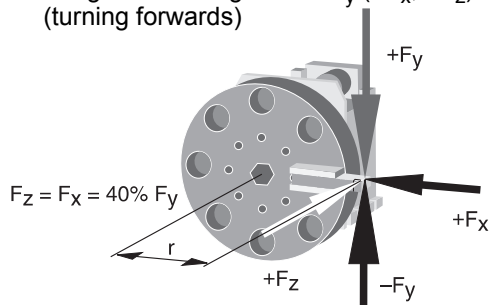
2.) Values on request.

Recommended drive motors – preferred series –

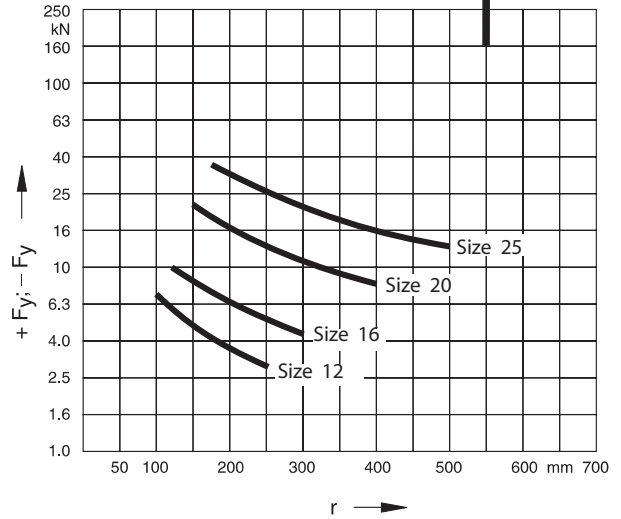
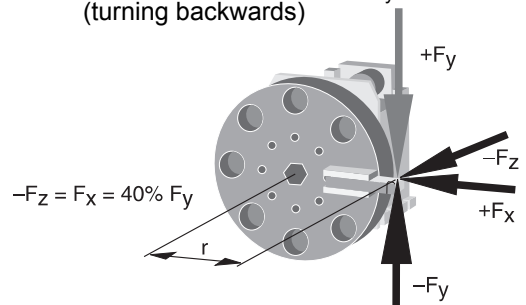
– The motors are not included in the SAUTER scope of supply –

Siemens servo-motor type 1 FT 6...	..064..	..084..	..086..	..105..
Indramat servo-motor, type MKD..	..071B	..090B	..112B	..112C
Fanuc spindle motor type Alpha	..1.5	..2	..3	..6

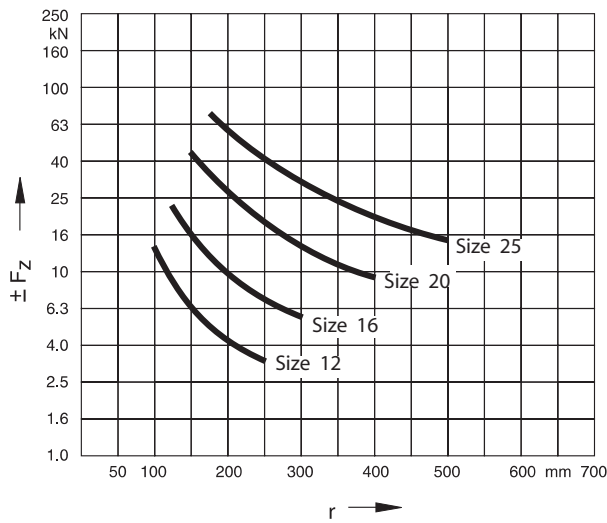
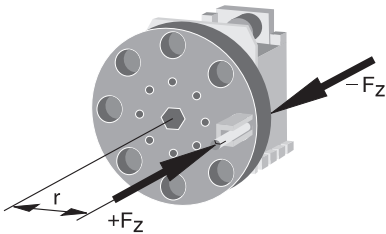
Tangential cutting force $\pm F_y$ ($+F_x, +F_z$)
(turning forwards)



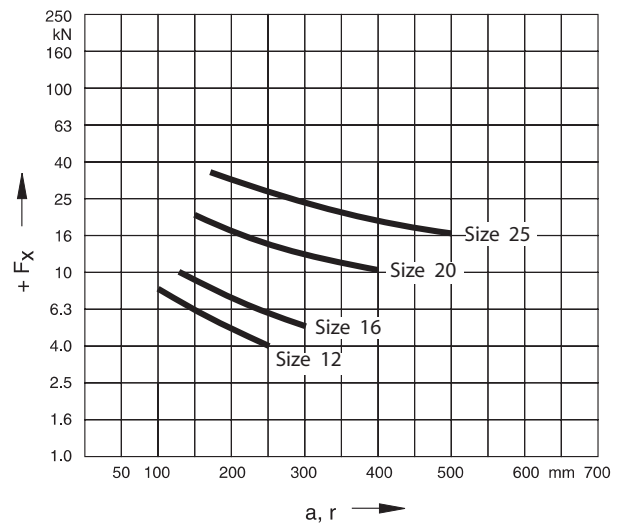
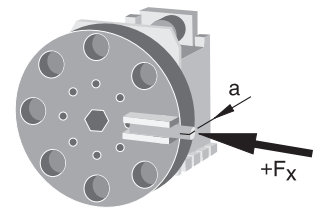
Tangential cutting force $\pm F_y$ ($+F_x, -F_z$)
(turning backwards)



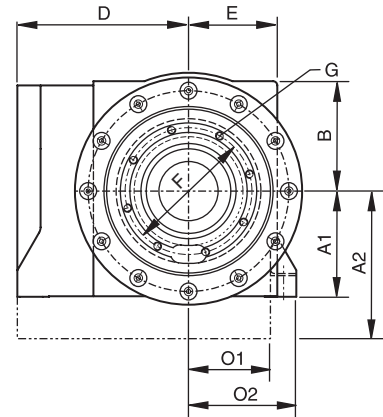
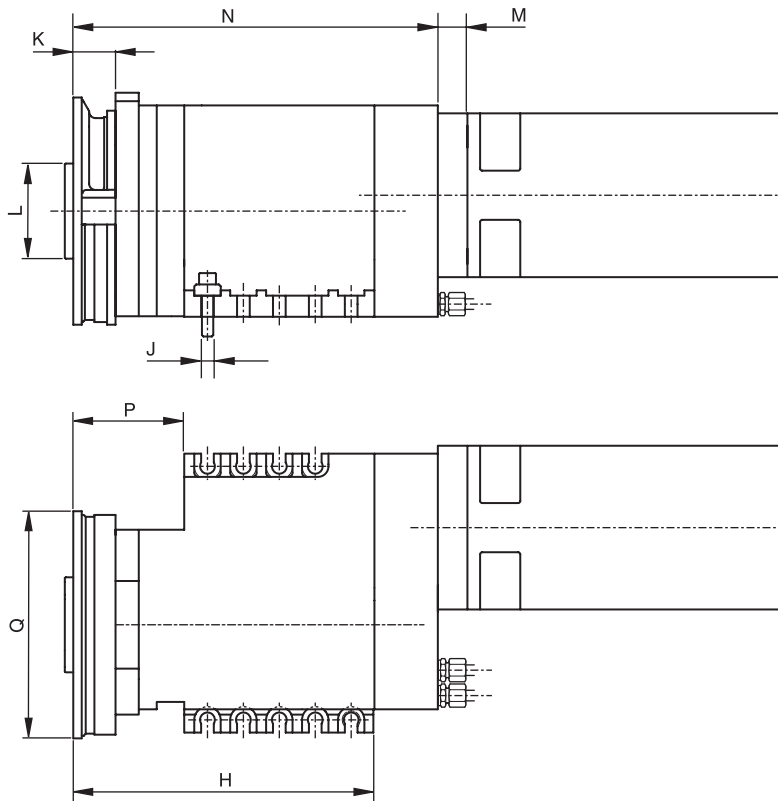
Advance force $\pm F_z$
(drilling forwards and backwards)



Transverse force $+F_x$



Note: The diagrams only apply to static loads.
In the event of shock loads (discontinuous cutting) it is necessary to use significantly lower values.



Shown: Design
L-shape right-hand.
Other designs and housing
shapes, see page 19

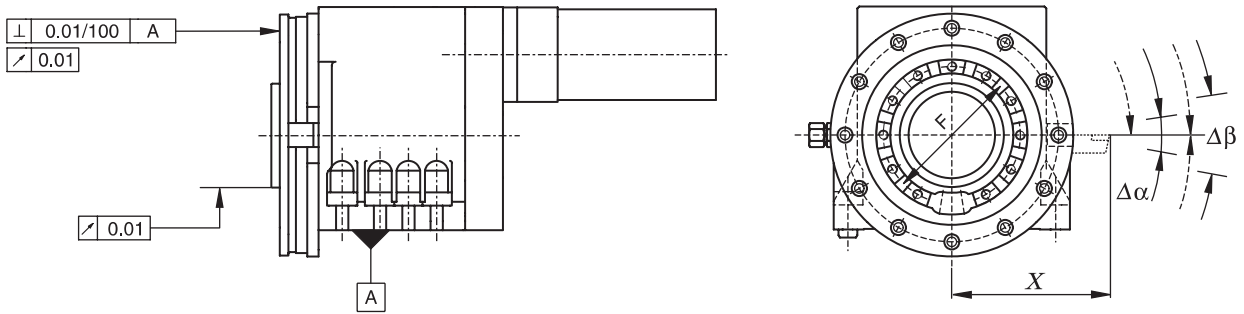
Series	Size			
Disk-type tool turret 0.5.460.xxx	12	16	20	25
A ₁ /A ₂ ^{2.)}	-/90	100/115	125/140	150/180
B	80	100	125	150
D	130	162	200	248
E	68	82	100	125
Ø F	90	120	145	182
G	8 x M8	8 x M8	11 x M10	11 x M12
H	236	285	330	372
J	M8	M10	M12	M16
K	32	40	41	52
Ø L	70	90	110	120
M ^{1.)}	44	30	45	65
N	300	343	397	445
O ₁ /O ₂ ^{2.)}	68	102/82	125/100	158/125
P	76	105	120	150
Q	175	215	255	318

1.) For the use of Siemens servo motors as indicated in the table on page 7

Dimensions in mm

2.) Optional

Precision



Repeating accuracy

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

$$\Delta\alpha = \pm 1,6'' \pm 0,8 \cdot \frac{X[mm]}{100[mm]} [\mu m]$$

Indexing precision

(Multiple move to a switching position from different direction)

$$\Delta\beta = \pm 4'' \pm 2 \cdot \frac{X[mm]}{100[mm]} [\mu m]$$

Disk-type tool turret 0.5.456.xxx with axial tool drive

The turrets consists of a basic turret of the 0.5.46... series and a decentralized tool drive for individually switchable, **axially** placed tools for **forwards** machining.

They can be supplied for

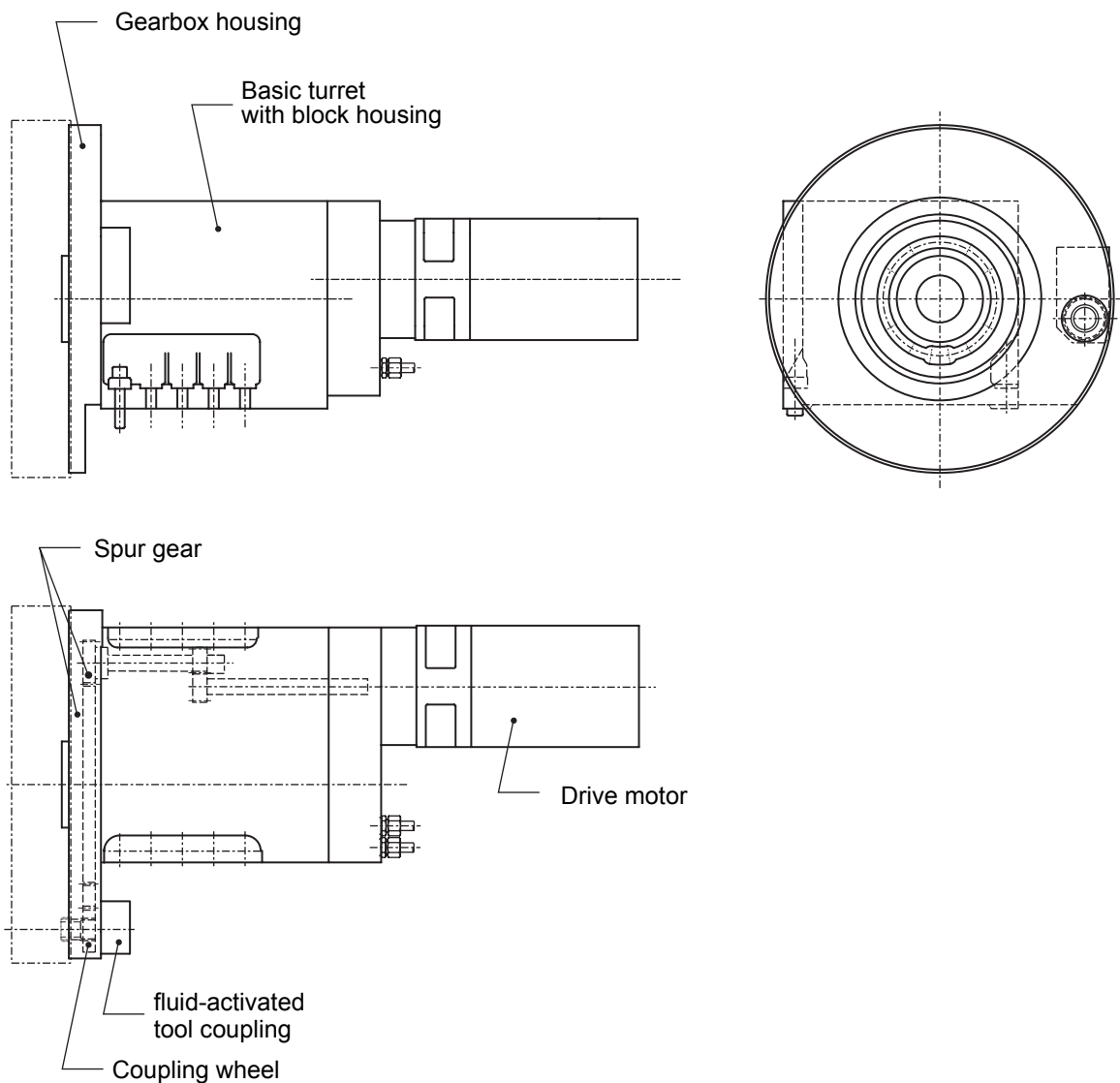
- **hydraulic operation** – turret type 0.5.456.4xx
or
- **pneumatic operation** – turret type 0.5.456.5xx

One-motor technology:

Turret and powered tools (spindle heads) are powered by single motor after the gear switching. Engaging and disengaging the active tool is effected through fluid activation, after positioning of the drive spindle - no tooth on tooth situation! This allows for quick engaging without searching.

The tool coupling is designed for spindle heads with coupling toothing in accordance with DIN 5480 and with spindle locking system.

See Sauter spindle heads of the 0.5.941.xxx series – Product Information PI 29.3.



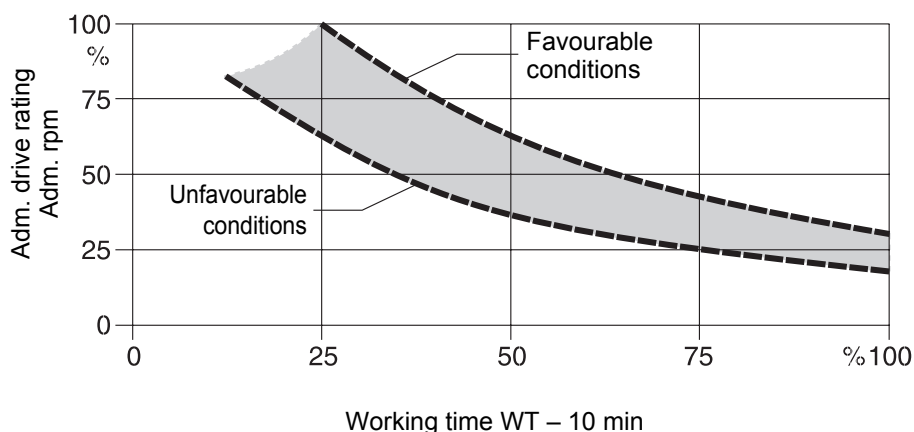
Performance data for the tool coupling

The gearbox is designed for the performance data given below for the tool coupling.
The actually available performance data depend on the utilised drive motor (see below).

Series		Size			
Disk-type tool turret 0.5.456.xxx		12	16	20	25
Gearbox performance data					
Adm. drive rating ^{1.)}	$P_{Adm.}$ kW	6	8	10	12.5
Adm. torque ^{2.)}	$M_{Adm.}$ Nm	20	32	63	100
Adm. rpm ^{1.) 4.)}	$n_{Adm.}$ min ⁻¹	6000	5000	4000	4000
Gear ratio $i = n_1/n_2$		1.0	1.0	1.0	1.0
Recommended drive motors					
Siemens servomotor, Type 1 FT 6..		..064-.AK.	..0.084-.AK.	..086-.AH.	..105-.AF..
Max. torque ^{5.)}	Nm	14	28	40	68
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000
Indramat servomotor, Type MKD.. ^{3.)}		..071B	..0.090B	..0.112B	..112C
Max. torque ^{5.)}	Nm	14	22	48	68
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000
Fanuc spindle motor, Type Alpha..		α 1.5	α 2	α 3	α 6
Max. torque ^{5.)}	Nm	15	25	40	56
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000

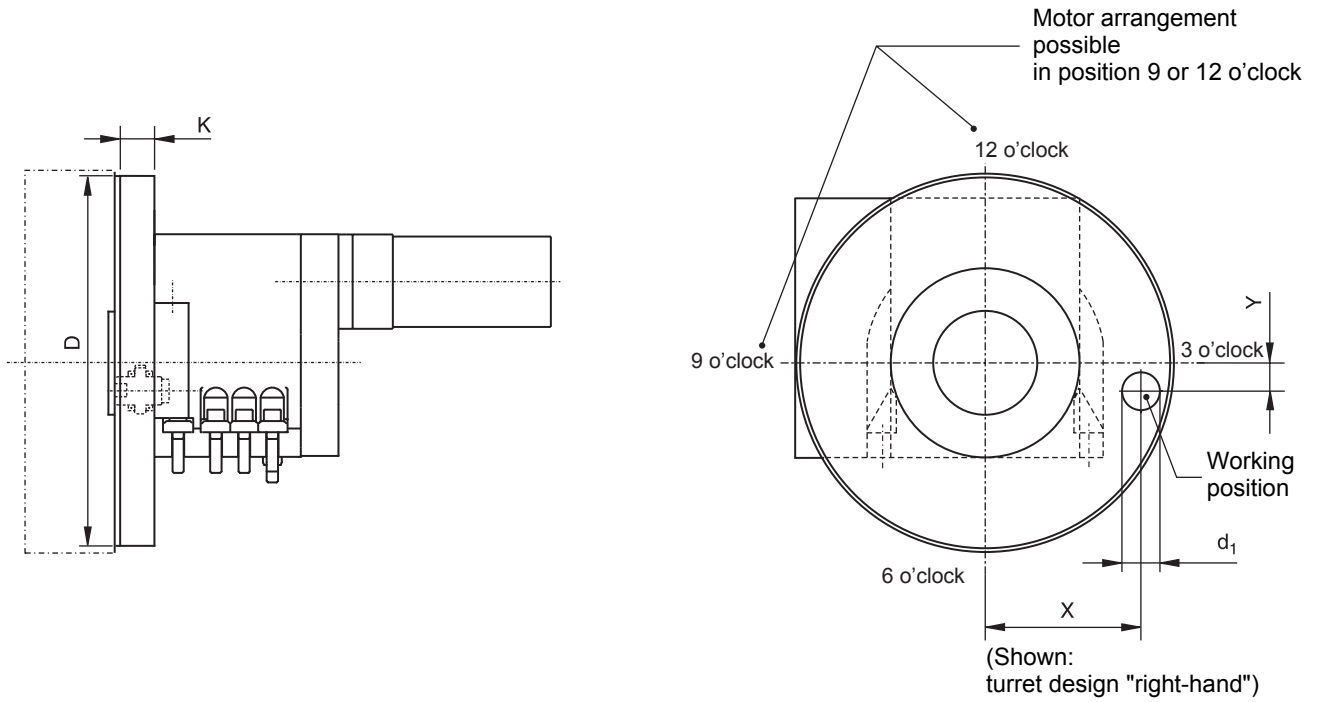
- 1.) The values are reference values for short-term operation. Higher rpms generate more heat and noise, especially when the belt drive is used!
- 2.) Torque limitation at motor converter required! Admissible torque partially smaller than with turret drive!
The listed torque values apply to smooth machining (such as 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 rpms upon request.
- 4.) With absolute value encoder.
- 5.) At tool coupling 40% WT – 10 min

Adm. relative working time – Reference values for gears –

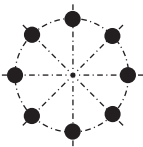


Example for size 20:

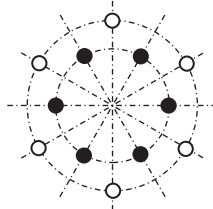
Tool coupling = 3000 min⁻¹
 $n_{adm.}$ = 4000 min⁻¹
 $\Rightarrow n_{Tool\ coupling} = 75\% n_{adm.}$
 \Rightarrow Working time $\leq 40\% - 10\ min$
(max. 4 min ON – min. 6 min OFF)



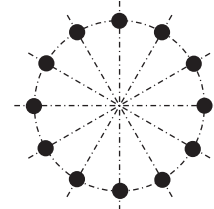
Tool arrangement:



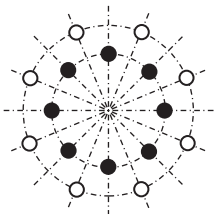
8 positions – 1 reference circle



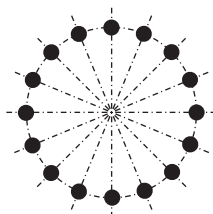
12 positions – 2 reference circles



12 positions – 1 reference circle



16 positions – 2 reference circles



16 positions – 1 reference circle

- Position with tool drive
- Position without tool drive

Alternative configurations

Turret series 0.5.456.xxx

Turret size	Turret version	Working position		Coupling profile DIN 5480	Toolholder DIN 69880 location Ø d ₁	Dimensions		Mass ^{1.)} (approx.) kg	Max. possible tool arrangement see page 13
		Position	X / Y			D	K		
12	Right	3 o'clock	+98.54 / -17 +100 / 0 +142.5 / 0	14 x 0.8	25	256 256 341	32	90 90 120	12-2 12-2 16-1
16	Right	3 o'clock	+117.4 / -25 +125 / -25 +135 / 0 +150 / 0	16 x 0.8	30	306 321 336 366	40	155 165 170 180	12-2 12-2 12-2 12-1
20	Right	3 o'clock	+155 / 0 +170 / 0 +185 / 0	20 x 0.8	40	384 414 444	41	230 245 260	12-2 12-2 12-1
25	Right	3 o'clock	+198 / -70 +200 / -20 +210 / 0 +235 / -70	24 x 1.25	50		52		12-2 12-2 12-2 12-1

Variants printed in **bold** are readily available!

Additional variants – e.g. variation „left-hand“ upon request

1.) Overall weight of the turret incl. tool disk, without motor

Disk-type tool turret 0.5.450.xxx with radial tool drive

These turrets consists of the following:

- Basic turret series 0.5.460.xxx and
- tool drive **central** for individually switchable radial tools

The system is equally suitable for **forwards** and **backwards** machining.

The turrets can be supplied for

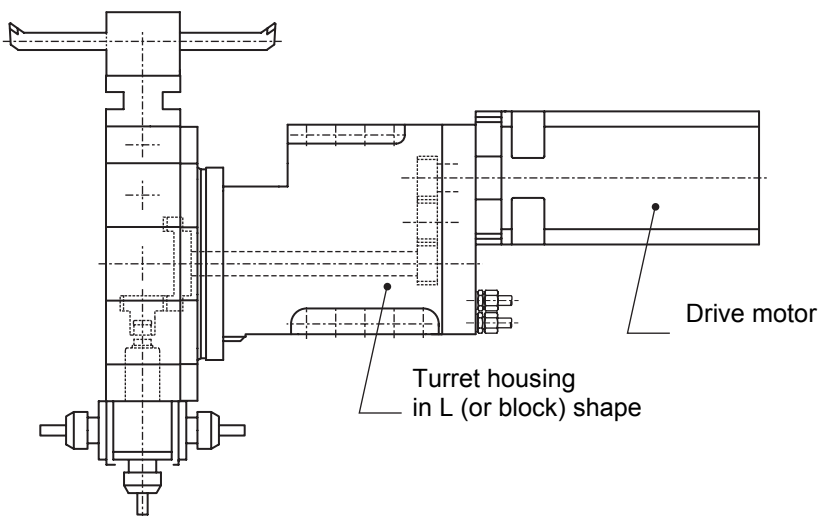
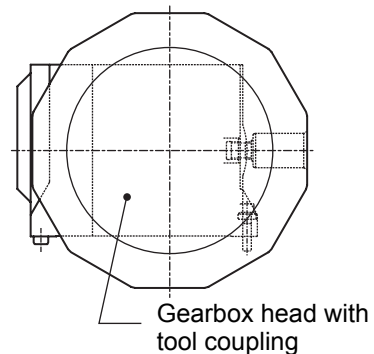
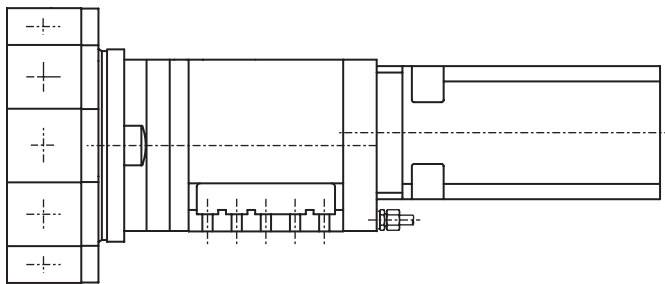
- **hydraulic** operation – turret type 0.5.450.4xx
or
- **pneumatic** operation – turret type 0.5.450.5xx

One-motor technology:

Turret and powered tools (spindle heads) are powered by single motor after the gear switching. Engaging and disengaging the active tool is effected through fluid activation, after positioning of the drive spindle - no tooth on tooth situation! This allows for the quick engaging without searching.

The tool coupling is designed for spindle heads with coupling toothing in accordance with DIN 5480 and with spindle locking system.

See Sauter spindle heads of the 0.5.941.xxx series – Product Information PI 29.3.



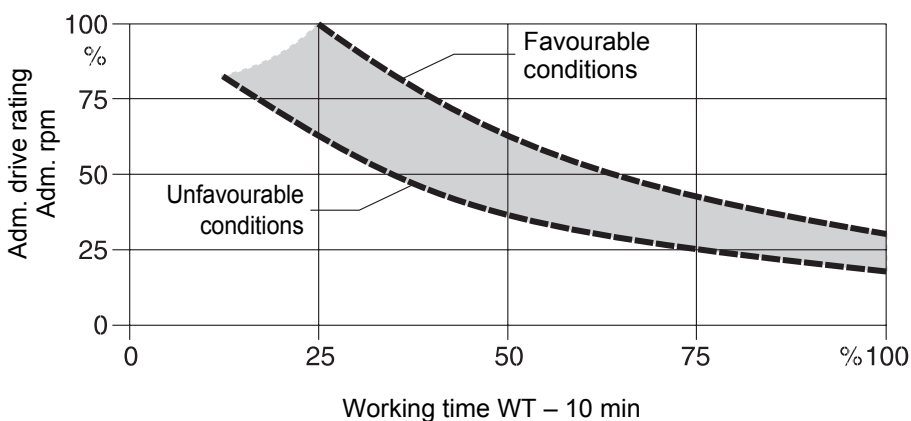
Performance data for the tool coupling

The gearbox is designed for the performance data given below for the tool coupling.
The actually available performance data depend on the utilised drive motor (see below).

Series		Size			
Disk-type tool turret 0.5.450.xxx		12	16	20	25
Gearbox performance data					
Adm. drive rating ^{1.)}	$P_{Adm.}$ kW	6	8	10	12.5
Adm. torque ^{2.)}	$M_{Adm.}$ Nm	20	32	63	100
Adm. rpm ^{1.) 3.)}	$n_{Adm.}$ min ⁻¹	6000	5000	4000	4000
Gear ratio $i = n_1/n_2$		1.0	1.0	1.0	1.0
Recommended drive motors					
Siemens servomotor, Type 1 FT 6..		..064-.AK.	..084-.AK.	..086-.AH.	..105-.AF..
Max. torque ^{5.)}	Nm	14	28	40	68
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000
Indramat servomotor, Type MKD.. ^{4.)}		..071B	..090B	..112B	..112C
Max. torque ^{5.)}	Nm	14	22	42	68
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000
Fanuc spindle motor, Type Alpha..		α 1.5	α 2	α 3	α 6
Max. torque ^{5.)}	Nm	11	25	40	56
Max. torque ^{5.)}	min ⁻¹	6000	5000	4000	4000

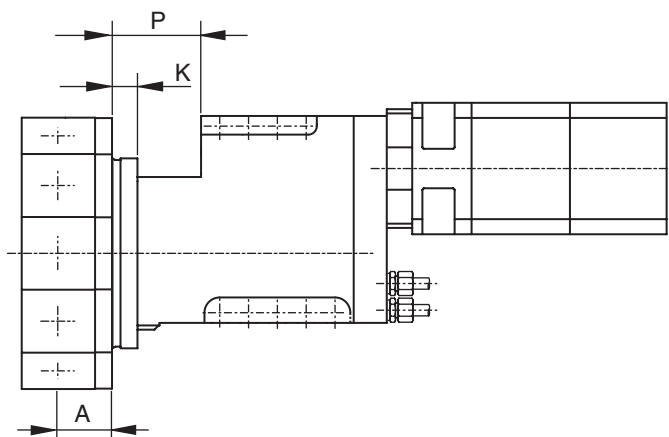
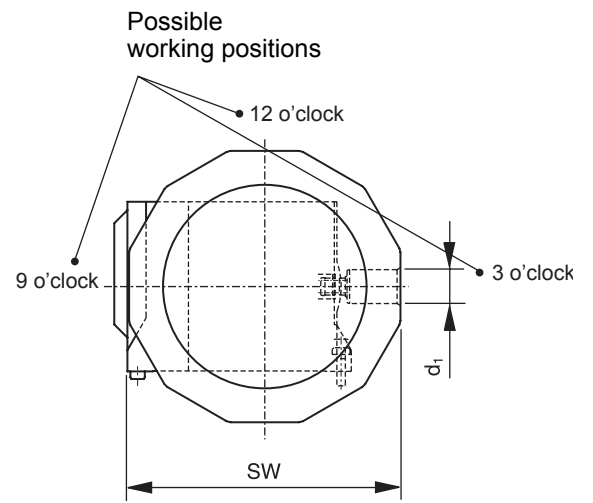
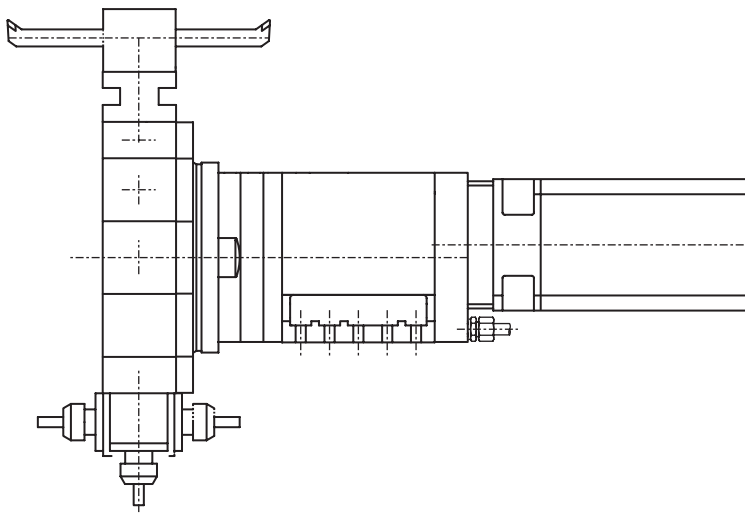
- 1.) The values are reference values for short-term operation. Higher rpms generate more heat and noise, especially when the belt drive is used!
- 2.) Torque limitation at motor converter required! Admissible torque partially smaller than with turret drive!
The listed torque values apply to smooth machining (such as 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 rpms upon request.
- 4.) With absolute value encoder.
- 5.) At tool coupling 40% WT – 10 min

Adm. relative working time – Reference values for gears –



Example for size 20:

Tool coupling = 3000 min⁻¹
 $n_{adm.}$ = 4000 min⁻¹
 $\Rightarrow n_{Tool\ coupling} = 75\% n_{adm.}$
 \Rightarrow Working time $\leq 40\% - 10\ min$
(max. 4 min ON – min. 6 min OFF)



Series		Size			
Disk-type tool turret 0.5.450.xxx		12	16	20	25
Coupling profile DIN 5480		14 x 0.8	16 x 0.8	20 x 0.8	24 x 1.25
Dimensions	K	32	40	41	52
	P	76	105	120	150
	A	48	55	80	100
Weight ^{1.)} approx.	kg	85	150	220	360
Toolholder system Cylinder shaft DIN 69880 ^{2.)}					
	d ₁	25	30	40	50
Width across flats	SW ₁ standard ^{4.) 5.)}	220	270	320	380
	SW ₂ ^{4.) 5.)}	240	–	360	410
	SW ₃ ^{4.)}	300	340	380	–
Toolholder system Coromant Capto ^{3.)}					
	NG	C3	C4	C5	C5
Width across flats	SW standard ^{4.) 5.)}	280	340	380	420

1.) Overall weight of the turret incl. tool disk SW₁ and without motor.

Dimensions in mm

2.) See SAUTER spindle units, type 0.5.941.xxx (Product information PI 29.3) and SAUTER toolholder (Product information PI 07).

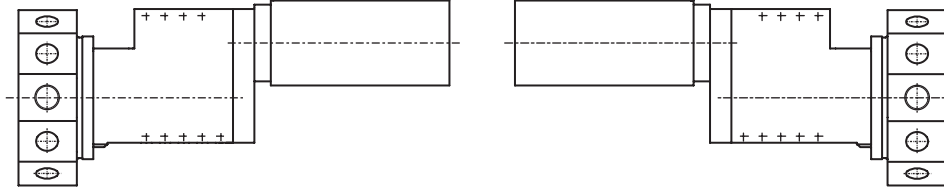
3.) See SAUTER spindle units, type 0.5.935.xxx (Product information PI 45)
Other toolholder systems – e.g. HSK – on request.

4.) Valid for 8 and 12 tool positions / 16 tool positions on request.

5.) High load load stage required.

1. Options

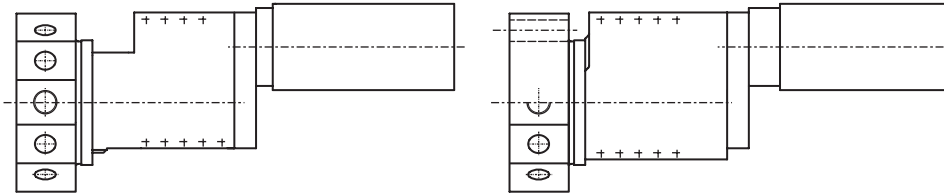
1.1 Version left/right



Version "right"
(L-shape and block housing)

Version "left"
(L-shape and block housing)

1.2 Housing shape

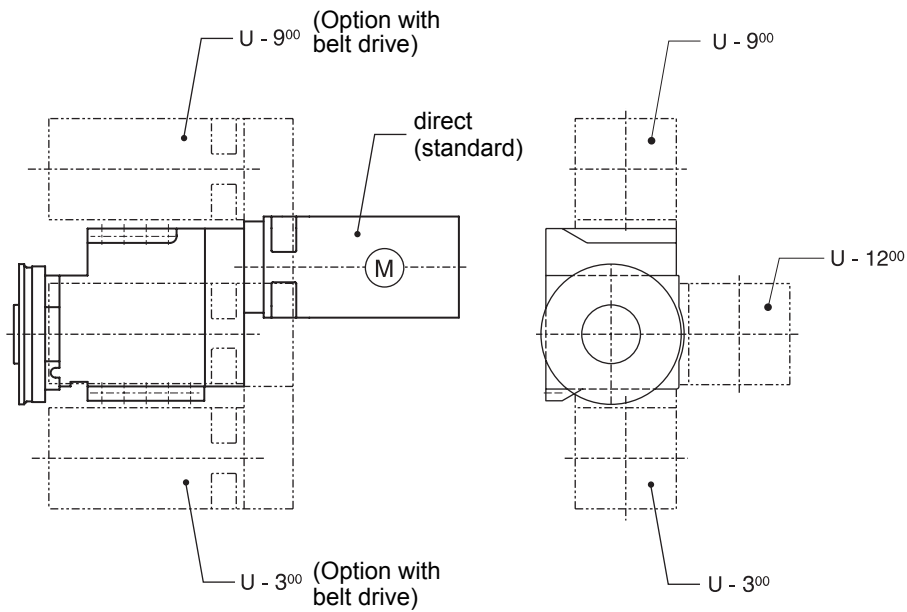


"L-shape"
For forwards and
backwards machining
with turret type 0.5.460/450

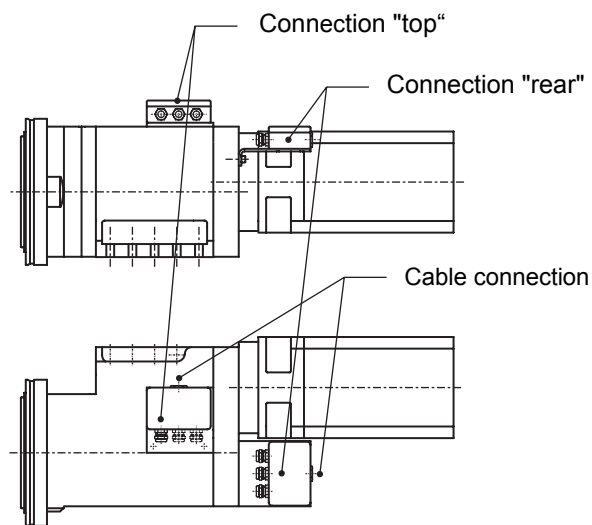
" block shape"
For forwards machining
with turret type 0.5.460/456/450....

1.3 Axis height (see page 10)

2. Arrangement of the drive motor



3. Electrical connections

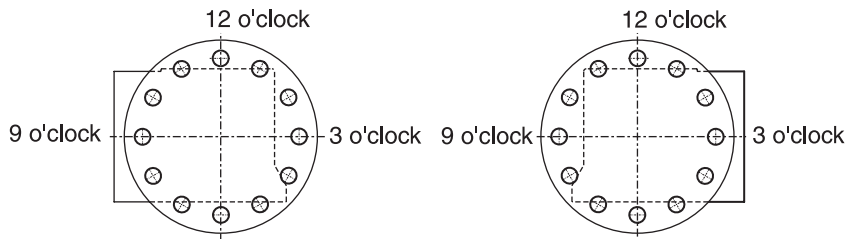


- Electrical connections:
- Terminal box (standard)
 - Terminal box with round plug connectors (optional)
 - Arrangement "top" or "rear"

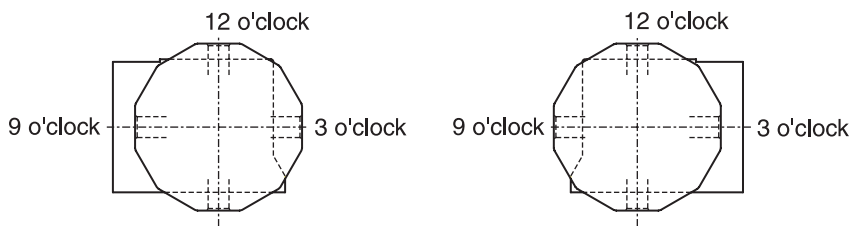
4. Working position

The working position is defined as **that** turret position, in which the tool is supplied with cooling lubricant and – with turret series 0.5.456.xxx and 0.5.450.xxx - driven.

4.1 Tool location axial



4.2 Tool location radial



5. Fluid rotary feedthrough

All turrets are available with a central fluid feed through arranged centrally in front of the tool disk:

- Version "Uncontrolled" – fluid feed in **all** indexing positions,
e.g. for sealing air, for grabber activation and the like
- Version "Controlled" – fluid feed in **one** indexing position,
e.g. for high pressure coolant automatic tool change and the like.

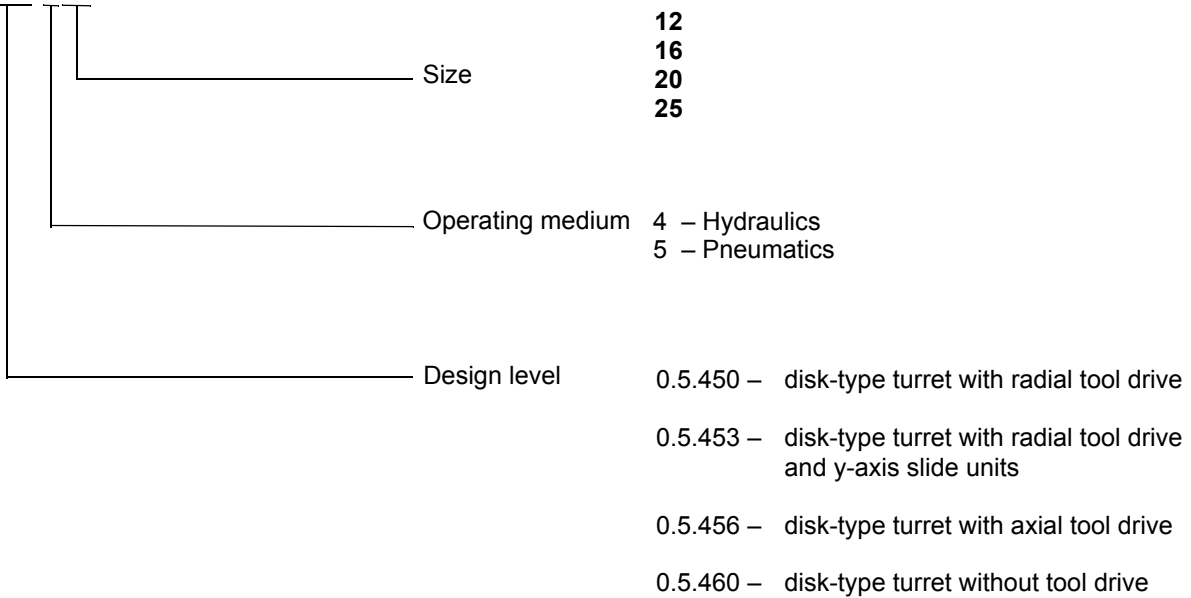
The maximally three supply lines are led through the middle of the turret.

Operating pressure $p_{adm} = 100 \text{ bar}$ (standard)

Type key

Example:

0.5.456.420



- 12
- 16
- 20
- 25

- 4 – Hydraulics
- 5 – Pneumatics

- 0.5.450 – disk-type turret with radial tool drive
- 0.5.453 – disk-type turret with radial tool drive and y-axis slide units
- 0.5.456 – disk-type turret with axial tool drive
- 0.5.460 – disk-type turret without tool drive

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



++49 (0) 7123-926-0



info@sauter-gmbh.com



SAUTER Feinmechanik GmbH
Postfach 1551
D-72545 Metzingen
Germany

Company: _____

Street: _____

ZIP/City: _____

Name: _____

Phone: _____

Fax: _____

Ordering details	Possible variants	Your selection
Basic turret Size Number of indexing positions Version Housing shape Axis height Operating medium Planned drive motor Arrangement of the drive motor Electrical connections Installation position	12 / 16 / 20 / 25 8 / 12 / 16 right / left L or block A ₁ / A ₂ Hydraulic / Pneumatic see page 8 direct / U-3 o'clock / U-9 o'clock U-12 o'clock see page 21	
Tool drive axial Working position Coupling profile	X / Y see page 15	
Tool drive radial Working position Coupling profile	3 o'clock / 9 o'clock / 12 o'clock see page 19	
Tool disk Toolholder system Toolholder nominal size Working position Clamping direction (with DIN 69880) Support pin position Sequence of numbers	DIN 69880 / Capto X/Y / SW right-hand / left-hand in front of / rear / both right-hand / left-hand	
Options Rotary feedthrough	see page 22	
Special requirements: 