Data sheet

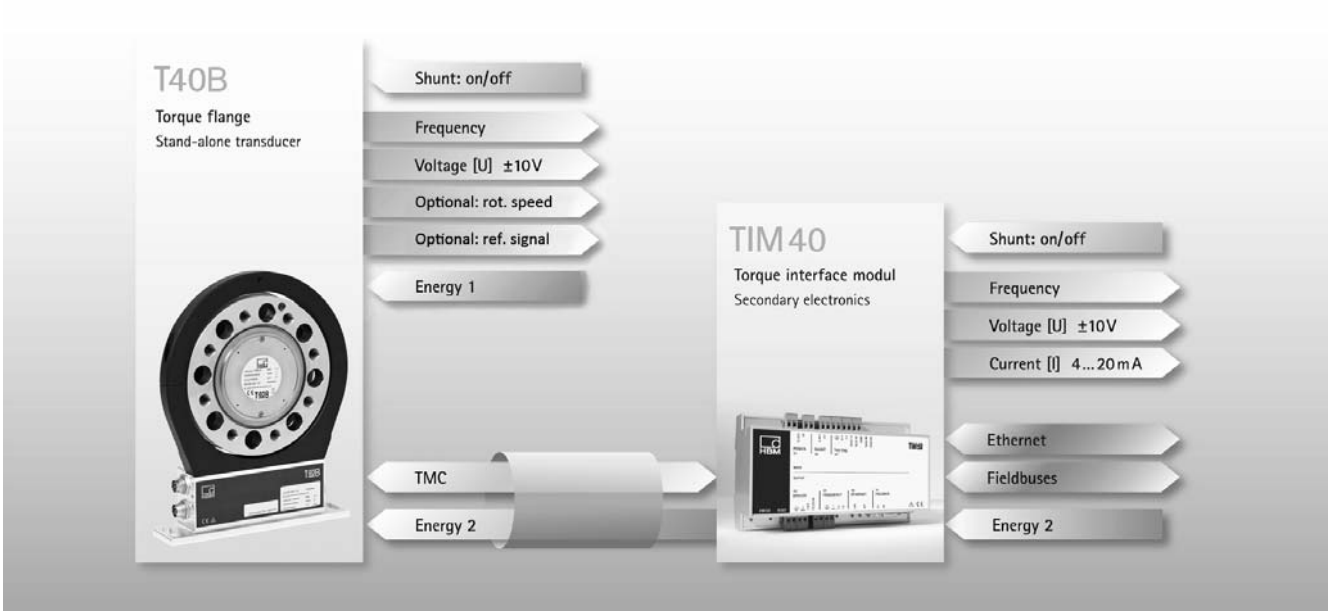
T40B

Torque flange

Special features

- **Nominal (rated) torques 50 N·m, 100 N·m, 200 N·m, 500 N·m, 1 kN·m, 2 kN·m, 3 kN·m, 5 kN·m and 10 kN·m**
- **Nominal (rated) speeds of 10 000 rpm to 20 000 rpm**
- **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: Speed measuring system, reference pulse**

Overall concept



Specifications

Type		T40B								
Accuracy class		0.05								
Torque measuring system										
Nominal (rated) torque M_{nom}	N·m	50	100	200	500					
	kN·m					1	2	3	5	10
Nominal (rated) speed	rpm	20 000					15 000		12 000	10 000
Linearity error including hysteresis, related to the nominal (rated) sensitivity										
Frequency output	%	< ± 0.03								
Voltage output	%	< ± 0.03								
Relative standard deviation of repeatability per DIN 1319, related to the variation of the output signal										
Frequency output	%	< ± 0.03								
Voltage output	%	< ± 0.03								
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	%	± 0.1	± 0.05							
Voltage output	%	± 0.4	± 0.2							
on the zero signal, related to the nominal (rated) sensitivity										
Frequency output	%	± 0.1	± 0.05							
Voltage output	%	± 0.2	± 0.1							
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)	%	± 0.1								
Output signal at torque = zero										
Frequency output	kHz	10/60/240								
Voltage output	V	0								
Nominal 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 at reference temperature										
Frequency output	%	< ± 0.06	< ± 0.03							
Voltage output	%	< ± 0.06	< ± 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								
Maximum control range [6]										
Frequency output	kHz	2.5 … 17.5 [1] / 15 … 105 [2] / 60 … 420 [3]								
Voltage output	V	−12 … +12								

[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	50	100	200	500					
	kN·m					1	2	3	5	10
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								
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								
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 speed for sufficient pulse stability	rpm	0								
Pulse tolerance [7]	Deg.	< ± 0.05								
Maximum permissible output frequency	kHz	420								
Group delay	µs	<150								
Radial nominal 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	Deg.	< approx. 0.2								
Horizontal stator vibration displacement	mm	< approx. 0.5								
Magnetic loading 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								
Reference pulse measuring system (0 index)										
Measurement system		Magnetic, with Hall sensor and magnet								
Output signal	V	5V symmetric (RS 422)								
Pulses per revolution		1								
Minimum speed for sufficient pulse stability	rpm	2								
Pulse width, approx.	Deg.	0.088								
Pulse tolerance [7]	Deg.	< ± 0.05								
Group delay	µs	<150								
Axial nominal distance between sensor head and magnetic ring (mechanical distance)	mm	2.0								
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								

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.

Nominal (rated) torque M_{nom}	N·m	50	100	200	500					
	kN·m					1	2	3	5	10
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								
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								
Load limits [11]										
Limit torque, related to M_{nom} [12]	%	400	200					160		
Breaking torque, related to M_{nom} [12]	%	800	> 400					> 320		
Longitudinal limit force [13]	kN	5	5	10	13	19	30	35	60	80
Lateral limit force [13]	kN	1	1	2	4	5	9	10	12	18
Limit bending moment [13]	N·m	50	50	100	200	220	560	600	800	1200
Oscillation width per DIN 50100 (peak-to-peak) [14]	N·m	200	200	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 forces 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.

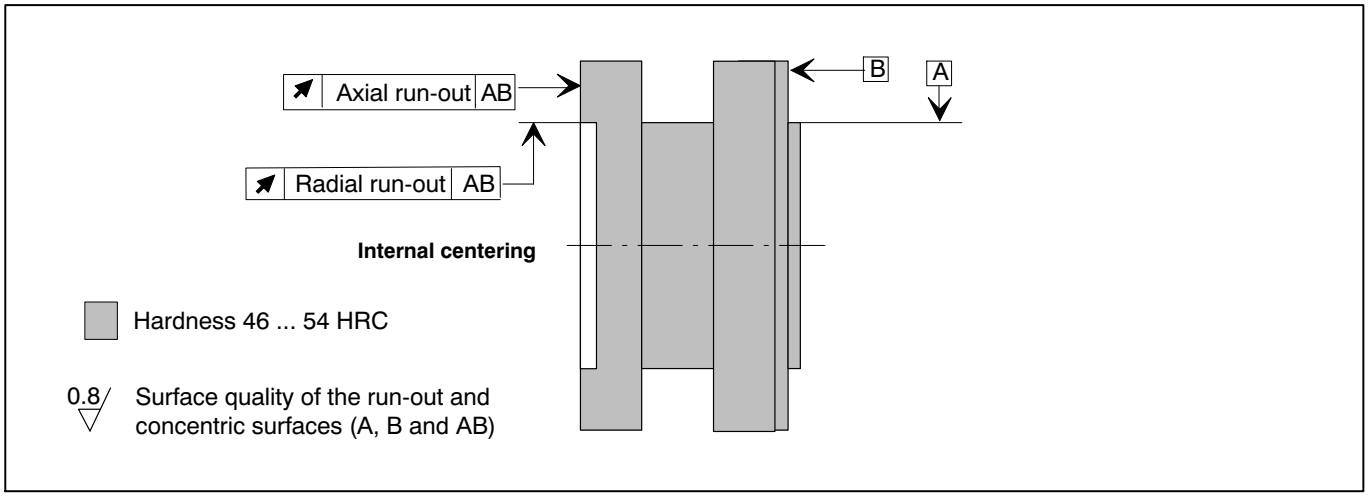
Specifications (continued)

Nominal (rated) torque M_{nom}	N·m	50	100	200	500					
	kN·m					1	2	3	5	10
Mechanical values										
Torsional stiffness c_T	kN·m/rad	180	180	360	745	1165	2515	3210	5565	14335
Torsion angle at M_{nom}	Deg.	0.016	0.032	0.032	0.038	0.049	0.046	0.054	0.051	0.040
Stiffness in the axial direction c_a	kN/mm	285	285	540	450	580	540	570	760	960
Stiffness in the radial direction c_r	kN/mm	160	160	315	560	860	1365	1680	2080	2940
Stiffness during the bending moment round a radial axis c_b	kN·m/deg.	1.9	1.9	3.6	4.2	5.9	9	9.3	20.2	45.5
Maximum deflection at longitudinal force limit	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 bending limit 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] Undulations in area of connection flange, based on ISO 7919-3										
Normal operation (continuous operation)	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$ (n in rpm^{-1})								
Start and stop operation/resonance ranges (temporary)	µm	$s_{(p-p)} = \frac{13200}{\sqrt{n}}$ (n in rpm^{-1})								
Mass moment of inertia of the rotor J_V										
without speed measuring system	$kg·m^2$	0.0010	0.0010	0.0017	0.0039		0.0128		0.0292	0.0771
with a magnetic speed measuring system	$kg·m^2$	0.0015	0.0015	0.0022	0.0048		0.0145	0.0146	0.0333	0.0872
Proportional mass moment of inertia for the transmitter side (side of the flange with external centering)										
without speed measuring system	% of J_V	68	68	62	59		54		53	54
with a magnetic speed measuring system	% of J_V	44	44	48	48		48		47	48
Max. permissible static eccentricity of the rotor (radially) to the center point of the stator										
without speed measuring system	mm	±2								
Permissible axial displacement between rotor and stator [16]										
without speed measuring system	mm	±2								
Weight										
Rotor without speed measuring system	kg	0.7	0.7	1.1	1.9		3.8	3.9	6.5	10.9
Rotor with magnetic speed measuring system	kg	0.8	0.8	1.3	2.1		4.1	4.1	6.9	11.7
Stator	kg	1.1	1.1	1.1	1.1		1.1	1.1	1.2	1.3

15) 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 wave oscillation.

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

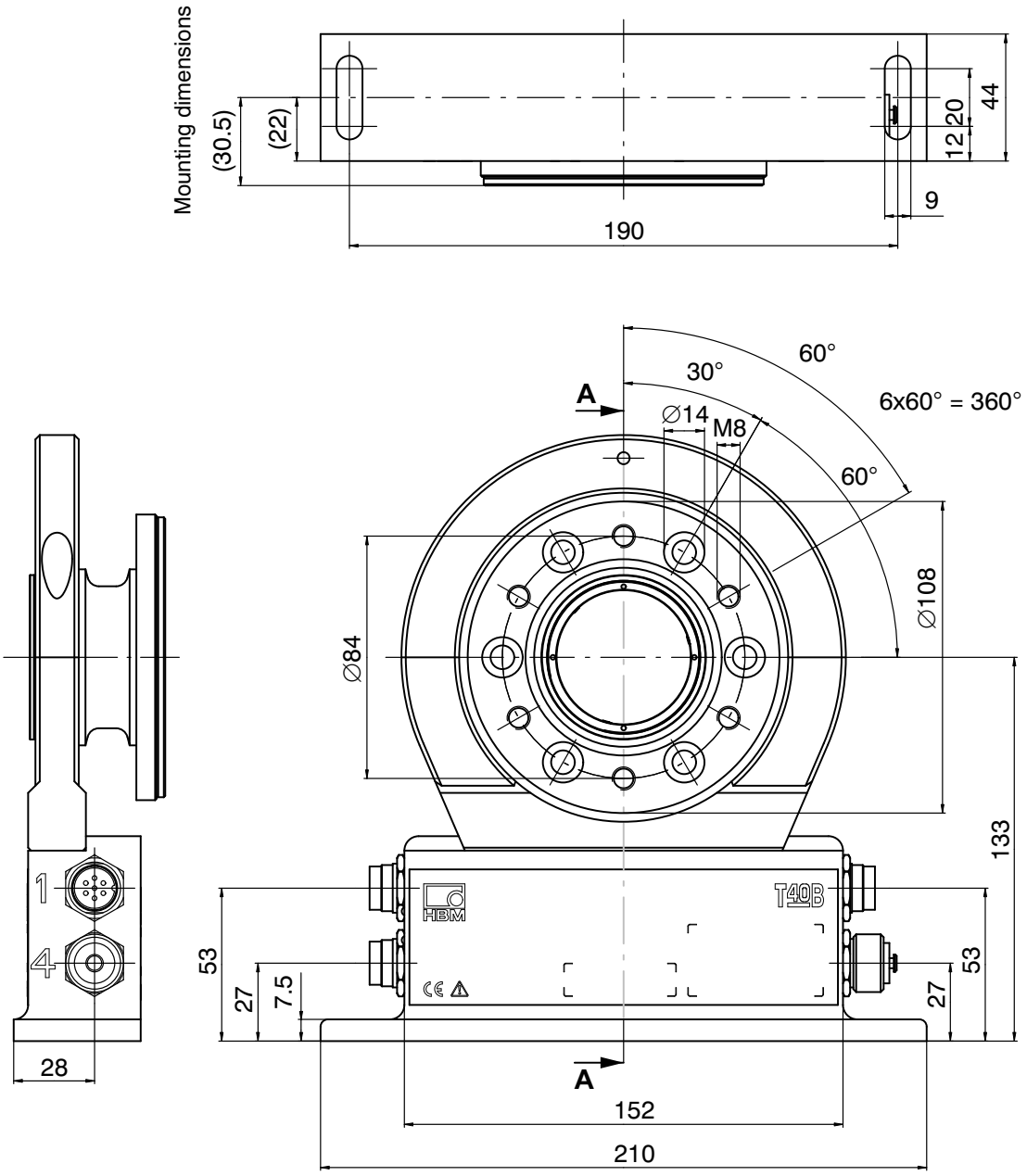
Radial and axial run-out tolerances



Measuring range (N·m)	Axial run-out tolerance (mm)	Radial run-out tolerance (mm)
50	0.01	0.01
100	0.01	0.01
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

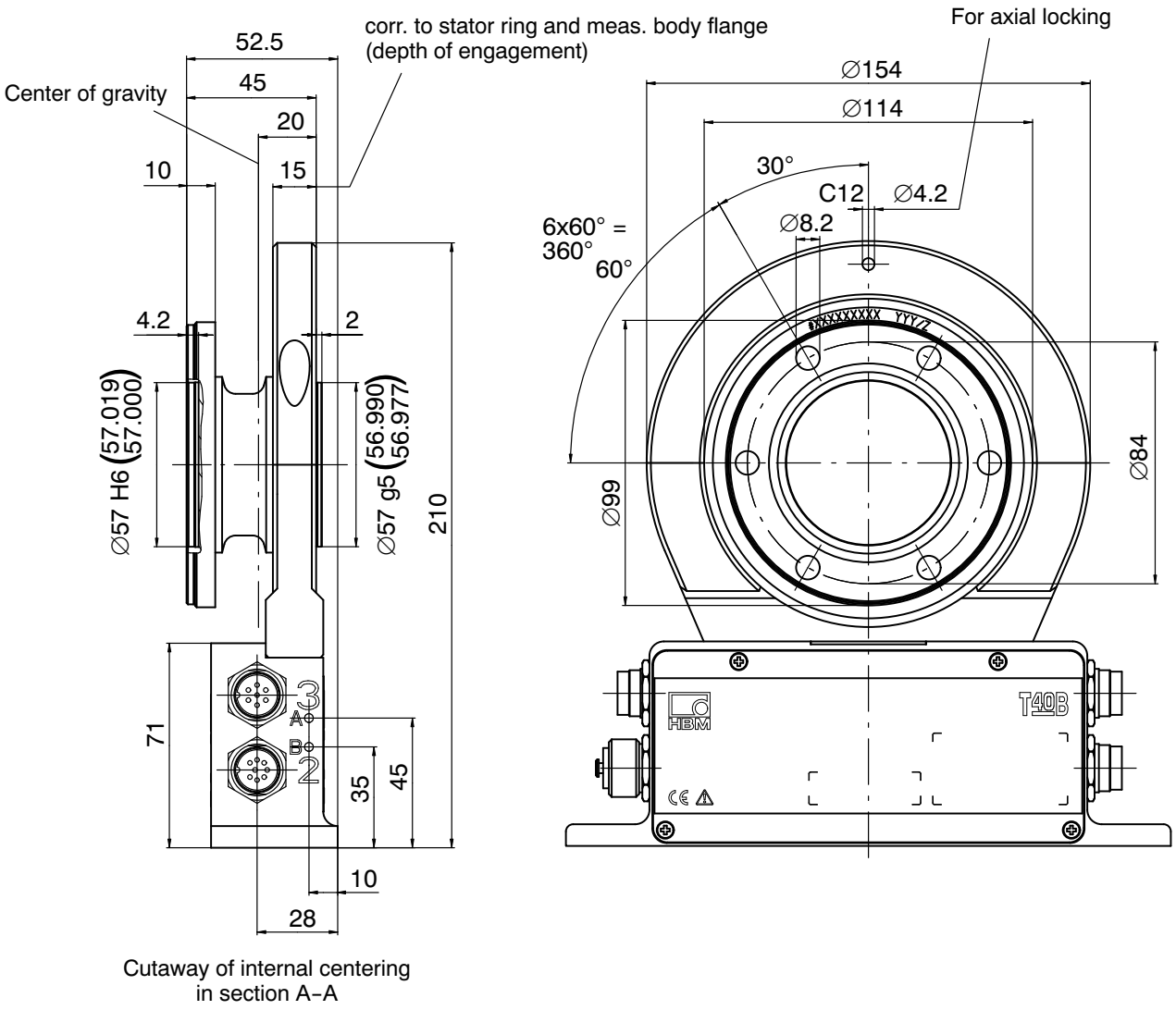
Dimensions of T40B/50 Nm and 100 Nm without speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



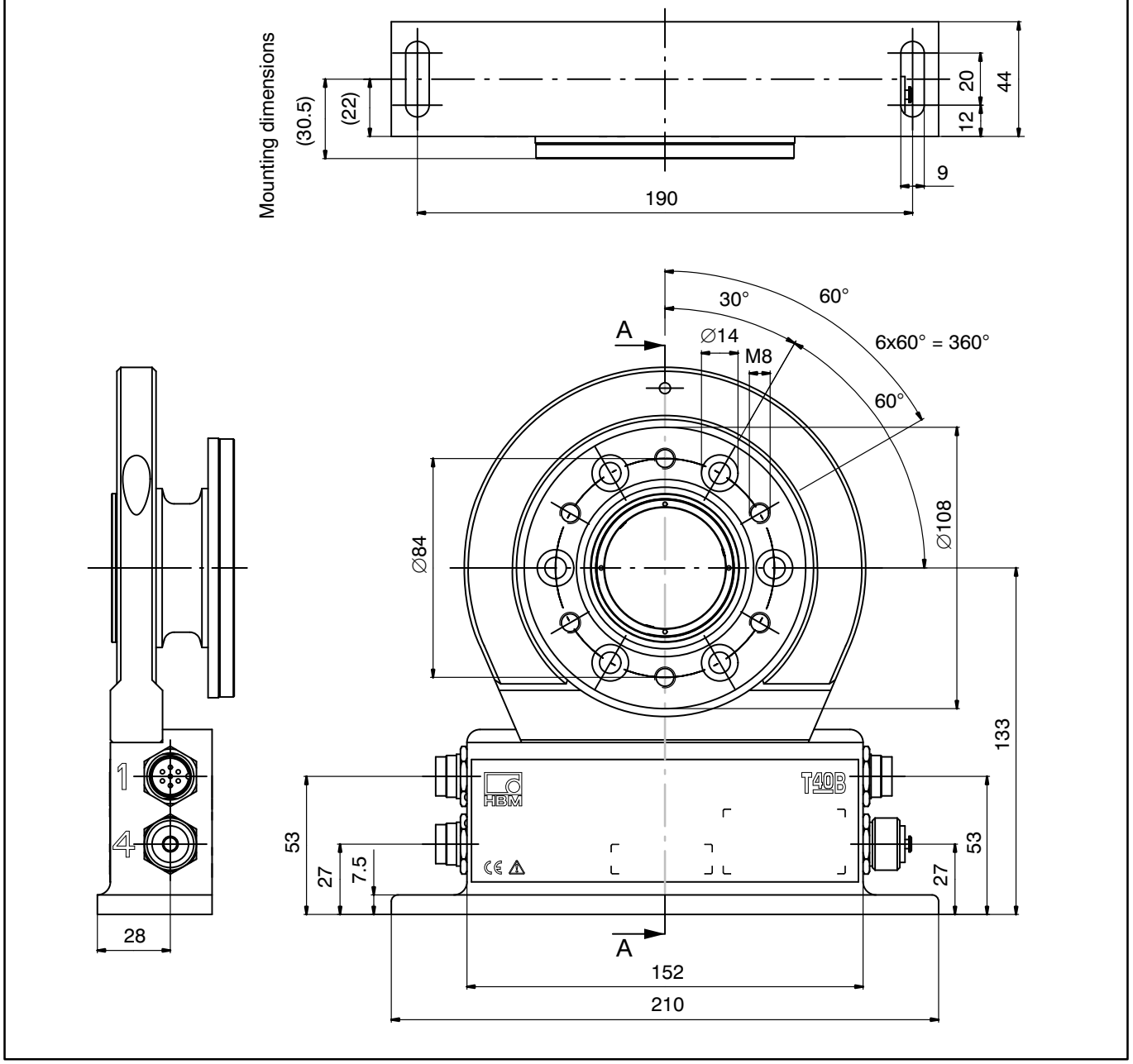
Dimensions of T40B/50 Nm and 100 Nm without speed measurement, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



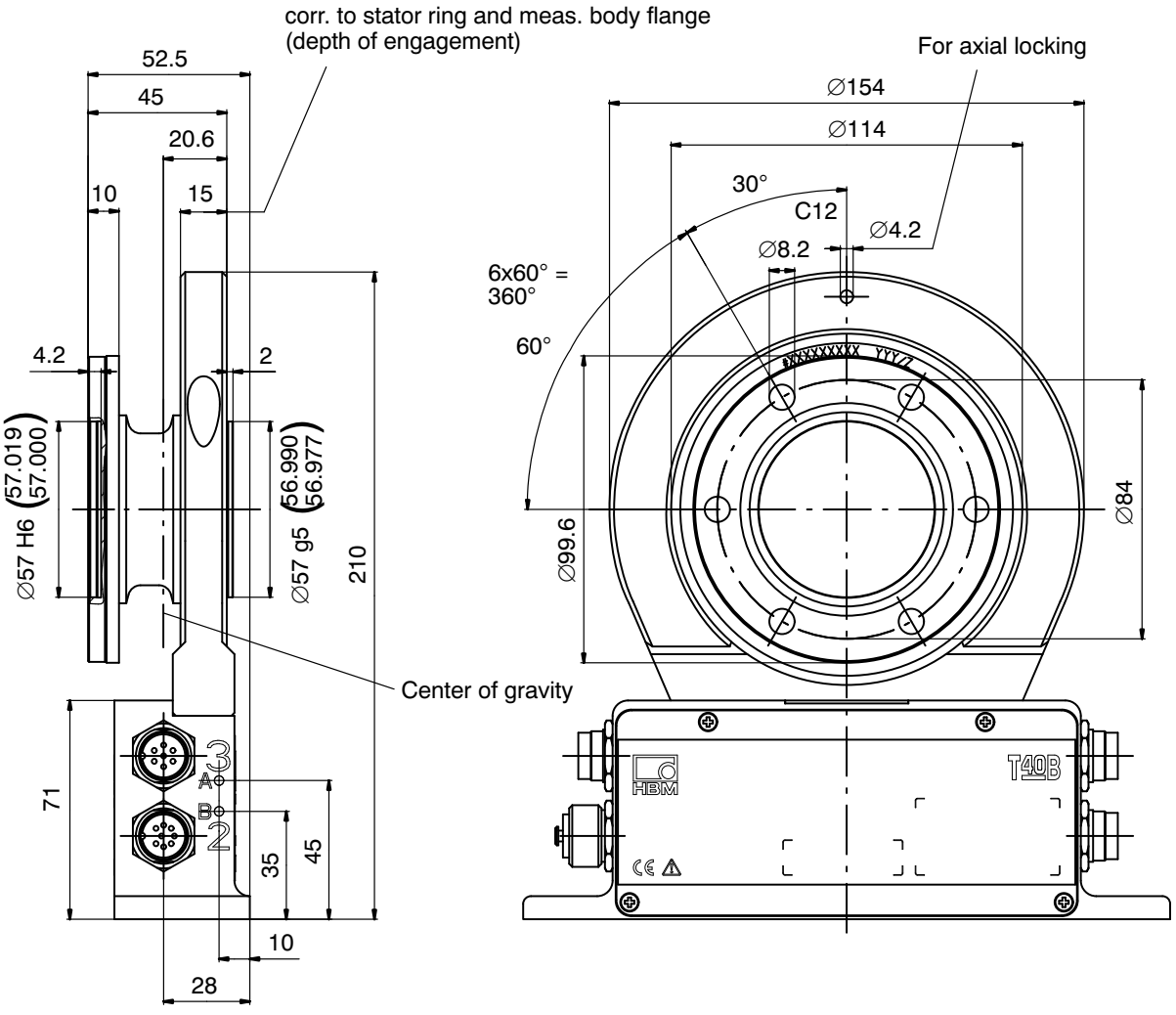
Dimensions of T40B/200 Nm without rotational speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



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

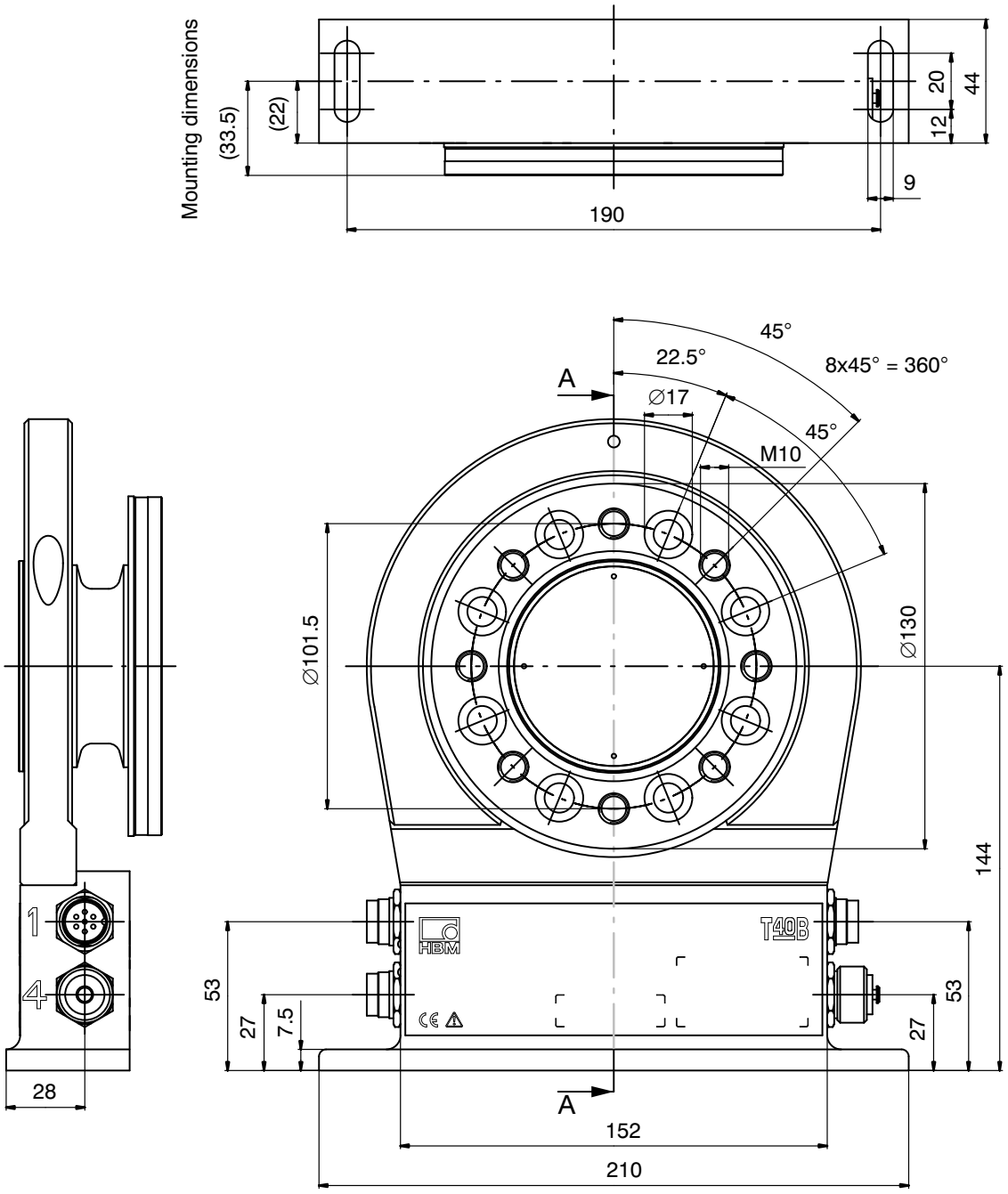
Dimensions (in mm; 1 mm = 0.03937 inches)



Cutaway of internal centering
in section A–A

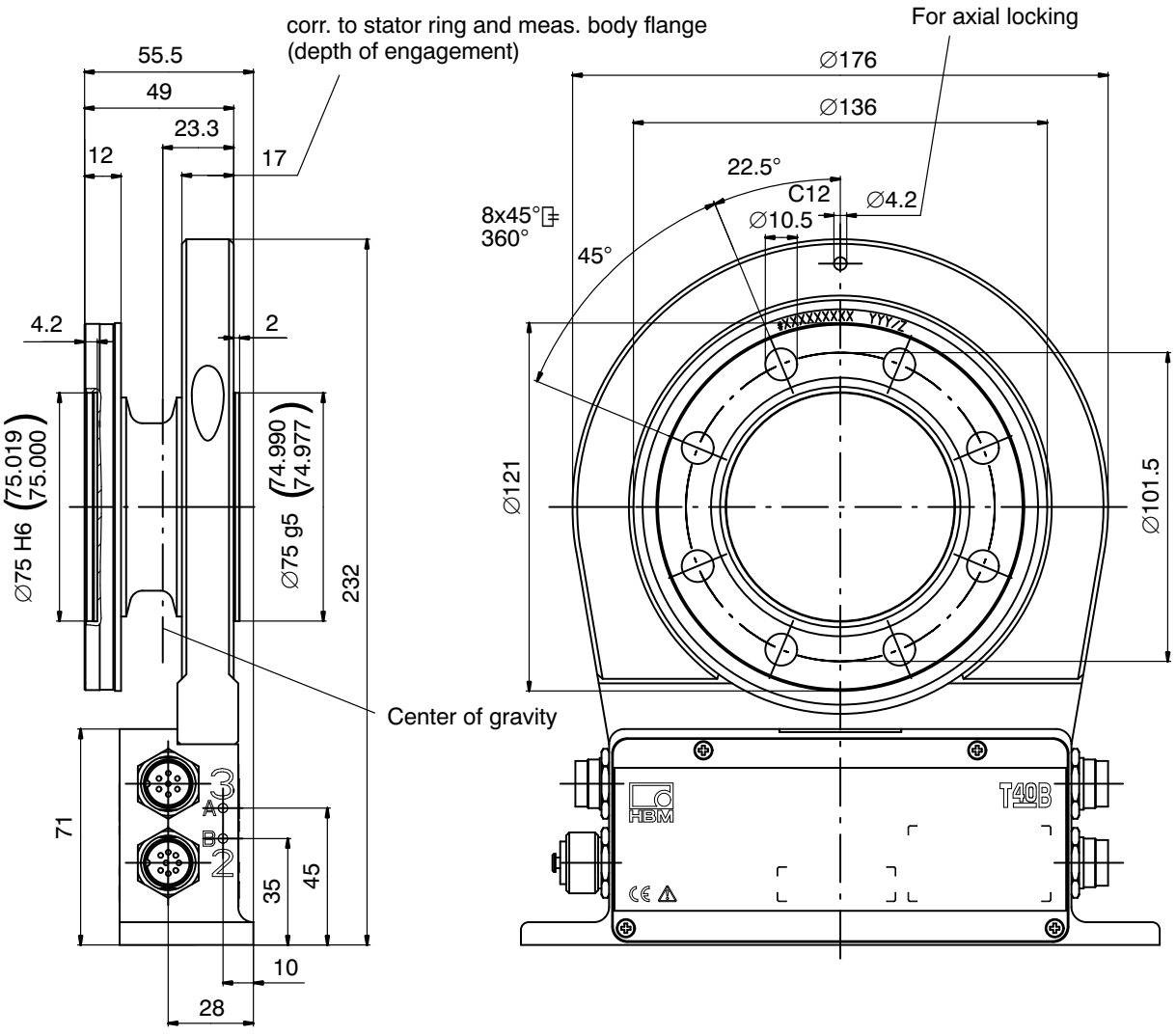
Dimensions of T40B/500 Nm and 1 kNm without speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



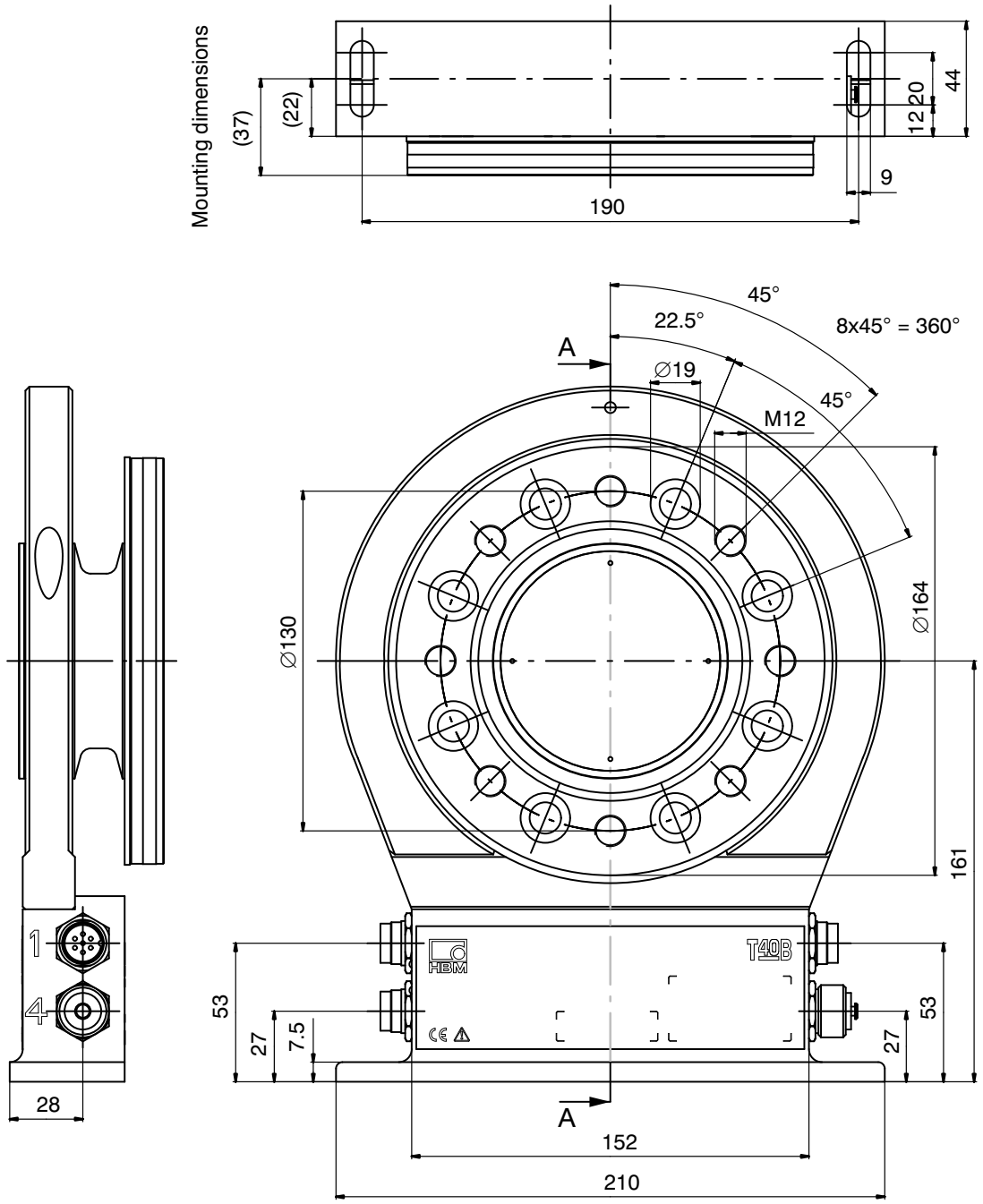
Dimensions of T40B/500 Nm and 1 kNm without rotational speed measurement, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



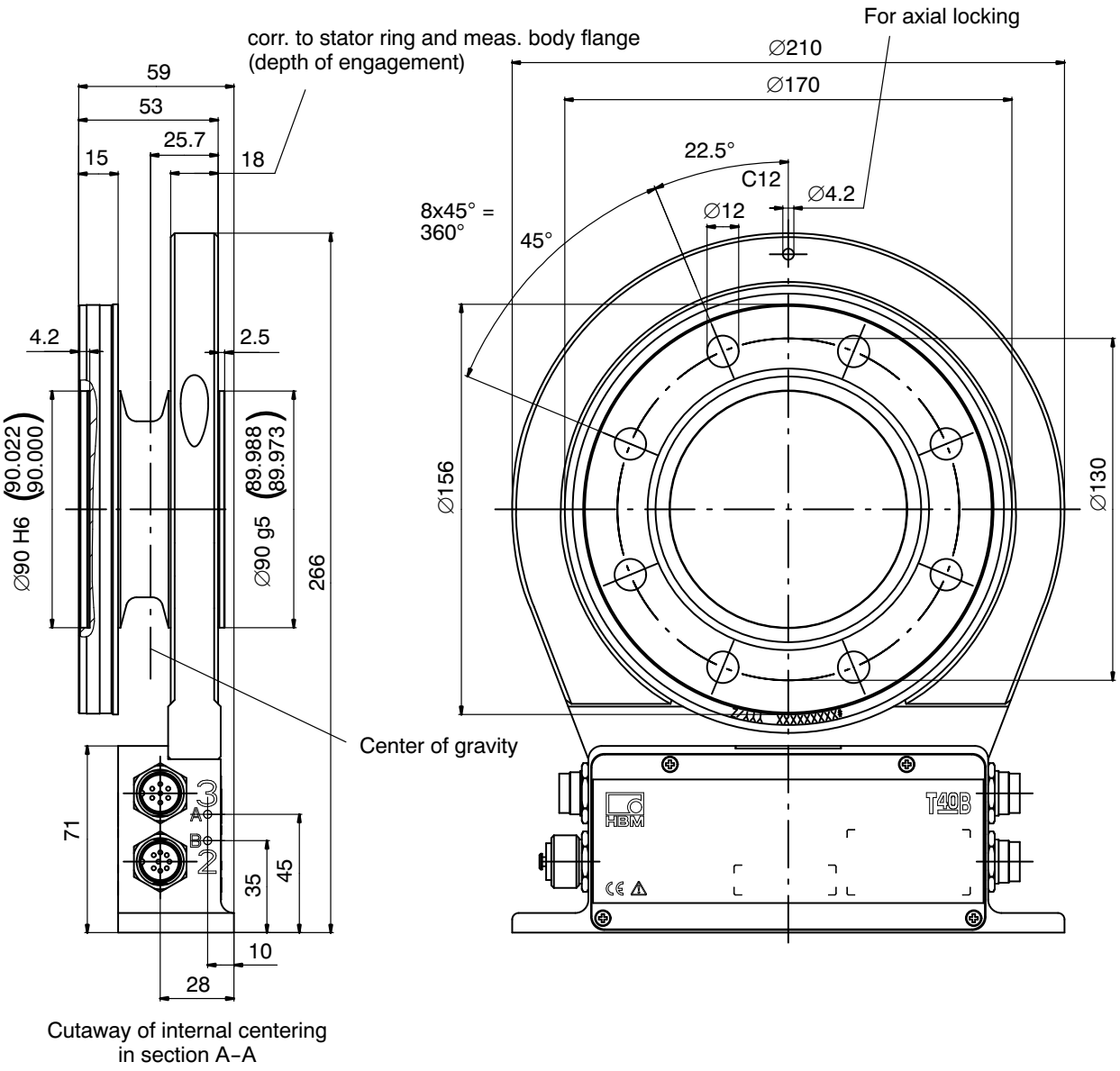
Dimensions of T40B/2 kNm and 3 kNm without rotational speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



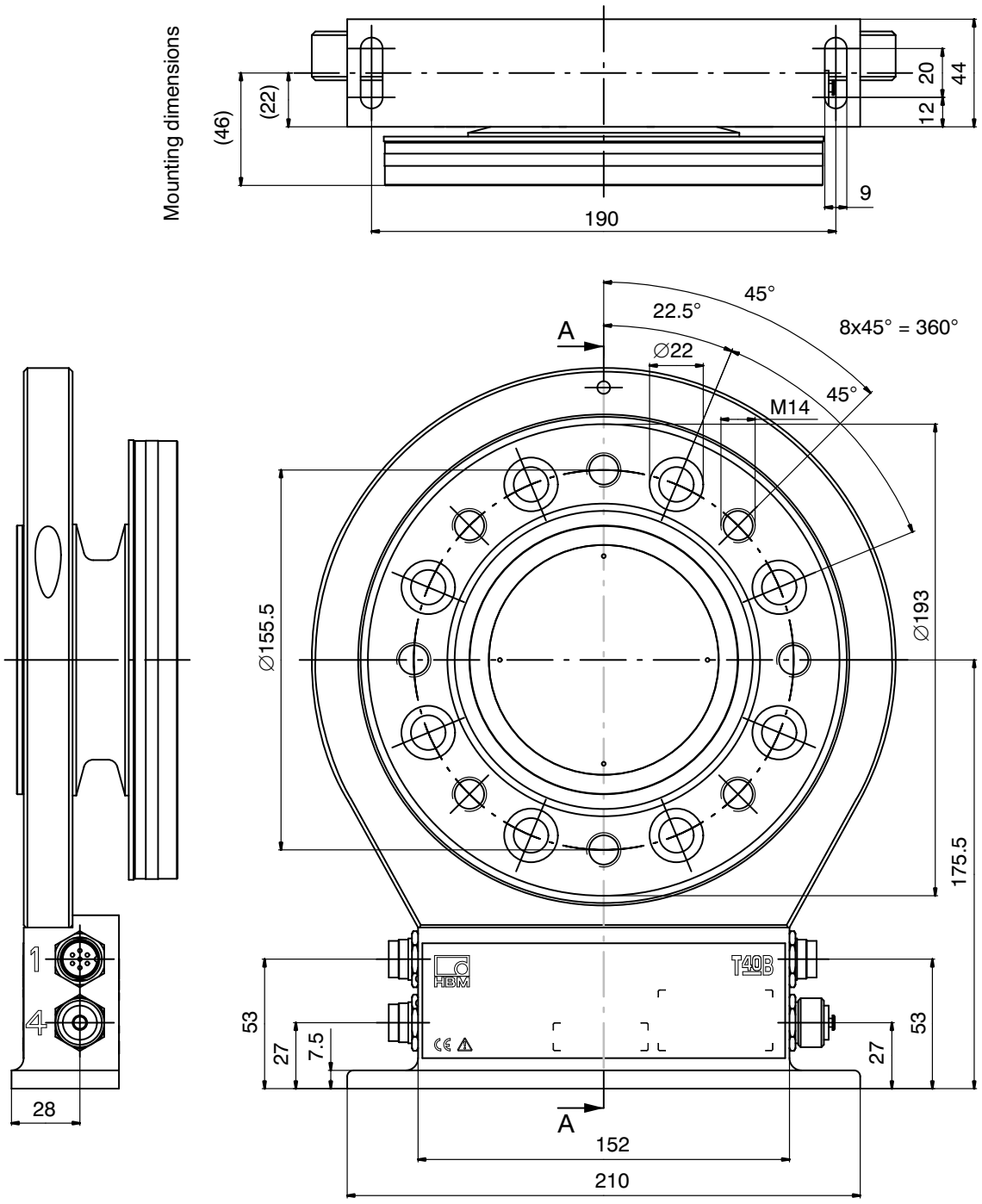
Dimensions of T40B/2 kNm and 3 kNm without rotational speed measurement, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



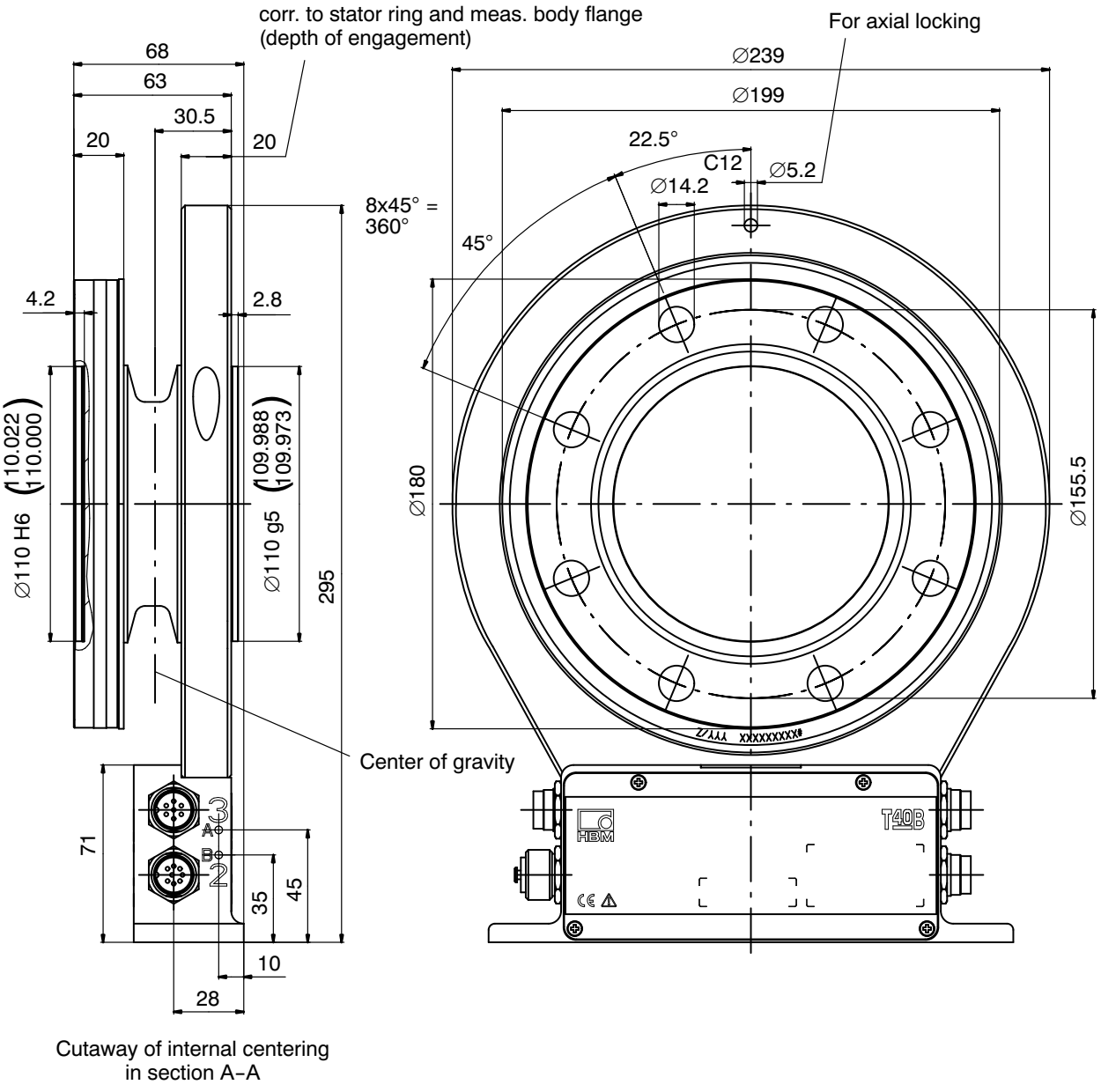
Dimensions of T40B/5 kNm without rotational speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



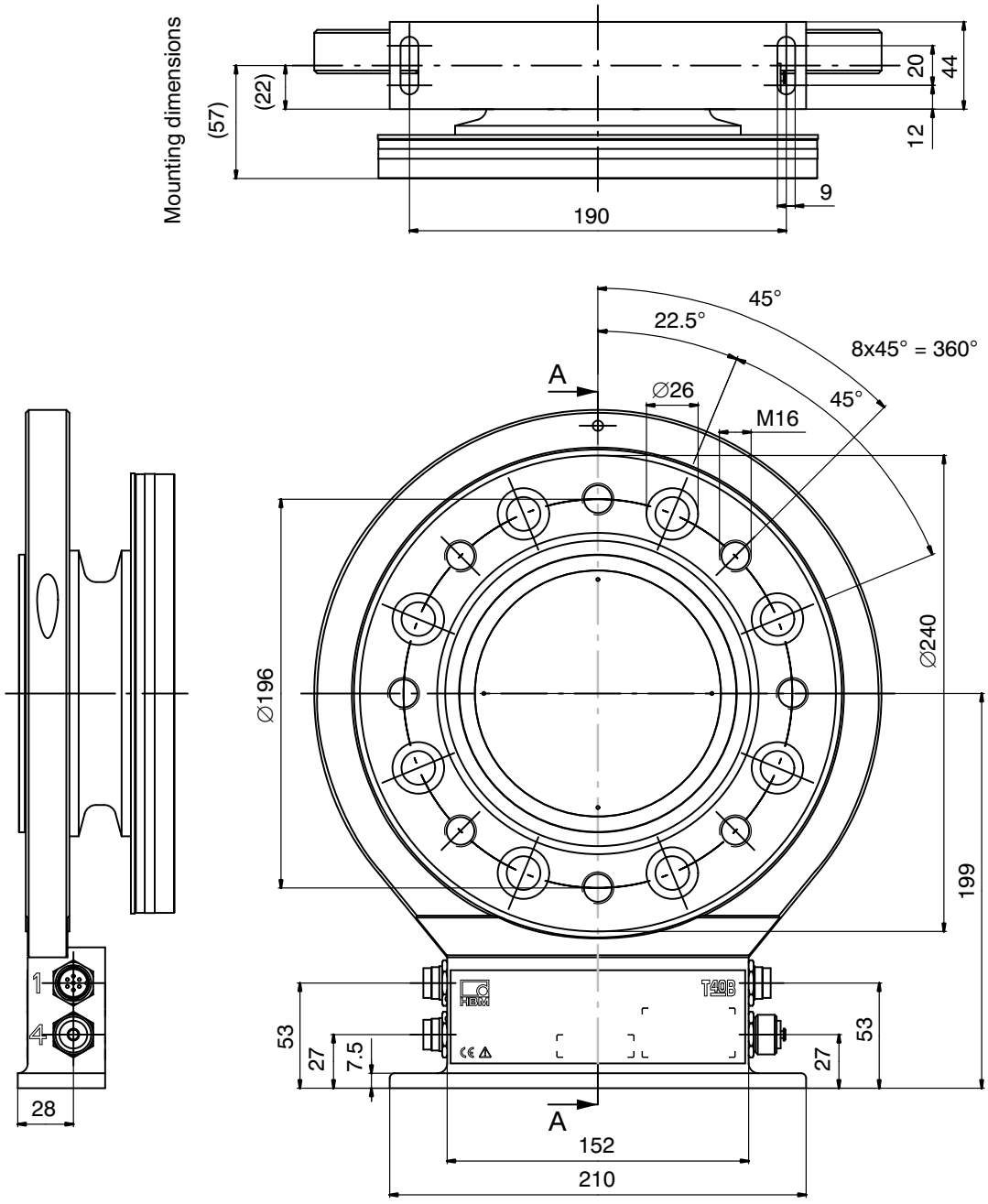
Dimensions of T40B/5 kNm without rotational speed measurement, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



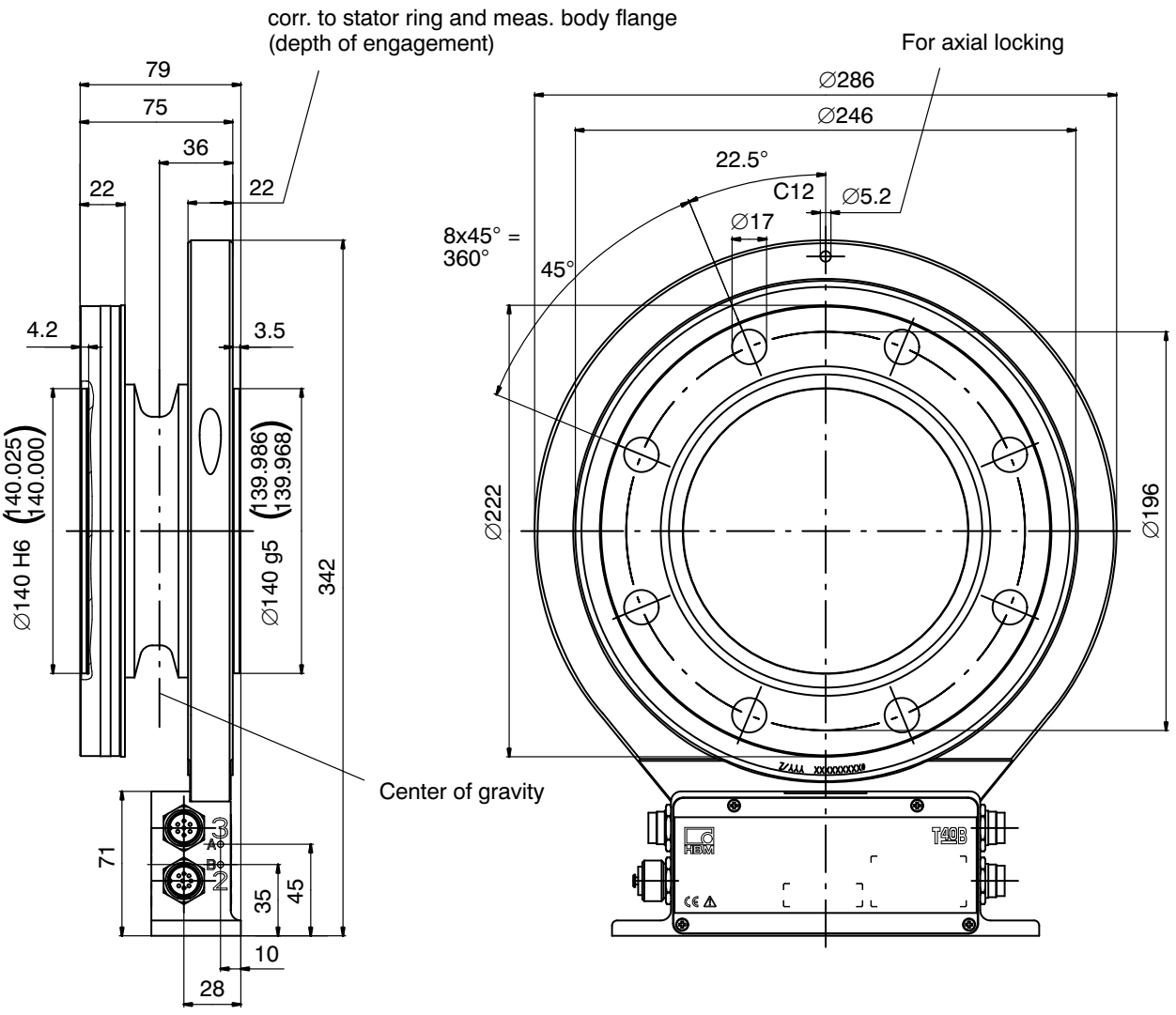
Dimensions of T40B/10 kNm without rotational speed measurement

Dimensions (in mm; 1 mm = 0.03937 inches)



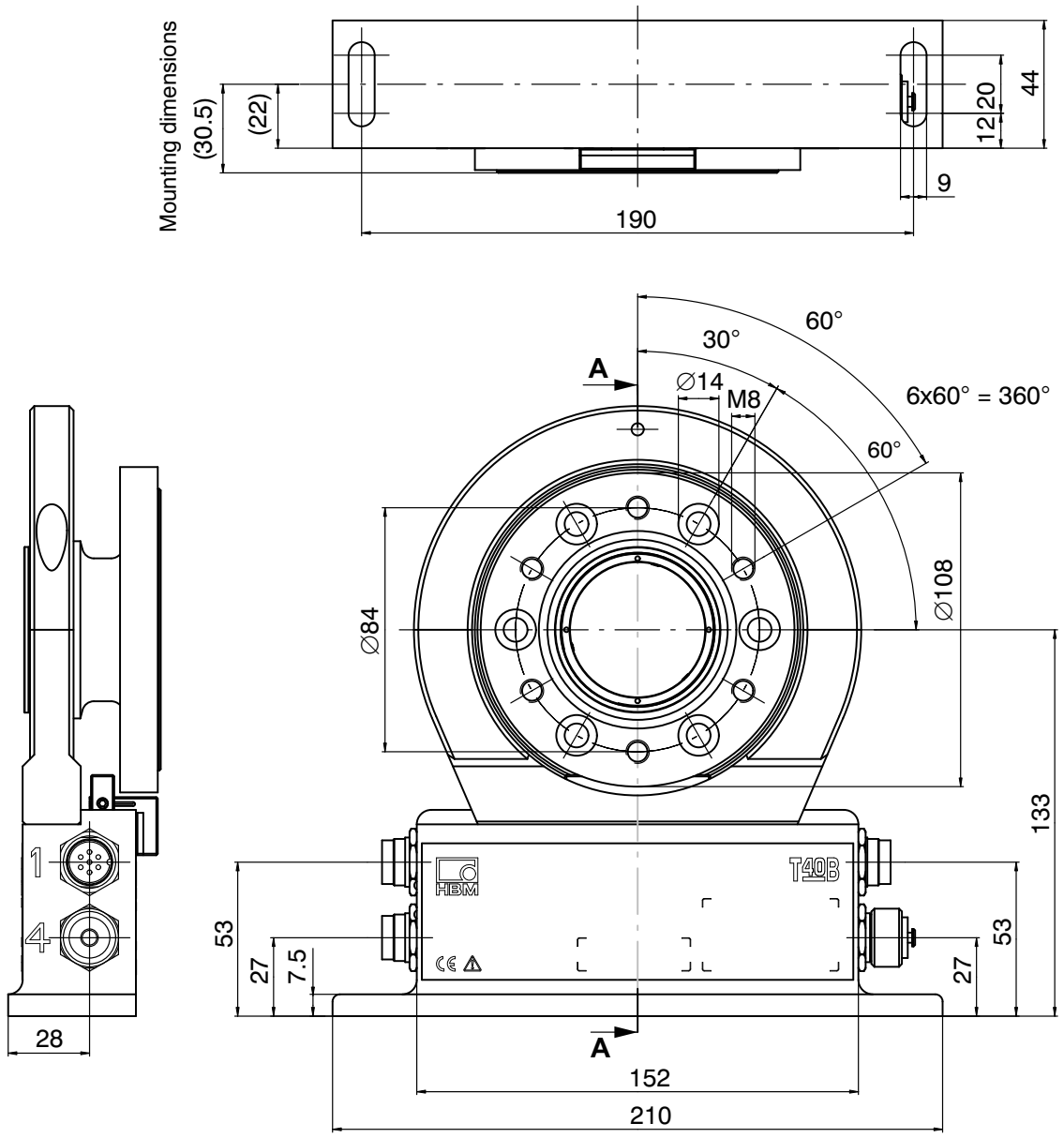
Dimensions of T40B/10 kNm without rotational speed measurement, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



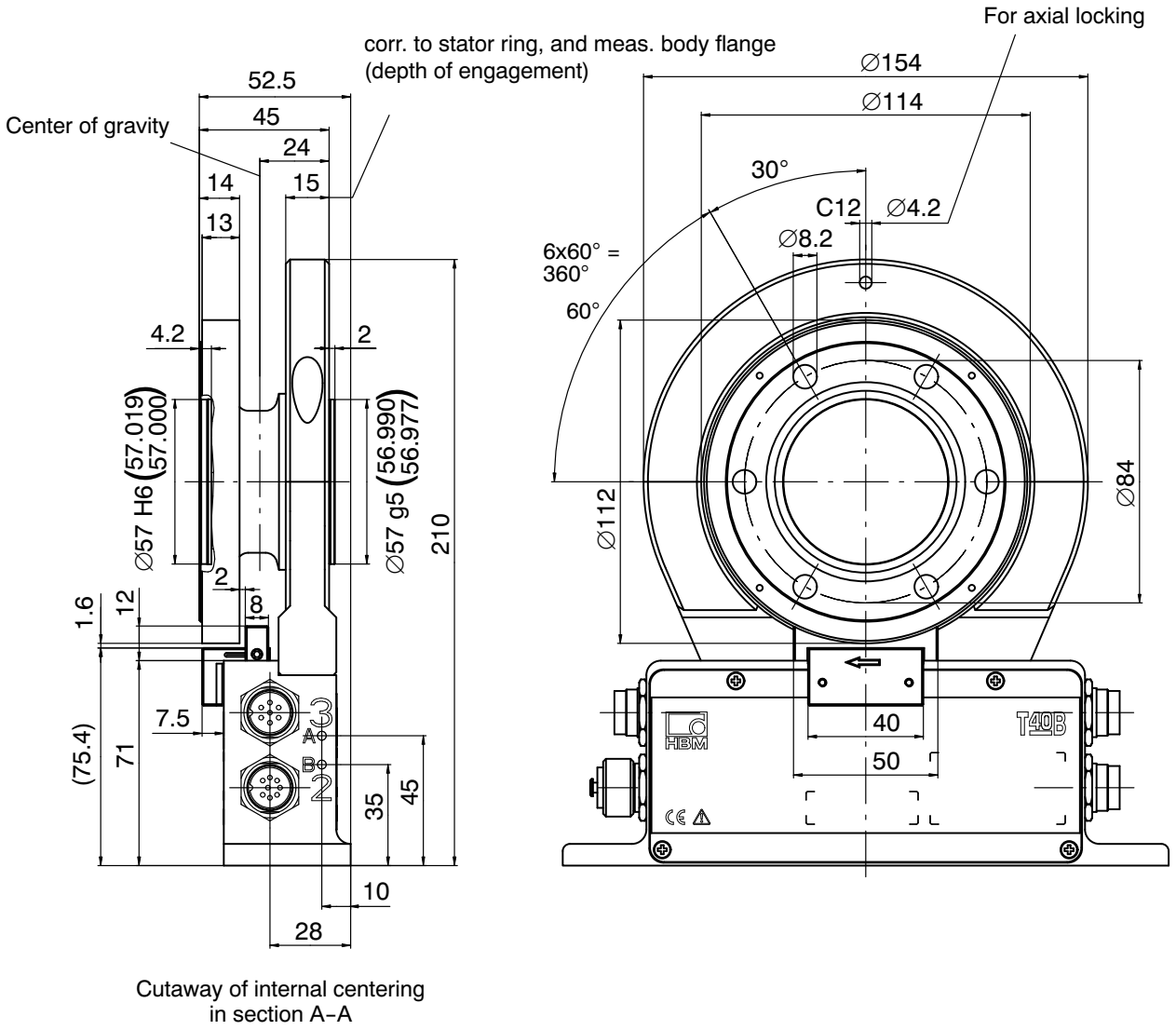
Dimensions of T40B/50 Nm and 100 Nm with speed measurement and reference pulse

Dimensions (in mm; 1 mm = 0.03937 inches)



Dimensions of T40B/50 Nm and 100 Nm with speed measurement and reference pulse, continued

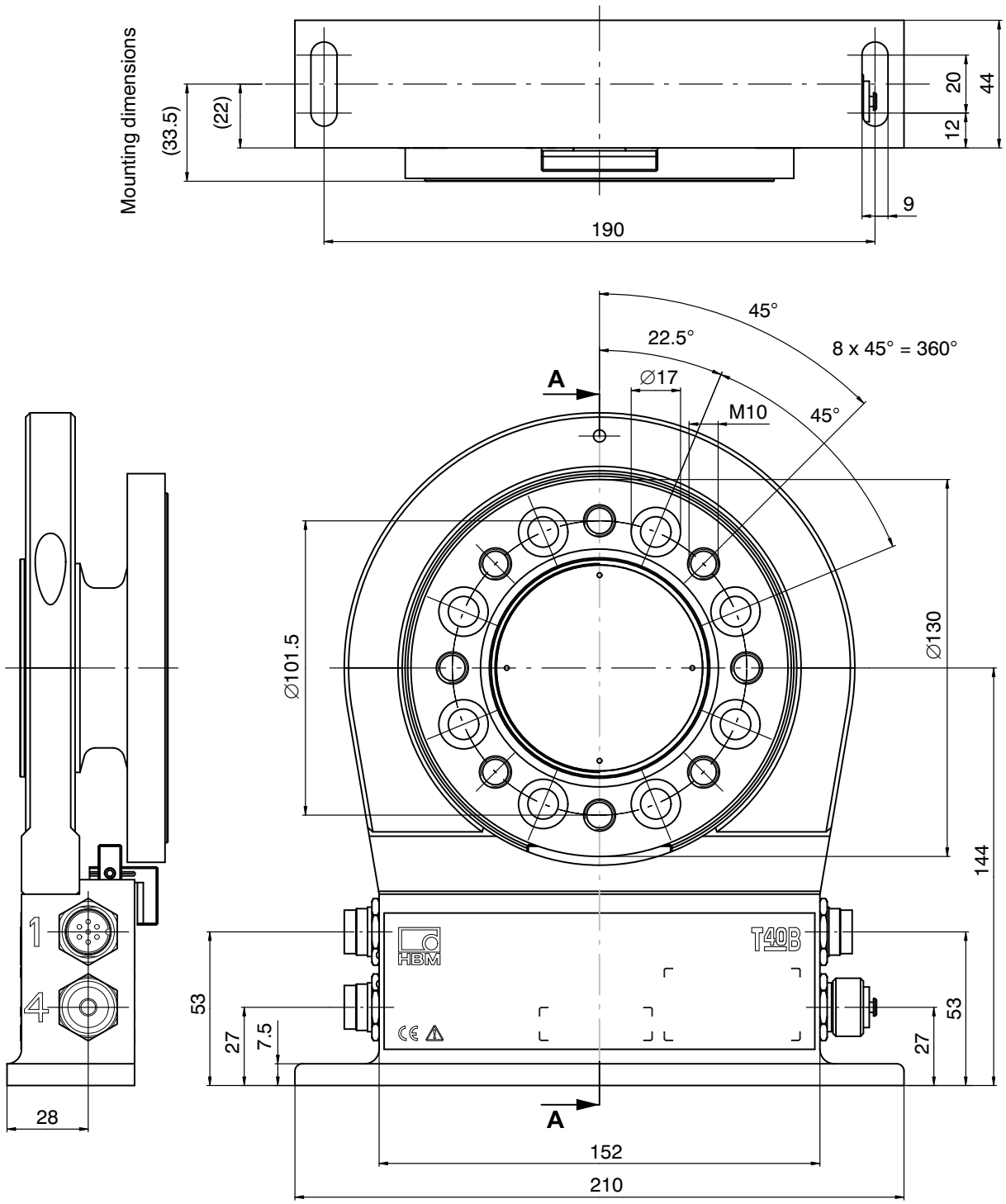
Dimensions (in mm; 1 mm = 0.03937 inches)



Cutaway of internal centering in section A–A

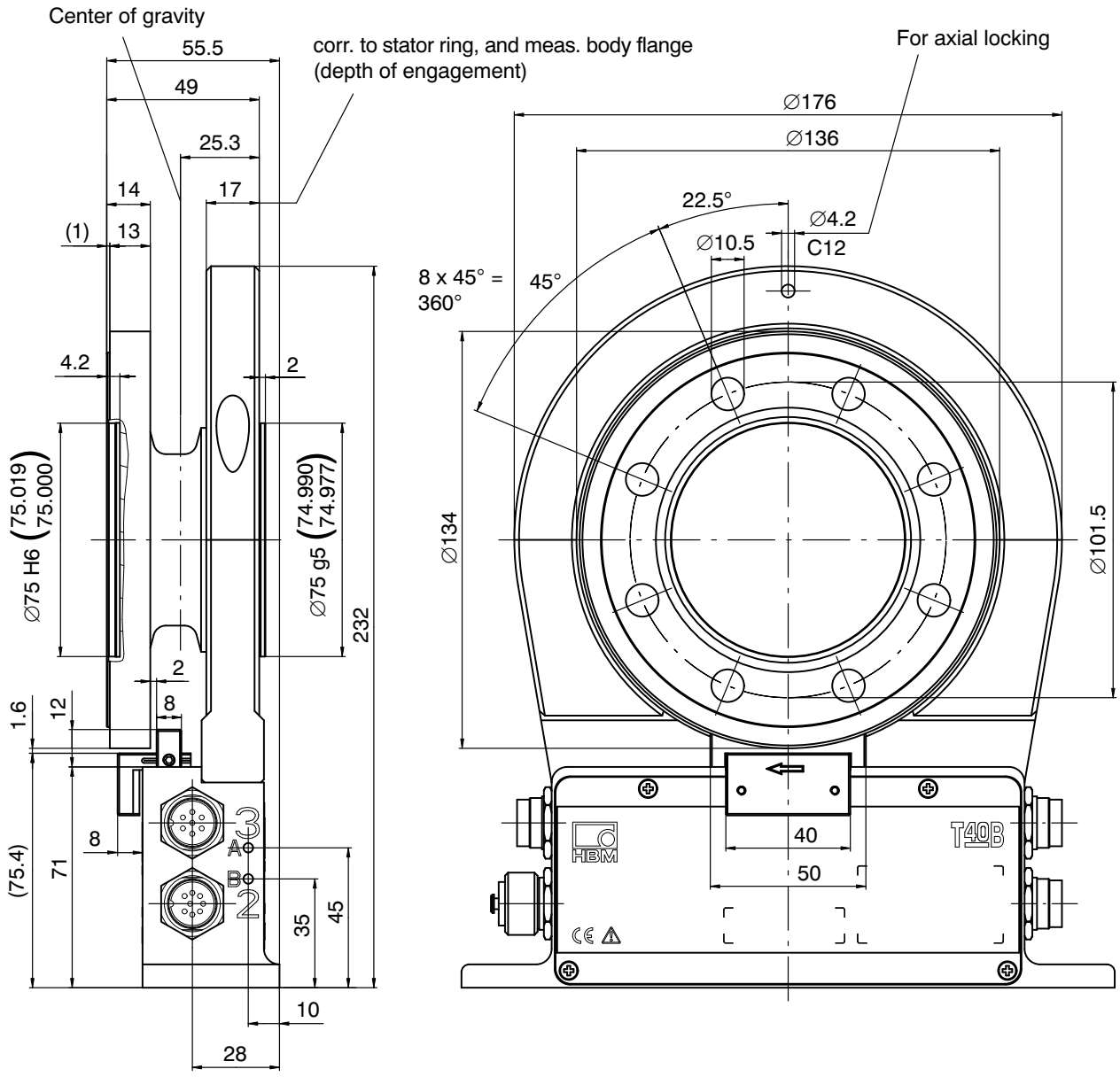
Dimensions of T40B/500 Nm and 1 kNm with speed measurement and reference pulse

Dimensions (in mm; 1 mm = 0.03937 inches)



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

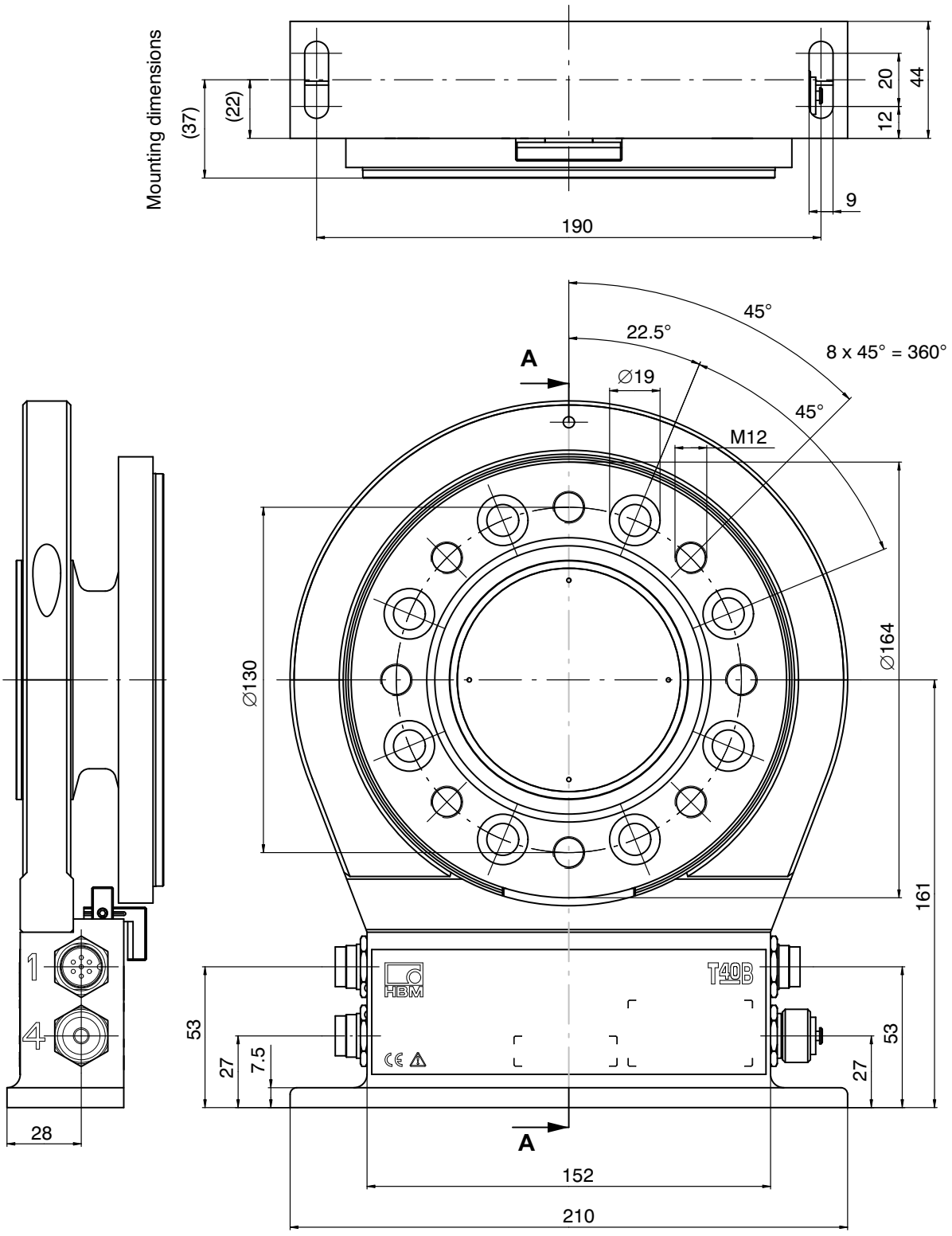
Dimensions (in mm; 1 mm = 0.03937 inches)



Cutaway of internal centering in section A–A

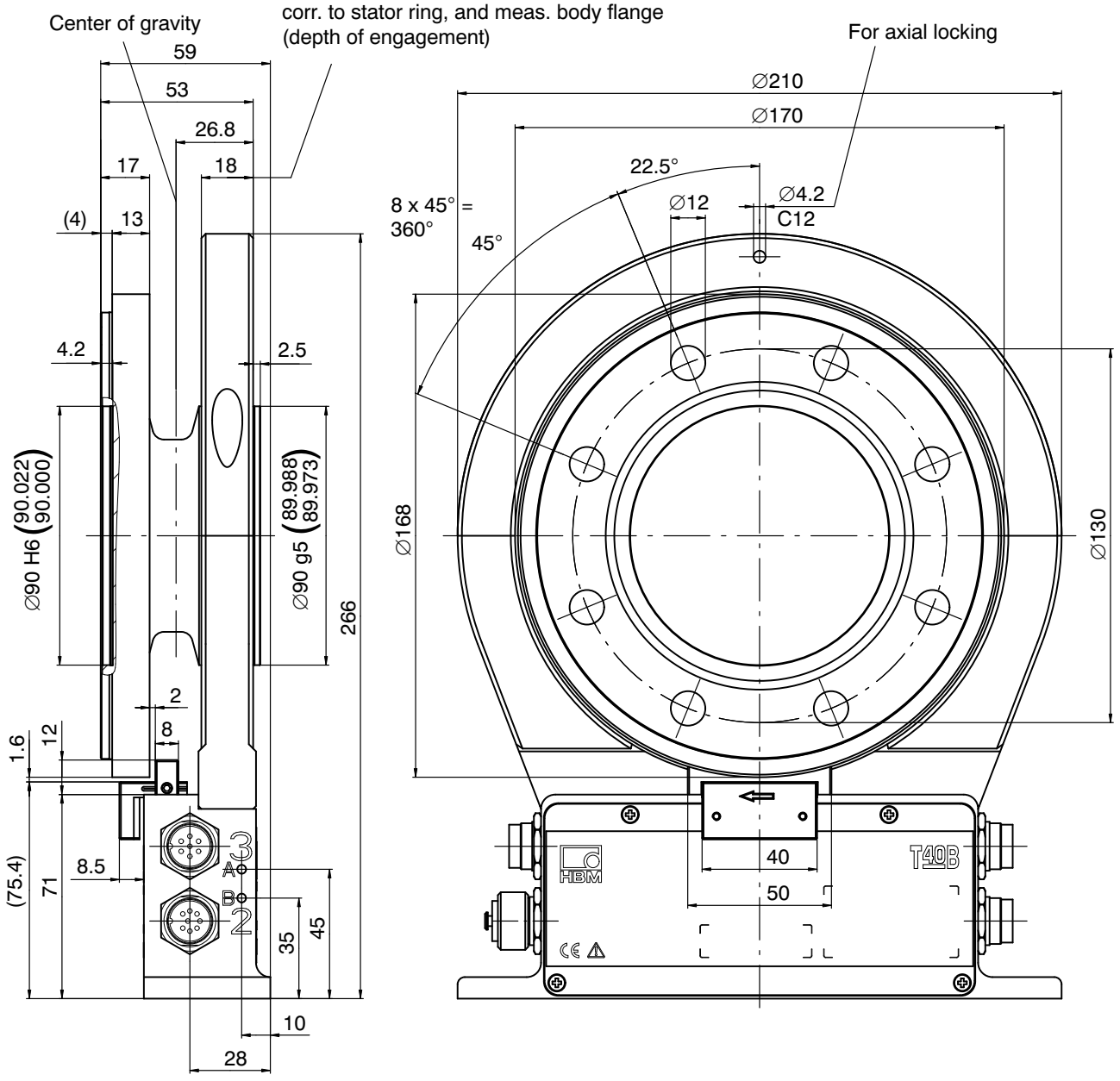
Dimensions of T40B/2 kNm and 3 kNm with speed measurement and reference pulse

Dimensions (in mm; 1 mm = 0.03937 inches)



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

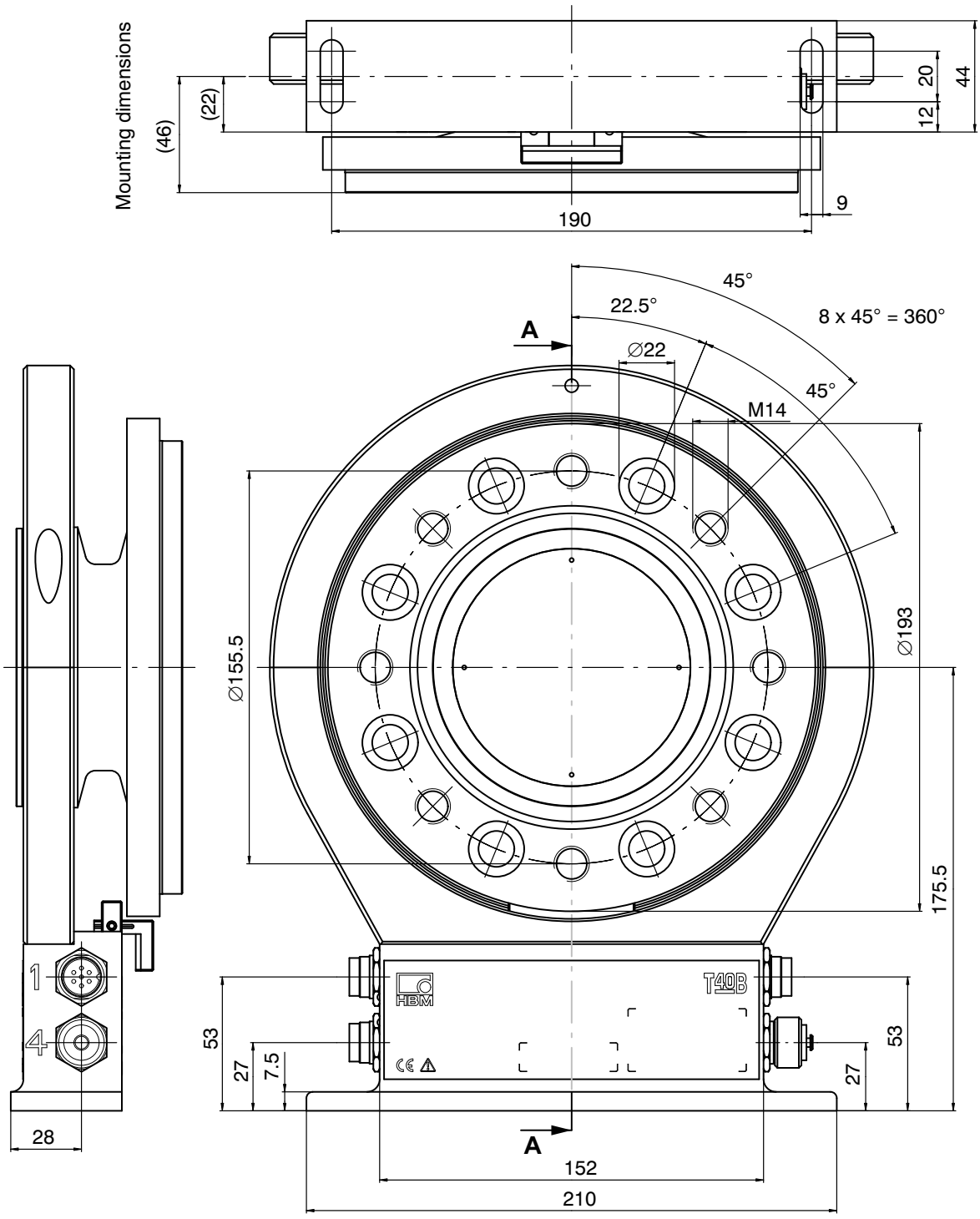
Dimensions (in mm; 1 mm = 0.03937 inches)



Cutaway of internal centering in section A–A

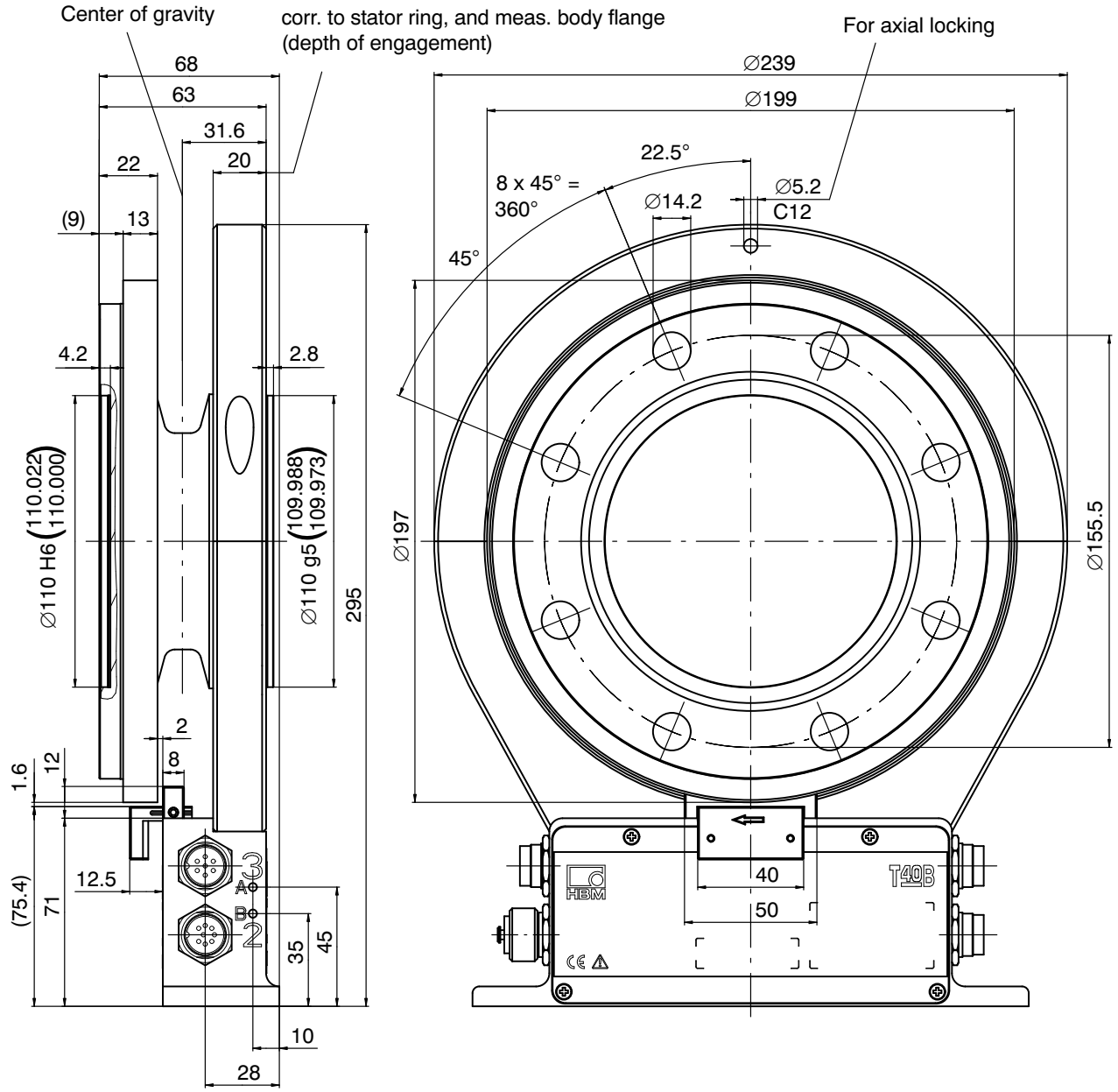
Dimensions of T40B/5 kNm with speed measurement and reference pulse

Dimensions (in mm; 1 mm = 0.03937 inches)



Dimensions of T40B/5 kNm with speed measurement and reference pulse, continued

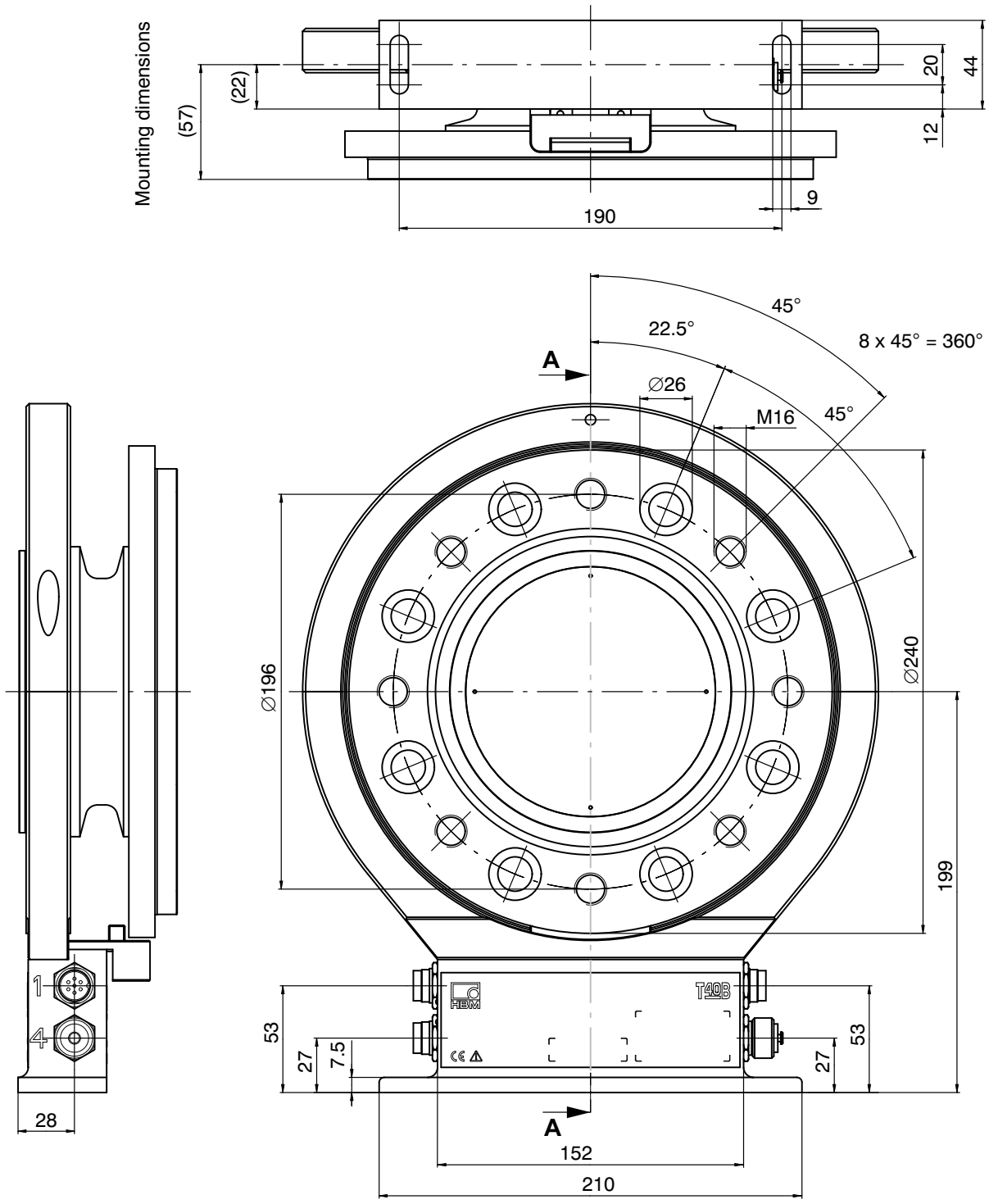
Dimensions (in mm; 1 mm = 0.03937 inches)



Cutaway of internal centering
in section A–A

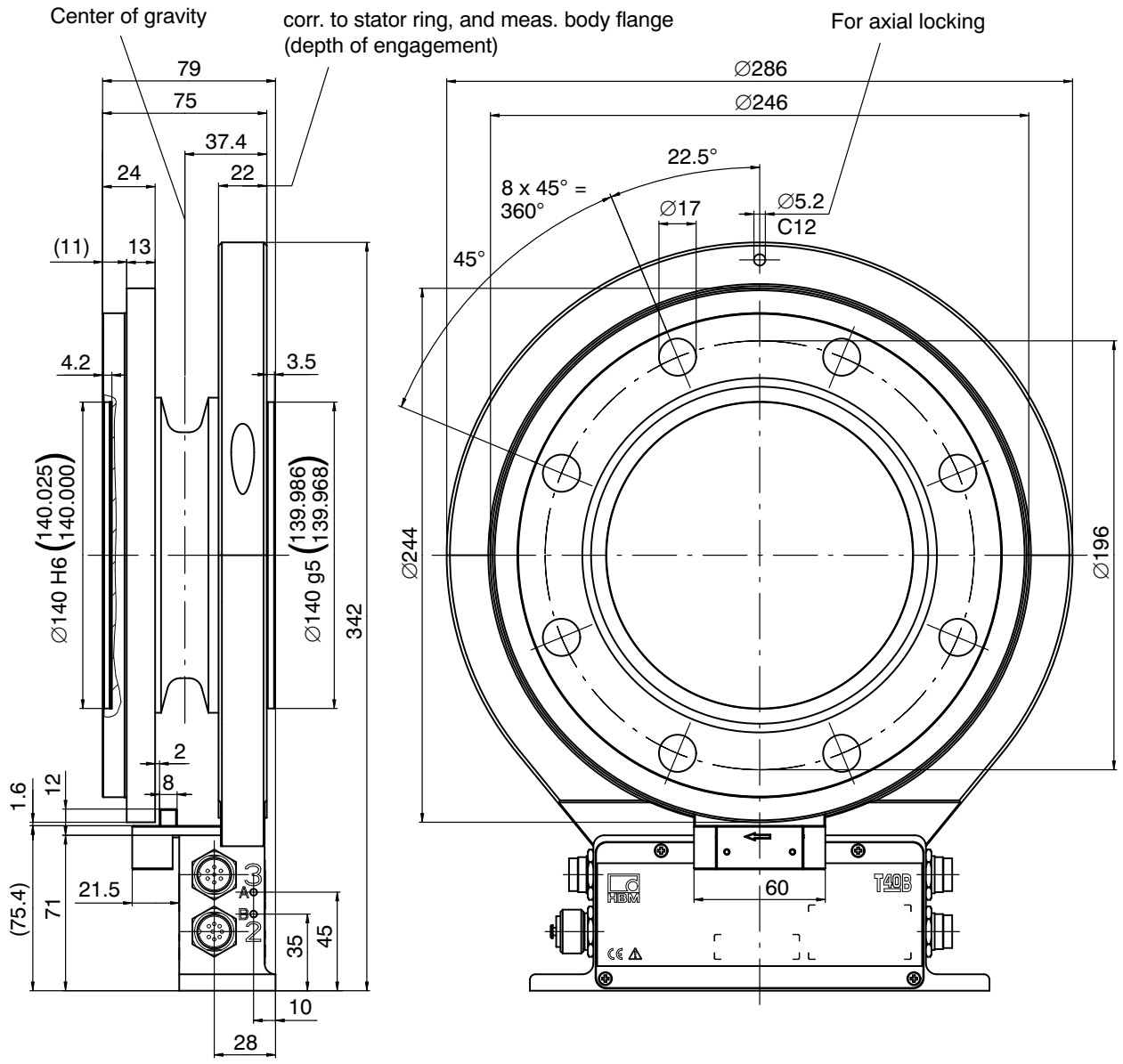
Dimensions of T40B/10 kNm with speed measurement and reference pulse

Dimensions (in mm; 1 mm = 0.03937 inches)



Dimensions of T40B/10 kNm with speed measurement and reference pulse, continued

Dimensions (in mm; 1 mm = 0.03937 inches)



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	
050Q	50 N·m	[only with Option 2 = MF / RO]
100Q	100 N·m	[only with Option 2 = MF / RO]
200Q	200 N·m	[only with Option 2 = MF / RO]
500Q	500 N·m	[only with Option 2 = MF / RO]
001R	1 kN·m	[only with Option 2 = MF / RO]
002R	2 kN·m	[only with Option 2 = MF / RO]
003R	3 kN·m	[only with Option 2 = MF / RO]
005R	5 kN·m	[only with Option 2 = MF / RO]
010R	10 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: Elektrical 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: Rotational speed measuring system
0	Without rotational speed measuring system
1	Magnetic rot. speed measuring system: 1024 pulses/revolution
A	Magnetic rot. speed meas. system (1024 pulses/revolution) and reference impuls

Code	Option 7: Customized modification
S	No customer-specific modification

K-T40B-0 0 1 R - M F - S - M - D U 2 - 0 - 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
Speed connection cable, Binder 423 – 8 pin, free ends, 6 m	1-KAB154-6
Speed connection cable, Binder 423 – 8 pin D-Sub, free ends, 6 m	1-KAB163-6
Speed connection cable, reference pulse, Binder 423 – 15 pin D-Sub, 6m	1-KAB163-6
Speed connection cable, reference pulse, Binder 423 – 8 pin, free ends, 6m	1-KAB164-6
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