

**PI 43 e**

***Disk-type tool turret***

*without tool drive*

*series*           **0.5.440.xxx**

*with tool drive*

*Series*           **0.5.433./436.xxx**

**0.5.435.xxx**

10/2003



**Disk-type tool turret series 0.5.440.xxx  
without tool drive**

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with axial tool drive**

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with radial tool drive**

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**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.

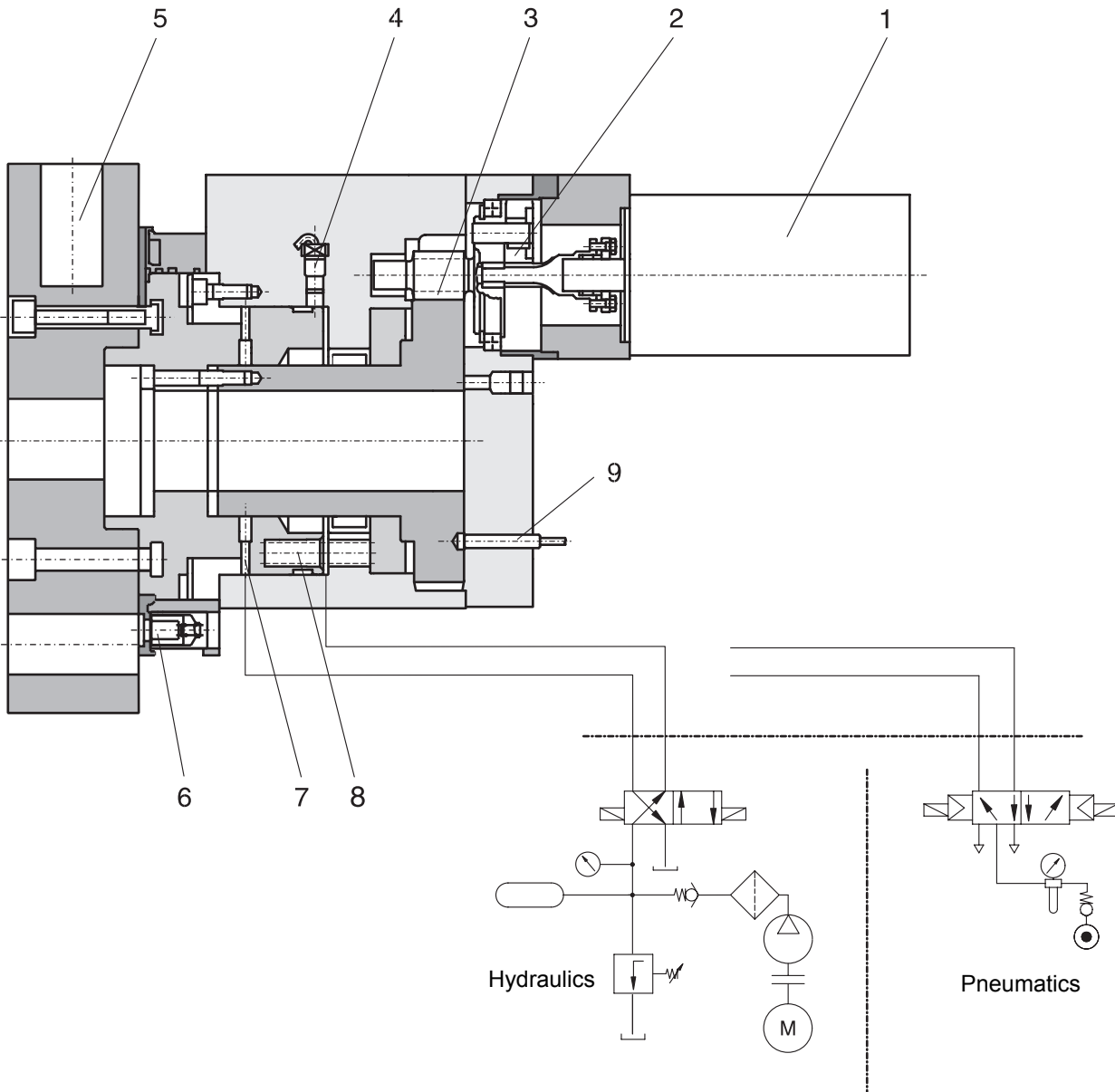
## Disk-type tool turret series 0.5.440.xxx

These turrets are suitable for use on turning machines for forward as well as 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 means they are also suitable for heavy-duty use in series manufacture.

Turret series	without tool drive	– 0.5.440.xxx
	with axial tool drive	– 0.5.433.xxx – 0.5.436.xxx
	with radial tool drive	– 0.5.435.xxx

### Features:

- Drive with controllable electric motor for very fast bidirectional positioning
- Optimum utilization of
  - standard servo-motors
  - or a Sauter drive unit with motor and converter
- Use of absolute encoders is possible – no reference point travel is required!
- High degree of stability due to high locking forces
- Hydraulically activated locking with triple generating crown gear (pat.) – hydraulic or pneumatic
- Not affected by collisions due to the low kinetic energy of the drive and fastening snapping groove for the tool disk
- Directly controllable with machine controller
- Connection with centralised lubricating system to ensure extremely high service and usage life
- Can be installed in any position
- Mechanically largely connection-compatible with Sauter disk-type tool turrets of series 0.5.480.5xxx and 0.5.680.1xx
- Options:
  - Block-shaped housing or with flange fitting form for especially high degree of rigidity
  - Central rotary feedthrough for fluid-actuated tools and for a high-pressure cooling lubricant device
  - Installation of transfer elements for switching buttons in the tool disk
  - Attachment of sensors for cutting force monitoring
  - **Turret with y-axis slide feed unit**
  - u.a.m.



- 1 Drive motor
- 2 Planetary gearbox
- 3 Spur gear
- 4 electrical locking control
- 5 Tool disk
- 6 Cooling lubricant valve
- 7 Hirth-type gearing
- 8 Spring
- 9 Reference switch – optional –

Series		
<b>Disk-type tool turret 0.5.440.xxx</b>		
Number of switching positions		
Admissible tangential load (turret locked) <sup>5.)</sup>		kNm
Adm. mass moment of inertia of tools <sup>1.)</sup> (tool disk and holder)	Standard load stage	kgm <sup>2</sup>
	High load load stage	kgm <sup>2</sup>
Adm. out-of-balance (load moment) due to tooling	Standard load stage	Nm
	High load load stage	Nm
<b>Indexing times <sup>2.)</sup></b>		
Rotate tool disk		
<ul style="list-style-type: none"> <li>incl. acceleration and braking per partial step 30°</li> </ul>	Standard load stage	s
	High load load stage	s
<ul style="list-style-type: none"> <li>without acceleration and braking per additional partial step</li> </ul>	Standard load stage	s
	High load load stage	s
Turret unlock/lock		
<ul style="list-style-type: none"> <li>hydraulic</li> <li>pneumatic</li> </ul>		s s
Adm. indexing frequency <sup>2.)</sup> (median switching angle $\varphi_m=90^\circ$ )		min <sup>-1</sup>
Gearbox ratio drive motor turret shaft <sup>3.)</sup>		
<b>Operating pressure</b>		
Hydraulics	± 10 %	bar
Pneumatics	± 15 %	bar
Cooling lubricant		
<ul style="list-style-type: none"> <li>with medium pressure valve</li> <li>with central high-pressure cooling lubricant device</li> </ul>		bar bar
<b>Fluid absorption volume</b>		
Turret unlock/lock		cm <sup>3</sup>
<b>Mass</b>		
Revolver (incl. drive motor)		kg
Tool disk and tooling (max.)		kg
<b>Adm. ambient temperature</b>		°C

1.) Indexing times available

- 2.) Conditions:
- Fluid supply sufficiently large
  - Turret up to operating temperature
  - Drive motor 1FK7043 7AH71 – made by Siemens
  - without controller-related non-productive time

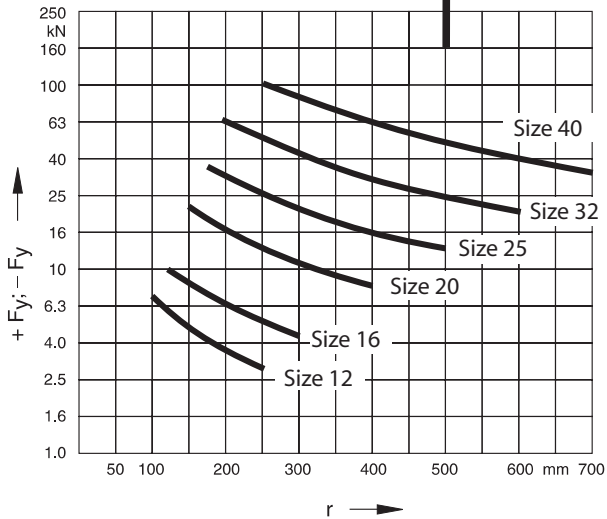
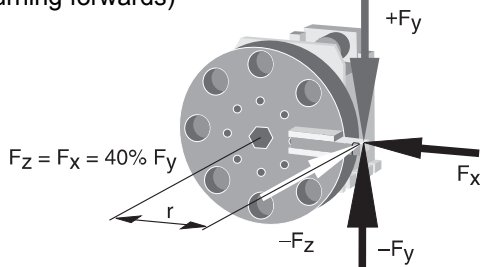
3.) Values in parentheses are subject to change with drive motors featuring higher mass moments of inertia; switching times may change as well.

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

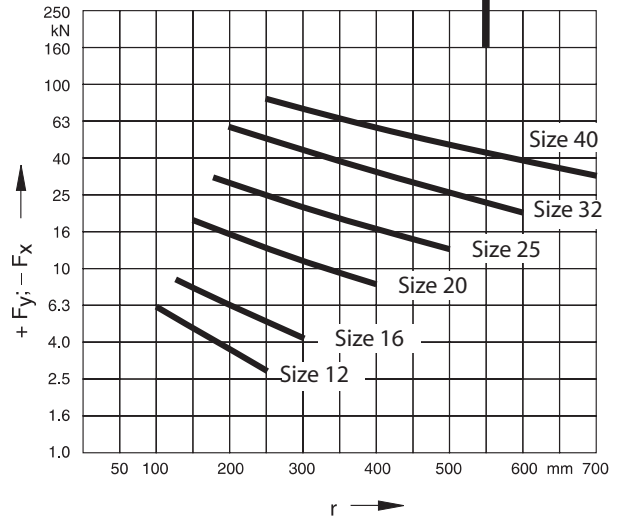
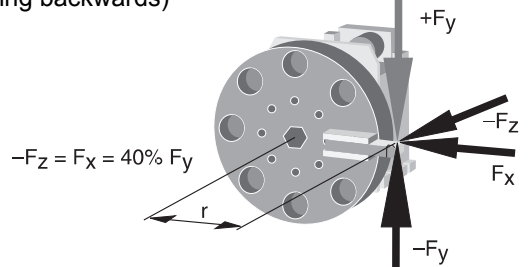
Size																	
12			16			20			25			32			40		
8 <sup>1.)</sup>	12	16 <sup>1.)</sup>	8 <sup>1.)</sup>	12	16 <sup>1.)</sup>	8 <sup>1.)</sup>	12	16 <sup>1.)</sup>	8 <sup>1.)</sup>	12	16 <sup>1.)</sup>	8	12	16	8	12	16
0.7 [0.8]			1.3 [1.8]			3.2 [3.6]			6.3 [7.2]			in preparation					
0.8 1.2			1.8 2.5			3.2 5.0			8 12								
12 16			25 32			40 63			80 125								
0.10 0.11			0.12 0.13			0.15 0.17			0.19 0.22								
0.06 0.06			0.07 0.07			0.09 0.09			0.12 0.12								
0.10/0.10 0.10/0.04			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								
45 (25)			54 (30)			72 (50)			90 (50)								
50 7			50 7			50 7			50 7								
5 .. 25 100						Filtering ≤ 100 µm <sup>4)</sup> Filtering ≤ 25 µm <sup>4)</sup>											
15			30			45			65								
38 40			50 80			70 160			110 250								
10 ... 40																	

5.) Values in square brackets apply to hydraulic locking

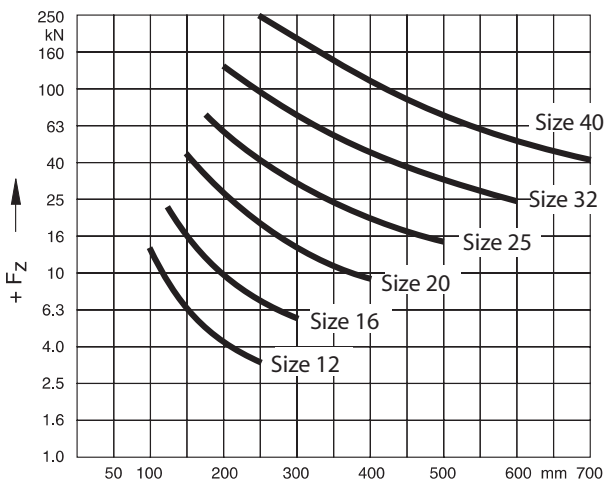
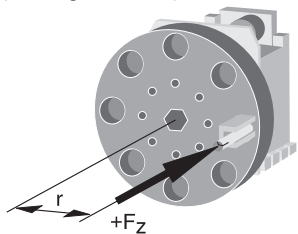
Main cutting force  $\pm F_y$  ( $F_x$ ,  $F_z$ )  
(turning forwards)



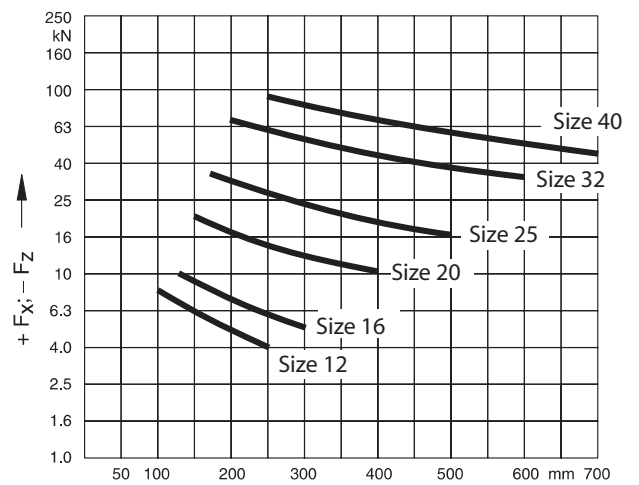
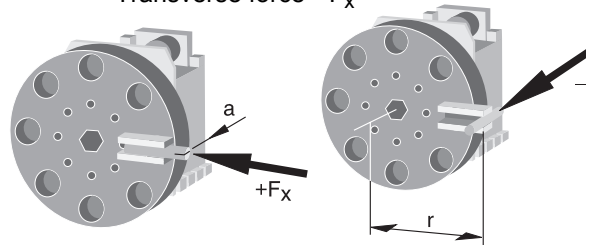
Main cutting force  $\pm F_y$  ( $F_x$ ,  $F_z$ )  
(turning backwards)



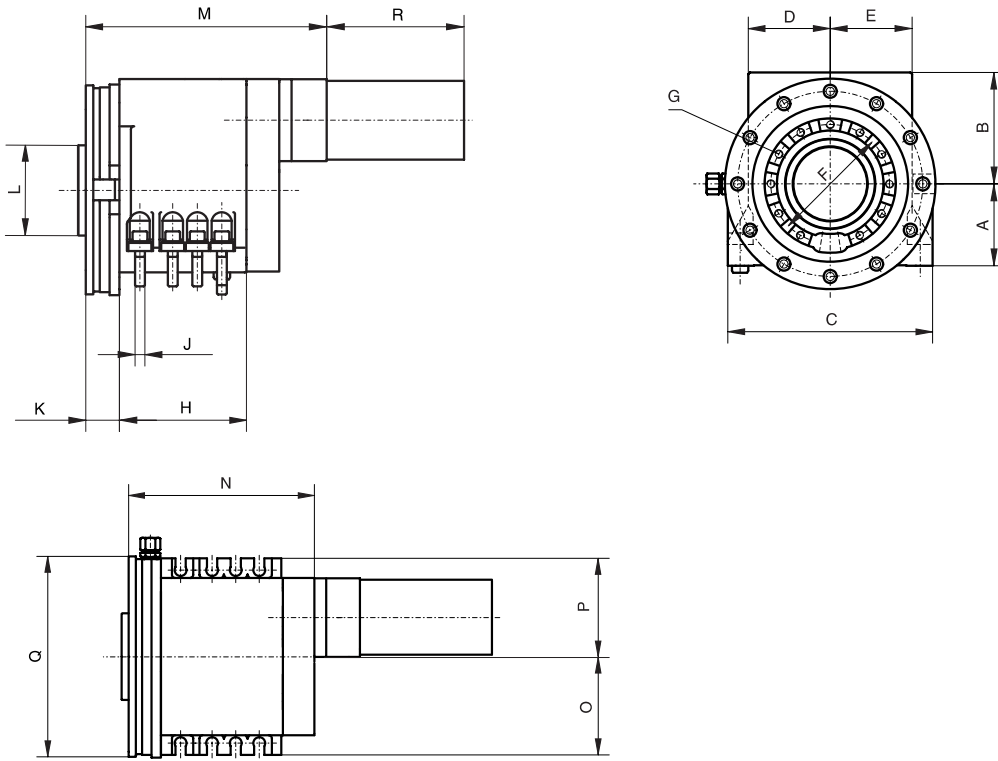
Feed force  $+F_z$   
(drilling forward)



Feed force  $-F_z$   
Transverse force  $+F_x$



Note: The diagrams apply to static loads.  
Significantly lower values have to be used with shock loads (discontinuous cutting).

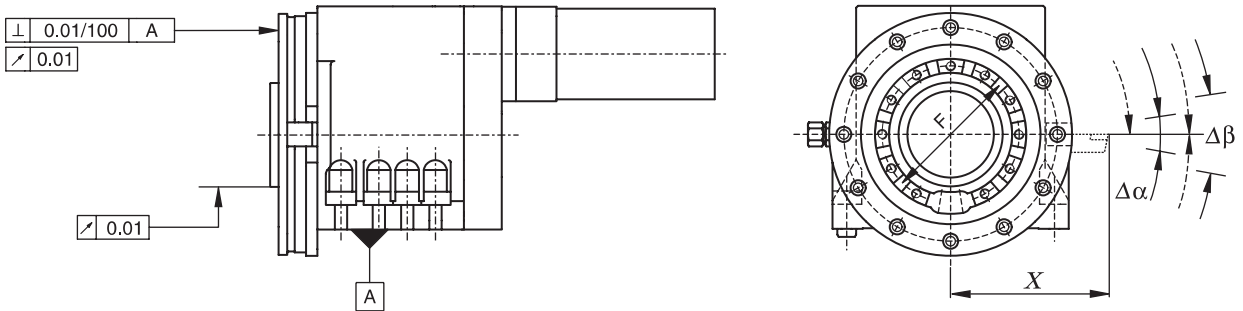


Series	Size					
Disk-type tool turret 0.5.440.xxx	12/ re/li	16	20	25	32	40
A	63	80	100	125	160	200
B	111	123	136	150		
C	185	212	250	316		
D	80/65	85	100	125		
E	65/80	85	100	125		
Ø F	90	120	145	182		
G	8 x M8	8 x M8	11 x M10	11 x M12		
H	128	138	155	230	in preparation	
I	M8	M10	M12	M16		
K	32	40	41	52		
Ø L	70	90	110	120		
M <sup>1.)</sup>	258	276	294	340		
N	200	218	236	282		
O	85/100	95	125	158		
P	100/85	95	125	158		
Ø Q	175	215	255	318		
R <sup>1.)</sup>	248	248	248	248		

1.) Motor 1FK 7043.. – Made by Siemens

dimensions in mm

## Precision



### Repeating accuracy

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

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

### Indexing precision

(Multiple move to a switching position from different direction)

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

## Fluid rotary feed-through

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

- “Uncontrolled” variation – fluid supply in **all** switching positions, e.g. for sealing air, for gripper activation, and similar actions
- “Controlled” variation – fluid supply to **one** switching position, e.g. for KSS, autom. tool changes, and other functions

A maximum of three supply lines are routed through the centre of the turret.

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

## Disk-type tool turret 0.5.433.xxx/0.5.436.xxx with axia tool drive

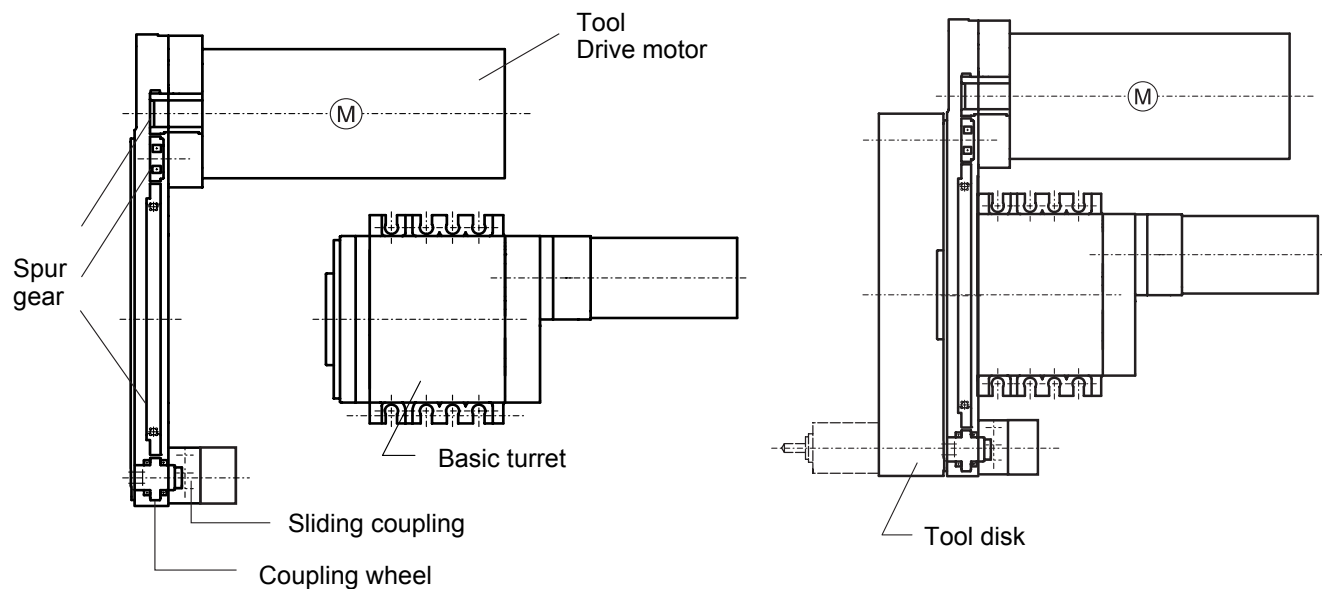
This turret is of modular construction and consists of a basic turret of the series 0.5.440.xxx and decentralized tool drive for individual switchable **axially** placed tools for **forwards** machining.

They can be supplied for hydraulic or pneumatic operation.

The tool coupling can alternatively be supplied for spindle heads with or without the patented spindle locking system. This means that the tools are either connected after positioning the drive spindle or after searching.

The performance data and dimensions of the swivel drive and the turret lock are identical to those of the basic turret 0.5.440.xxx series.

Operating medium	Coupling process with	Suitable spindle heads		Turret series
		Patented spindle locking system	SAUTER spindle heads type	
Hydraulics	Searching	no	0.5.921.xxx	<b>0.5.433.2xx</b>
	Spindle positioning	yes	0.5.941.xxx	<b>0.5.436.2xx</b>
Pneumatics	Searching	no	0.5.921.xxx	<b>0.5.433.3xx</b>
	Spindle positioning	yes	0.5.941.xxx	<b>0.5.436.3xx</b>



The tool drive motor drives the coupling wheel via the spur gear incorporated in the gearbox casing. The relevant tool is switched into the working position by means of the sliding coupling.

The drive motor can be located to the side opposite the working position or above the turret casing, depending on the application.

### Performance data for the tool coupling

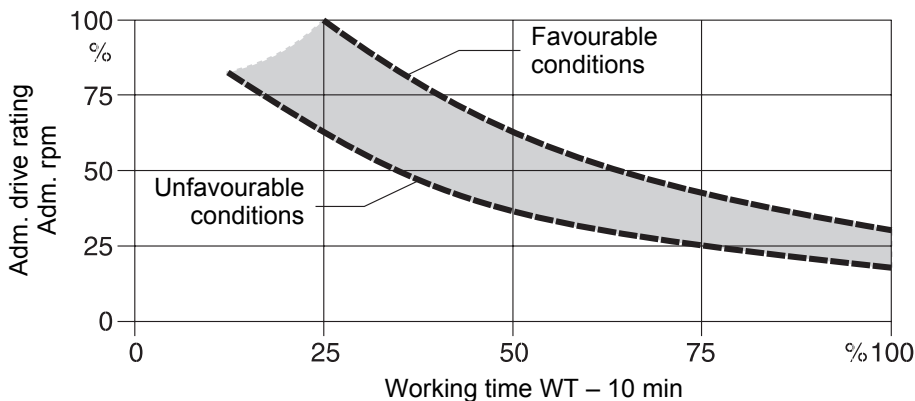
The gearbox is designed for the performance data given below for the tool coupling. The actually available performance data depend on the utilised drive motor (see below).

Series		
<b>Disk-type tool turret 0.5.433.xxx/436.xxx</b>		
Gearbox performance data Adm. drive rating <sup>1.)</sup> Adm. torque <sup>2.)</sup> Adm. rpm <sup>1.) 3.)</sup>	$P_{adm.}$ $M_{adm.}$ $n_{adm.}$	$kW$ $Nm$ $min^{-1}$
Gear ratio <sup>7.)</sup>		$i$
<b>Recommended drive motors</b>		
Siemens servomotor, Type 1 FT 6.. Max. torque <sup>6.)</sup> Max. rpm <sup>6.)</sup>		$Nm$ $min^{-1}$
Indramat servomotor, Type MKD.. <sup>4.)</sup> Max. torque <sup>6.)</sup> Max. rpm <sup>6.)</sup>		$Nm$ $min^{-1}$
Fanuc spindle motor, Type Alpha.. Max. torque <sup>6.)</sup> Max. rpm <sup>6.)</sup>		$Nm$ $min^{-1}$

- 1.) The values are reference values for short-term operation. Higher rpms generate more heat and noise.
- 2.) Torque limitation at motor converter required!  
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 for turret series 0.5.436.xxx
- 5.) Spindle motor
- 6.) At tool coupling 40% WT – 10 min
- 7.)  $i = 1.5$  only with turret series 0.5.433.xxx

Size											
12		16		20		25		32		40	
6 20 6000		8 32 5000		10 63 4000		12.5 100 4000		16 160 3200		16 160 3200	
~1.5	1.0	1.0		~1.5	1.0	~1.5	1.0	~1.5	1.0	~1.5	1.0
..062 -AK..		..064 -AK..		..084 -AK..		..86 - AH..		..102 -AH..		..105 -AF..	
12.5 4500		14 6000		28 5000		58   40 3000   4000		58 3200		68 4000	
1PH7 <sup>5.)</sup> -107..		..105 -AF		1PH7 <sup>5.)</sup> -107..		..105 -AF..		125 3200		68 3200	
..071 B		..090 B		..112 B		2AD <sup>5.)</sup> 100 C		..112C		2AD 100D <sup>5.)</sup>	
15 4000		14 6000		22 5000		60   42 2600   4000		78 4000		108   72 3200   3200	
α 1.5		α 2		α 3		α 6		α 8		α 8	
11 6000		25 5000		55   40 4000   4000		56 4000		120 3200		120 3200	

**Adm. relative working time** – Reference values for gears –



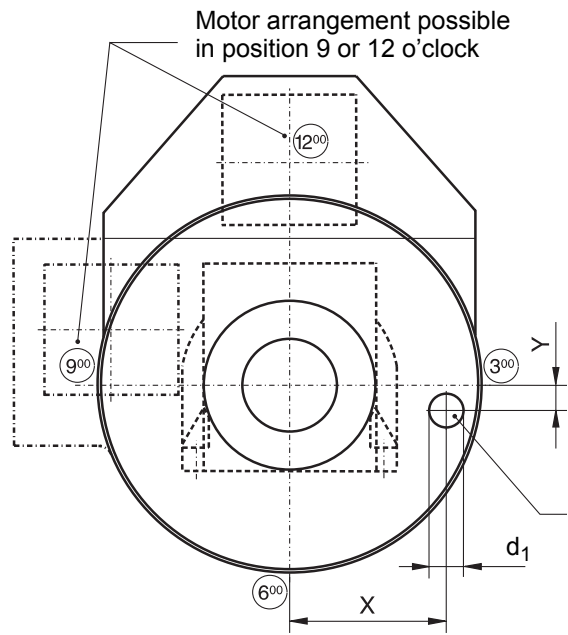
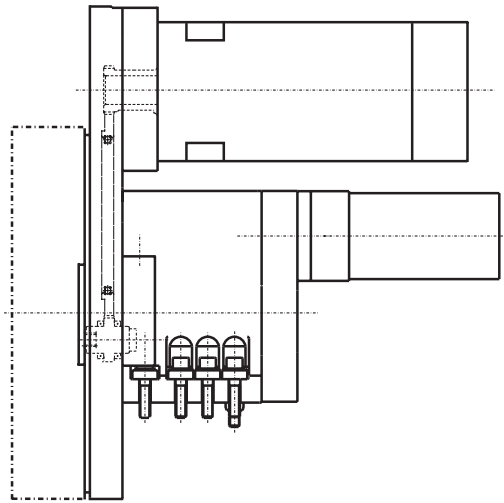
Example for size 20:

Tool coupling = 3000 min<sup>-1</sup>

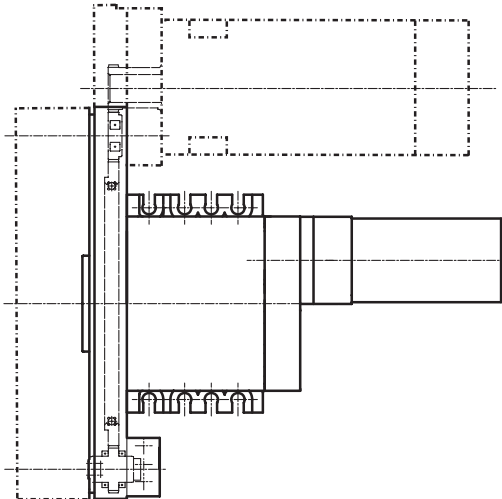
n<sub>adm.</sub> = 4000 min<sup>-1</sup>

⇒ n<sub>Tool coupling</sub> = 75% n<sub>adm.</sub>

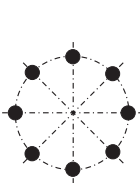
⇒ Working time ≤ 40% - 10 min (max. 4 min ON – min. 6 min OFF)



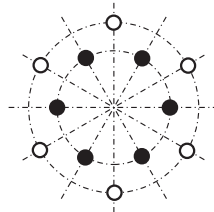
(Depicted turret arrangement "right")



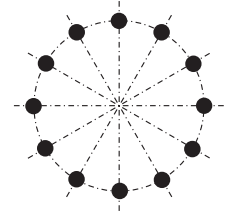
**Tool arrangement:**



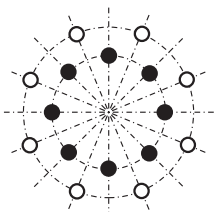
8 pos. – 1 graduated circle



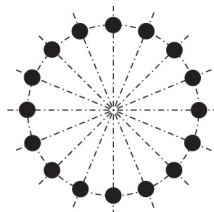
12 pos. – 2 graduated circles



12 pos. – 1 graduated circle



16 pos. – 2 graduated circles



16 pos. – 1 graduated circle

- Position with tool drive
- Position w/o tool drive

### Alternate configurations

Turret Size	Working position X / Y	Motor position	Coupling profile		Tool holder Receptacle Ø DIN 69880 d <sub>1</sub>	Possible tool arrangement see page 14
			Coupling process			
			with searching	with spindle positioning		
<b>12</b>	<b>+98.54 / -17</b> <b>+100 / 0</b> <b>+142.5 / 0</b>	<b>9°°</b> <b>9°°</b> <b>9°°</b>	<b>DIN 5480- W10x0.8</b>	<b>DIN 5480- W11x0.8</b>	<b>20</b> <b>20</b> <b>20</b>	<b>12-2</b> <b>12-2</b> <b>16-1</b>
	<b>+100/0</b>	<b>9°°</b>	<b>-</b>	<b>DIN 5480- W14x0.8</b>	<b>25</b>	<b>12-2</b>
<b>16</b>	<b>+117.4 / -25</b>	<b>9°°</b>	<b>DIN 5482- 15x12</b>	<b>DIN 5480- W16x0.8</b>	<b>30</b>	<b>12-2</b>
	<b>+125 / -25</b>	<b>9°°</b>			<b>30</b>	<b>12-2</b>
	<b>+135 / 0</b>	<b>12°°</b>			<b>30</b>	<b>12-2</b>
	<b>+150 / 0</b>	<b>9°°</b>			<b>30</b>	<b>12-1</b>
	<b>+150 / 0</b>	<b>12°°</b>			<b>30</b>	<b>12-1</b>
<b>20</b>	<b>+155 / 0</b>	<b>9°°</b>	<b>DIN 5482- 17x14</b>	<b>DIN 5480- W20x0.8</b>	<b>40</b>	<b>12-2</b>
	<b>+170 / 0</b>	<b>9°°</b>			<b>40</b>	<b>12-2</b>
	<b>+185 / 0</b>	<b>9°°</b>			<b>40</b>	<b>12-1</b>
<b>25</b>	<b>+198 / -70</b>	<b>9°°</b>	<b>DIN 5482- 20x17</b>	<b>DIN 5480- W24x1.25</b>	<b>50</b>	<b>12-2</b>
	<b>+200 / 0</b>	<b>9°°</b>			<b>50</b>	<b>12-2</b>
	<b>+200 / -20</b>	<b>12°°</b>			<b>50</b>	<b>12-2</b>
	<b>+235 / -70</b>	<b>9°°</b>			<b>50</b>	<b>12-1</b>
<b>32</b>	<b>+265 / -80</b>	<b>12°°</b>	<b>DIN 5482- 25x22</b>	<b>-</b>	<b>60</b>	<b>12-1</b>
<b>40</b>	<b>+387.8 / -125</b>	<b>9°°</b>			<b>60</b>	<b>12-1</b>

**Bold** print indicates quickest delivery!

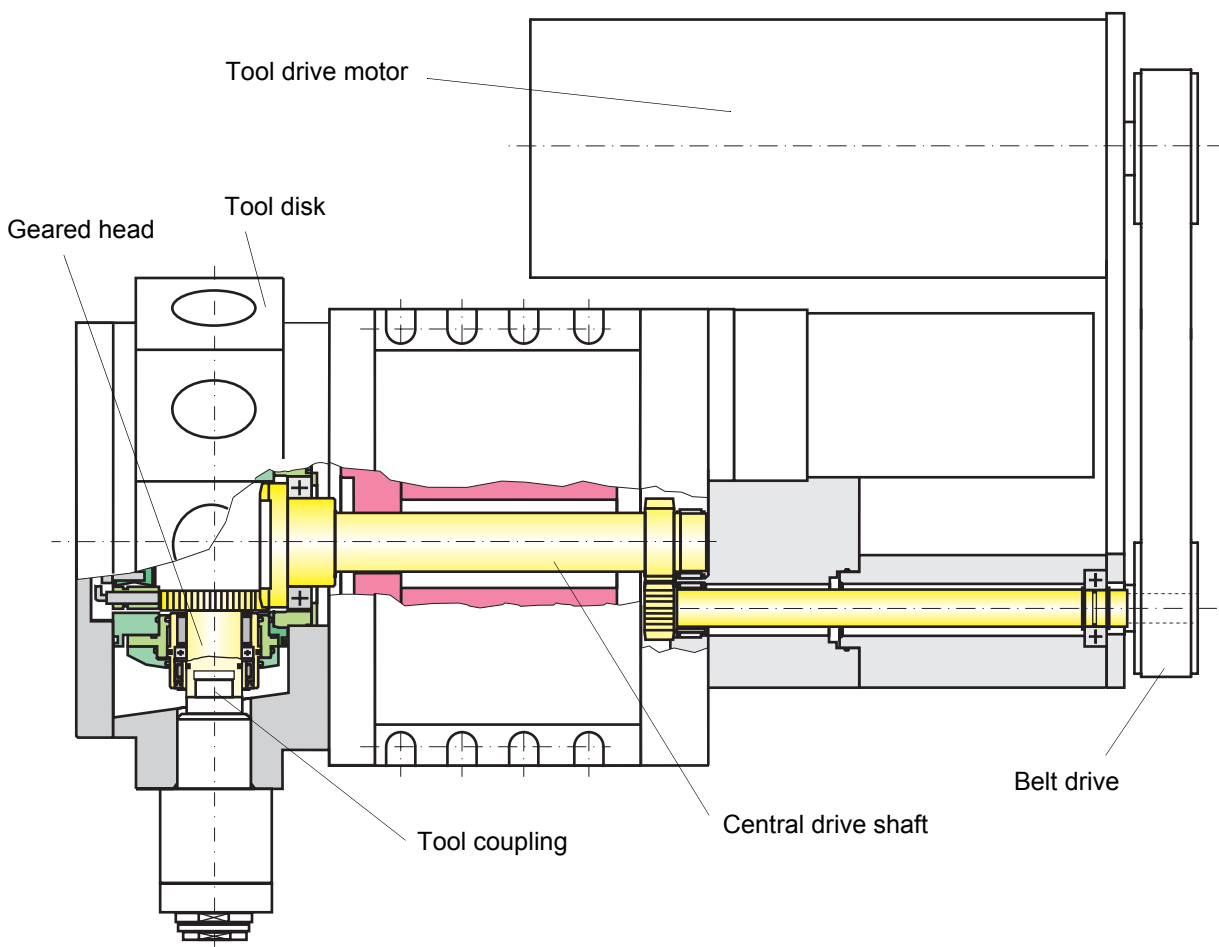
Additional variations – e.g. variation “left” upon request.

## Disk-type tool turret series 0.50.435.xxx with radial tool drive

These turrets consists of the following:

- Basic turret series 0.5.440.xxx and
- tool drive **central**  
for individually switchable **radial** tools  
for **forward** and **backward** machining.

The tool drive is intended for the spindle positioning. This requires spindle heads with spindle locking system  
– Sauter spindle heads series 0.5.941.xx – .



The tool drive motor drives the drive shaft, which is located centrally within the turret in a hollow shaft. The relevant tool is switched into the working position by means of a bevel gear and a fluid-switched coupling in the gearbox head at the front.

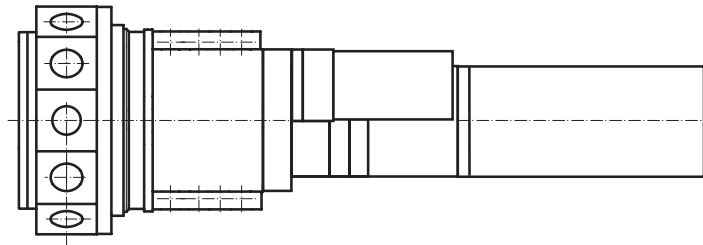
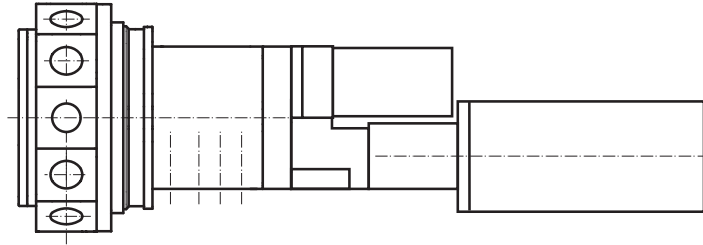
Coupling and decoupling of the spindle head located in the working position is executed after each positioning of the drive spindle – not tooth-on-tooth situation, shortest switching time!

The tool disk is an integrated part of the turret with these turret systems.

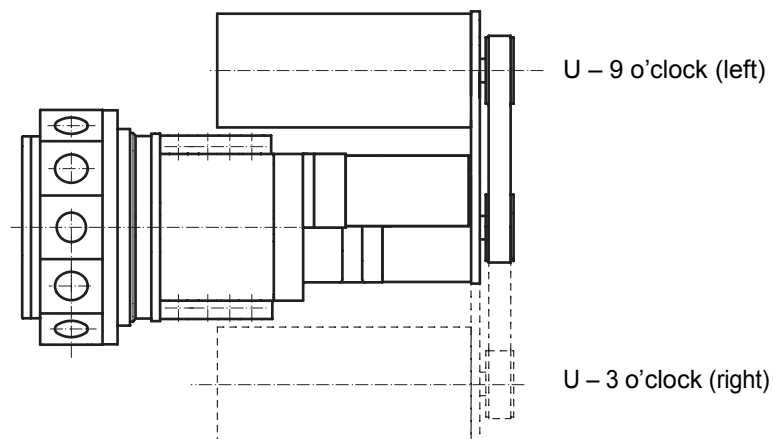
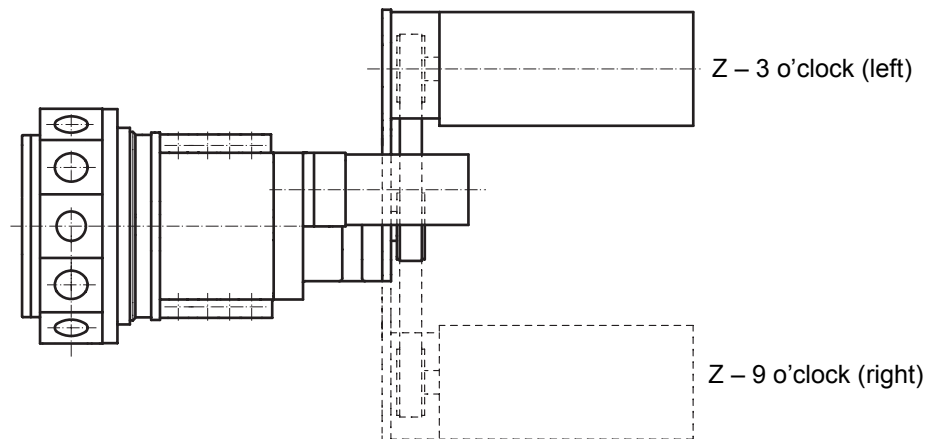
## Motor arrangement

The tool drive motor can be installed directly on the turret or with a belt drive, depending on the application specifications.

- Direct motor installation



- Motor installation with belt drive



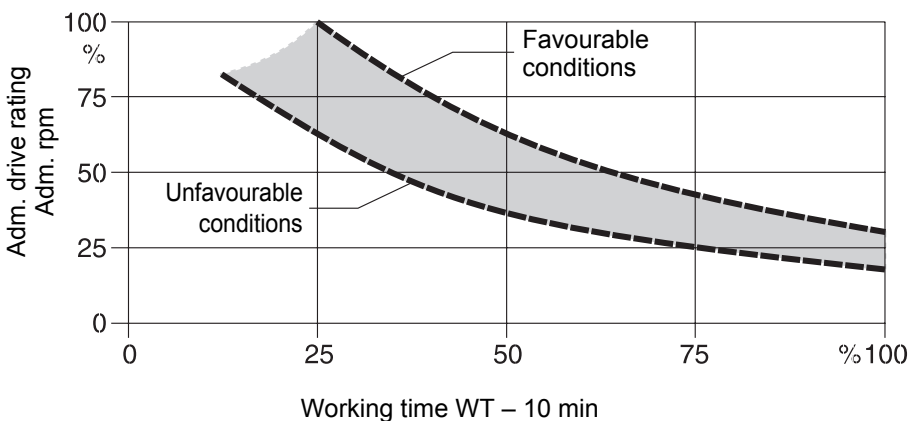
### Performance data for the tool coupling

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			
<b>Disk-type tool turret 0.5.435.xxx</b>		<b>12</b>	<b>16</b>	<b>20</b>	<b>25</b>
Gearbox performance data					
Adm. drive rating <sup>1.)</sup>	$P_{Adm.}$ kW	6	8	10	12.5
Adm. torque <sup>2.)</sup>	$M_{Adm.}$ Nm	20	32	63	100
Adm. rpm <sup>1.) 3.)</sup>	$n_{Adm.}$ min <sup>-1</sup>	6000	5000	4000	4000
Gear ratio $i = n_1/n_2$		1.0	1.0	1.0	1.0
<b>Recommended drive motors</b>					
Siemens servomotor, Type 1 FT 6..		..064-.AK.	..0.084-.AK.	..086-.AH.	..105-.AF..
Max. torque <sup>5.)</sup>	Nm	14	28	40	68
Max. torque <sup>5.)</sup>	min <sup>-1</sup>	6000	5000	4000	4000
Indramat servomotor, Type MKD.. <sup>4.)</sup>		..071B	..0.090B	..0.112B	..112C
Max. torque <sup>5.)</sup>	Nm	14	22	48	68
Max. torque <sup>5.)</sup>	min <sup>-1</sup>	6000	5000	4000	4000
Fanuc spindle motor, Type Alpha..		$\alpha$ 1.5	$\alpha$ 2	$\alpha$ 3	$\alpha$ 6
Max. torque <sup>5.)</sup>	Nm	15	25	40	56
Max. torque <sup>5.)</sup>	min <sup>-1</sup>	6000	5000	4000	4000

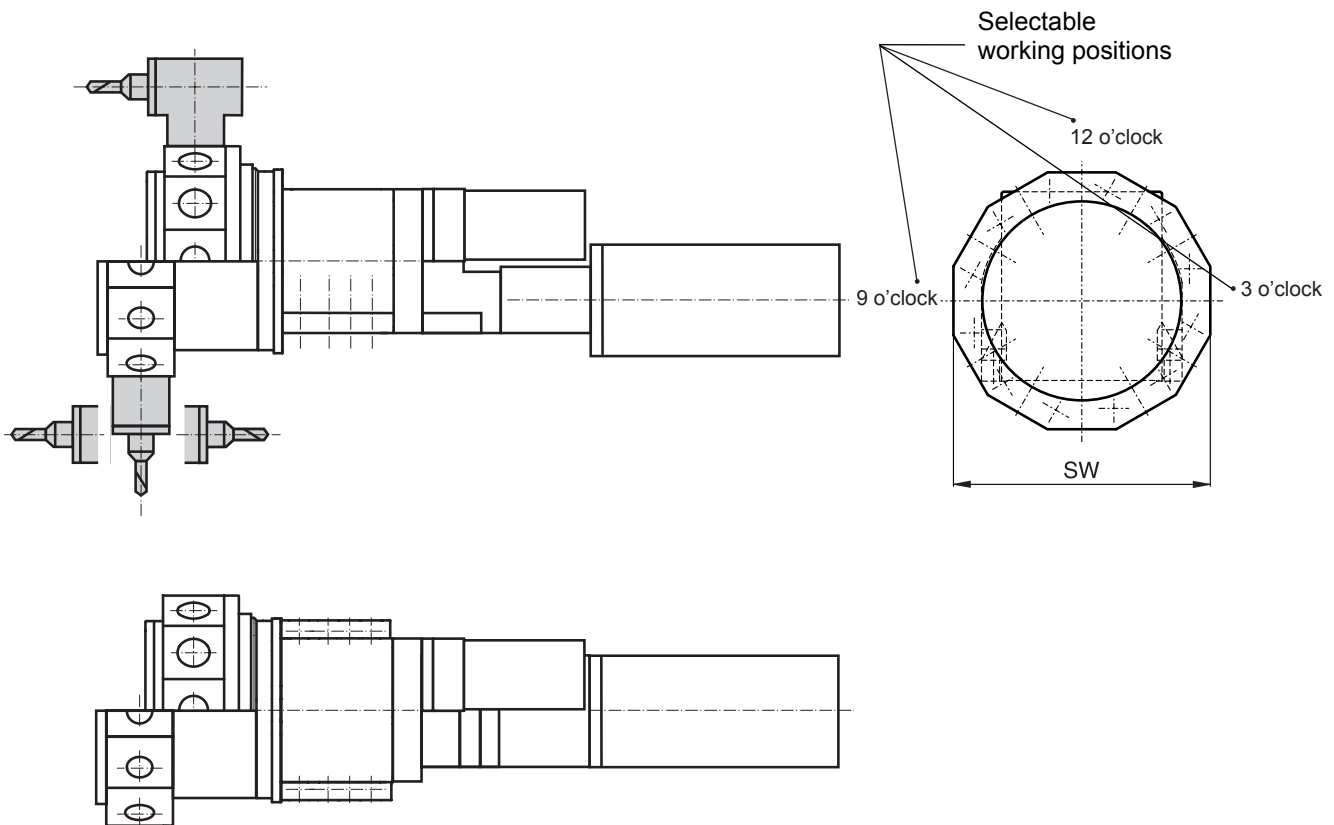
- 1.) The values are reference values for short-term operation. Higher rpms generate more heat and noise, especially when the belt drive is used!
- 2.) Torque limitation at motor converter required!  
The listed torque values apply to smooth machining (such as thread-cutting). In the case of machining 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<sup>-1</sup>  
 $n_{adm.}$  = 4000 min<sup>-1</sup>  
 $\Rightarrow n_{Tool\ coupling} = 75\% n_{adm.}$   
 $\Rightarrow$  Working time  $\leq 40\% - 10\ min$   
 (max. 4 min ON – min. 6 min OFF)



Series		Size			
<b>Disk-type tool turret 0.5.435.xxx</b>		<b>12</b>	<b>16</b>	<b>20</b>	<b>25</b>
Coupling profile DIN 5480		14 x 0.8	16 x 0.8	20 x 0.8	24 x 1.25
Distance dimension	A <sub>1</sub> (standard)	–	55	80	100
	A <sub>2</sub> (upon request)	80	96	159	198
K		32	40	41	52
Tool holder receptacle system Cylinder shaft DIN 69880 <sup>1.)</sup>					
d <sub>1</sub>		25	30	40	50
SW <sub>1</sub> standard		220	270	320	380
SW <sub>2</sub>		240		360	410
SW <sub>3</sub>		300	340	380	
Tool system Coromant Capto <sup>2.)</sup>					
NG		C3	C4	C5	
SW		280	340	380	

1.) Use SAUTER spindle heads Type 0.5.941.xxx (product information PI 29.3)

2.) Use SAUTER spindle heads Type 0.5.934.xxx (product information PI 45)

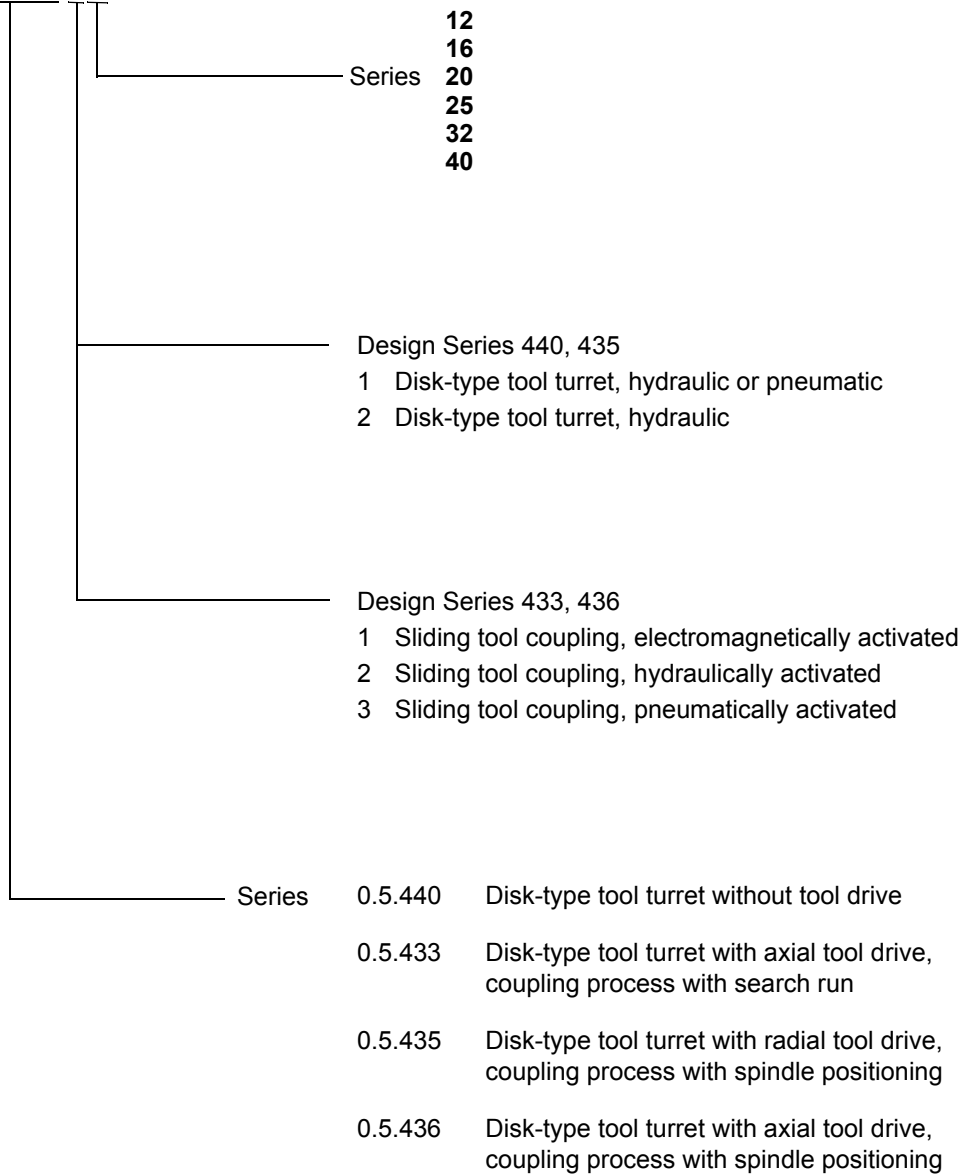
3.) High load load stage required

Additional tool systems – e.g. HSK available upon request.

**Type key**

Exampe:

0.5.440.120



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SAUTER disk-type tool turret 0.5.440.xxx / 0.5.433./436.xxx/0.5.435.xxx		
Ordering details	Possible variants	Your selection
<b>Basic turret</b> Size Number of switching positions Turret drive Reference switches Operating medium Installation position	12 / 16 / 20 / 25 / 32 / 40 8 / 12 / 16 Siemens / Sauter / .. yes / no Hydraulic / Pneumatic	
<b>Tool drive axial</b> Working position X / Y Motor position  Motor used Gearing ratio Coupling profile	see page 15 3 o'clock / 9 o'clock° / 12 o'clock  see pages 12 / 13 1.0 / 1.5	
<b>Tool drive radial</b> Working position  Tool disk SW – neck length A Tool system Motor arrangement Motor used Gearing ratio	3 o'clock / 9 o'clock° / 12 o'clock  SW <sub>1</sub> / SW <sub>2</sub> / SW <sub>3</sub> A <sub>1</sub> / A <sub>2</sub> DIN 69880 /Sandvik Capto U/Z – right / left see page 18 1.0 / 2.0	
Special requirements: 