Data Sheet

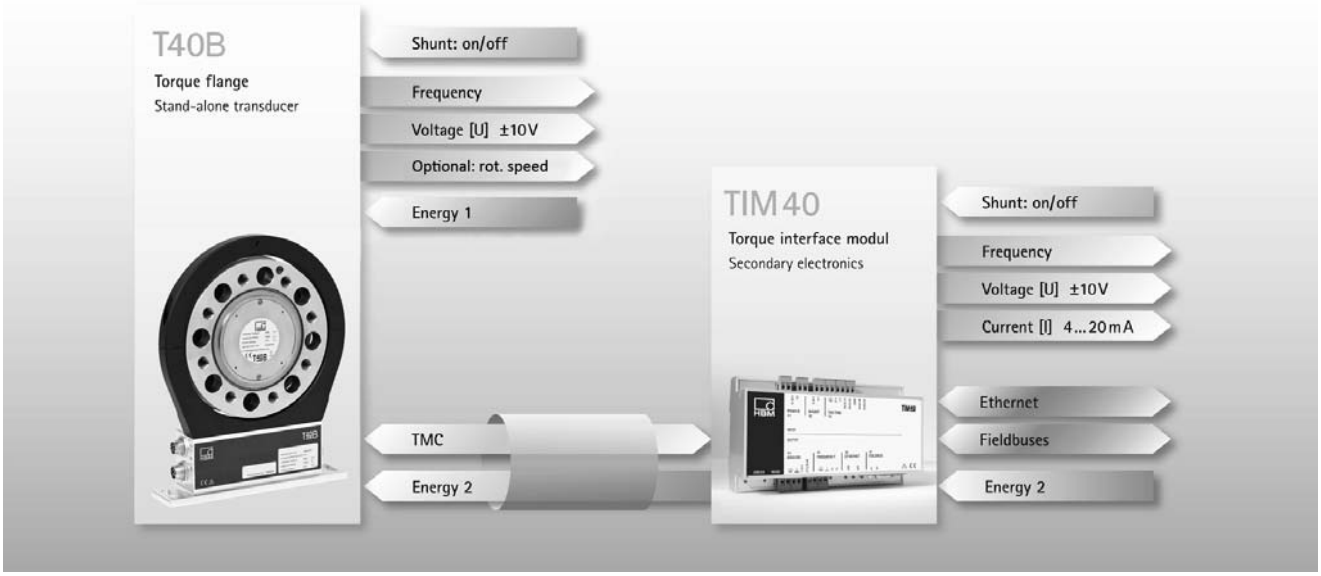
T40B

Torque flange

Special features

- **Nominal (rated) torques 200 N·m, 500 N·m, 1 kN·m, 2 kN·m, 3 kN·m, 5 kN·m and 10 kN·m**
- **Nominal (rated) rotational speeds of 10 000 min^{-1} to 20 000 min^{-1}**
- **Accuracy class 0.05**
- **Large measurement frequency range up to 6 kHz (–3 dB)**
- **Digital transmission of measured values**
- **Compact design**
- **Low rotor weights and mass moments of inertia**
- **Optional: rotational speed measuring system**

Overall concept



Specifications

Type		T40B						
Accuracy class		0.05						
Torque measurement system								
Nominal (rated) torque M_{nom}	N·m	200	500					
	kN·m			1	2	3	5	10
Nominal (rated) sensitivity (spread between torque = zero and nominal (rated) torque)								
Frequency output 10 kHz / 60 kHz / 240 kHz	kHz	5/30/120						
Voltage output	V	10						
Sensitivity tolerance (deviation of the actual output quantity at M_{nom} from the nominal (rated) sensitivity)								
Voltage output	%	±0.1						
Output signal at torque = zero								
Frequency output	kHz	10/60/240						
Voltage output	V	0						
Nominal (rated) output signal								
Frequency output								
at positive nominal (rated) torque	kHz	15 [1] / 90 [2] / 360 [3] (5 V symmetrical [4])						
at negative nominal (rated) torque	kHz	5 [1] / 30 [2] / 120 [3] (5 V symmetrical [4])						
Voltage output								
at positive nominal (rated) torque	V	+10						
at negative nominal (rated) torque	V	−10						
Load resistance								
Frequency output	kΩ	≥ 2						
Voltage output	kΩ	≥ 10						
Longterm drift over 48 h								
Frequency output	%	< ±0.03						
Voltage output	%	< ±0.03						
Measurement frequency range, −3 dB	kHz	1 [1] 3 [2] 6 [3]						
Group delay	µs	< 400 [1] < 220 [2] < 150 [3]						
Residual ripple								
Voltage output [5]	mV	< 40						
Effect of temperature per 10 K in the nominal (rated) temperature range								
on the output signal, related to the actual value of the signal spread								
Frequency output	%	±0.05						
Voltage output	%	±0.2						
on the zero signal, related to the nominal (rated) sensitivity								
Frequency output	%	±0.05						
Voltage output	%	±0.1						
Maximum modulation range [6]								
Frequency output	kHz	2.5 … 17.5 [1] / 15 … 105 [2] / 60 … 420 [3]						
Voltage output	V	−12 … +12						
Energy supply								
Nominal (rated) supply voltage (separated extralow DC voltage)	V	18 … 30						
Current consumption in measuring mode	A	< 1						
Current consumption in startup mode	A	< 4 (typ. 2) 50 µs						
Nominal (rated) power consumption	W	< 10						
Maximum cable length	m	50						

1) Option 5, 10 ± 5 kHz (code SU2)
2) Option 5, 60 ± 30 kHz (code DU2)
3) Option 5, 240 ± 120 kHz (code HU2)
4) RS-422 complementary signals, note termination resistor.
5) Signal frequency range 0.1 to 10 kHz
6) Output signal range in which there is a repeatable correlation between torque and output signal.

Specifications (continued)

Nominal (rated) torque M_{nom}	N·m	200	500					
	kN·m			1	2	3	5	10
Non-linearity including hysteresis, related to the nominal (rated) sensitivity								
Frequency output	%				< ± 0.05			
Voltage output	%				< ± 0.05			
Relative standard deviation of repeatability per DIN 1319, related to the variation of the output signal								
Frequency output	%				< ± 0.03			
Voltage output	%				< ± 0.03			
Shunt signal					approx. 50 % of M_{nom}			
Tolerance of the shunt signal, related to M_{nom}	%				< ± 0.05			
Nominal (rated) trigger voltage	V				5			
Trigger voltage limit	V				36			
Shunt signal ON	V				min. >2.5			
Shunt signal OFF	V				max. <0.7			
Rotational speed measuring system								
Measurement system					Magnetic, via AMR sensor (Anisotropic Resistive Effect) and magnetized plastic ring with embedded steel ring			
Magnetic poles		72	86		108		126	156
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	min^{-1}				0			
Pulse tolerance [7]	degree				< ± 0.05			
Maximum permissible output frequency	MHz				4			
Group delay	µs				<5			
Radial nominal (rated) distance between sensor head and magnetic ring (mechanical distance)	mm				1.6			
Working distance range between sensor head and magnetic ring	mm				0.4 … 2.5			
Max. permissible axial displacement of the rotor to the stator [8]	mm				± 1.5			
Hysteresis of reversal in the case of relative vibrations between the rotor and the stator								
Torsional vibration of the rotor	degree				<approx. 0.2			
Horizontal stator vibration displacement	mm				<approx. 0.5			
Magnetic load limit								
Remanent flux density	mT				>100			
Coercive field strength	kA/m				>100			
Permissible magnetic field strength for signal deviations	kA/m				<0.1			
Load resistance [9]	kΩ				≥2			

7) At nominal (rated) conditions.

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

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

General information								
EMC								
Emission (per EN 61326-1, Section 7)								
RFI field strength	–	Class B						
Immunity from interference (EN 61326-1, Table 2)								
Electromagnetic field (AM)	V/m	10						
Magnetic field	A/m	100						
Electrostatic discharge (ESD)								
Contact discharge	kV	4						
Air discharge	kV	8						
Rapid transients (burst)	kV	1						
Impulse voltages (surge)	kV	1						
Conducted interference (AM)	V	10						
Degree of protection per EN 60529		IP 54						
Weight, approx. Rotor	kg	1.1	2.0		4.0	4.1	7.0	12.0
Stator	kg	1.1					1.2	1.3
Reference temperature	°C	23						
Nominal (rated) temperature range	°C	+10 … +70						
Operating temperature range	°C	−20 … +85						
Storage temperature range	°C	−40 … +85						
Mechanical shock per EN 60068-2-27 [10]								
Number	n	1000						
Duration	ms	3						
Acceleration (half sine)	m/s^2	650						
Vibrational stress in 3 directions per EN 60068-2-6 [10]								
Frequency range	Hz	10 … 2000						
Duration	h	2.5						
Acceleration (amplitude)	m/s^2	200						
Nominal (rated) rotational speed	min^{-1}	20 000			15 000		12 000	10 000
Load limits [11]								
Limit torque, related to M_{nom} [12]	%	200				160		
Breaking torque, related to M_{nom} [12]	%	> 400				> 320		
Longitudinal limit force [13]	kN	10	13	19	30	35	60	80
Lateral limit force [13]	kN	2	4	5	9	10	12	18
Limit bending moment [13]	N·m	100	200	220	560	600	800	1200
Oscillation width per DIN 50100 (peaktopeak) [14]	N·m	400	1000	2000	4000	4800	8000	16000

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

11) Each type of irregular stress (bending moment, lateral or longitudinal force, exceeding nominal (rated) torque), can only be permitted up to its specified 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 and lateral forces can affect the measurement result by approx. 0.3% of the nominal (rated) torque. The load limits only apply for the nominal (rated) temperature range. At temperatures < 10 C°, load limits are expected to reduce by up to 30%, because there is an increased reduction in toughness as temperatures fall.

12) With a static loading.

13) Static and dynamic.

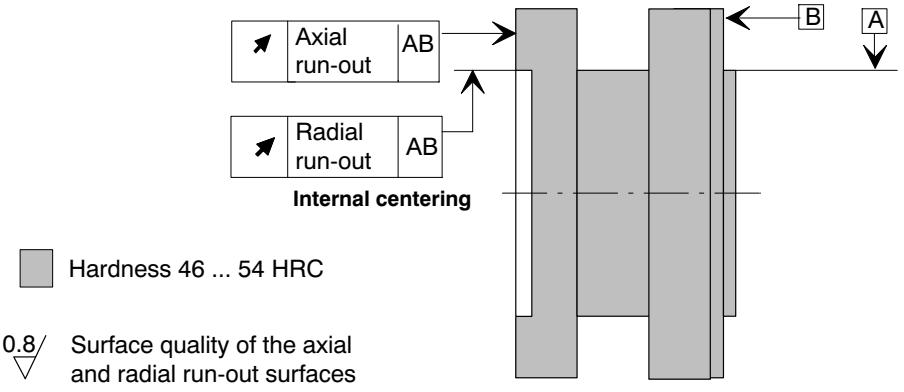
14) The nominal (rated) torque must not be exceeded.

Specifications (continued)

Nominal (rated) torque M_{nom}	N·m	200	500					
	kN·m			1	2	3	5	10
Mechanical values								
Torsional stiffness c_T	kN·m/rad	360	745	1165	2515	3210	5565	14335
Torsion angle at M_{nom}	degree	0.032	0.038	0.049	0.046	0.054	0.051	0.040
Stiffness in the axial direction c_a	kN/mm	540	450	580	540	570	760	960
Stiffness in the radial direction c_r	kN/mm	315	560	860	1365	1680	2080	2940
Stiffness during the bending moment round a radial axis c_b	kN·m/deg.	3.6	4.2	5.9	9	9.3	20.2	45.5
Maximum deflection at longitudinal limit force	mm	< 0.04	< 0.05		< 0.06		< 0.08	< 0.09
Additional max. radial run-out deviation at lateral limit force	mm	< 0.02						
Additional plumb/parallel deviation at limit bending moment (at ∅ d_B)	mm	< 0.06	< 0.11	< 0.09	< 0.18	< 0.19	< 0.14	< 0.12
Balance quality level per DIN ISO 1940		G 2.5						
Max. limits for relative shaft vibration (peak-to-peak) [15] Undulation in the connection flange area following ISO 79193								
Normal operation (continuous operation)	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$ (n in min^{-1})						
Start and stop operation/resonance ranges (temporary)	µm	$s_{(p-p)} = \frac{13200}{\sqrt{n}}$ (n in min^{-1})						
Mass moment of inertia of the rotor								
I_V (around the rotary axis; does not take flange bolts into account)	kg·m^2	0.0017	0.0045		0.0139	0.0142	0.0341	0.0914
Proportional mass moment of inertia for the transmitter side (side of the flange with external centering)		63	51		50	49	45	
Max.permissible static eccentricity of the rotor (radially) to the center point of the stator								
without the rotational speed measuring system	mm	±2						
Max. permissible axial displacement of the rotor to the stator	mm	±2						

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

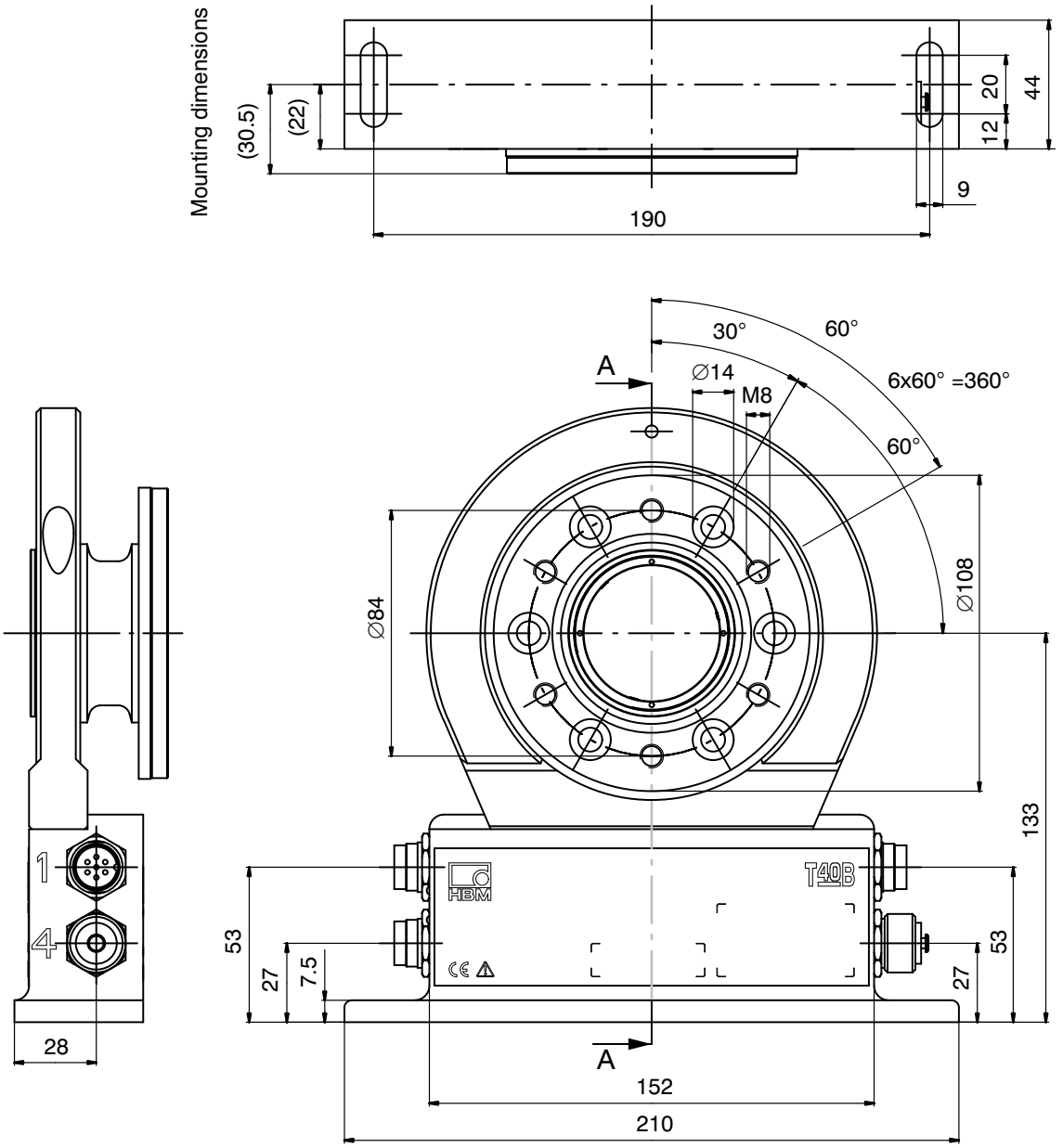
Radial and axial run-out tolerances



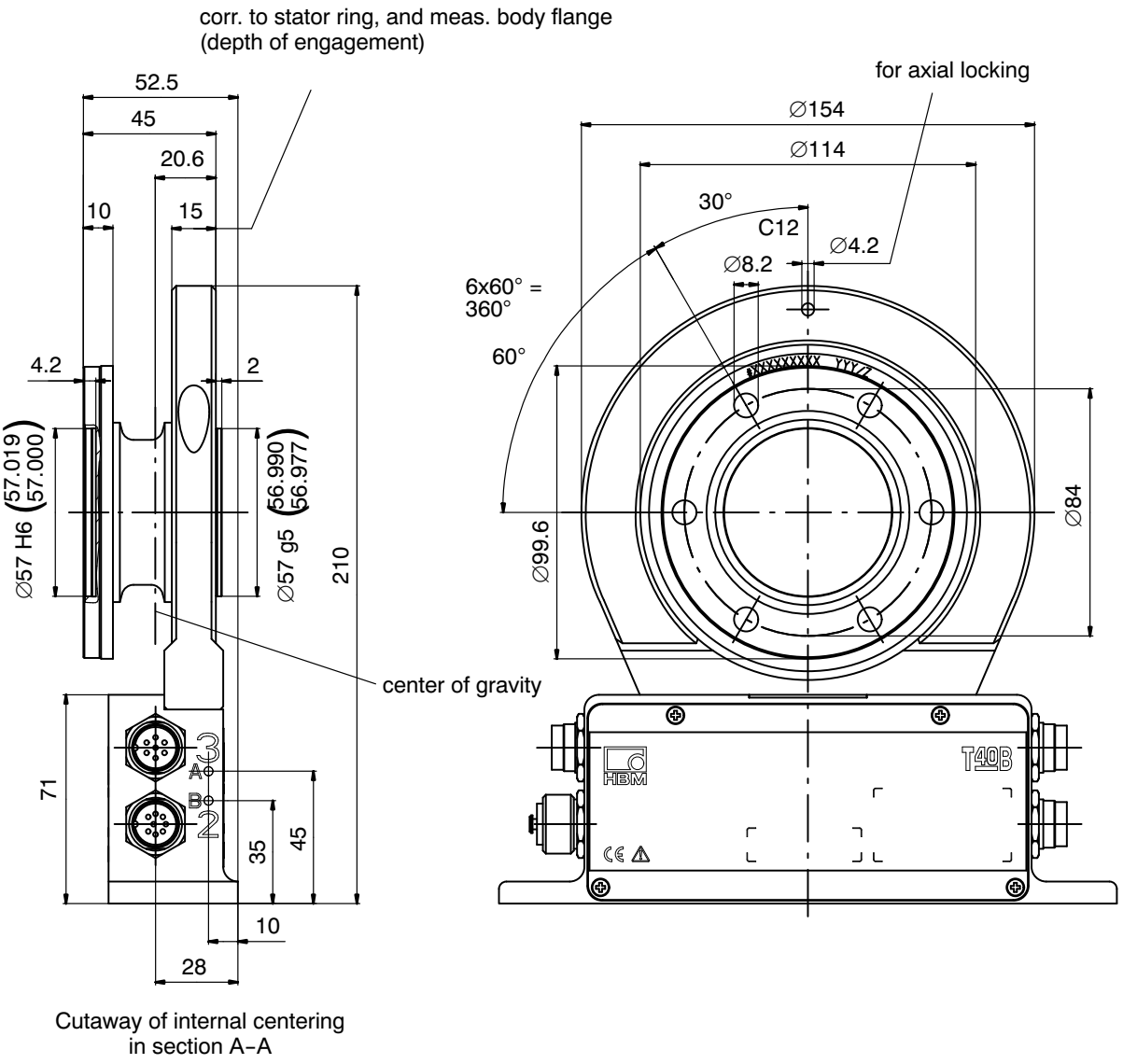
Measuring range (N·m)	Axial run-out tolerance (mm)	Radial run-out tolerance (mm)
200	0.01	0.01
500	0.01	0.01
1 k	0.01	0.01
2 k	0.02	0.02
3 k	0.02	0.02
5 k	0.02	0.02
10 k	0.02	0.02

Dimensions of T40B/200 Nm without rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



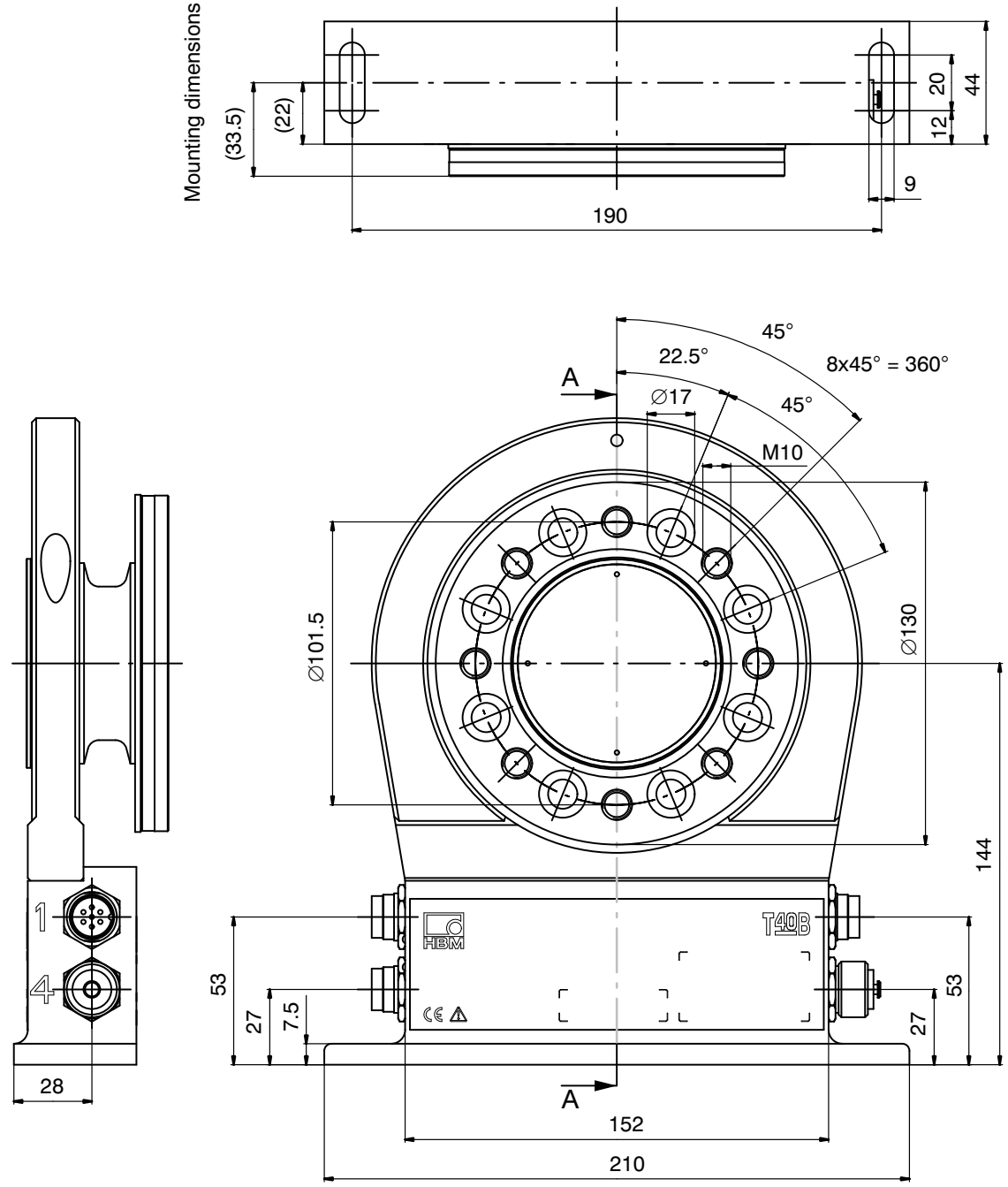
Dimensions of T40B/200 Nm without rotational speed measurement, continued



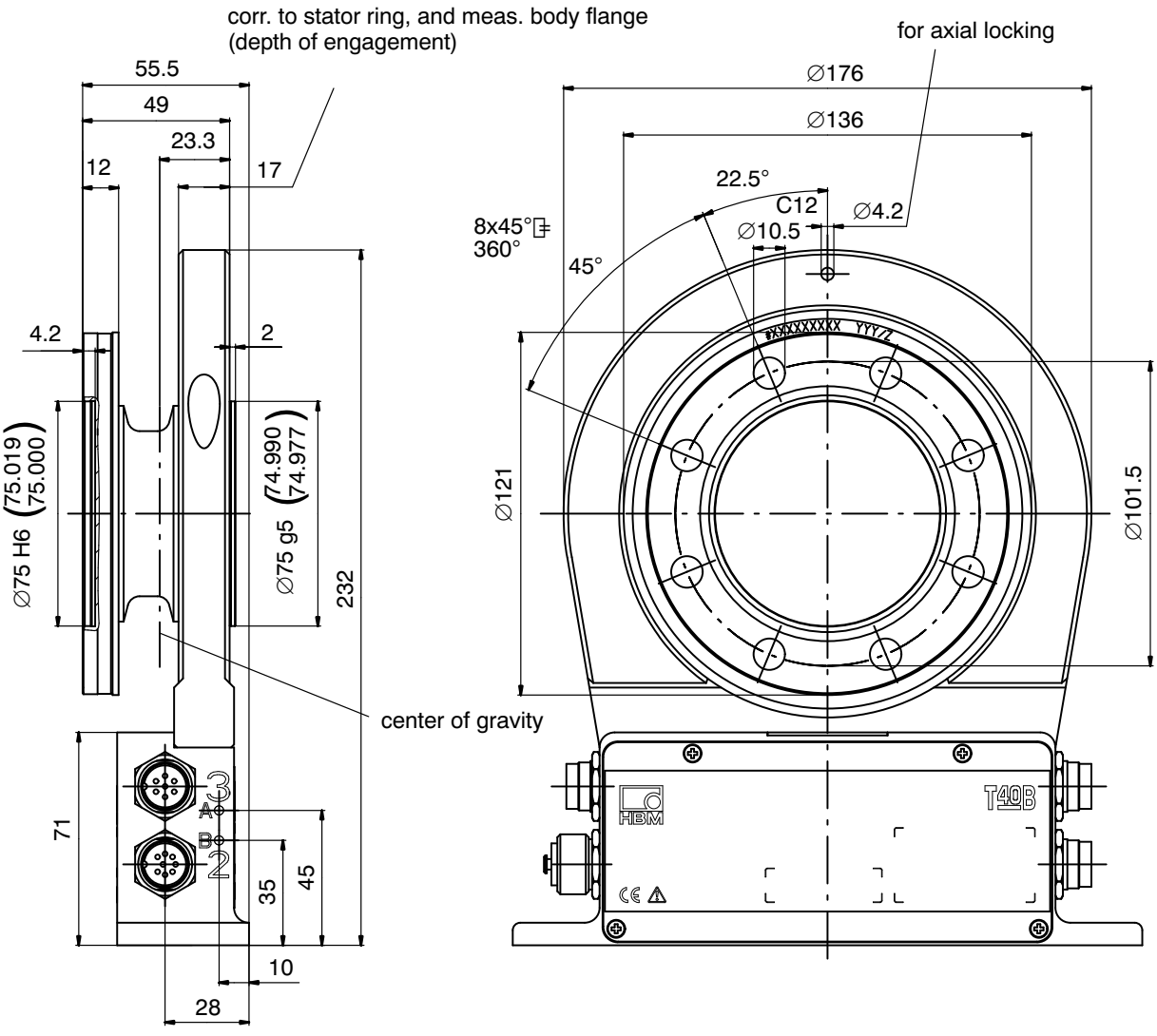
Cutaway of internal centering
in section A–A

Dimensions of T40B/500 Nm and 1 kNm without rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



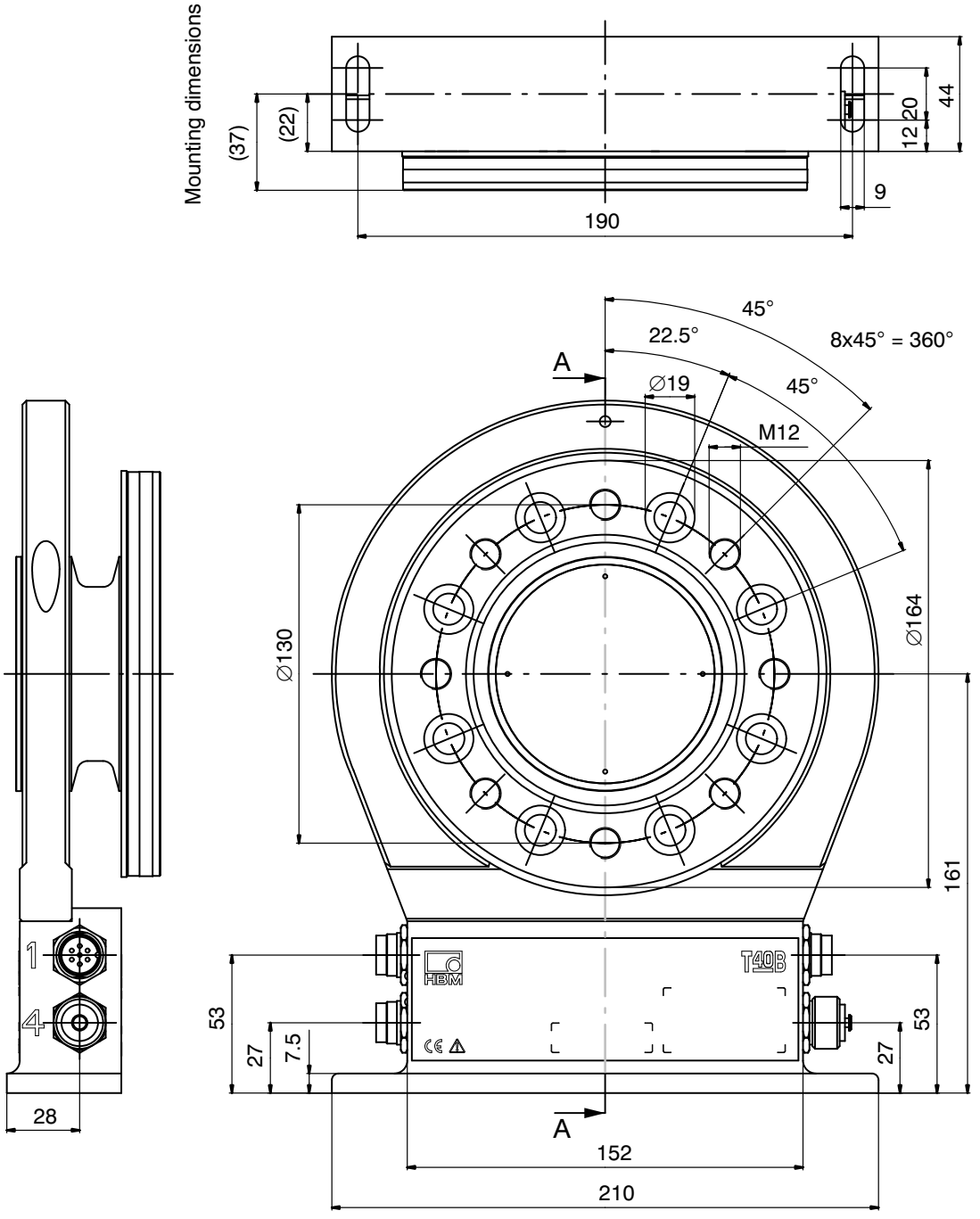
Dimensions of T40B/500 Nm and 1 kNm without rotational speed measurement, continued



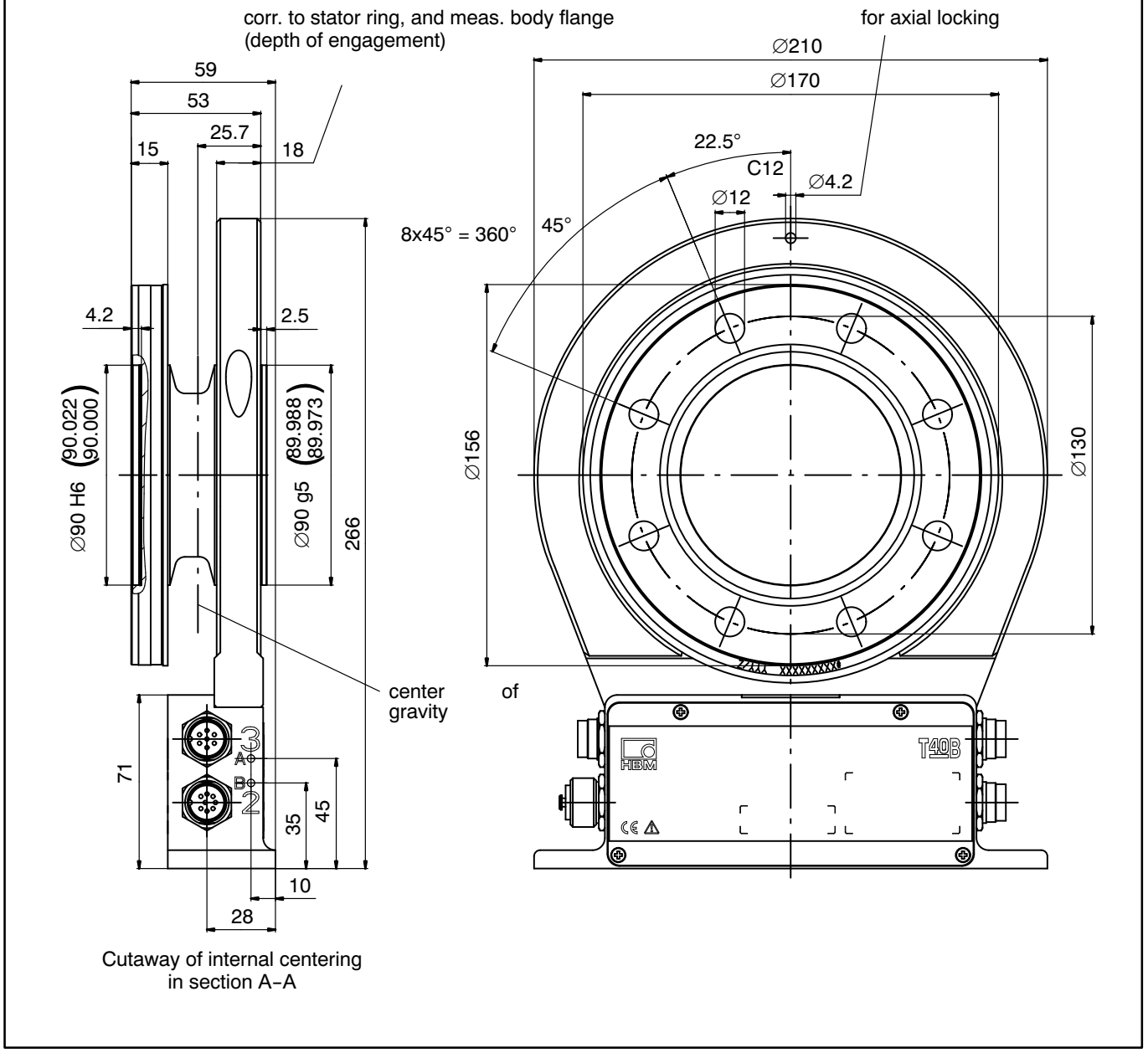
Cutaway of internal centering
in section A–A

Dimensions of T40B/2 kNm and 3 kNm without rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



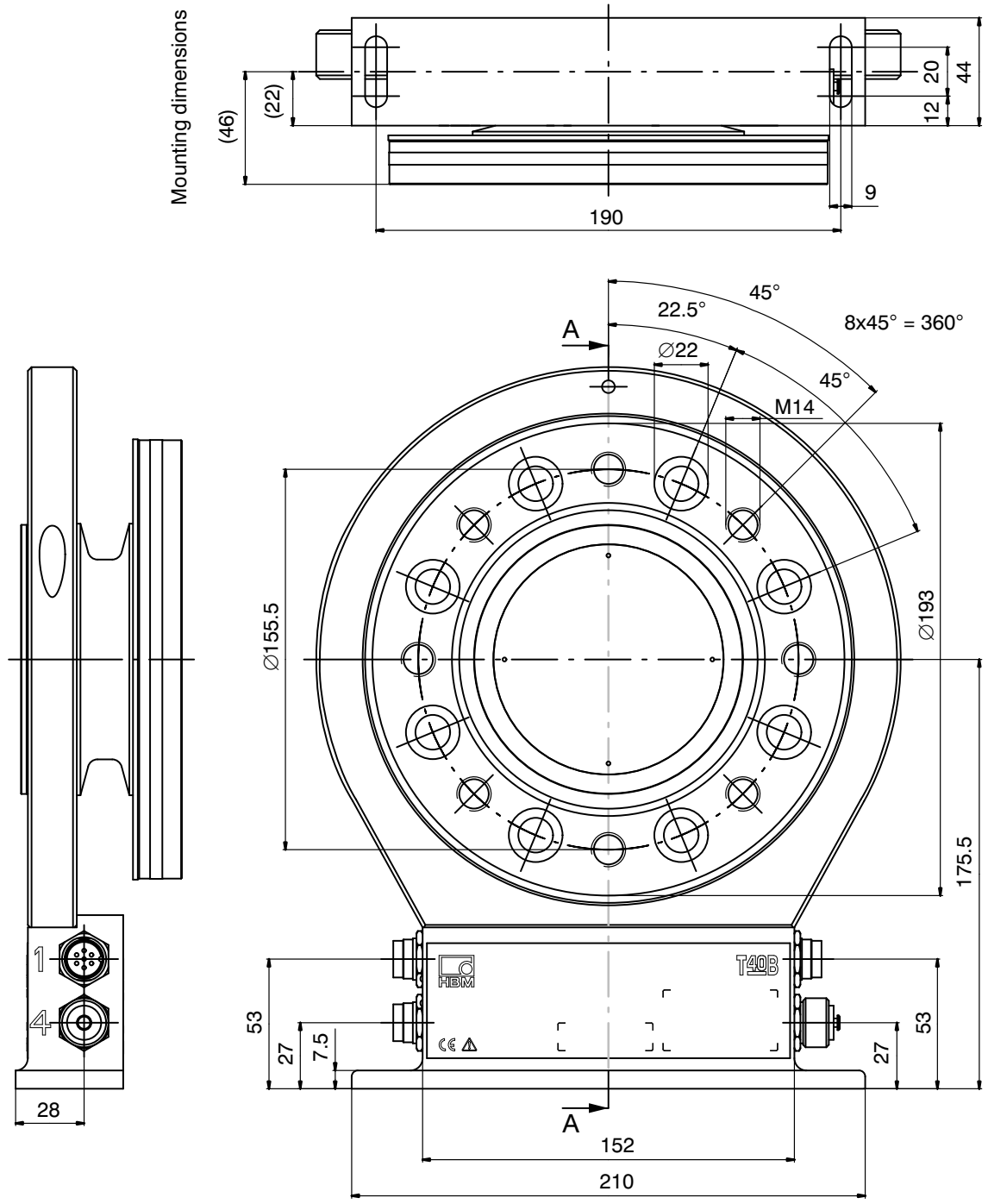
Dimensions of T40B/2 kNm and 3 kNm without rotational speed measurement, continued



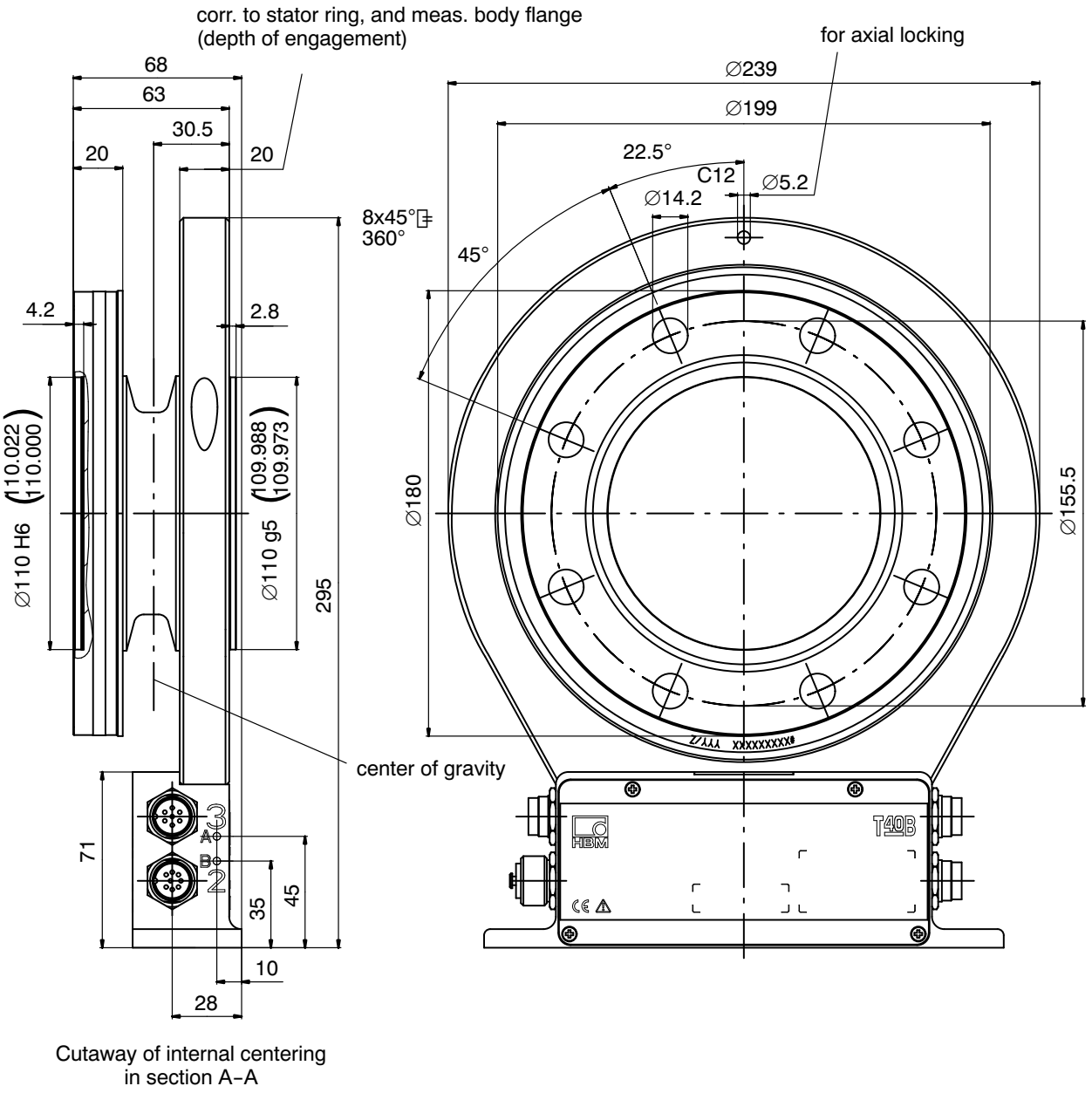
Cutaway of internal centering
in section A–A

Dimensions of T40B/5 kNm without rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



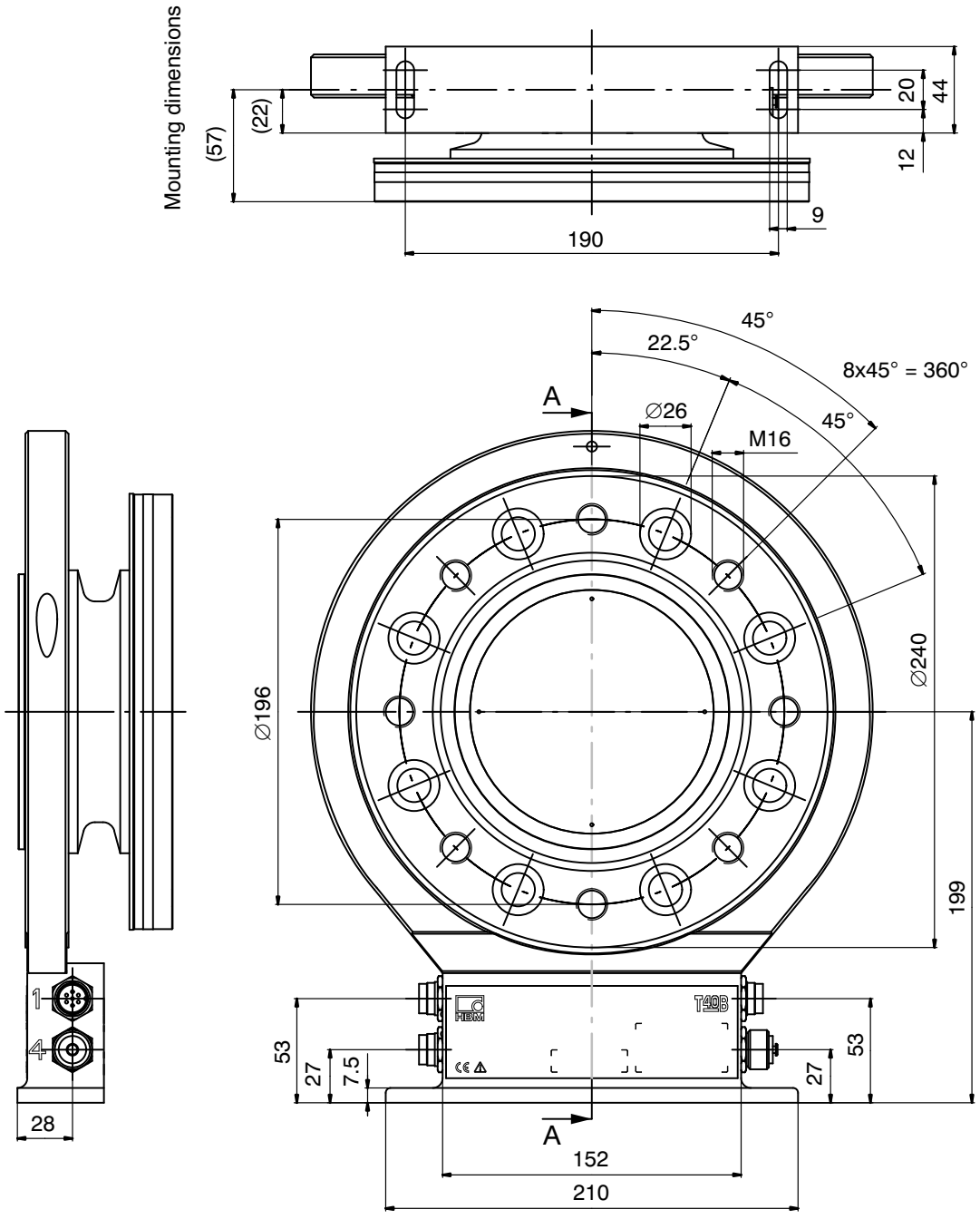
Dimensions of T40B/5 kNm without rotational speed measurement, continued



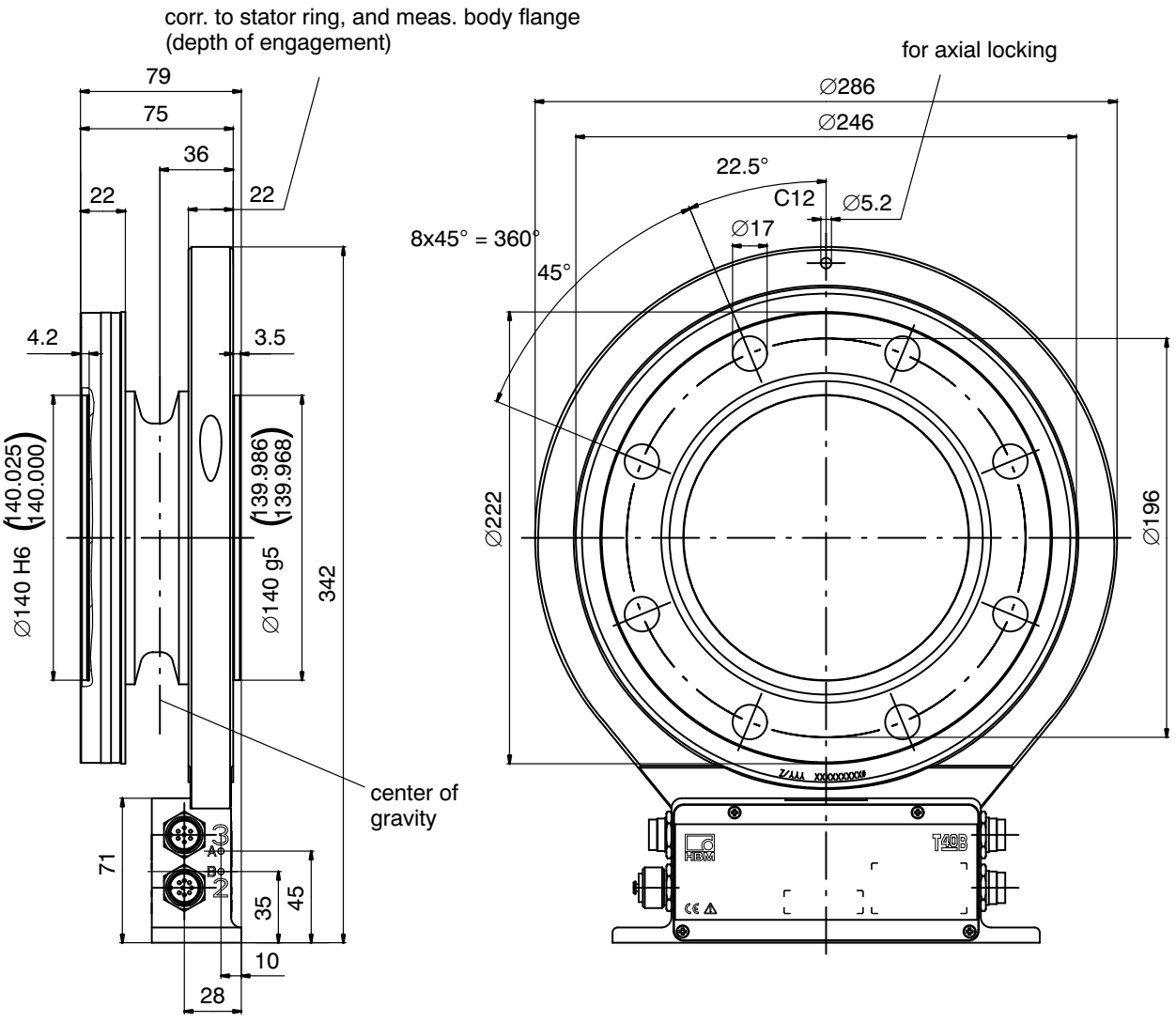
Cutaway of internal centering
in section A–A

Dimensions of T40B/10 kNm without rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



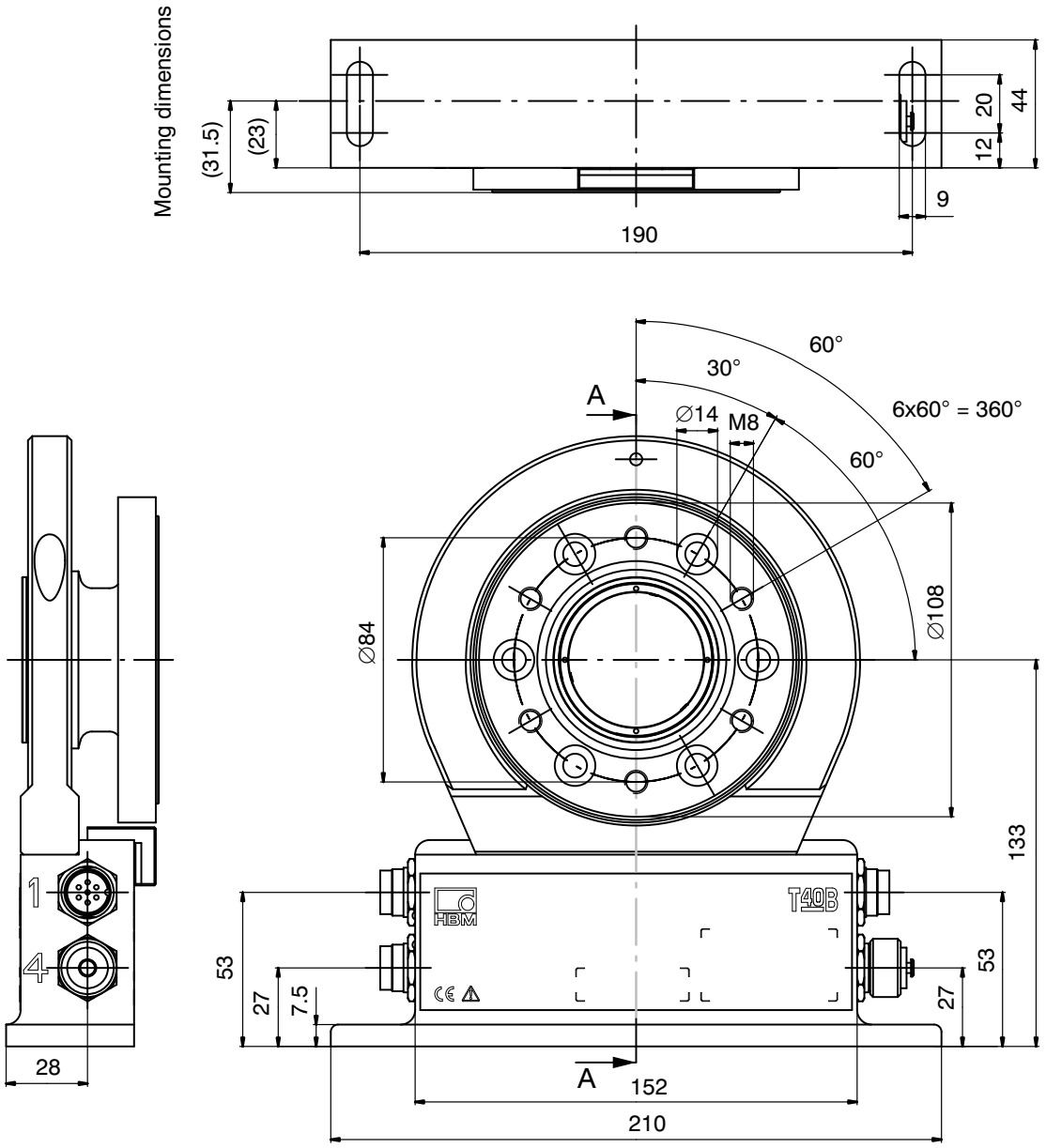
Dimensions of T40B/10 kNm without rotational speed measurement, continued



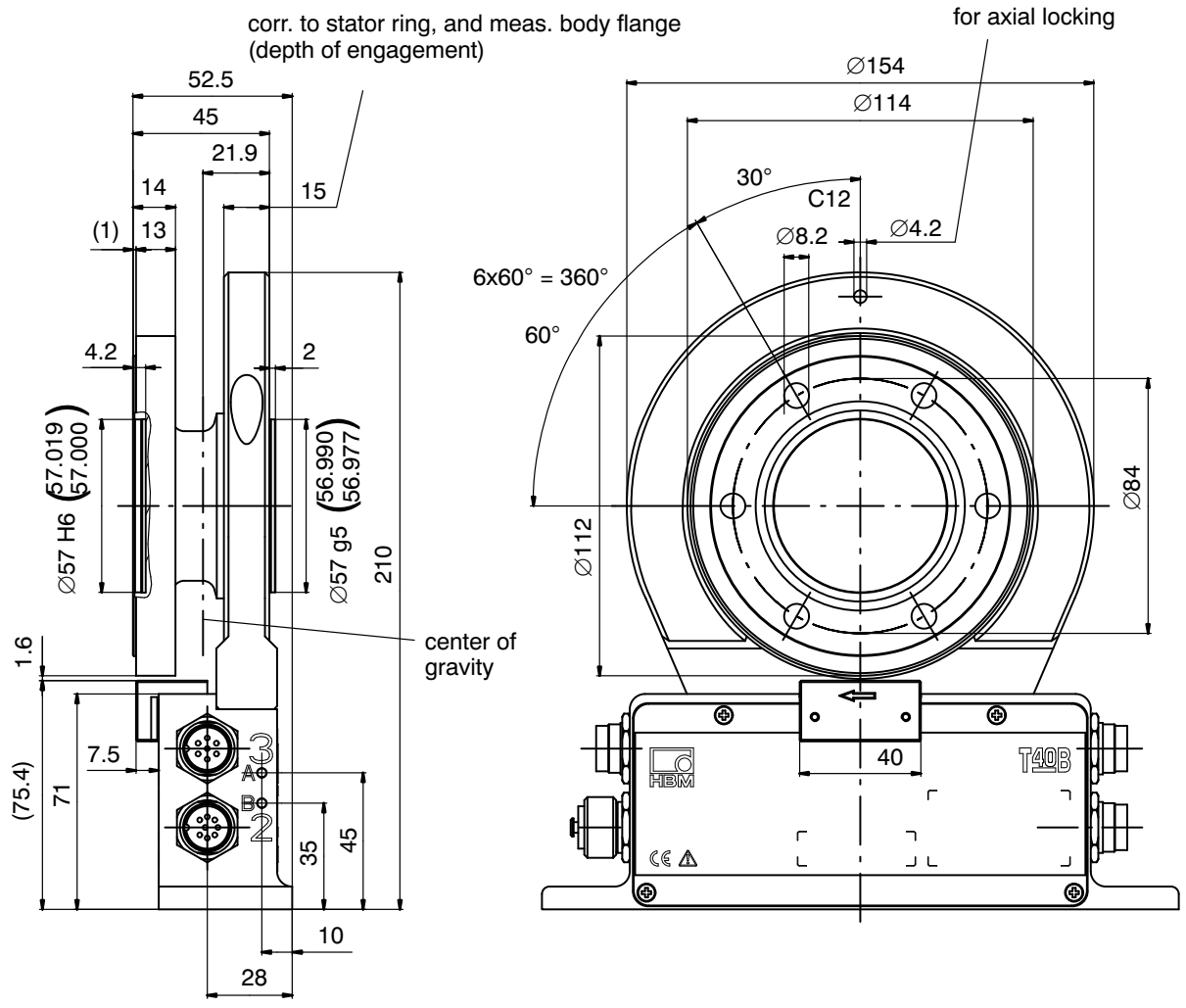
Cutaway of internal centering
in section A–A

Dimensions of T40B/200 Nm with rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



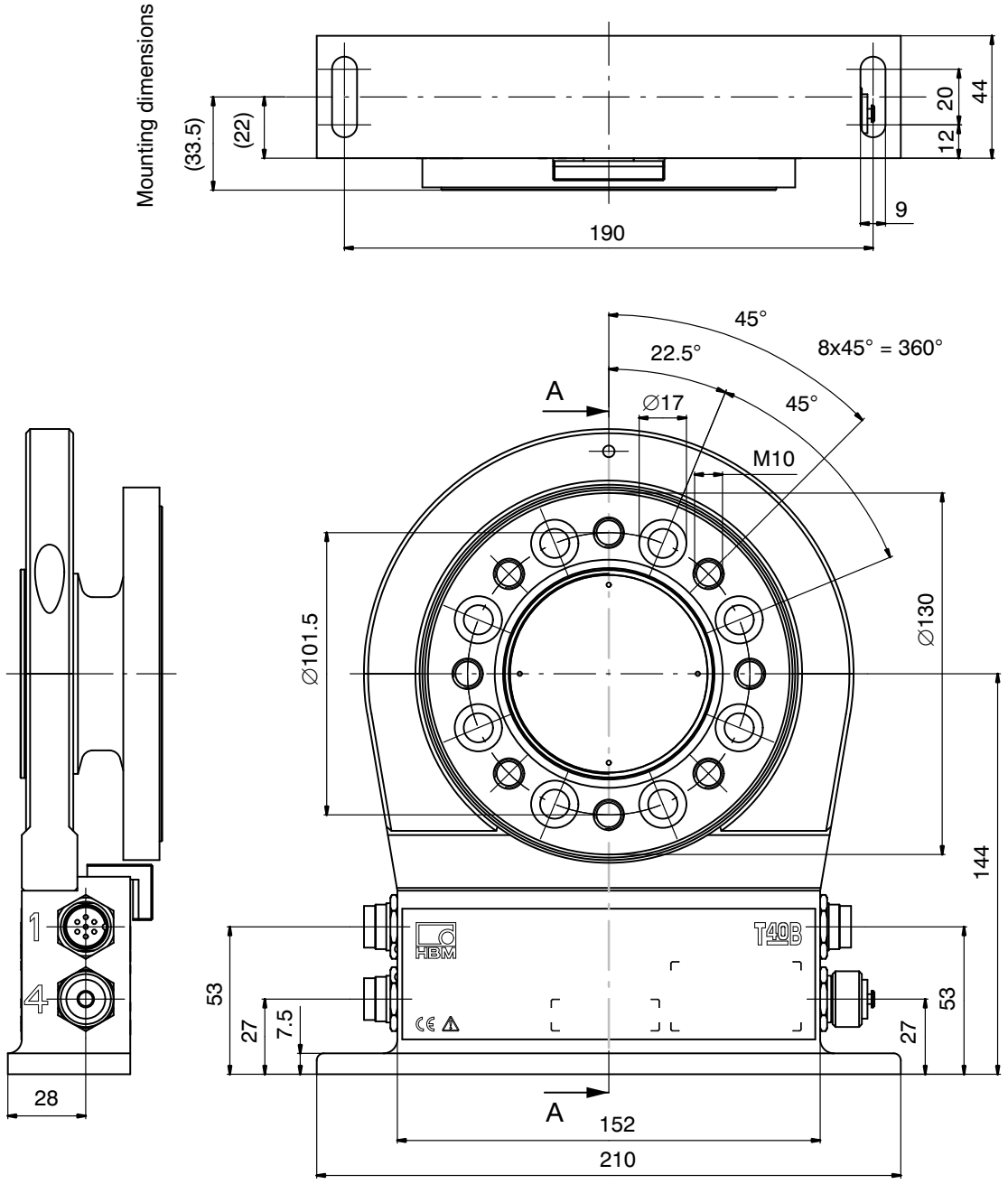
Dimensions of T40B/200 Nm with rotational speed measurement, continued



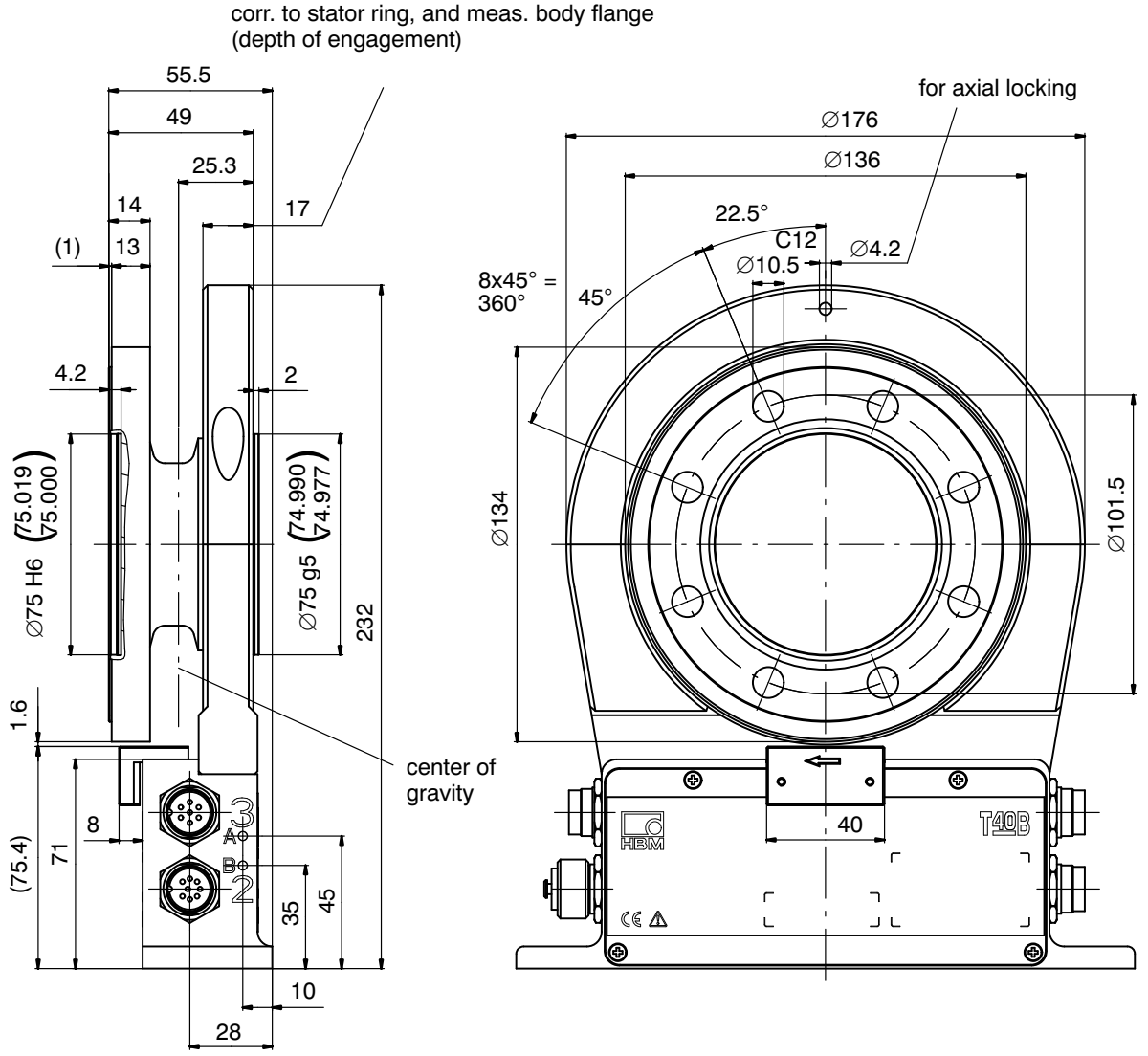
Cutaway of internal centering
in section A–A

Dimensions of T40B/500 Nm and 1 kNm with rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



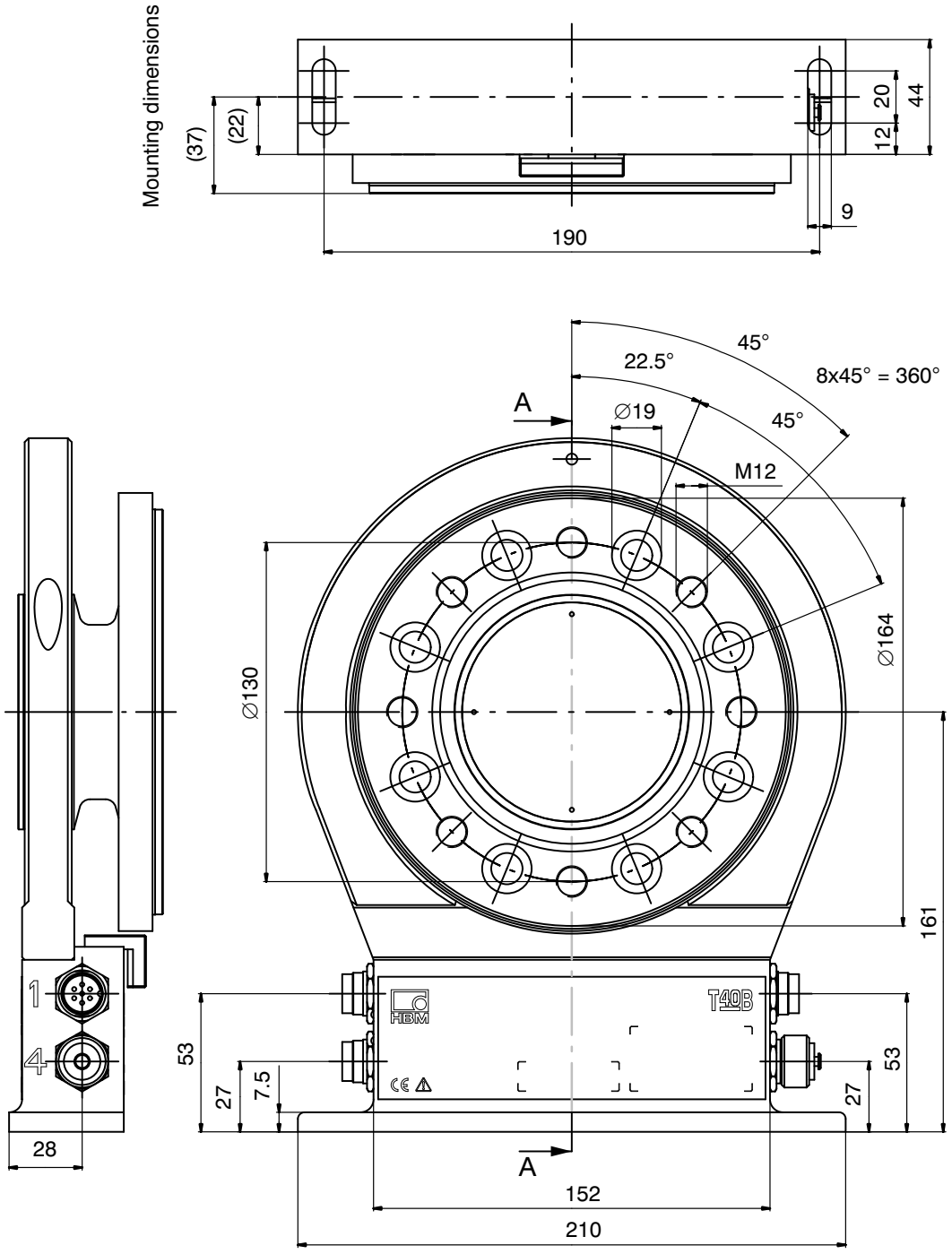
Dimensions of T40B/500 Nm and 1 kNm with rotational speed measurement, continued



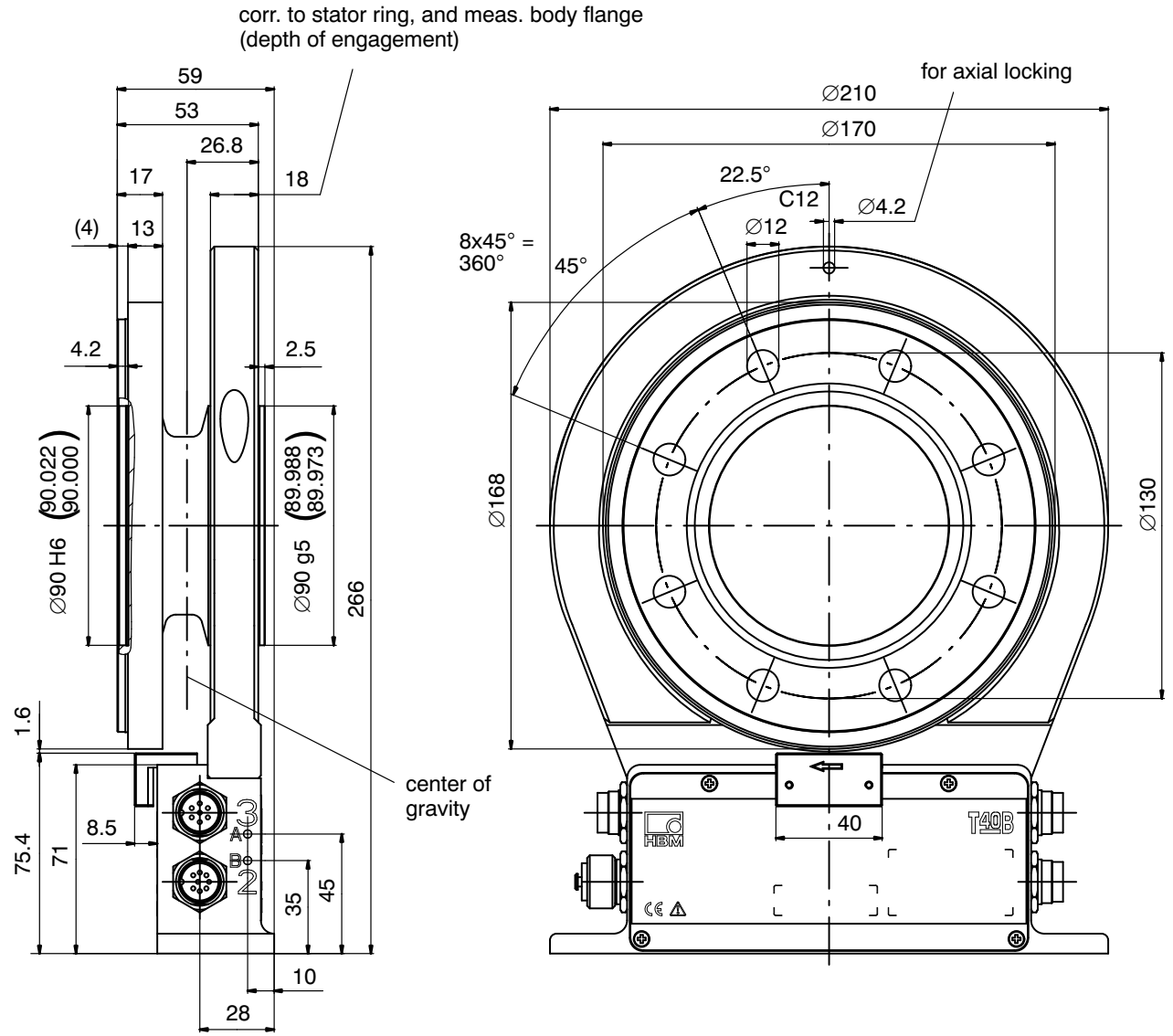
Cutaway of internal centering
in section A–A

Dimensions of T40B/2 kNm and 3 kNm with rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)

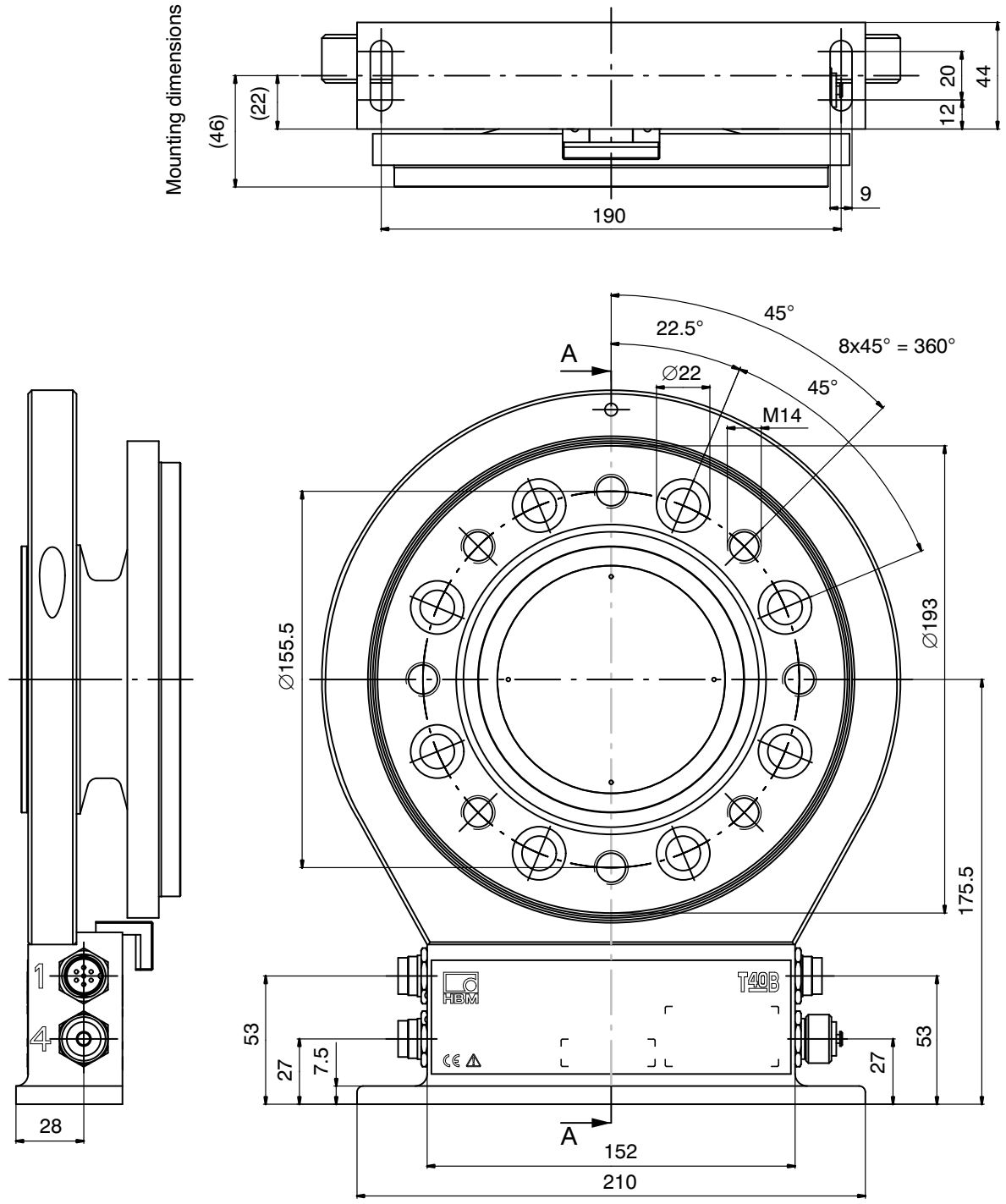


Dimensions of T40B/2 kNm and 3 kNm with rotational speed measurement, continued

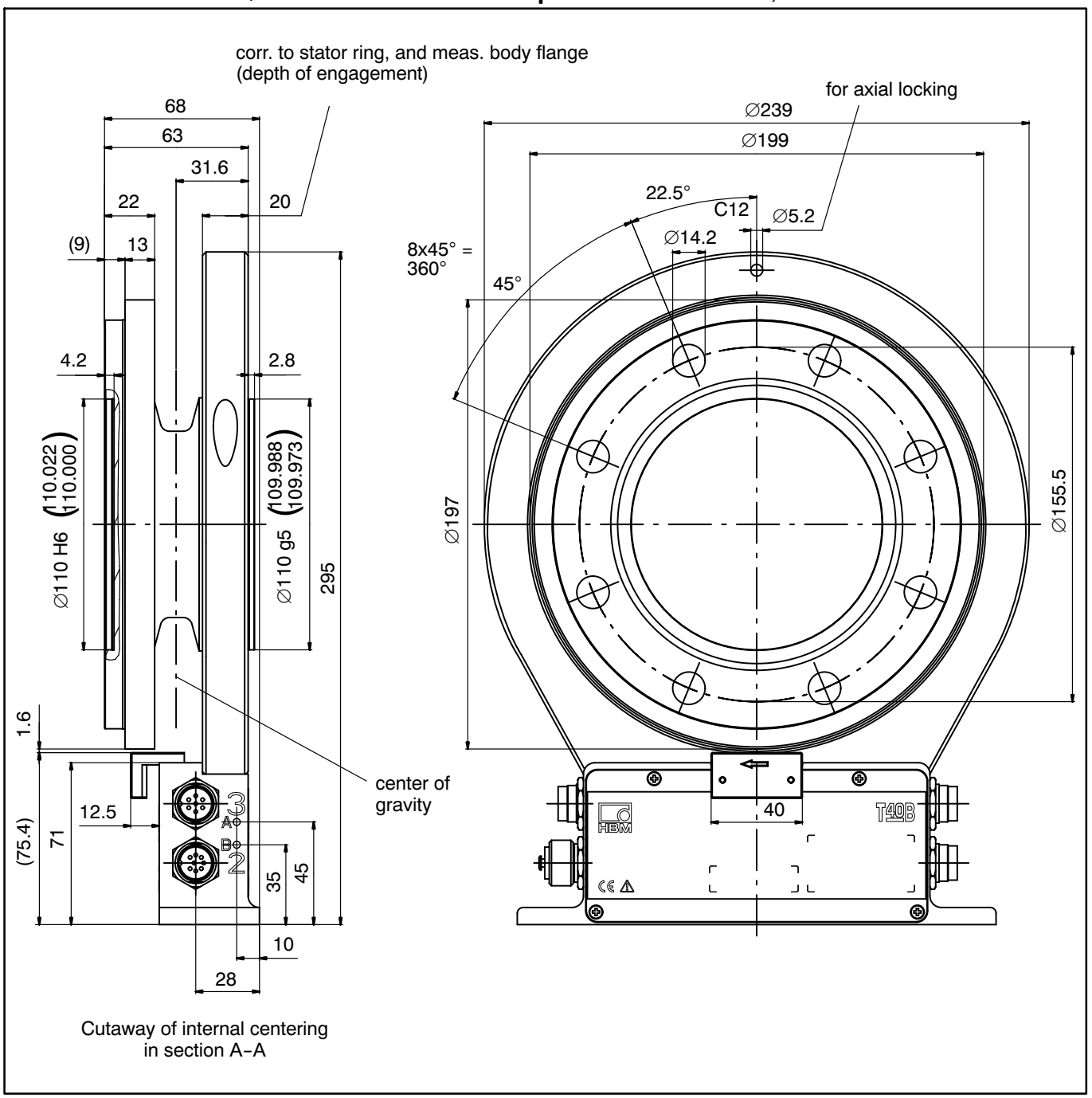


Dimensions of T40B/5 kNm with rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



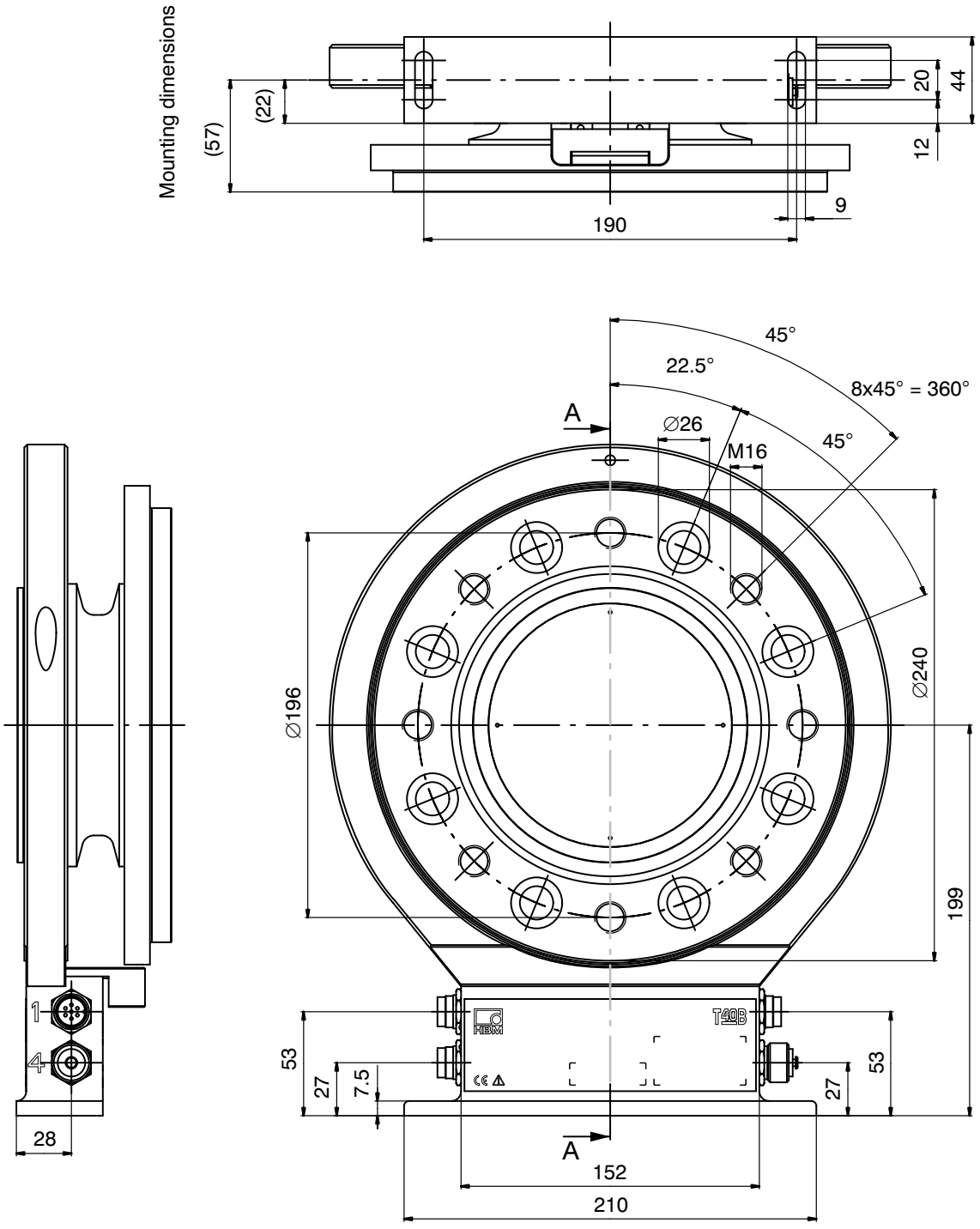
Dimensions of T40B/5 kNm with rotational speed measurement, continued



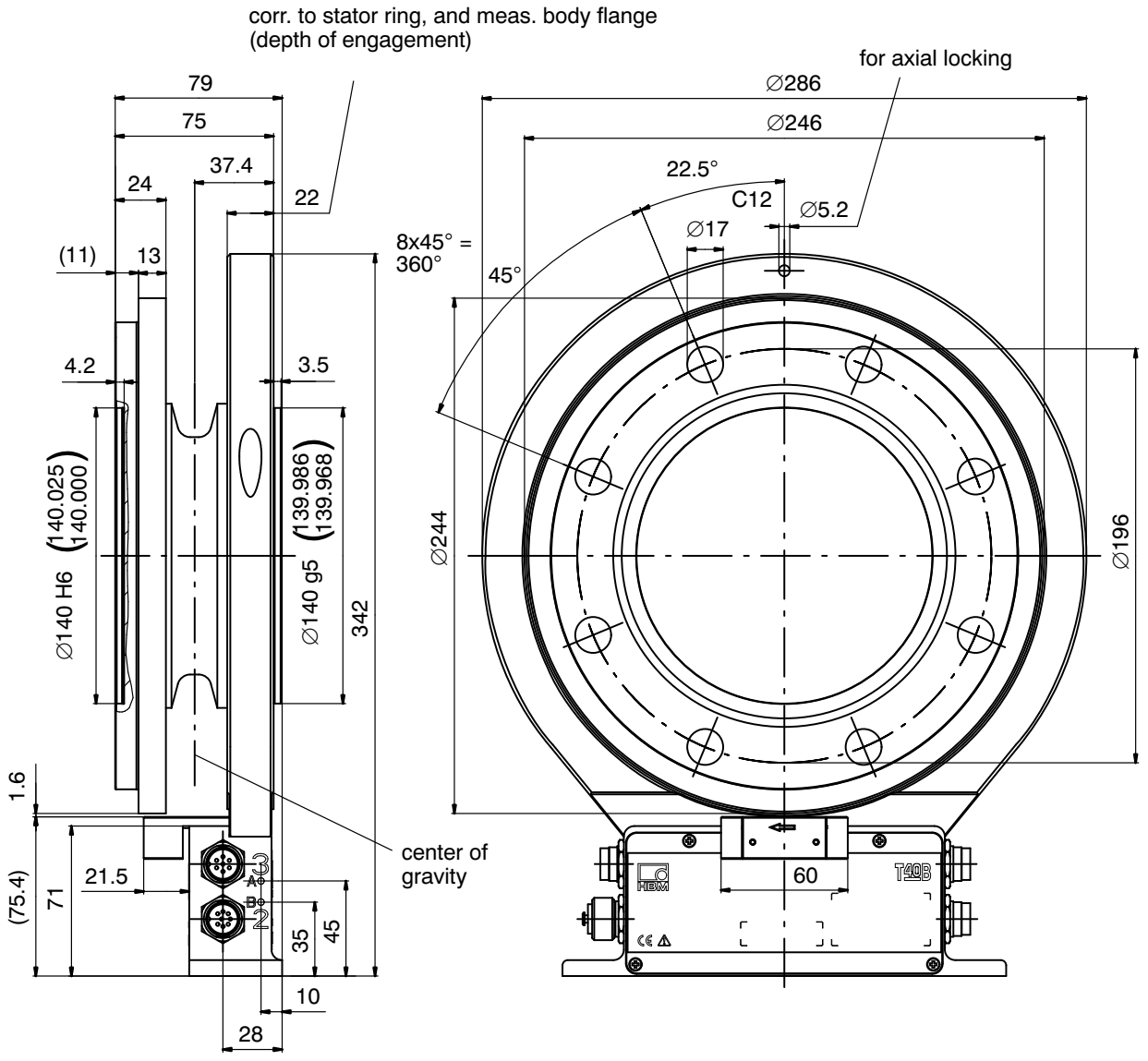
Cutaway of internal centering
in section A–A

Dimensions of T40B/10 kNm with rotational speed measurement

Dimensions in mm (1 mm = 0.03937 inches)



Dimensions of T40B/10 kNm with rotational speed measurement, continued



Cutaway of internal centering
in section A–A

Ordering numbers

Order no.

K-T40B [only with Option 2 = MF / ST]

Code	Option 1: Measuring range up to	
015R	15 kN·m	[only with Option 2 = MF / RO]
020R	20 kN·m	[only with Option 2 = MF / RO]
025R	25 kN·m	[only with Option 2 = MF / RO]
030R	30 kN·m	[only with Option 2 = MF / RO]
040R	40 kN·m	[only with Option 2 = MF / RO]
050R	50 kN·m	[only with Option 2 = MF / RO]
060R	60 kN·m	[only with Option 2 = MF / RO]
070R	70 kN·m	[only with Option 2 = MF / RO]
080R	80 kN·m	[only with Option 2 = MF / RO]

Code	Option 2: Component
MF	Measurement flange, complete
RO	Rotor
ST	Stator

Code	Option 3: Accuracy
S	Standard

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

K-T40B- [ ][ ][ ][ ] - [ ][ ] - **S** - **M** - [ ][ ][ ][ ] - [ ] - **S** = **PREFERENCE Types**

Accessories, to be ordered separately

Article	**Order no.**
Connection cable, set	
Torque connection cable, Binder 423 – D-Sub 15P, 6 m	1-KAB149-6
Torque connection cable, Binder 423 – free ends, 6 m	1-KAB153-6
TMC connection cable, Binder 423 – 16-pin free ends, 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

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