

# T40

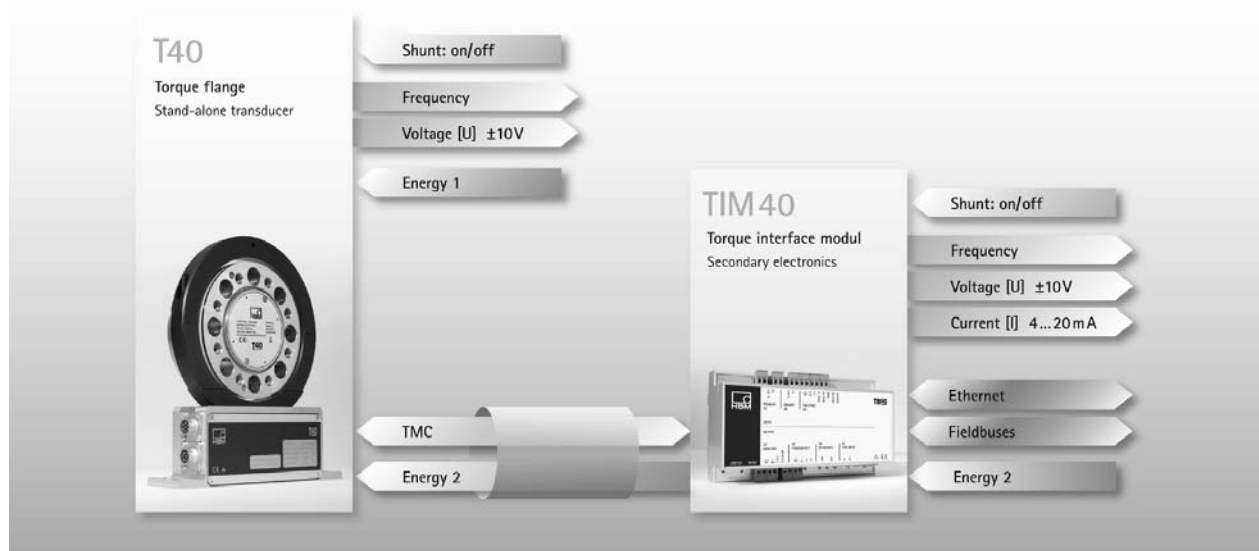
## Torque Flange



### Special features

- Nominal (rated) torques of 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 from 10,000 rpm to 20,000 rpm
- Accuracy class 0.05
- Wide measurement frequency range up to 6 kHz (–3 dB)
- Digital transmission of measurement signals
- Short design
- Low rotor weight and mass moments of inertia

### Concept



# Specifications

Type		T40							
Accuracy class		0.05							
Torque measuring system									
Nominal (rated) torque $M_{nom}$	N·m	200	500						
	kN·m			1	2	3	5	10	
<b>Nominal (rated) sensitivity</b> (spread between torque = zero and nominal (rated) torque) Frequency output 10 kHz/60 kHz/240 kHz Voltage output <b>Sensitivity tolerance</b> (deviation of the actual output quantity at $M_{nom}$ from the nominal (rated) sensitivity) Voltage output	kHz	5/30/120							
	V	10							
	%	± 0.1							
<b>Output signal at torque = zero</b> Frequency output Voltage output	kHz	240/60/10							
	V	0							
<b>Nominal (rated) output signal</b> Frequency output at positive nominal (rated) torque at negative nominal (rated) torque Voltage output at positive nominal (rated) torque at negative nominal (rated) torque	kHz	$15^{1)}/90^{2)}/360^{3)}$ (5 V symmetrical <sup>4)</sup> $5^{1)}/30^{2)}/120^{3)}$ (5 V symmetrical <sup>4)</sup>							
	kHz								
	V	+10							
	V	-10							
<b>Load resistance</b> Frequency output Voltage output <b>Long term drift over 48 h</b> Frequency output Voltage output	kΩ	≥ 2							
	kΩ	≥ 10							
	%	< ± 0.03							
	%	< ± 0.03							
<b>Measurement frequency range – 3 dB</b>  <b>Group delay</b>	kHz	$1^{1)}$ $3^{2)}$ $6^{3)}$							
		< 400 <sup>1)</sup>							
		< 220 <sup>2)</sup>							
	μs	< 150 <sup>3)</sup>							
<b>Residual ripple</b> Voltage output	mV	< 40							
<b>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</b> Frequency output Voltage output <b>on the zero signal, related to the nominal (rated) sensitivity</b> Frequency output Voltage output	%	± 0.05							
	%	± 0.2							
	%	± 0.05							
	%	± 0.1							
<b>Maximum level control range<sup>5)</sup></b> Frequency output Voltage output	kHz	2.5...17.5 <sup>1)/15...105<sup>2)/60...420<sup>3)</sup></sup></sup>							
	V	-12 ... +12							
<b>Power supply</b> Nominal (rated) supply voltage (separated extra low DC voltage) Current consumption in measuring mode Current consumption in startup mode Nominal (rated) power consumption Maximum cable length	V	18 ... 30							
	A	< 1 (typ. 0.5)							
	A	< 4 (typ. 4) 50 μs							
	W	< 10							
	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, observe terminating resistance.

5) 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
<b>Linearity error including hysteresis</b> , related to the nominal (rated) sensitivity								
Frequency output	%	< ± 0.05						
Voltage output	%	< ± 0.05						
<b>Relative standard deviation of repeatability</b> per DIN 1319, related to the variation of the output signal								
Frequency output	%	< ± 0.03						
Voltage output	%	< ± 0.03						
<b>Shunt signal</b>		approx. 50 % of $M_{nom}$						
<b>Tolerance of the shunt signal, related to <math>M_{nom}</math></b>	%	< ± 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						
<b>General data</b>								
<b>EMC</b>								
<b>Emission</b> (per EN61326-1, Section 7)								
RFI field strength	-	Class B						
<b>Interference immunity</b> (per EN61326-1, EN61326-2-3)								
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						
<b>Degree of protection per EN 60529</b>		IP 54						
<b>Weight</b> , approx.								
Rotor	kg	1.1	2.0	4.0	4.1	7.0	12.0	
Stator	kg		1.1			1.2	1.3	
<b>Reference temperature</b>	°C [°F]	23 [ 73.4 ]						
<b>Nominal (rated) temperature range</b>	°C [°F]	+10 ... +70 [ +50 ... +70 ]						
<b>Operating temperature range</b>	°C [°F]	-20 ... +85 [ -20 ... +85 ]						
<b>Storage temperature range</b>	°C [°F]	-40 ... +85 [ -40 ... +85 ]						
<b>Mechanical shock according to EN 60068-2-27<sup>6)</sup></b>								
Number	n	1000						
Duration	ms	3						
Acceleration (half sine)	m/s <sup>2</sup>	650						
<b>Vibration in 3 directions according to EN 60068-2-6<sup>6)</sup></b>								
Frequency range	Hz	10 ... 2000						
Duration	h	2.5						
Acceleration (amplitude)	m/s <sup>2</sup>	200						
<b>Nominal (rated) rational speed</b>	rpm	20,000			15,000		12,000	10,000
<b>Load limits</b> (data applies to the nominal (rated) temperature range) <sup>7)</sup>								
<b>Limit torque, related to <math>M_{nom}</math><sup>8)</sup></b>	%	200			160			
<b>Breaking torque, related to <math>M_{nom}</math><sup>8)</sup></b>	%	> 400			> 320			
<b>Longitudinal limit force<sup>9)</sup></b>	kN	10	13	19	30	35	60	80
<b>Lateral limit force<sup>9)</sup></b>	kN	2	4	5	9	10	12	18
<b>Bending limit moment<sup>9)</sup></b>	N·m	100	200	220	560	600	800	1200
<b>Oscillation width per DIN 50100 (peak to peak)<sup>10)</sup></b>	N·m	400	1000	2000	4000	4800	8000	16000

<sup>6)</sup> Antenna ring and connector need to be fastened.

<sup>7)</sup> 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 bending limit 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 apply only to the nominal temperature range. At temperatures < 10 °C load limits reduced by up to 30 % have to be allowed for because of increasingly reduced viscosity at decreasing temperatures.

<sup>8)</sup> With static load.

<sup>9)</sup> Static and dynamic.

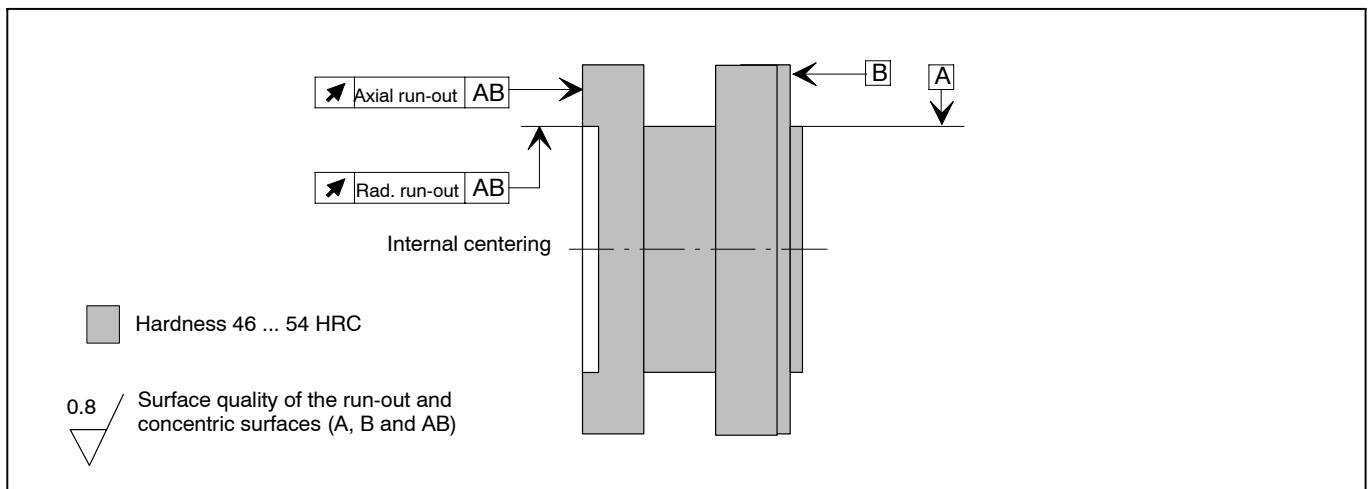
<sup>10)</sup> The nominal (rated) torque must not be exceeded.

## Specifications (continued)

<b>Nominal (rated) torque <math>M_{nom}</math></b>	N·m	200	500					
	kN·m			1	2	3	5	10
<b>Mechanical values</b>								
<b>Torsional stiffness <math>c_T</math></b>	kN·m/rad	360	745	1165	2515	3210	5565	14335
<b>Torsion angle at <math>M_{nom}</math></b>	Deg.	0.032	0.038	0.049	0.046	0.054	0.051	0.040
<b>Stiffness in the axial direction <math>c_a</math></b>	kN/mm	540	450	580	540	570	760	960
<b>Stiffness in the radial direction <math>c_r</math></b>	kN/mm	315	560	860	1365	1680	2080	2940
<b>Stiffness during the bending moment round a radial axis <math>c_b</math></b>	kN·m/deg.	3.6	4.2	5.9	9	9.3	20.2	45.5
<b>Maximum deflection at longitudinal force limit</b>	mm	< 0.04	< 0.05		< 0.06		< 0.08	< 0.09
<b>Additional max. radial run-out deviation at lateral limit force</b>	mm	< 0.02						
<b>Additional plumb/parallel deviation at bending limit moment (at <math>\varnothing d_B</math>)</b>	mm	< 0.06	< 0.11	< 0.09	< 0.18	< 0.19	< 0.14	< 0.12
<b>Balance quality level per DIN ISO 1940</b>		G 2.5						
<b>Max. limits for relative shaft vibration (peak to peak) <sup>11)</sup> Wave oscillations in the area of the connection flanges acc. to ISO 7919-3</b>								
Normal mode (continuous operation)	$\mu\text{m}$	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$ (n in rpm)						
Start and Stop mode/resonance ranges (temporary)	$\mu\text{m}$	$s_{(p-p)} = \frac{13200}{\sqrt{n}}$ (n in rpm)						
<b>Mass moment of inertia of the rotor</b> $I_V$ (around the rotary axis; does not take flange bolts into account)	kg·m <sup>2</sup>	0.0017	0.0045	0.0139	0.0142	0.0341	0.0914	
<b>Proportional mass moment of inertia for the transmitter side (side of the flange with external centering)</b>		63	51	50	49	45		
<b>Max. permissible static eccentricity</b> of the rotor (radially) to the center point of the stator without the speed measuring system	mm	$\pm 2$						
<b>Max. permissible axial displacement of the rotor to the stator</b>	mm	$\pm 2$						

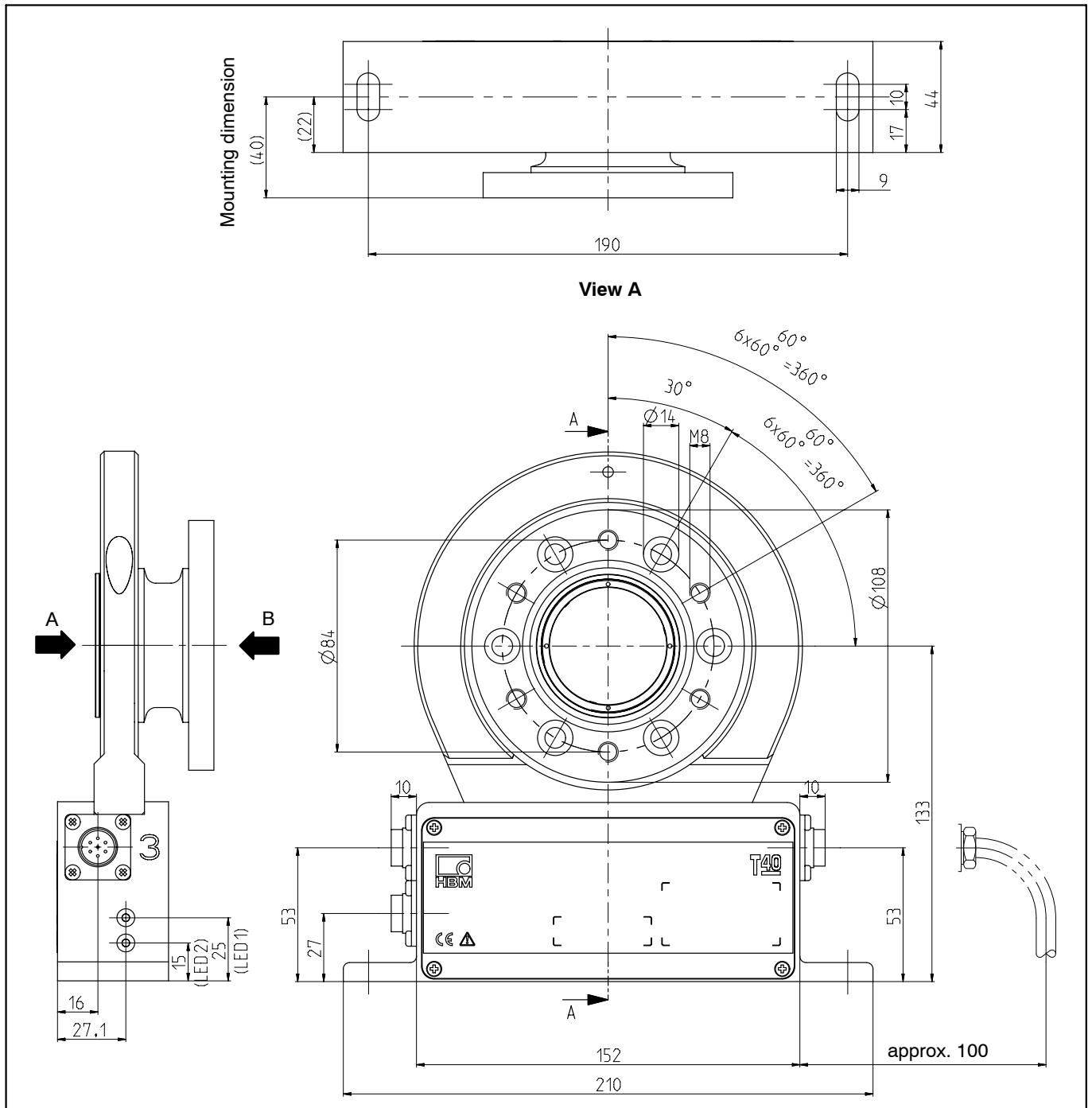
<sup>11)</sup> The impact of radial run-out deviations, eccentricity, defects of form, notches, marks, local residual magnetism, structural variations or material anomalies needs to be taken into account and isolated from the actual wave oscillation.

## Run-out and concentric tolerances

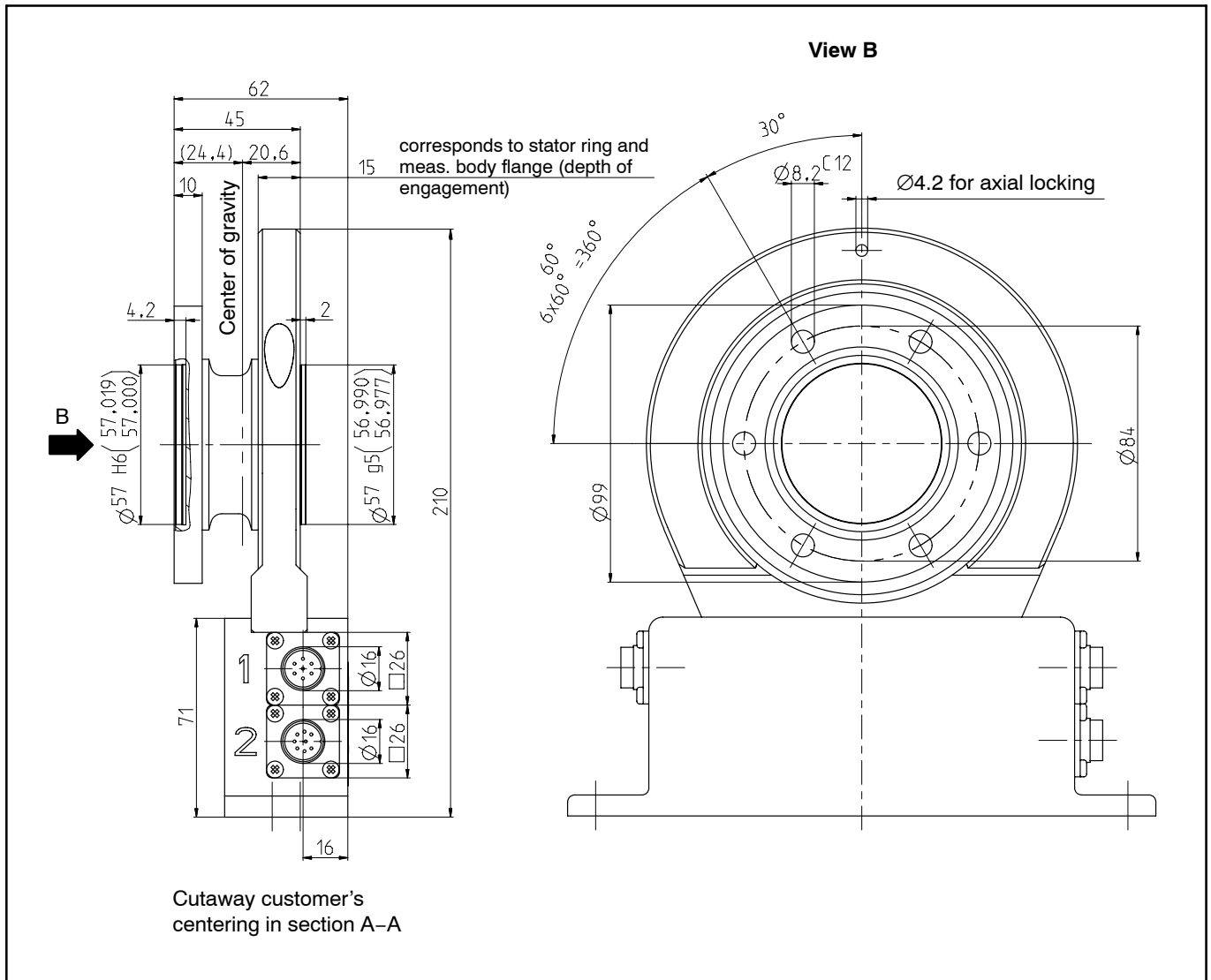


Measuring range (N·m)	Axial run-out tolerance (mm)	Radial run-out tolerance (mm)
200	0.01	0.01
500	0.01	0.01
1 k	0.01	0.01
2 k	0.02	0.02
3 k	0.02	0.02
5 k	0.02	0.02
10 k	0.02	0.02

**Dimensions T40/200 N · m (in mm; 1 mm=0.03937 inches)**



Dimensions T40/200 N · m (in mm; 1 mm=0.03937 inches), continued



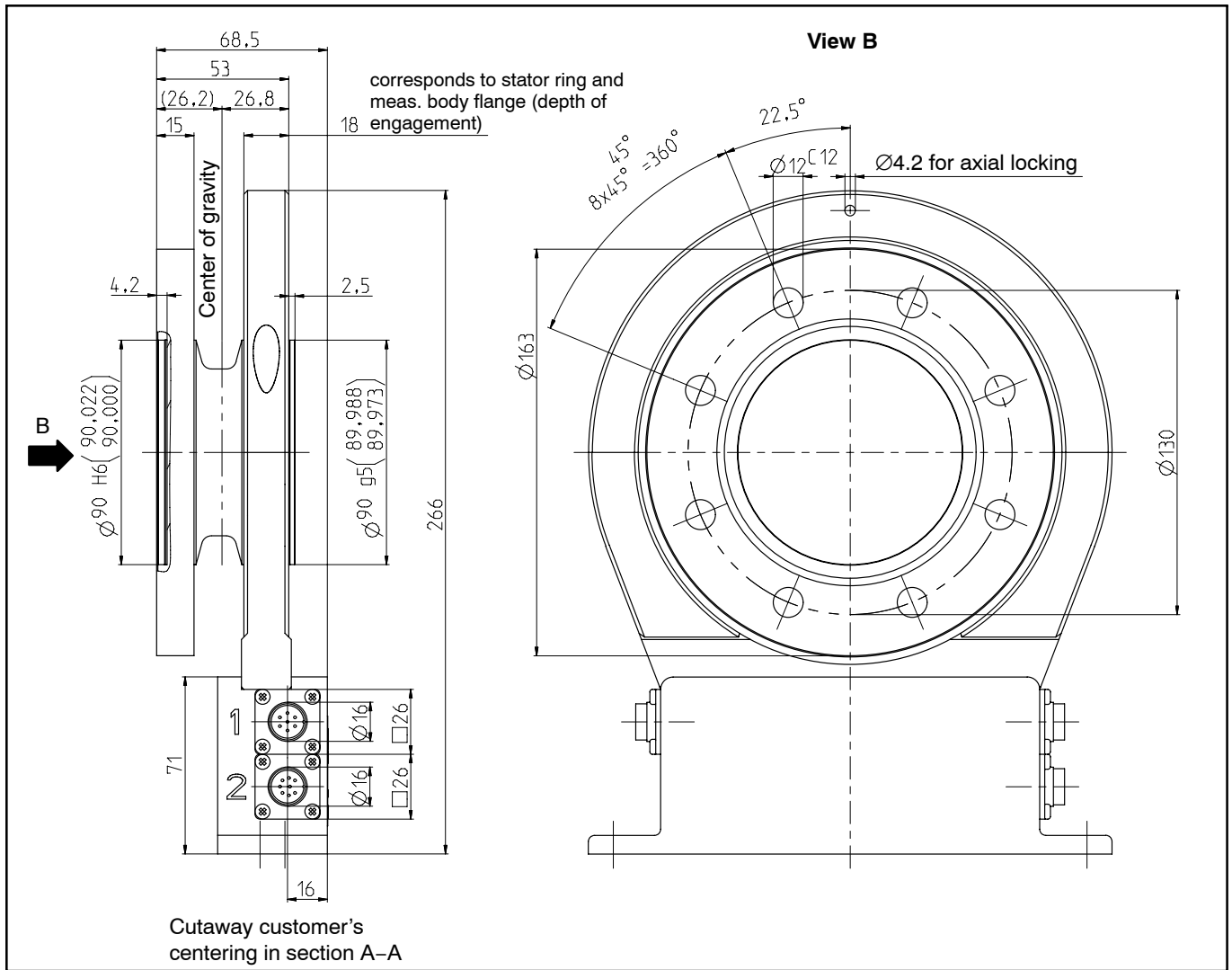




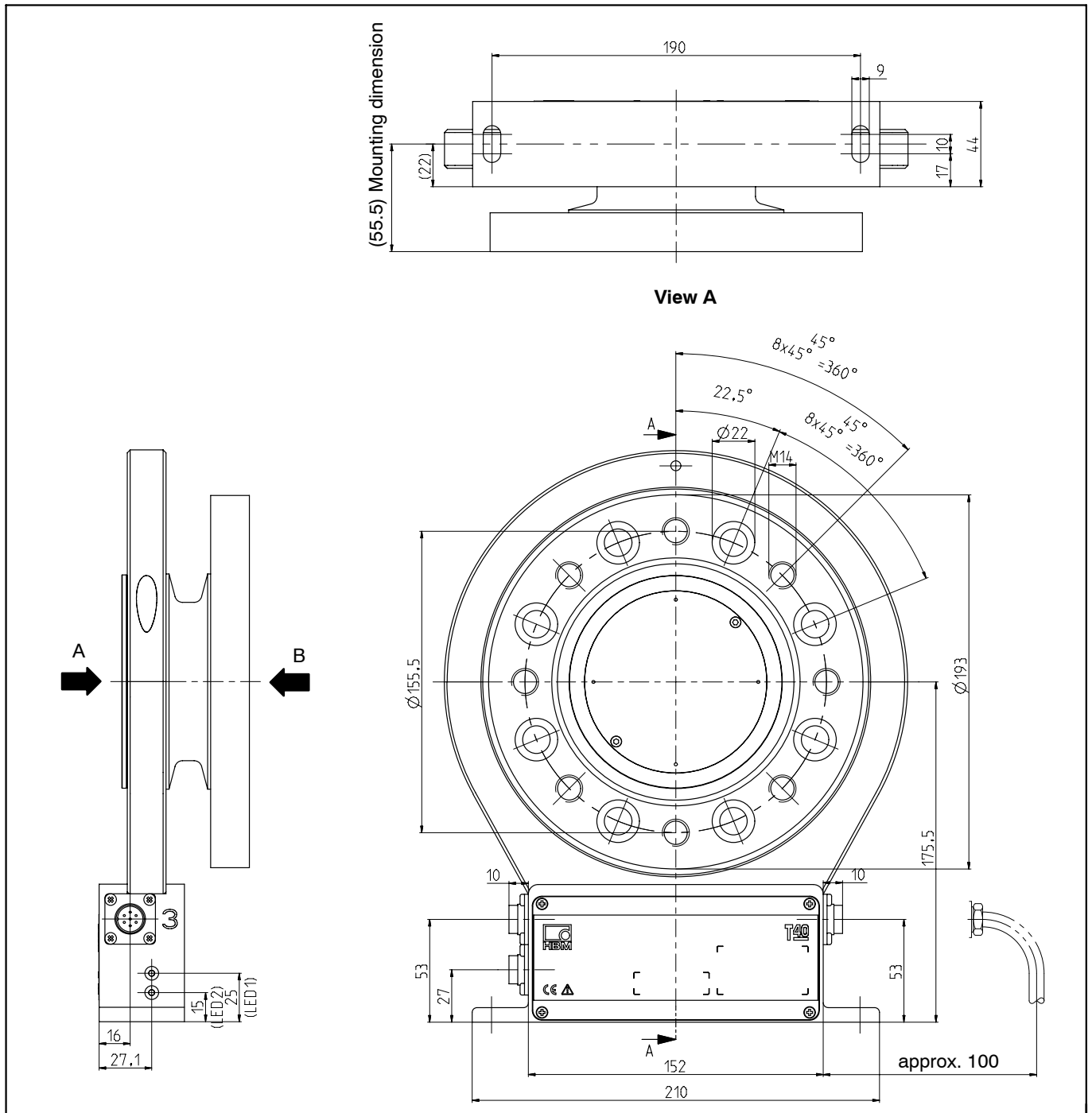




Dimensions T40/2 kN · m and 3 kN · m (in mm; 1 mm=0.03937 inches), continued

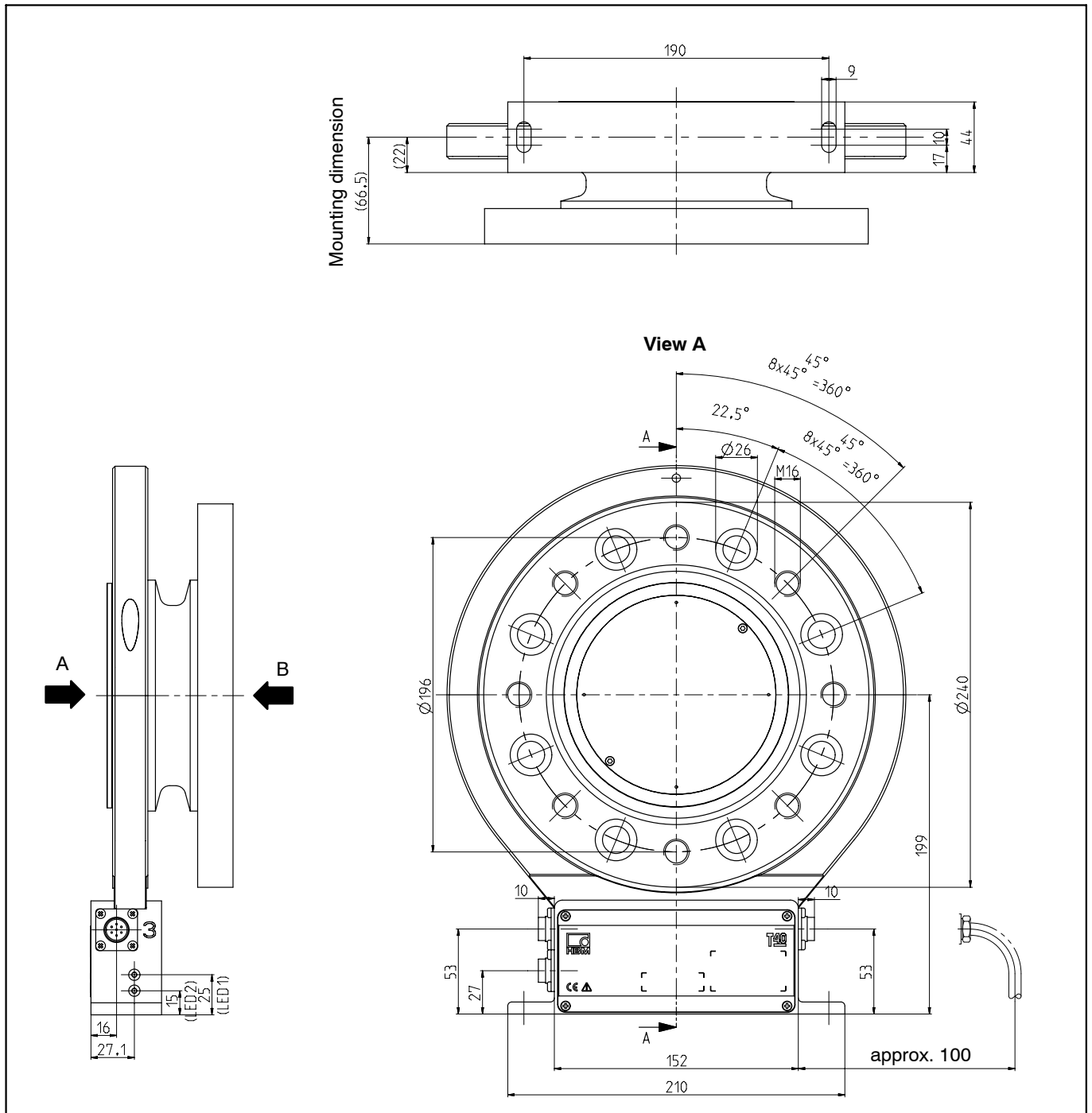


**Dimensions T40/5 kN·m (in mm; 1 mm=0.03937 inches)**





**Dimensions T40/10 kN · m (in mm; 1 mm=0.03937 inches)**





## Order numbers

Order no.		
<b>K-T40</b>		
<b>Code</b>	<b>Option 1: Measuring range up to</b>	
<b>200Q</b>	200 N·m	
<b>500Q</b>	500 N·m	
<b>001R</b>	1 kN·m	
<b>002R</b>	2 kN·m	
<b>003R</b>	3 kN·m	
<b>005R</b>	5 kN·m	
<b>010R</b>	10 kN·m	
<b>Code</b>	<b>Option 2: Component</b>	
<b>MF</b>	Measurement flange, complete	
<b>RO</b>	Rotor	
<b>ST</b>	Stator	
<b>Code</b>	<b>Option 3: Accuracy</b>	
<b>S</b>	Standard	
<b>Code</b>	<b>Option 4: Adjustment</b>	
<b>M</b>	Metric (N·m)	
<b>Code</b>	<b>Option 5: Electrical configuration</b> [ only with Option 2 = MF / ST ]	
<b>SU2</b>	10 kHz ±5 kHz and ±10 V output signal, 18...30 V DC supply voltage	
<b>DU2</b>	60 kHz ±30 kHz and ±10 V output signal, 18...30 V DC supply voltage	
<b>HU2</b>	240 kHz ±120 kHz and ±10 V output signal, 18...30 V DC supply voltage	
<b>Code</b>	<b>Option 6: Rot. speed measuring system</b>	
<b>0</b>	Without rot. speed measuring system	
<b>Code</b>	<b>Option 7: Customised modification</b>	
<b>S</b>	No customer-specific modification	
<p>K-T40- <input type="text"/> - <input type="text"/> - <b>S</b> - <b>M</b> - <input type="text"/> - <input type="text"/> - <b>0</b> - <b>S</b></p>		

= PREFERENCE Types

## Accessories, to be ordered separately

Item	Order-No.
<b>Ready made connecting cables</b>	
Torque connection cable, 423 – D-Sub 15P, 6 m	1-KAB149-6
Torque connection cable, 423 – free ends, 6 m	1-KAB153-6
<b>Cable sockets</b>	
423G-7S, 7-pin (straight)	3-3101.0247
423W-7S, 7-pin (angular)	3-3312.0281
423G-8S, 7-pin (straight)	3-3312.0120
423W-8S, 7-pin (angular)	3-3312.0282
<b>Connecting cable by the meter (minimum order quantity: 10 m, price)</b>	
Kab8/00-2/2/2	4-3301.0071

© Hottinger Baldwin Messtechnik GmbH.  
Modifications reserved. All details describe our products in  
general form only. They are not to be understood as express  
warranty and do not constitute any liability whatsoever.

**Hottinger Baldwin Messtechnik GmbH**

Im Tiefen See 45 · 64293 Darmstadt · Germany  
Tel. +49 6151 803-0 · Fax: +49 6151 803-9100  
Email: [info@hbm.com](mailto:info@hbm.com) · [www.hbm.com](http://www.hbm.com)

measure and predict with confidence

