

DATA SHEET

T210

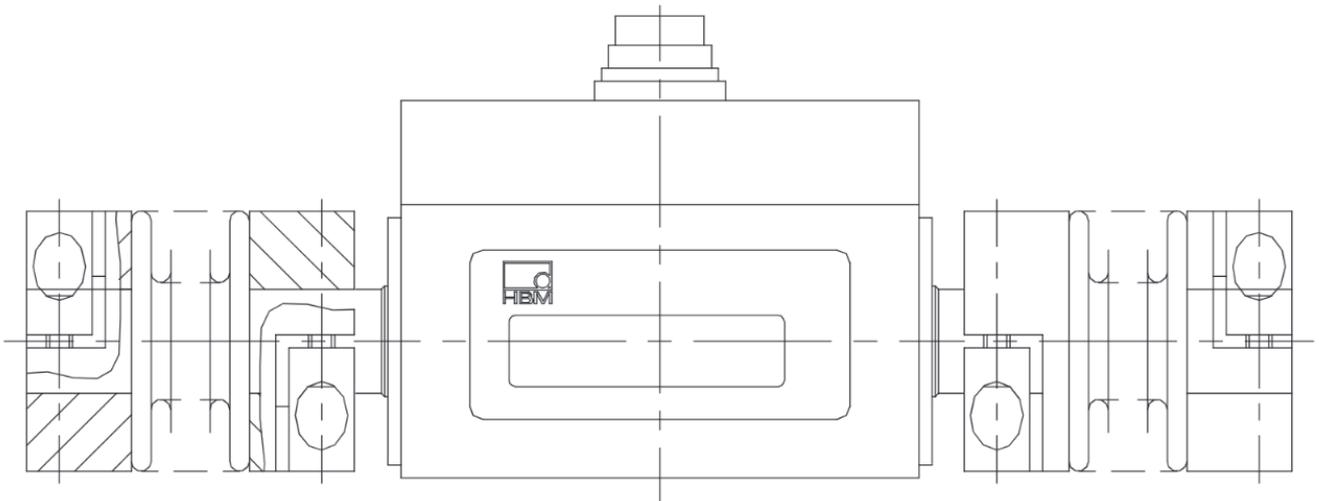
Torque transducers

SPECIAL FEATURES

- Linearity deviation, including hysteresis $\leq \pm 0.05\%$
- Nominal (rated) torque of 0.5 to 200 Nm
- High speeds of up to 30,000 rpm
- Variant with and without rotational speed measurement with 512/1024 pulses/revolution available
- Output signals ± 10 V and 10 kHz ± 5 kHz
- New: Optional IO-Link version
- Non-contacting transmission of measured values
- Cylindrical shaft ends for friction fits



INSTALLATION EXAMPLE WITH BELLOWS COUPLINGS



SPECIFICATIONS

Type		T210									
Accuracy class		0.1									
Size		BG1			BG2			BG3			
Nominal (rated) torque M_{nom}		Nm	0.5	1	2	5	10	20	50	100	200
Nominal (rated) rotational speed n_{max}		rpm	30,000			20,000			14,000		
Torque measuring system											
Linearity deviation including hysteresis relating to the rated output (nominal)		%	$\leq \pm 0.05$								
Relative standard deviation of repeatability, as per DIN 1319 relating to the variation of the output signal		%	$\leq \pm 0.05$								
Temperature effect per 10 K in the nominal (rated) temperature range on the output signal, relating to the actual value of the signal spread											
Frequency output, digital		%	$\leq \pm 0.1$								
Voltage output		%	$\leq \pm 0.1$								
on the zero signal relating to the rated output (nominal)											
Frequency output, digital		%	$\leq \pm 0.1$								
Voltage output		%	$\leq \pm 0.1$								
Nominal (rated) sensitivity (nominal (rated) signal range between torque = zero and nominal (rated) torque)											
Frequency output 10 kHz		kHz	5								
Voltage output		V	10								
Rated output tolerance (deviation of the actual output quantity at M_{nom} from the nominal (rated) signal range)		%	$\leq \pm 0.1$								
nominal (rated) output signal											
Frequency output (RS422, 5V symmetrical)											
with positive nominal (rated) torque		kHz	15								
with negative nominal (rated) torque		kHz	5								
Voltage output											
with positive nominal (rated) torque		V	+10								
with negative nominal (rated) torque		V	-10								
Output signal at torque = zero											
Frequency output		kHz	10								
Voltage output		V	0								
Calibration signal		%vC	50								
Load resistance											
Frequency output (differential)		Ω	≥ 100								
Voltage output		k Ω	≥ 100								
Long-term drift over 48 h at reference temperature											
Frequency output		%	<0.05								
Voltage output		%	<0.5								
Measurement frequency range, -3 db		kHz	1								
Residual ripple (voltage output)		mV _{SS}	<100								
Group delay		ms	<1								
Maximum modulation range											
Digital		%	112								
Frequency output		kHz	4.4 ... 15.6 (switch-on process: approx. 0)								
Voltage output		V	-11.2 ... +11.2 (switch-on process: approx. -14)								

Type		T210								
Nominal (rated) torque M_{nom}	Nm	0.5	1	2	5	10	20	50	100	200
Nominal (rated) rotational speed n_{max}	rpm	30,000			20,000			14,000		
Resolution										
Digital	Bit	14								
Frequency output	Hz	0.5 at 10 kHz								
Voltage output	mV	0.5								
Energy supply										
Nominal (rated) supply voltage (safety extra low voltage (SELV))	V DC	10...30								
Calibration signal triggering	V	3 ... 30								
Current consumption in measuring mode	A	<0.2 (at U_{b12V})								
Nominal (rated) power consumption	W	<2.5 (in the range of the nominal (rated) supply voltage)								
Permissible residual ripple of supply voltage	mV _{SS}	400								
Measurement system for rotational speed/angle of rotation										
Measurement system		Optical								
Pulses per revolution	-	512/1024 ¹⁾								
Output signal	V	5 (asymmetrical), two square wave signals, shifted by approx. 90°								
Minimum rotational speed for sufficient pulse stability	rpm	0								
Load resistance	Ω	>200								
Group delay	μs	1.5								
IO-Link										
Output signal; interface		COM3, to IO-Link standard, class A								
Min. cycle (max. output rate)	ms	1.4								
Sample rate (internal)	kS/s	20								
Cut-off frequency (-3 dB), internal	kHz	4								
Reference supply voltage	V	24								
Supply voltage range	V	19 - 30								
Max. power consumption	W	≤2.5								
Noise, relative to the rated output (nominal)	ppm	With Bessel filter 1Hz: 25 With Bessel filter 10 Hz: 63 With Bessel filter 100 Hz: 195 With Bessel filter 200 Hz: 275 Filter off: 3020								
Filter										
Low-pass filter		Freely adjustable cut-off frequency, Bessel or Butterworth characteristic, 6th order								
Device functions										
Process data/Measured values		Torque, rotational speed, angle, power, temperature								
Limit value switches		2 limit value switches. Invertible, freely adjustable hysteresis. Output via process data or digital output								
Digital IO		According to IO-Link Smart Sensor Profile, 1 permanently available digital output; 1 output can be set to data output. Measurement is then not possible								
Slave pointer function		Yes								
Peak value memory		Yes								
Peak-to-peak memory		Yes								
Warning functions		Warning on exceeding nominal (rated) force/maximum operating force; Nominal (rated) temperature/maximum operating force								

Type		T210								
Nominal (rated) torque M_{nom}	Nm	0.5	1	2	5	10	20	50	100	200
Nominal (rated) rotational speed n_{max}	rpm	30,000			20,000			14,000		
General information										
EMC immunity to interference (as per EN 61326-1, Table A.1)										
Electromagnetic field	V/m	10								
Magnetic field	A/m	100								
Electrostatic discharge (ESD)										
Contact discharge	kV	4								
Air discharge	kV	4								
Fast transients (burst)	kV	1								
Emission (as per EN 61326-1, Table 3)										
RFI voltage		Class B								
RFI power		Class B								
RFI field strength		Class B								
Degree of protection as per EN 60529										
IP40										
Weight, approx.										
	kg	0.2			0.6			1.3		
Nominal (rated) temperature range										
	°C	+10...+70								
Operating temperature range										
	°C	-20...+85								
Storage temperature range										
	°C	-40...+85								
Mechanical shock resistance according to EN 60068-2-27										
Number	n	1,000								
Duration	ms	3								
Acceleration (half sine)	m/s ²	650								
Vibration testing per EN 60068-2-6										
Frequency range	Hz	10...2,000								
Duration	h	1.5								
Acceleration	m/s ²	50								

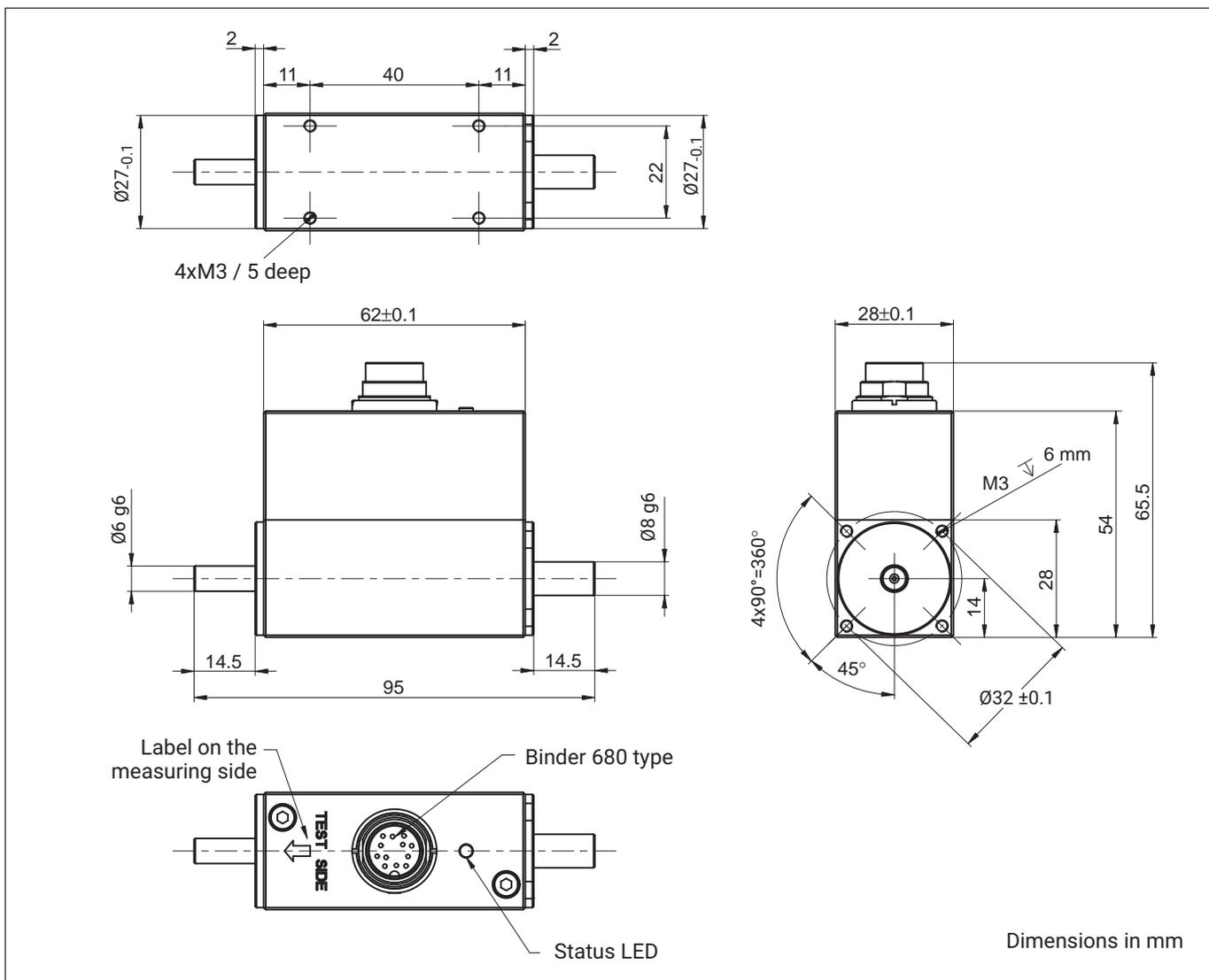
Type		T210								
Nominal (rated) torque M_{nom}	Nm	0.5	1	2	5	10	20	50	100	200
Load limits ²⁾										
Limit torque, relating to M_{nom}	%	200								
Breaking torque, relating to M_{nom}	%	≥300								
Axial limit force	N	200	350	500	1,100	1,750	2,500	5,000	7,000	9,500
Lateral limit force ³⁾	N	4	6	10	15	30	50	100	150	250
Oscillation width as per DIN 50100 (peak-to-peak) ⁴⁾	%	80								
Mechanical values										
Torsional stiffness c_T	Nm/rad	46	89	133	585	1,367	2,933	10,893	24,043	50,388
Torsion angle at M_{nom}	°	0.62	0.64	0.86	0.49	0.42	0.39	0.26	0.24	0.23
Max. permissible vibration displacement of the rotor (peak-to-peak) ⁵⁾ Undulations in the connection geometry, based on ISO 7919-3	µm	$s_{max} = \frac{4500}{\sqrt{n}}$ (n in min ⁻¹)								
Effective velocity in the vicinity of the housing, as per VDI 2056		$v_{eff} = \frac{\sqrt{n}}{3}$ (n in min ⁻¹)								
Mass moment of inertia of the rotor (around the rotary axis) with rotational speed measuring system	g*cm ²	9.5	9.5	9.5	130	135	140	910	920	930

Type	T210									
Nominal (rated) torque M_{nom}	Nm	0.5	1	2	5	10	20	50	100	200
Mass moment of inertia of the rotor (around the rotary axis) without rotational speed measuring system	g*cm ²	9.1	9.1	9.5	124	129	134	891	901	911
Balance quality level as per DIN ISO 1940		G6.3								

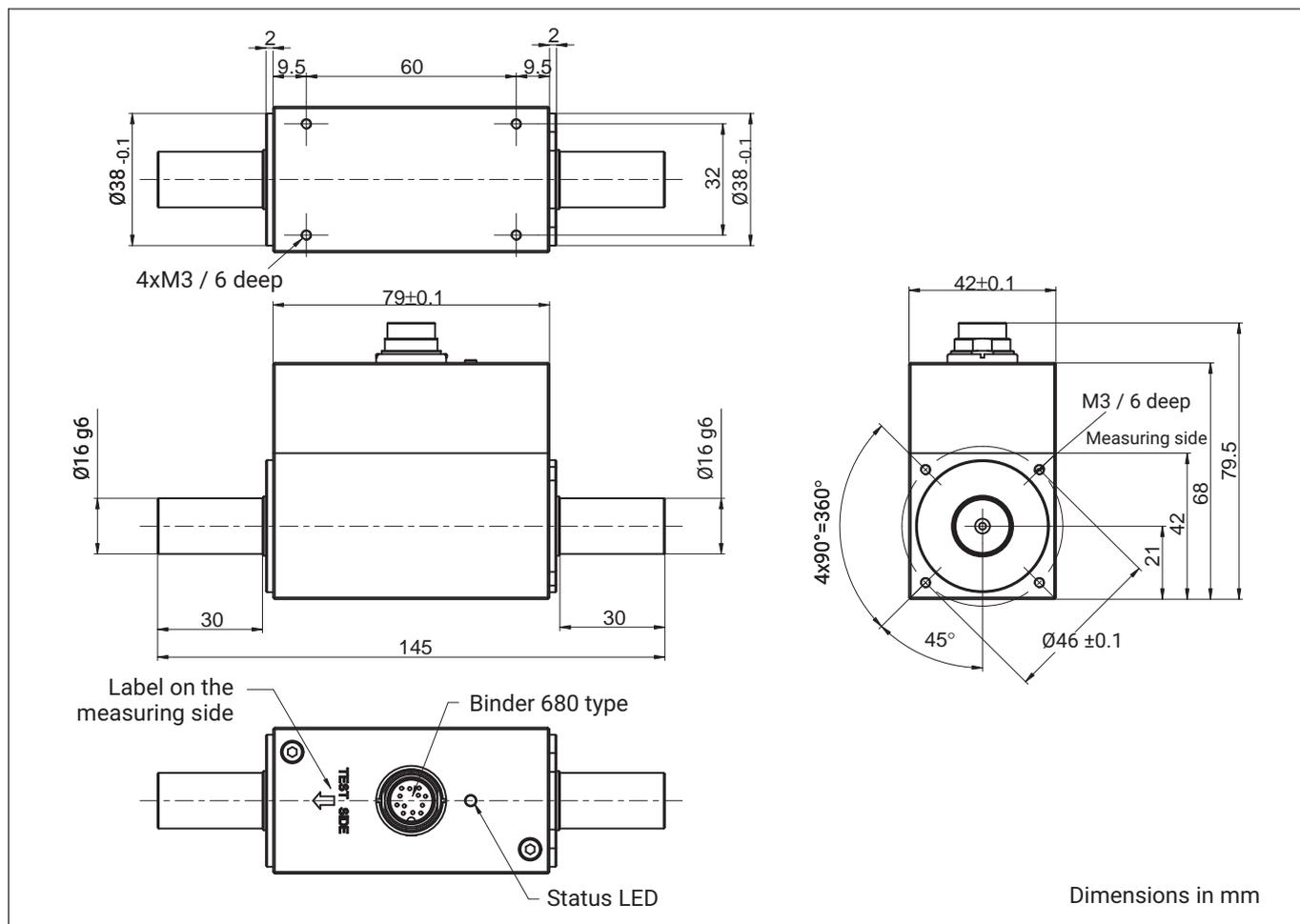
- 1) 512 pulses/revolution as standard with 1-T210
1024 pulses/revolution optionally via K-T210
- 2) Each type of irregular stress (lateral or longitudinal force, exceeding nominal (rated) torque) can only be permitted up to its specified static load limit and provided none of the others can occur at the same time. If this condition is not met, the limit values must be reduced. If 50% of the lateral limit force occurs, only 50% of the axial limit force is permissible and the nominal (rated) torque must not be exceeded. In the measurement result, the permissible irregular stresses can have an effect of approx. 1% of the nominal (rated) torque.
The specified loads only apply to the measurement shaft and must not be routed or stabilized via the housing.
- 3) Measured on the center of the shaft stub.
- 4) The nominal (rated) torque must not be exceeded.
- 5) The influence on the vibration measurements caused by radial run-out deviations, eccentricity, defects of form, notches, marks, local residual magnetism, structural inhomogeneity or material anomalies must be taken into account and isolated from the actual undulation.

DIMENSIONS

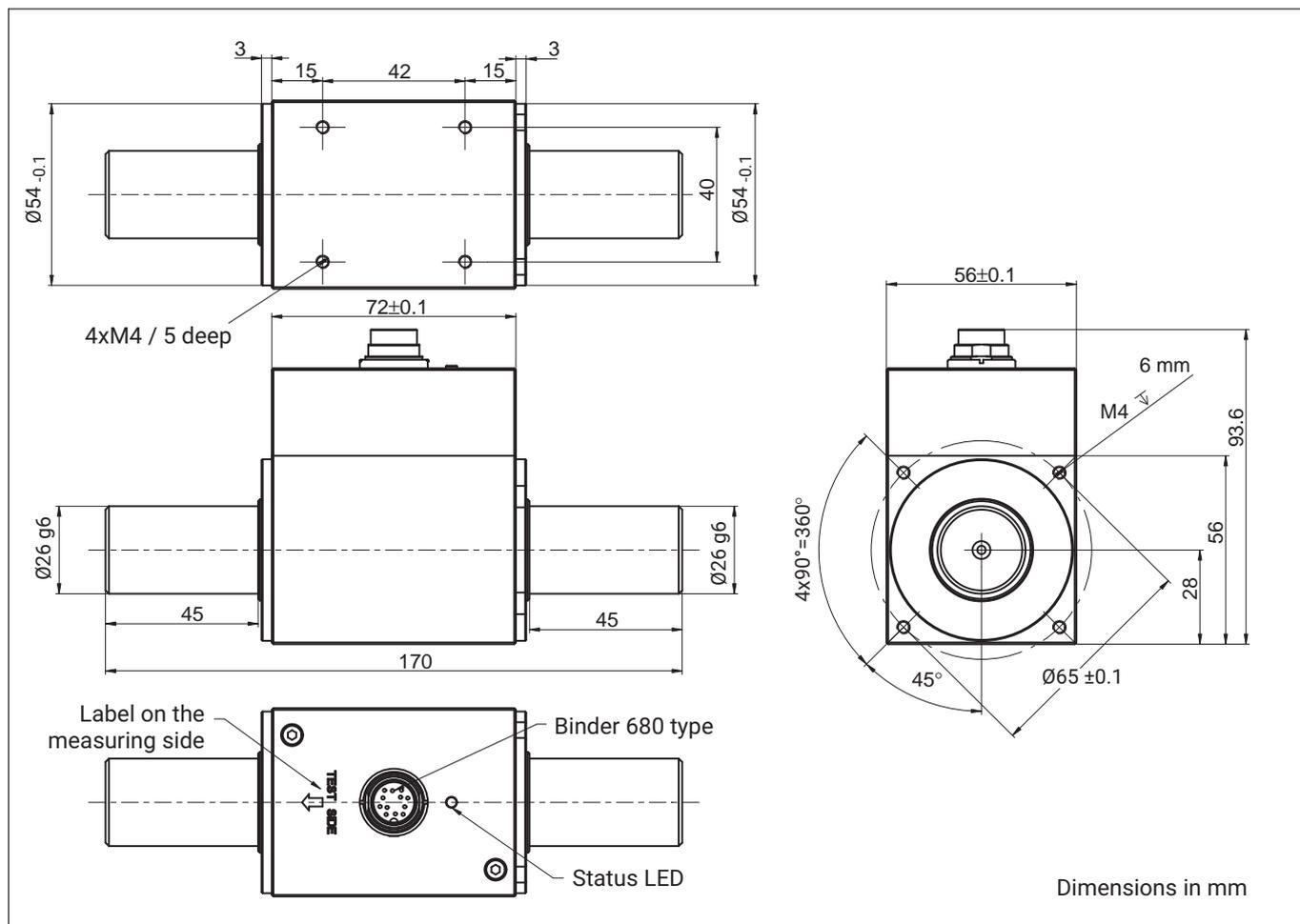
Code FA (Frequency + Analog), 0.5 N·m, 1 N·m, 2 N·m



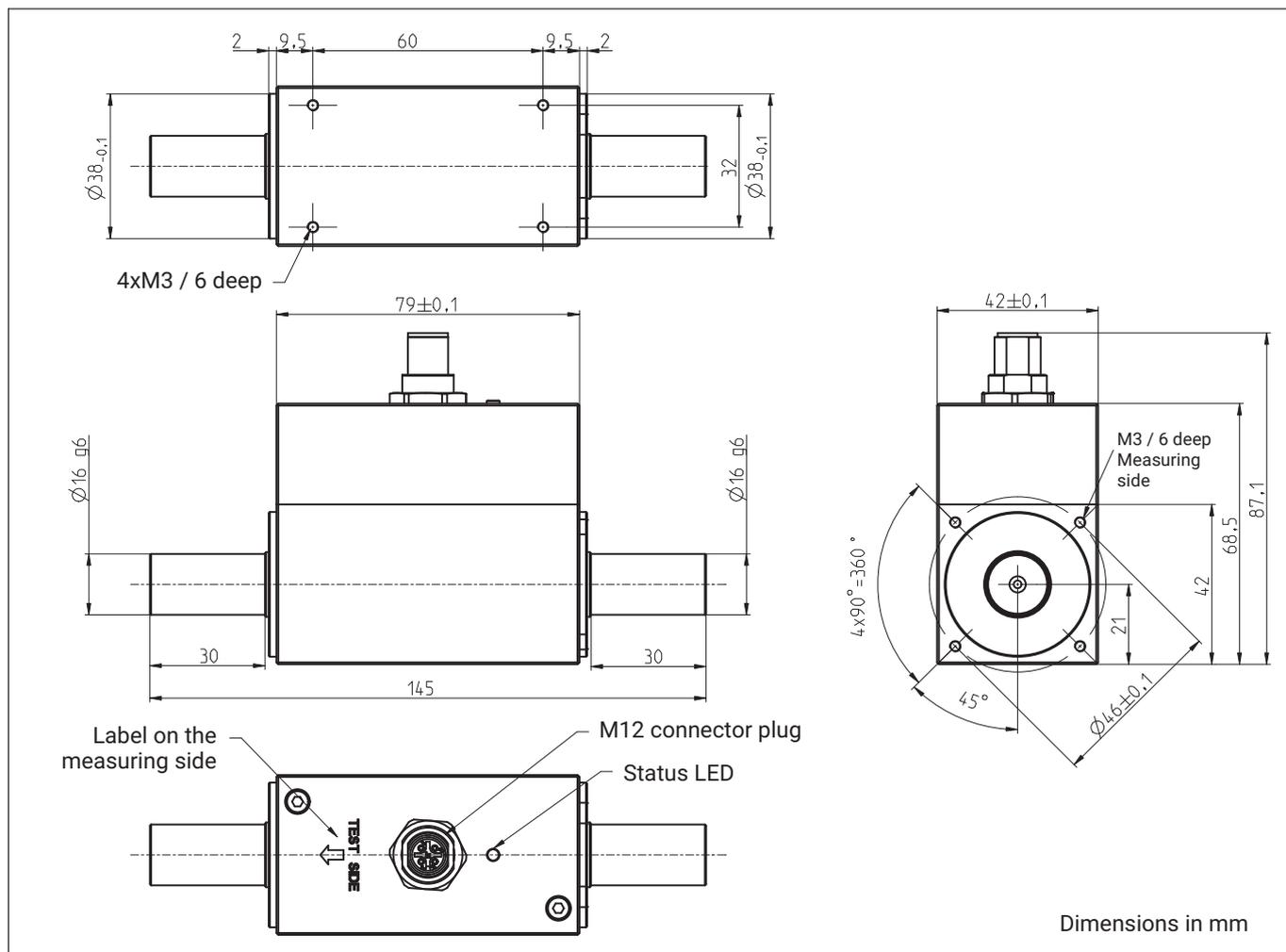
Code FA (Frequency + Analog), 5 N·m, 10 N·m, 20 N·m



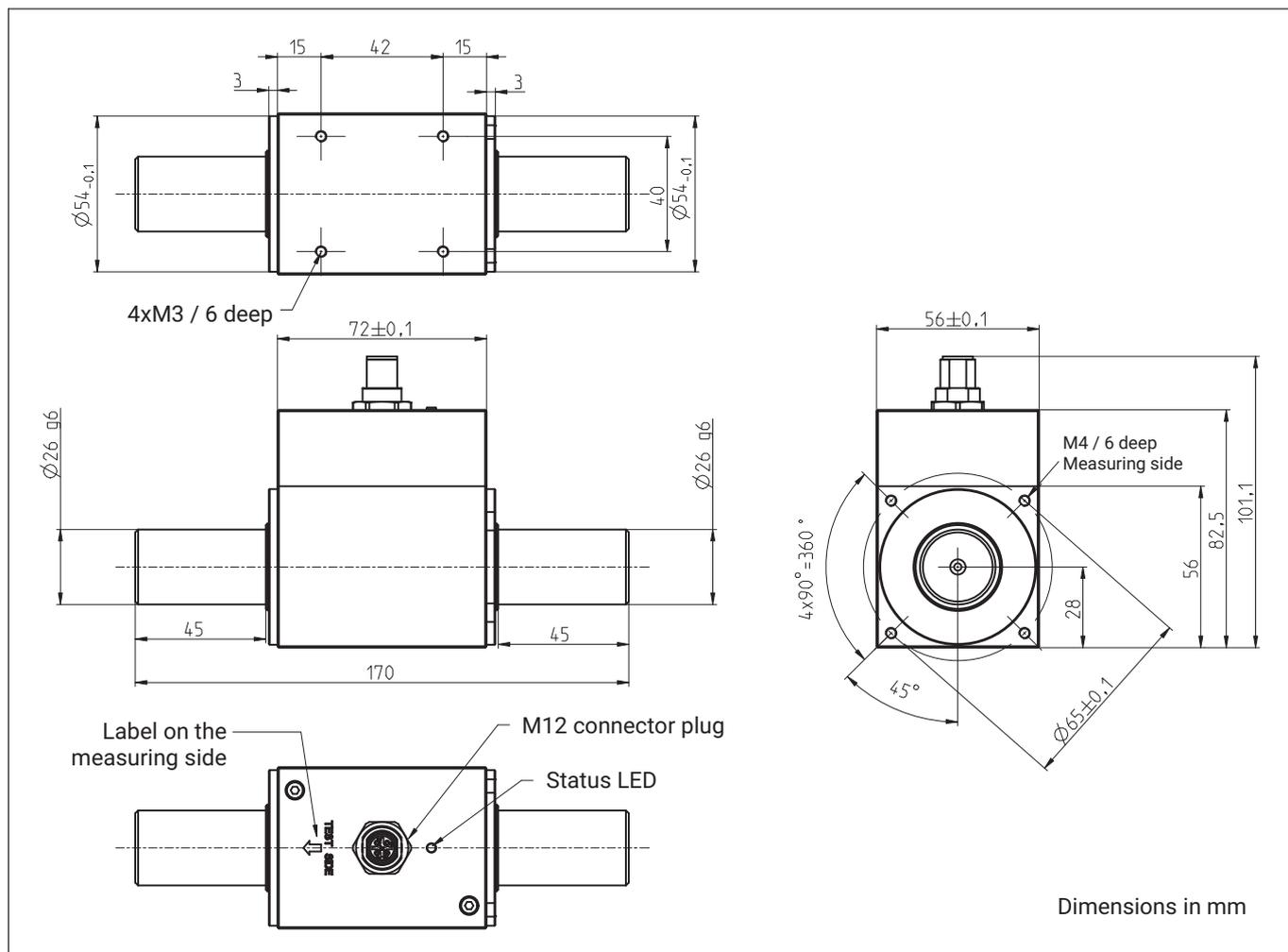
Code FA (Frequency + Analog), 50 N·m, 100 N·m, 200 N·m



Code L (IO-Link), 5 N·m, 10 N·m, 20 N·m



Code L (IO-Link), 50 N·m, 100 N·m, 200 N·m



ORDERING NUMBERS

The following versions are available from stock at short notice as a standard product in the configuration with a 512 pulses/revolution rotational speed measuring system:

Material no.	Nominal (rated) torque (Nm)
1-T210/0.5NM	0.5
1-T210/1NM	1
1-T210/2NM	2
1-T210/5NM	5
1-T210/10NM	10
1-T210/20NM	20
1-T210/50NM	50
1-T210/100NM	100
1-T210/200NM	200

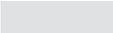
The product is also available as a configurable variant.

PRODUCT DESIGNATION (OVERVIEW)

K-T210		
1	Code	Option 1: Measuring range
	0.5	0.5 Nm
	1	1 Nm
	2	2 Nm
	5	5 Nm
	10	10 Nm
	20	20 Nm
	50	50 Nm
	100	100 Nm
	200	200 Nm
2	Code	Option 2: Accuracy
	S	Standard
3	Code	Option 3: Maximum speed
	S	Standard
4	Code	Option 4: Electrical outputs
	FA	Frequency + Analog
4	L	IO-Link
5	Code	Option 5: Rotational speed measuring system
	0	Without rotational speed measuring system
	1	512 pulses/revolution and reference pulse
	2	1024 pulses/revolution and reference pulse
	3	IO-Link with rotational speed measuring system
6	Code	Option 6: Customized modification
	N	None
7	Code	Option 7: IO-Link firmware version
	N	None
	IO01	Version 1.0.0

K-T210 - - - - - - -

1 2 3 4 5 6 7

 Preferred types

SCOPE OF SUPPLY

- T210 torque transducer
- Test report
- Mounting instructions

ACCESSORIES

To be purchased separately.

- Transducer connection cable, 5 m long, order no. 1-KAB434-5
- Transducer connection cable, 10 m long, order no. 1-KAB435-10
- Cable socket, 12-pin (binder), order no. 3-3312.0268
- Junction box, order no. 1-VK20A
- Bellows couplings, e.g. 1-4413.00xx

ACCESSORIES FOR JUNCTION BOX VK20A

To be purchased separately.

- Connection cable, 1.5 m long (D-Sub, 15-pin – free ends), order no. 1-KAB151A-1.5
- Connection cable, 1.5 m long (SUBCON5 – free ends), order no. 1-KAB152-1.5

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