

T40FM

Torque flange



Special features

- Nominal (rated) torque: 15 kN·m, 20 kN·m, 25 kN·m, 30 kN·m, 40 kN·m, 50 kN·m, 60 kN·m, 70 kN·m and 80 kN·m
- Nominal (rated) rotational speed up to 8000 rpm
- Compact design
- High permissible lateral forces
- High radial and torsional stiffness
- No bearings or slip rings
- Digital transmission of measured values
- Large measurement frequency range up to 6 kHz (-3 dB)
- Optional: magnetic rotational speed measuring system

Overall concept



Specifications

Type		T40FM								
Accuracy class		0.1								
Nominal (rated) torque M_{nom}	kN·m	15	20	25	30	40	50	60	70	80
Nominal (rated) rotational speed Optional	rpm	6000			4000			3000		
	rpm	8000			6000			4500		
Torque measuring system, frequency output										
Nominal (rated) sensitivity (nominal (rated) signal range between torque = zero and nominal (rated) torque) Option SU2 Option DU2 Option HU2	kHz	5								
	kHz	30								
	kHz	120								
Sensitivity tolerance (deviation of the actual output frequency at M_{nom} from the nominal (rated) sensitivity)	%	± 0.2								
Non-linearity including hysteresis, relative to the nominal (rated) sensitivity	%	< ± 0.1 (optional < ± 0.05)								
Relative standard deviation of repeatability (variability) , per DIN 1319, relative to the variation of the output signal	%	< ± 0.05								
Load resistance	kΩ	> 2								
Output signal at torque zero Option SU2 Option DU2 Option HU2	kHz	10								
	kHz	60								
	kHz	240								
Nominal (rated) output signal (RS422, 5 V symmetrical) With positive nominal (rated) torque, Option SU2 With positive nominal (rated) torque, Option DU2 With positive nominal (rated) torque, Option HU2 With negative nominal (rated) torque, Option SU2 With negative nominal (rated) torque, Option DU2 With negative nominal (rated) torque, Option HU2	kHz	15								
	kHz	90								
	kHz	360								
	kHz	5								
	kHz	30								
	kHz	120								
Maximum modulation range ¹⁾ Option SU2 Option DU2 Option HU2	kHz	2.5 ... 17.5								
	kHz	15 ... 105								
	kHz	60 ... 420								
Maximum bandwidth (-3 dB) Option SU2 Option DU2 Option HU2	kHz	1								
	kHz	3								
	kHz	6								
Group delay Option SU2 Option DU2 Option HU2	μs	< 400								
	μs	< 220								
	μs	< 150								
Temperature effect per 10 K in nominal (rated) temperature range on the output signal , relative to the actual value of the signal range on the zero signal , relative to the nominal (rated) sensitivity	%	< ± 0.1								
	%	< ± 0.05								
Long-term drift over 48 h at reference temperature , relative to nominal (rated) sensitivity	%	≤ 0.03								

¹⁾ Output signal range in which there is a repeatable correlation between torque and output signal.

Specifications (continued)

Torque measuring system, voltage output										
Nominal (rated) sensitivity (spread between torque = zero and nominal (rated) torque)	V	10								
Sensitivity tolerance (deviation of the actual output frequency at M_{nom} from the nominal (rated) sensitivity)	%	± 0.2								
Non-linearity including hysteresis , relative to the nominal (rated) sensitivity	%	$< \pm 0.1$								
	Optional	%	$< \pm 0.05$							
Relative standard deviation of reproducibility (variability) , per DIN 1319, relative to the variation in the output signal	%	$< \pm 0.05$								
Output signal at torque zero	V	0								
Nominal output signal with positive nominal (rated) torque	V	10								
	with negative nominal (rated) torque	V	-10							
Maximum modulation range ²⁾ invalid measured value	V	± 12								
	V	13 ... 15								
Load resistance	k Ω	> 10								
Residual ripple ³⁾	mV	< 40 (peak-to-peak)								
Temperature effect per 10 K in the nominal (rated) temperature range on the output signal , relative to the actual value of the signal range	%	$< \pm 0.2$								
	on the zero signal , relative to the nominal (rated) sensitivity	%	$< \pm 0.15$							
Long-term drift over 48 h at reference temperature , relative to nominal (rated) sensitivity	%	≤ 0.03								
Rotational speed measuring system										
Nominal (rated) torque M_{nom}	kN·m	15	20	25	30	40	50	60	70	80
Measurement system		Magnetic, via AMR sensor (Anisotropic Resistive Effect) and magnetized plastic ring with embedded steel ring								
Magnetic poles		158			186			204		
Maximum position deviation of the poles		± 50 angular seconds								
Output signal	V	5 V symmetrical (RS-422); 2 square wave signals approx. 90° phase shifted								
Pulses per revolution		1024								
Minimum rotational speed for sufficient pulse stability	rpm	0								
Pulse tolerance ⁴⁾	degrees	$< \pm 0.05$								
Maximum permissible output frequency	kHz	420								
Group delay	μ s	< 150								
Radial nominal (rated) distance between sensor head and magnetic ring (mechanical distance)	mm	1.6								
Working distance range between sensor head and magnetic ring ⁵⁾	mm	0.4 ... 2.5								
Max. permissible axial displacement of the rotor to the stator ⁶⁾	mm	± 1.5								
Hysteresis of reversing the direction in the case of relative vibrations between the rotor and the stator Torsional vibration of the rotor	degrees	$< \text{approx. } 0.2$								
	Horizontal stator vibration displacement	mm	$< \text{approx. } 0.5$							
Load resistance ⁷⁾	k Ω	≥ 2								

2) Output signal range in which there is a repeatable correlation between torque and output signal.

3) Signal frequency range 0.1 to 10 kHz.

4) At nominal conditions.

5) The pulse tolerance improves with reduced distance and vice versa.

6) The data refers only to a central axial alignment. Deviations lead to a change in pulse tolerance.

7) Note the termination resistances as per RS-422.

Specifications (continued)

Application limitations											
Reference temperature	°C	+20									
Nominal temperature range	°C	+10 ... +70									
Operating temperature range ⁸⁾	°C	-20 ... +85									
Storage temperature range	°C	-40 ... +85									
Permissible ambient humidity Relative humidity / no condensation	%	5 ... 95									
Load limits ⁹⁾											
Nominal (rated) torque M_{nom}	kN·m	15	20	25	30	40	50	60	70	80	
Limit torque	kN·m	32			60			110			
Max. limit load of measuring body ¹⁰⁾	kN·m	100			200			350			
Breaking torque (static)	kN·m	>100			>200			>350			
Longitudinal limit force (static)	kN	60			120			240			
Lateral limit force (static)	kN	80			160			240			
Limit bending moment (static)	N·m	6000			12000			24000			
Oscillation width, per DIN 50100 (peak-to-peak) ¹¹⁾	kN·m	30	32		60			100			
Protection class, as per EN 60529 (rotor/stator)	-	IP 54									
Shunt											
Nominal (rated) trigger voltage	V	5									
Trigger voltage limit	V	36									
Calibration signal on	V_{min}	>2.5									
Calibration signal off	V_{max}	<0.7									
Tolerance of the shunt signal, relative to M_{nom} at reference temperature	%	< ± 0.05									
Energy supply											
Nominal (rated) supply voltage (separated extra-low voltage)	V_{DC}	18 to 30									
Rated current consumption											
In measuring mode	A	<1 (typ. 0.3 at 20 V supply voltage)									
In startup mode	A	<4 (typ. 2) for max. 50 µs									
Nominal (rated) power consumption	W	<10 (typ. 6)									
Maximum cable length	m	50									

⁸⁾ Heat conductance via the stator base plate necessary over 70°C. The temperature of the base plate must not exceed 85°C.

⁹⁾ Each type of irregular stress (bending moment, lateral or longitudinal force, exceeding nominal (rated) torque) can only be permitted up to its specified static load limit, provided none of the others can occur at the same time. If this condition is not met, the limit values must be reduced. If 30% of the limit bending moment and lateral limit force occur at the same time, only 40% of the longitudinal limit force is permissible and the nominal (rated) torque must not be exceeded. The permissible bending moments, longitudinal forces and lateral forces can affect the measurement result by approx. 1 % of the nominal (rated) torque. The load limits only apply for the nominal (rated) temperature range. At temperatures <10°C, the load limits must be reduced by approx. 30% (viscosity reduction).

¹⁰⁾ The data refer to static loading of the measuring body; note the screw connection!

¹¹⁾ The nominal (rated) torque must not be exceeded.

Specifications (continued)

General information										
EMC										
Emission, as per EN 61326-1, Section 7										
RFI field strength										
-										
Class B										
Immunity from interference , as per EN 61326-1, EN 61326-2-3										
Electromagnetic field (AM)										
V/m										
10										
Magnetic field										
A/m										
100										
Electrostatic discharge (ESD)										
Contact discharge										
kV										
4										
Air discharge										
kV										
8										
Fast sweeps (burst)										
kV										
1										
Impulse voltages (surge)										
kV										
1										
Conducted interference (AM)										
V										
10										
Mechanical shock , as per EN 60068-2-72 ¹²⁾										
Number										
n										
1000										
Duration										
ms										
3										
Acceleration (half sine)										
m/s ²										
650										
Vibrational stress in 3 directions , as per EN 60068-2-6 ¹²⁾										
Frequency range										
Hz										
10 ... 2000										
Duration										
h										
2.5										
Acceleration (amplitude)										
m/s ²										
200										
Mechanical data										
Nominal (rated) torque M_{nom}										
kN-m										
15										
20										
25										
30										
40										
50										
60										
70										
80										
Torsional stiffness c_T										
kN-m/rad										
32050										
63260										
106200										
Torsion angle at M_{nom}										
degrees										
0.027										
0.036										
0.045										
0.027										
0.036										
0.045										
0.033										
0.038										
0.043										
Stiffness in the axial direction c_a										
kN/mm										
1380										
1710										
2280										
Stiffness in the radial direction c_r										
kN/mm										
3900										
5080										
6170										
Stiffness during the bending moment round a radial axis c_b										
kN-m/degree										
94										
188										
290										
Maximum deflection at longitudinal limit force										
mm										
<0.05										
<0.08										
<0.12										
Additional max. radial run-out deviation at lateral limit force										
mm										
<0.05										
<0.05										
<0.05										
Additional maximum plumb/parallel deviation at limit bending moment										
mm										
<0.5										
<0.7										
Balance quality level , as per DIN ISO 1940										
G 6.3										
Max. permissible vibration displacement of the rotor (peak-to-peak) ¹³⁾										
Undulations in the area of the connection flange, based on ISO 7919-3										
Normal operation (continuous operation)										
µm										
$s_{(p-p)} = \frac{9000}{\sqrt{n}}$ (n in rpm)										
Start and stop operation/resonance ranges (temporary)										
µm										
$s_{(p-p)} = \frac{13200}{\sqrt{n}}$ (n in rpm)										
Mass moment of inertia of rotor J_v										
(around the rotary axis; does not take flange bolts into account)										
without rotational speed measuring system										
kg·m ²										
0.20										
0.46										
0.75										
with rotational speed measuring system										
kg·m ²										
0.22										
0.51										
0.81										
Proportional mass moment of inertia for the transmitter side										
(side of the flange with external centering)										
without rotational speed measuring system										
% of J _v										
28										
23										
26										
with rotational speed measuring system										
% of J _v										
37										
30										
32										
Permissible eccentricity of the rotor (radially) to the center point of the stator (without rotational speed measuring system)										
mm										
± 2										
Permissible axial displacement between rotor and stator (without rotational speed measuring system) ¹⁴⁾										
mm										
± 2										
Weight										
Rotor without rotational speed measuring system										
kg										
18										
28										
39										
Rotor with rotational speed measuring system										
kg										
20										
32										
42										
Stator										
kg										
1.8										
2.1										
3.0										

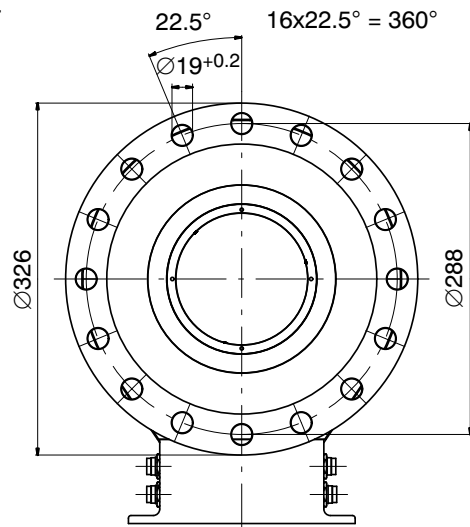
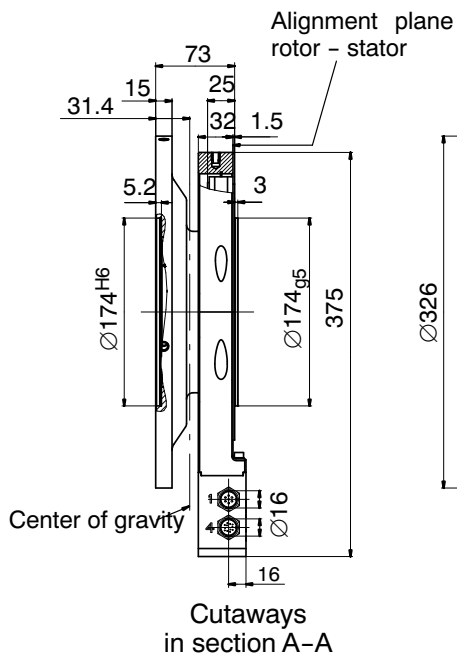
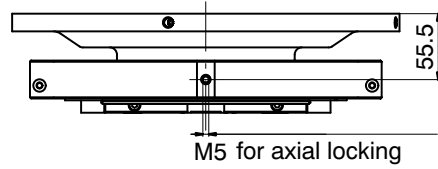
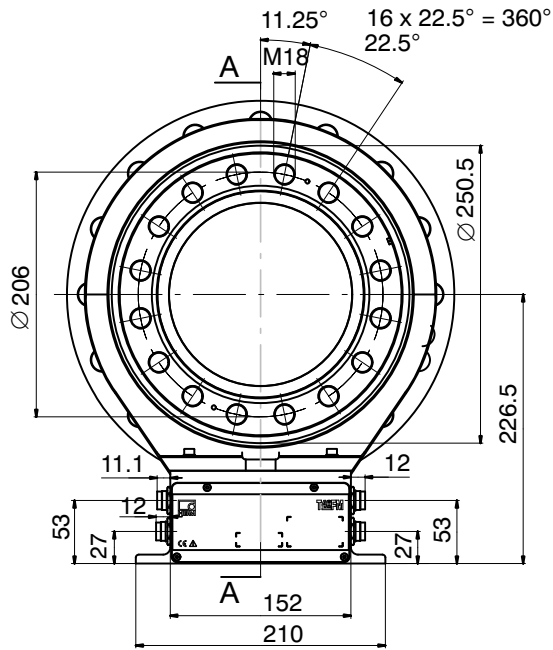
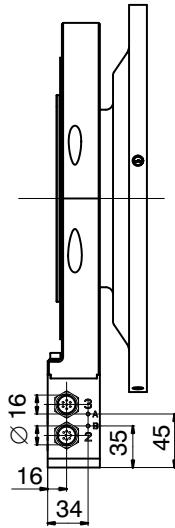
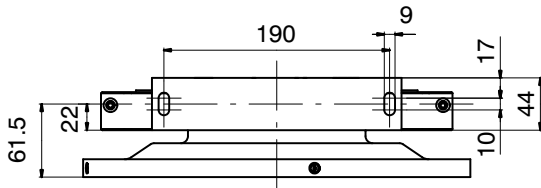
¹²⁾ The antenna ring and connection plug must be fixed.

¹³⁾ The influence of radial run-out deviations, eccentricity, defects of form, notches, marks, local residual magnetism, structural variations or material anomalies needs to be taken into account and isolated from the actual undulation.

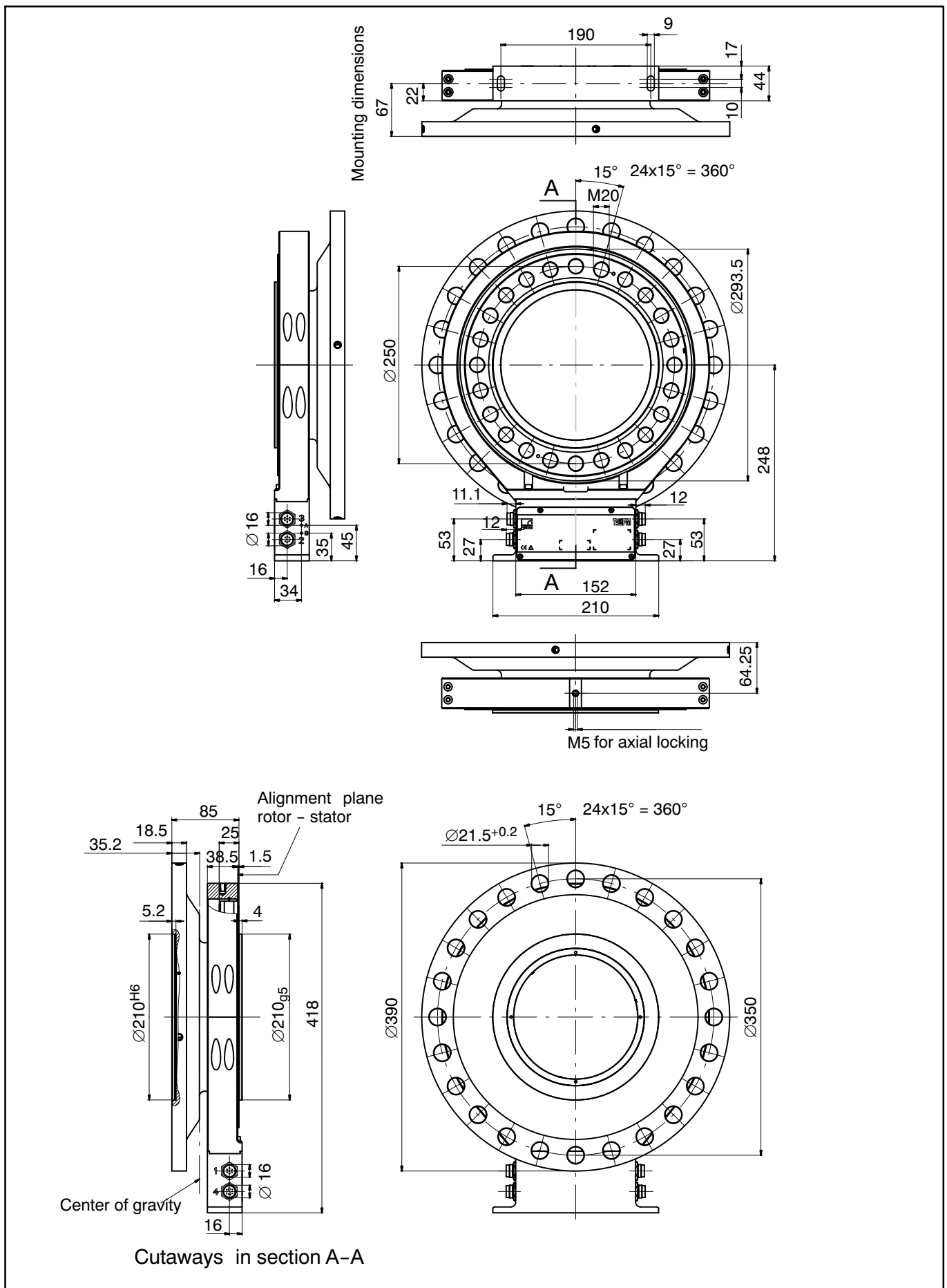
¹⁴⁾ Above the nominal (rated) temperature range ±1.5 mm.

Dimensions T40FM 15kNm - 25 kNm without rotational speed measurement

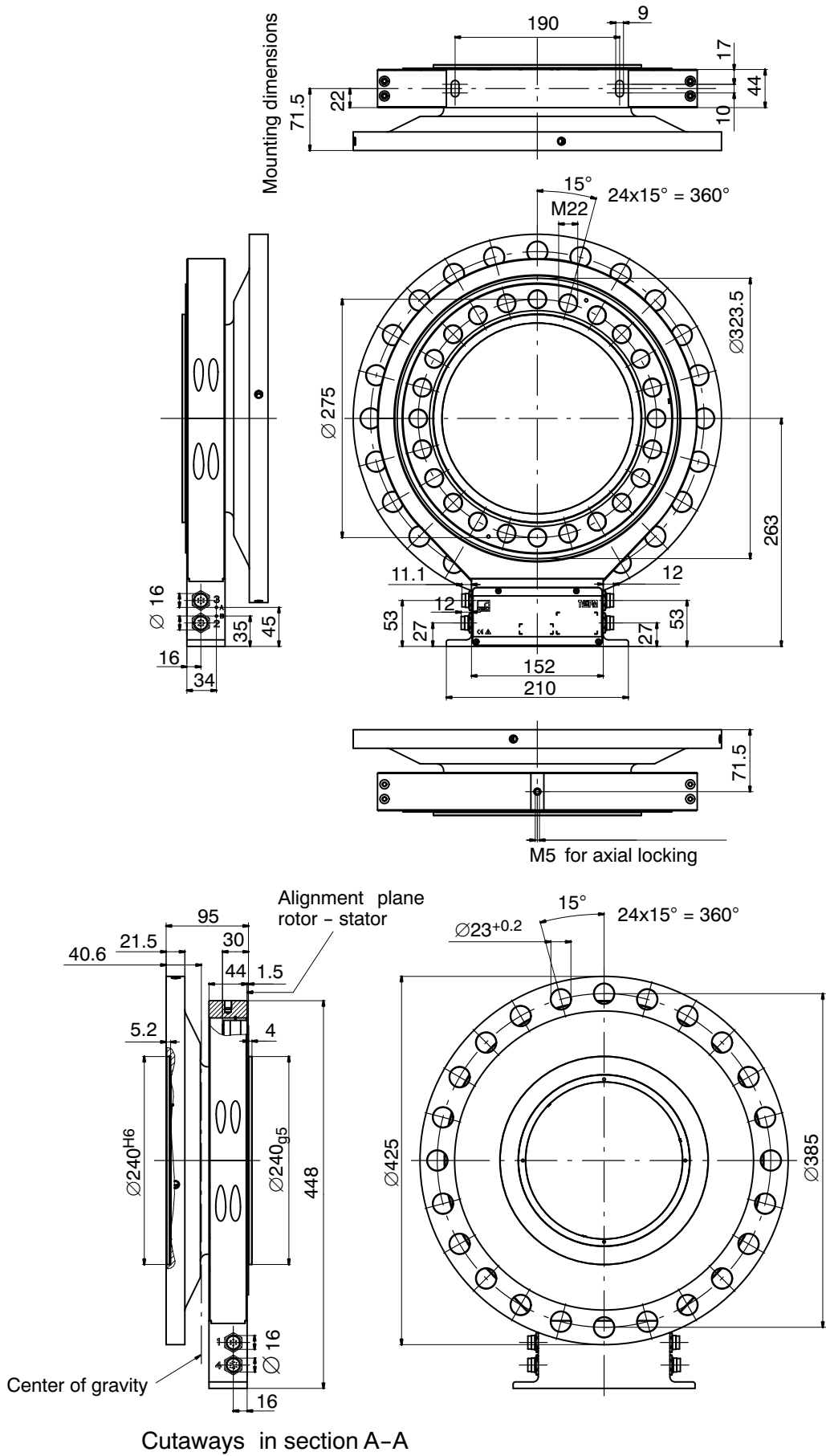
Mounting dimensions



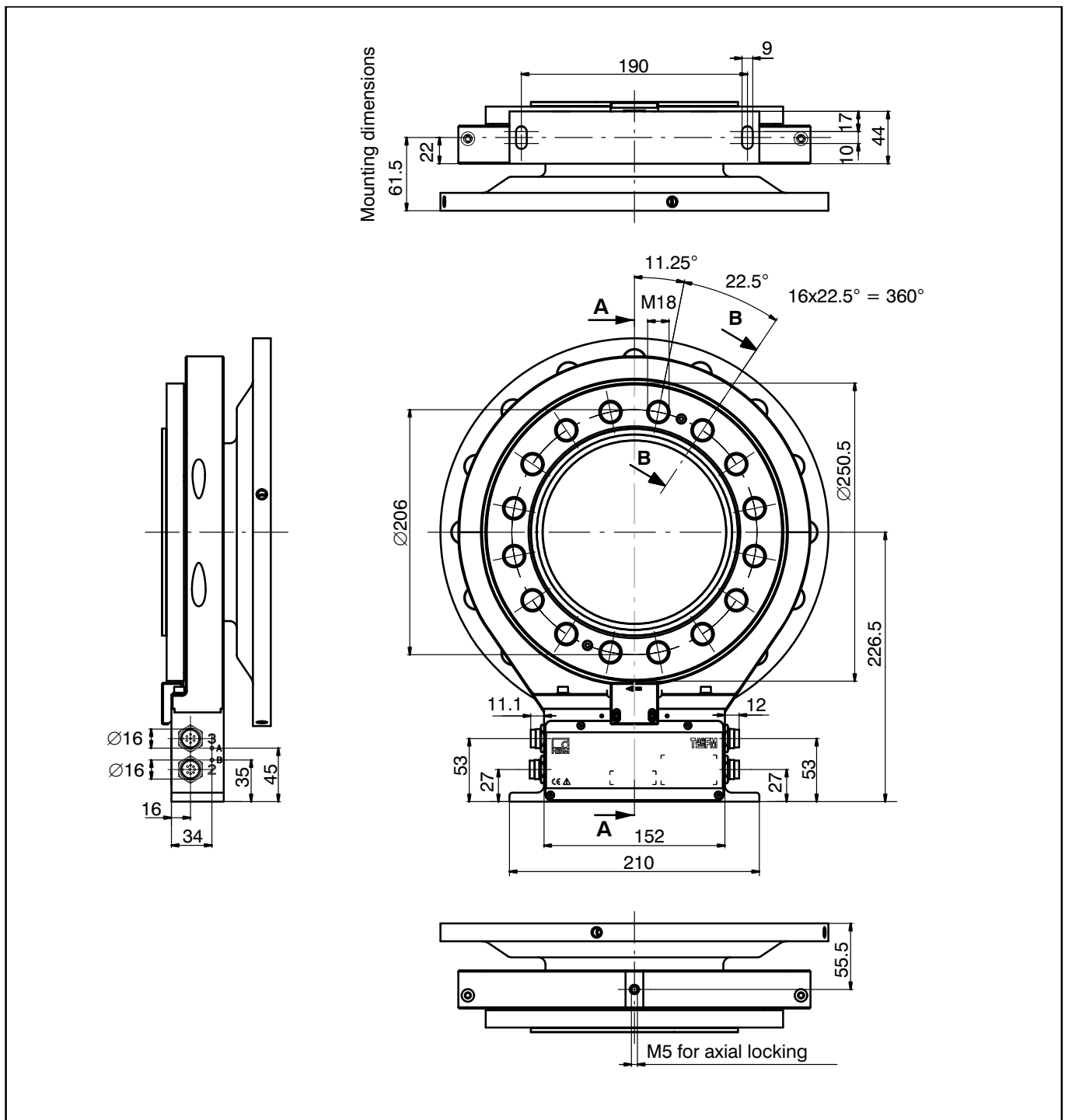
Dimensions T40FM 30kNm - 50 kNm without rotational speed measurement



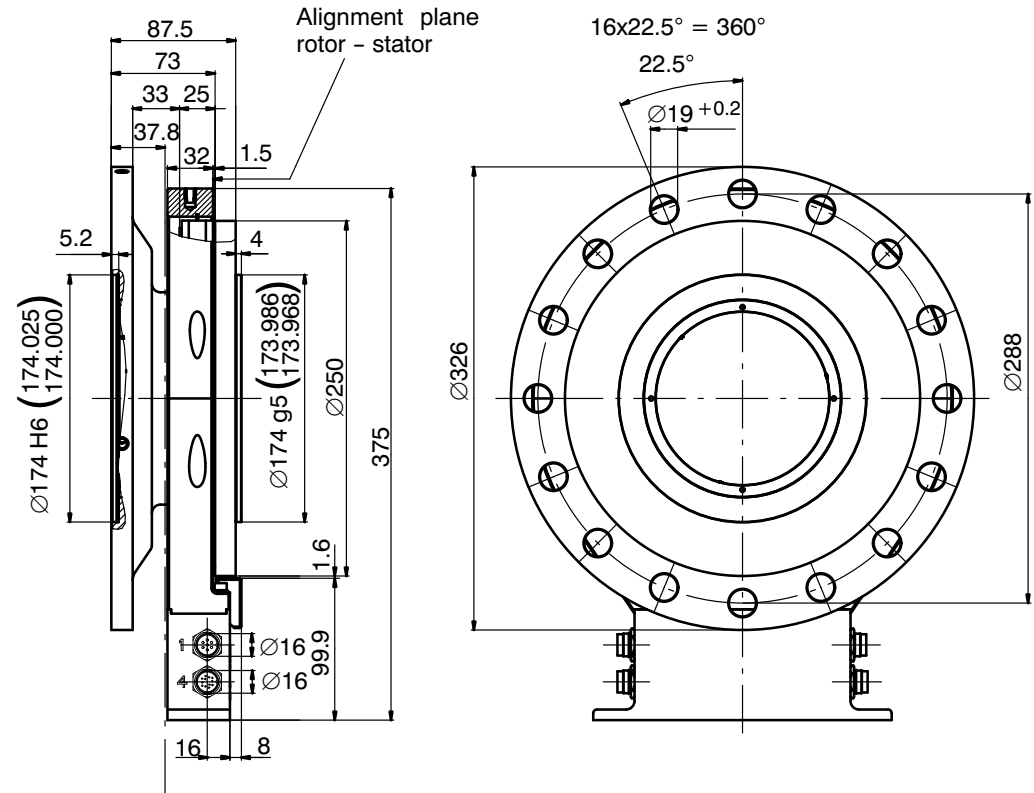
Dimensions T40FM 60kNm - 80 kNm without rotational speed measurement



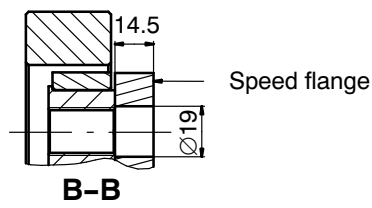
Dimensions T40FM 15 kNm – 25 kNm with rotational speed measurement



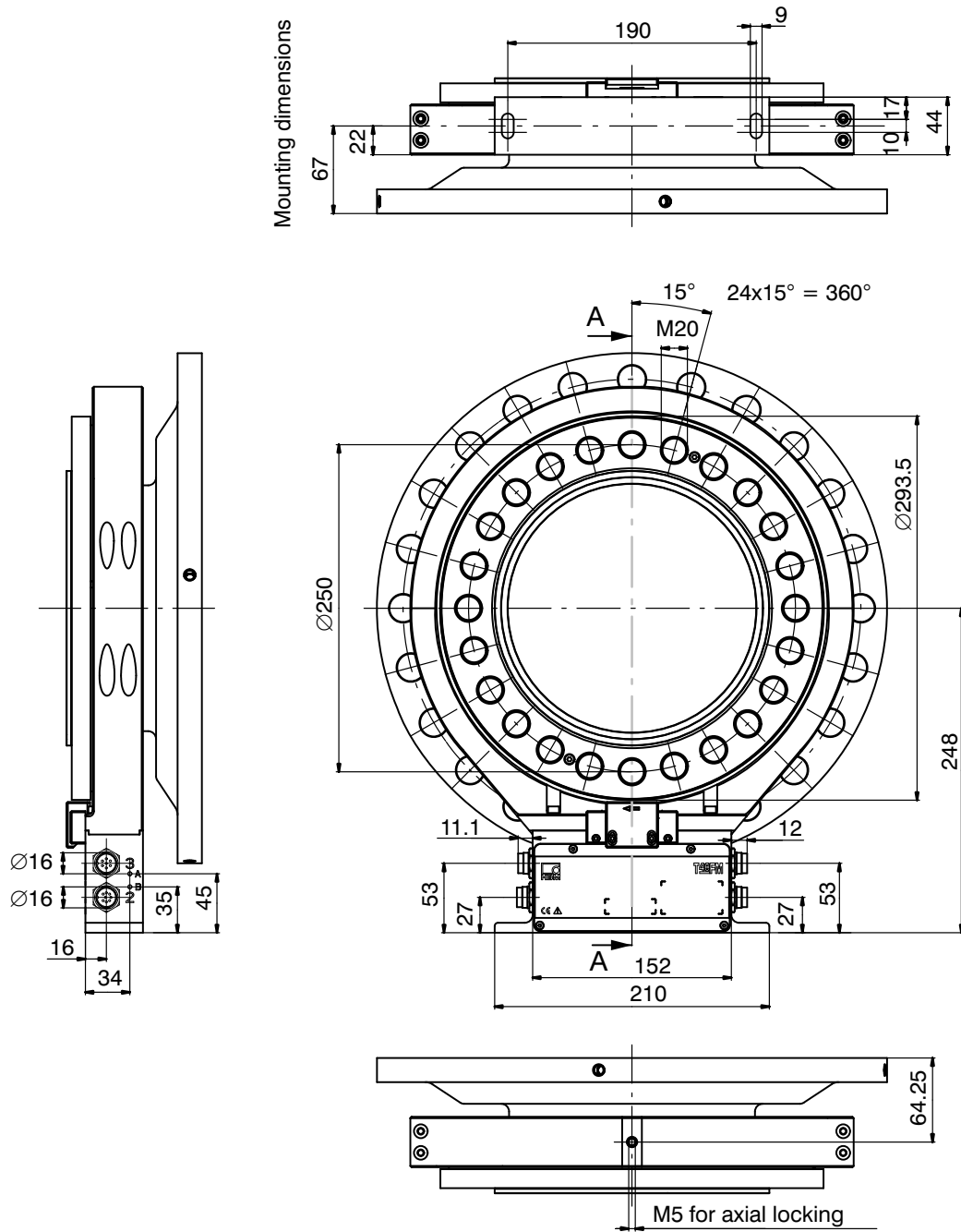
Dimensions T40FM 15 kNm – 25 kNm with rotational speed measurement (continued)



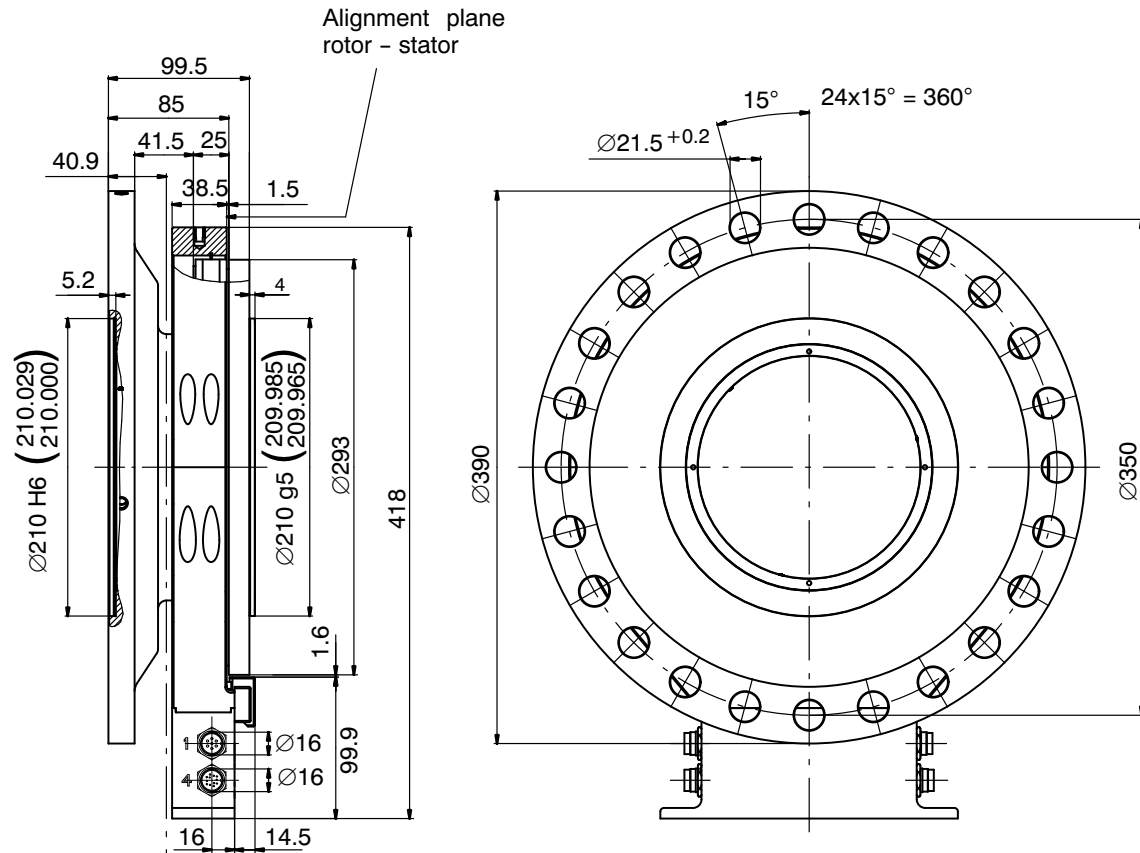
Center of gravity
Cutaways in section A-A



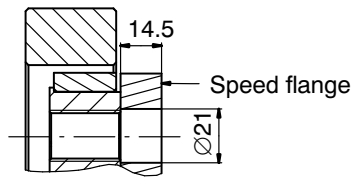
Dimensions T40FM 30 kNm - 50 kNm with rotational speed measurement



Dimensions T40FM 30 kNm – 50 kNm with rotational speed measurement (continued)

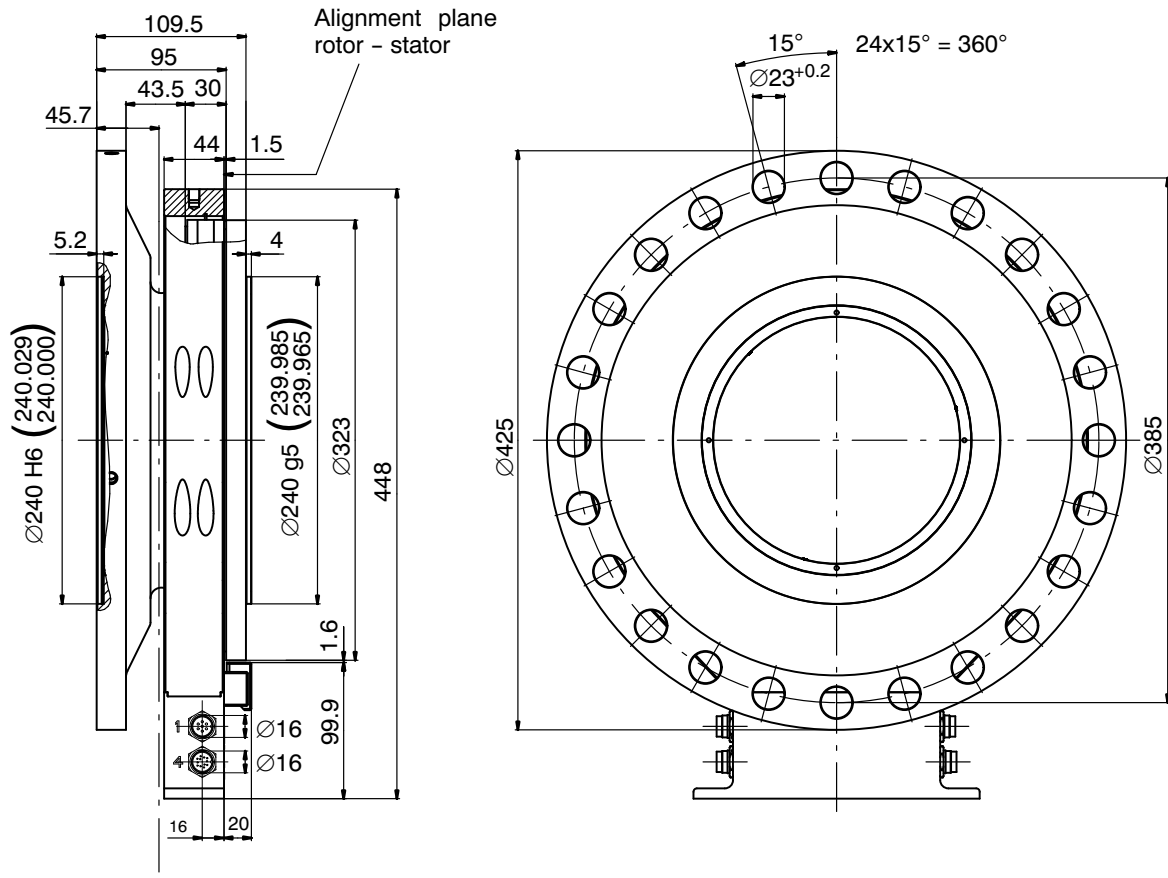


Center of gravity
Cutaways in section A-A

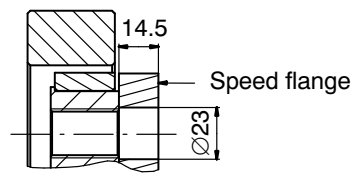


A-A

Dimensions T40FM 60 kNm – 80 kNm with rotational speed measurement (continued)

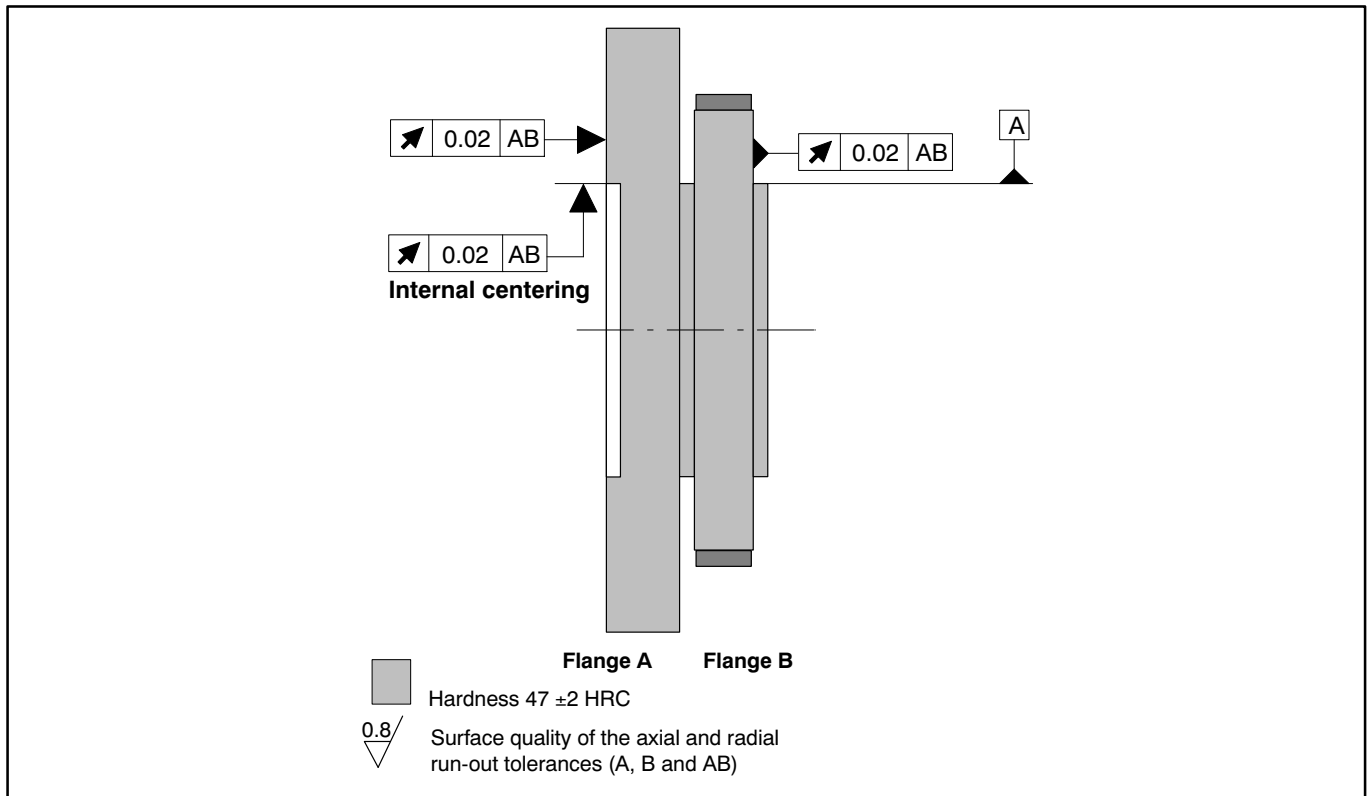


Cutaways in section A-A

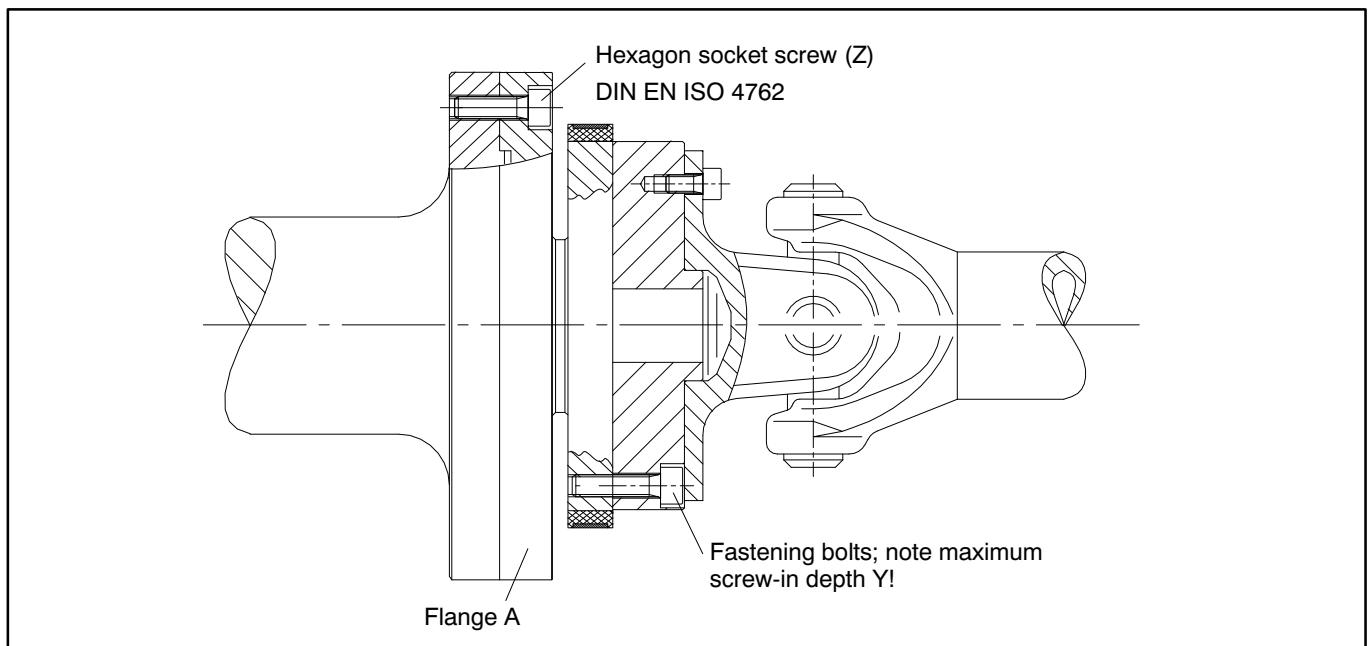


A-A

Radial and axial run-out tolerances



Fastening screws



Measuring range (kN·m)	Fastening screws (Z) ¹⁾	Fastening screws Property class	Prescribed tightening moment (N·m)
15/20/25	M18	10.9	400
30/40/50	M20		560
60/70/80	M22		760

¹⁾ DIN EN ISO 4762; black/oiled/ $\mu_{tot}=0.125$

Order number

Order no.		
K-T40FM		Basic price Stator: [only with Option 2 = MF / ST]
Code	Option 1: Measuring range up to	
015R	15 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
020R	20 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
025R	25 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
030R	30 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
040R	40 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
050R	50 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
060R	60 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
070R	70 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
080R	80 kN·m	Basic price Rotor: [only with Option 2 = MF / RO]
Code	Option 2: Component	
MF	Measurement flange, complete	
RO	Rotor	
ST	Stator	
Code	Option 3: Accuracy	
S	Standard	
G	Linearity deviation including hysteresis < ±0.05	
Code	Option 4: Adjustment	
M	Metric (N·m)	
Code	Option 5: Electrical configuration [only with Option 2 = MF / ST]	
SU2	10 kHz ±5 kHz and ±10 V output signal, 18...30 V DC supply voltage	
DU2	60 kHz ±30 kHz and ±10 V output signal, 18...30 V DC supply voltage	
HU2	240 kHz ±120 kHz and ±10 V output signal, 18...30 V DC supply voltage	
Code	Option 6: Rot. speed measuring system	
0	Without rot. speed measuring system	
1	Magnetic rot. Speed measuring system; 1024 pulses/revolution	
Code	Option 7: Customised modification	
S	No customer-specific modification	
H	Permissible rotational speed, depending on measuring range 4500 rpm to 8000 rpm	
K-T40FM- 0 3 0 R - MF - S - M - DU 2 - 0 - S		☐ = PREFERENCE Types

Accessories, to be ordered separately

Article	Order no.
Connection cable, set	
Torque connection cable, 423 - D-Sub 15P, 6 m	1-KAB149-6
Torque connection cable, 423 - free ends, 6 m	1-KAB153-6
Connection cable TIM40/TMC, 6 m	1-KAB174-6
Cable sockets	
423G-7S, 7-pin (straight)	3-3101.0247
423W-7S, 7-pin (angle)	3-3312.0281
423G-8S, 8-pin (straight)	3-3312.0120
423W-8S, 8-pin (angle)	3-3312.0282
Connection cable, by the meter (min. order quantity: 10 m, price per meter)	
Kab8/00-2/2/2	4-3301.0071

Modifications reserved.

All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability and do not constitute any liability whatsoever.

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measure and predict with confidence

