

# T22

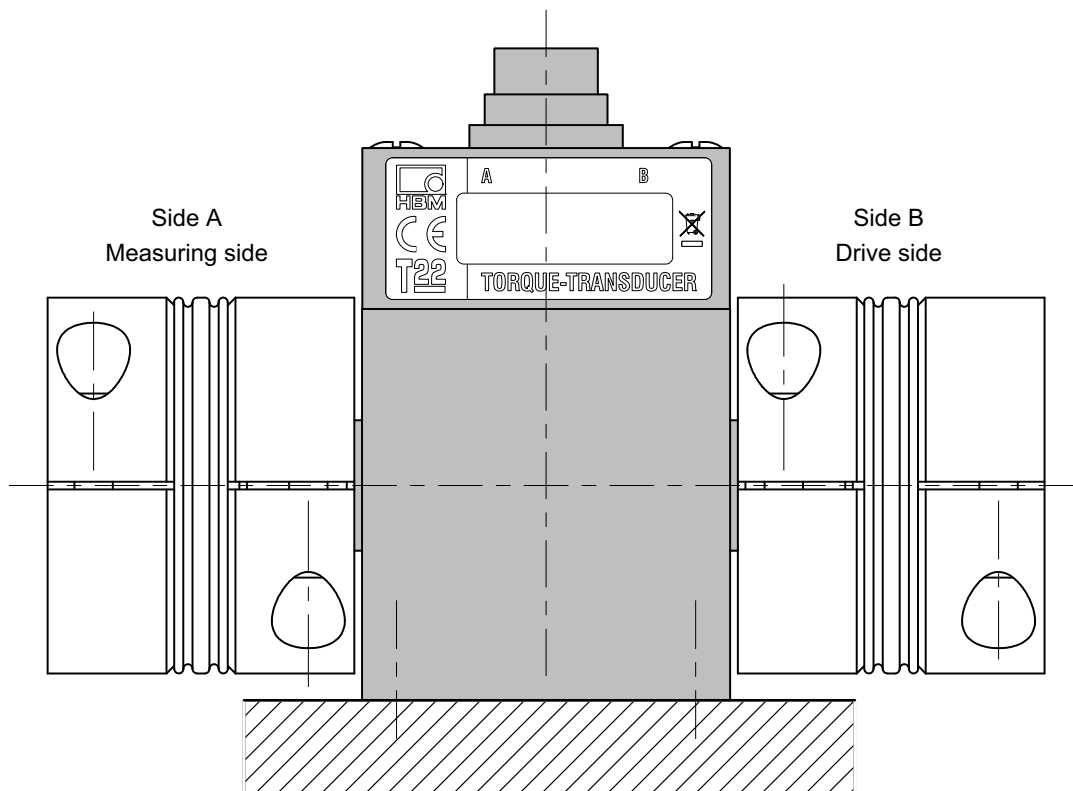
## Torque transducer

### Special features

- Nominal (rated) torques 0.5 Nm, 1 Nm, 2 Nm, 5 Nm, 10 Nm, 20 Nm, 50 Nm, 100 Nm, 200 Nm, 500 Nm and 1 kNm
- Nominal (rated) rotational speed up to 20000 rpm (depending on measuring range)
- Accuracy class: 0.5
- Contactless transmission of measurement signals
- Measurement on rotating or stationary parts
- Cylindrical shaft ends for non-play friction joints
- $\pm 5$  V and  $10 \pm 8$  mA torque output signal



### Installation example with two bellows couplings



# Specifications

<b>Type</b>		T22											
<b>Accuracy class</b>		0.5											
<b>Torque measuring system</b>													
<b>Nominal (rated) torque <math>M_{nom}</math></b>	N·m	0.5	1	2	5	10	20	50	100	200	500		
	kN·m												1
<b>Nominal (rated) sensitivity</b> (span between torque = zero and nominal (rated) torque $M_{nom}$ )													
Voltage output	V	5											
Current output	mA	8											
<b>Sensitivity tolerance</b> (deviation of the actual output quantity at $M_{nom}$ from the nominal (rated) sensitivity)													
Voltage output	%	±0.5											
Current output	%	±0.5											
<b>Output signal at torque = zero</b>													
Voltage output	V	0 ± 0.2											
Current output	mA	10 ± 0.2											
<b>Nominal (rated) output signal</b>													
Voltage output													
at positive nominal (rated) torque	V	+5											
at negative nominal (rated) torque	V	-5											
Current output													
at positive nominal (rated) torque	mA	+18											
at negative nominal (rated) torque	mA	+2											
<b>Load resistance</b> (Voltage output)	MΩ	>1											
<b>Burden</b> (current output)													
with $U_B = 12\text{ V}$	Ω	250											
with $U_B = 24\text{ V}$	Ω	500											
<b>Longterm drift over 48h</b>													
Voltage output	mV	< ± 50											
Current output	μA	< ± 80											
<b>Cut-off frequency (-3 dB)</b> (volt. output / current output)	kHz	1											
<b>Group delay</b> (voltage output / current output)	μs	450											
<b>Residual ripple</b>													
Voltage output	mV <sub>pp</sub>	< 100											
Current output	mA <sub>pp</sub>	< 0.1											
<b>Effect of temperature per 10 K in the nominal (rated) temperature range</b>													
on the <b>output signal</b> , related to the actual value of the signal span	%	≤ ± 0.2											
on the <b>zero signal</b> , relat. to the nominal (rated) sensitivity	%	≤ ± 0.5											
<b>Power supply</b>													
Nominal (rated) supply voltage range	V (DC)	11.5 ... 30											
Current consumption in measuring mode	A	< 0.2											
Nominal (rated) power consumption	W	< 2.4											
Permissible residual ripple of supply voltage	mV <sub>pp</sub>	200											
<b>Linearity error including hysteresis</b> , related to the nominal (rated) sensitivity	%	≤ ± 0.3											
<b>Rel. standard deviation of repeatability</b> per DIN 1319, related to the variation of the output signal	%	≤ ± 0.1											
<b>Max. level control range</b> <sup>1)</sup>													
voltage output / current output	%	≤ 120											

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

## Specifications (continued)

Nominal (rated) torque $M_{nom}$	N·m	0.5	1	2	5	10	20	50	100	200	500	
	kN·m											1
<b>General data</b>												
<b>EMC <sup>2)</sup></b>												
<b>Immunity from interference</b> (DIN EN 61326-1 and EN 61326-2-3)												
HF line interference 150 kHz ... 80 MHz	V						10					
ESD (electrostatic discharge)												
Contact discharge	kV						4					
Air discharge	kV						8					
Electromagnetic field												
80 MHz ... 2000 MHz	V/m						10					
2000 MHz ... 2700 MHz	V/m						3					
Burst (fast transients)	kV						1					
<b>Emission (EME) (EN 61326-1 / EN 55011)</b>												
RFI voltage (interference voltage at DC connection) 150 kHz ... 30 MHz	-						Class B					
RFI field strength (Electromagnetic RFI field strength) 30 MHz ... 1000 MHz	-						Class B					
<b>Degree of protection per EN 60529</b>												
							IP 40					
<b>Nominal (rated) temperature range</b>												
	°C [°F]						+5...+45 [+41...+113]					
<b>Operating temperature range</b>												
	°C [°F]						0...+60 [+32...+140]					
<b>Storage temperature range</b>												
	°C [°F]						-5...+70 [+23...+158]					
<b>Impact resistance, test severity level per DIN IEC 68; Part 2-27; IEC 68-2-29-1987</b>												
number	n						1000					
duration	ms						3					
acceleration (halfsine)	m/s <sup>2</sup>						650					
<b>Ambient influences - part 2-27: Test procedure - Testing: Shock in accordance with EN 60068-2-27:2009</b>												
frequency range	Hz						5 ... 65					
duration	h						1.5					
acceleration (amplitude)	m/s <sup>2</sup>						50					
<b>Nominal (rated) rotational speed <math>n_{nom}</math></b>												
	min <sup>-1</sup>		20 000			16 000		12 000			9 000	
<b>Load limits <sup>3)</sup></b>												
<b>Limit torque, related to <math>M_{nom}</math></b>												
	%						200 <sup>5)</sup>					
<b>Breaking torque, related to <math>M_{nom}</math></b>												
	%						> 280					
<b>Longitudinal limit force</b>												
	kN	0.19	0.19	0.19	0.9	0.9	0.9	1.6	1.6	1.6	4	4
<b>Lateral limit force</b>												
	N	30	30	60	25	45	90	210	420	850	1400	2800
<b>Bending limit moment</b>												
	N·m	0.3	0.3	0.5	0.5	0.9	1.9	5.5	11	22	54	109
<b>Oscillation width per DIN 50100 (peak-to-peak)<sup>4)</sup></b>												
	%						80					

<sup>2)</sup> Test severity / criterion: Industrial environment, cable length  $\leq 30$  m. Application not outside buildings.

<sup>3)</sup> 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 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. 1 % of the nominal (rated) torque.

<sup>4)</sup> The nominal (rated) torque must not be exceeded.

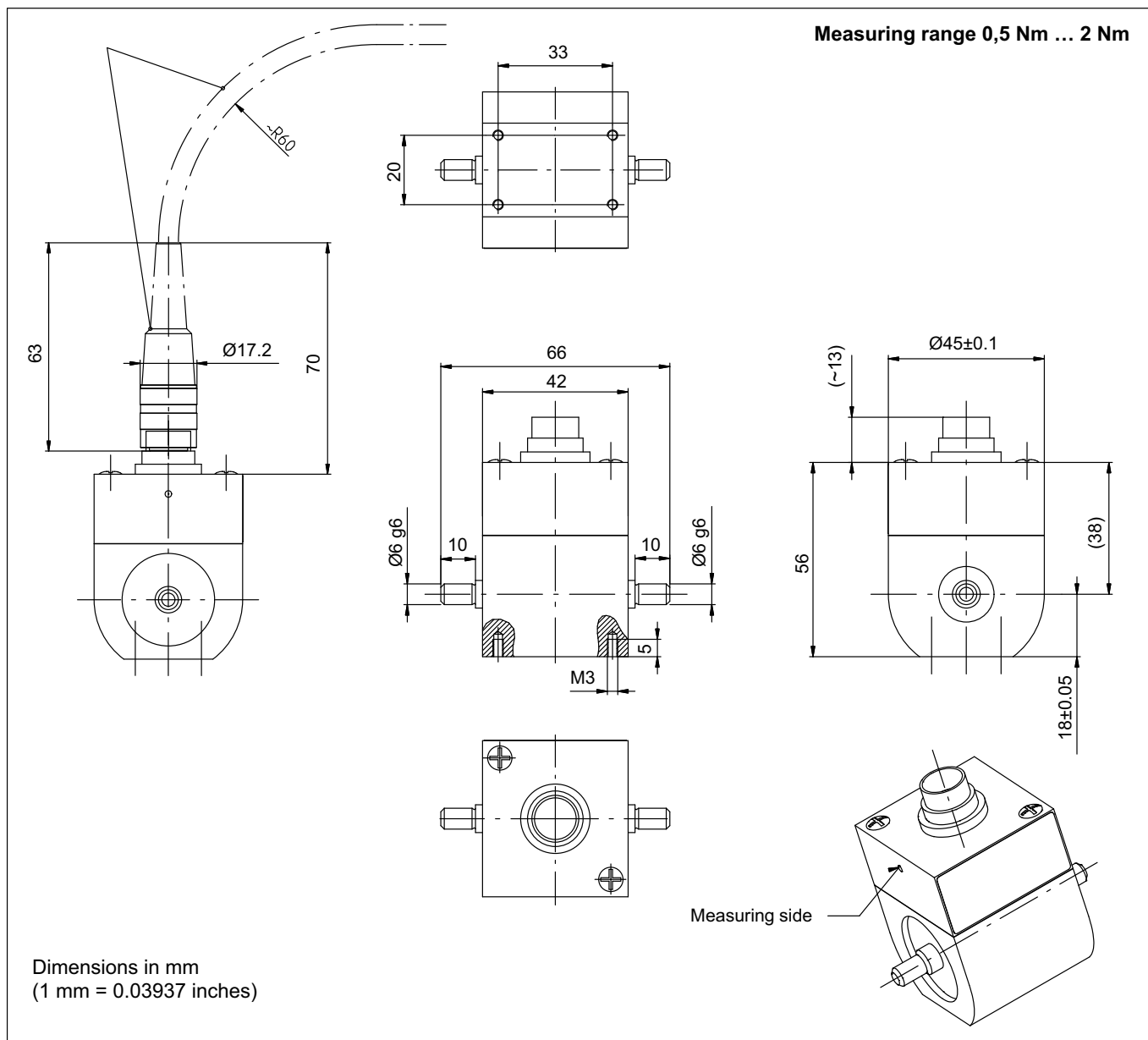
<sup>5)</sup> Please adhere to the maximum torque ( $T_{max}$ ) of the couplings.

## Specifications (continued)

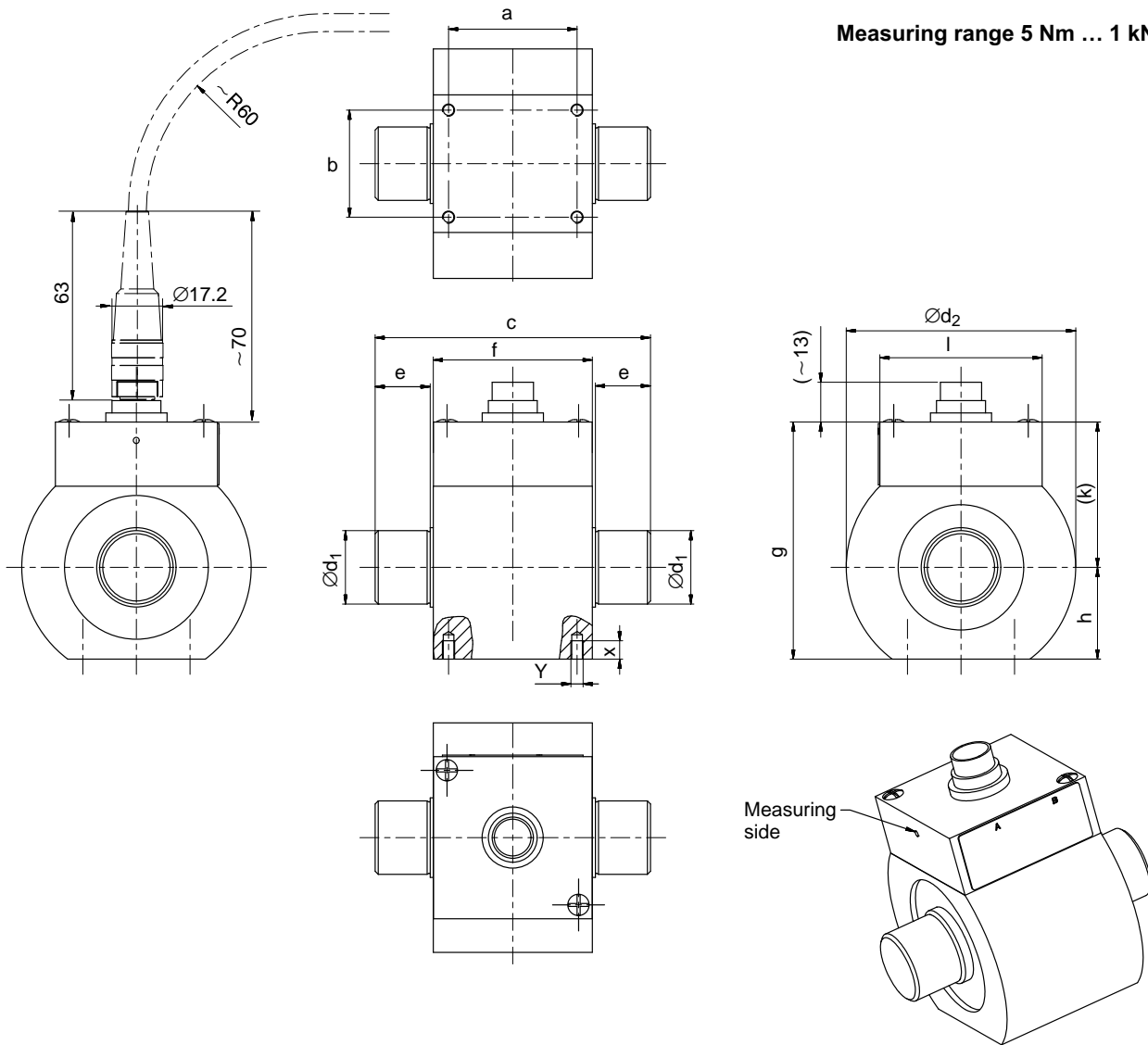
Nominal (rated) torque $M_{nom}$	N·m	0.5	1	2	5	10	20	50	100	200	500	
	kN·m											1
<b>Mechanical values</b>												
Torsional stiffness $c_T$	kN·m/ rad	0.14	0.14	0.29	1.1	2.7	5.4	19.7	35.5	52.4	288. 6	418. 9
Torsion angle at $M_{nom}$	Deg.	0.20	0.39	0.39	0.26	0.21	0.21	0.15	0.16	0.22	0.10	0.14
Balance quality-level per DIN ISO 1940		G 6.3										
Max. limits for relative shaft vibration (peak-to-peak) <sup>6)</sup>	μm	$s_{max} = \frac{4500}{\sqrt{n}}$ (n in rpm)										
Rms value for the vibration velocity of the enclosure designated in VDI 2056	mm/s	$v_{eff} = \frac{\sqrt{n}}{3}$ (n in rpm)										
<b>Mass moment of inertia</b>												
total		1.5	1.5	1.5	13.4	13.5	13.6	39.8	40.5	42.4	335. 0	351. 9
drive side of shaft	$10^{-3}$ g·m <sup>2</sup>	1.45	1.45	1.45	11.6	11.7	11.7	29.2	29.6	30.5	187. 9	196. 3
measuring side of shaft		0.05	0.05	0.05	1.8	1.8	1.9	10.6	10.9	11.9	147. 1	155. 6
<b>Weight</b>	g	230			550			850			2400	

<sup>6)</sup> Relative undulation in the area of the connecting shaft stubs, following DIN 45670/VDI 2059

# Dimensions of the T22



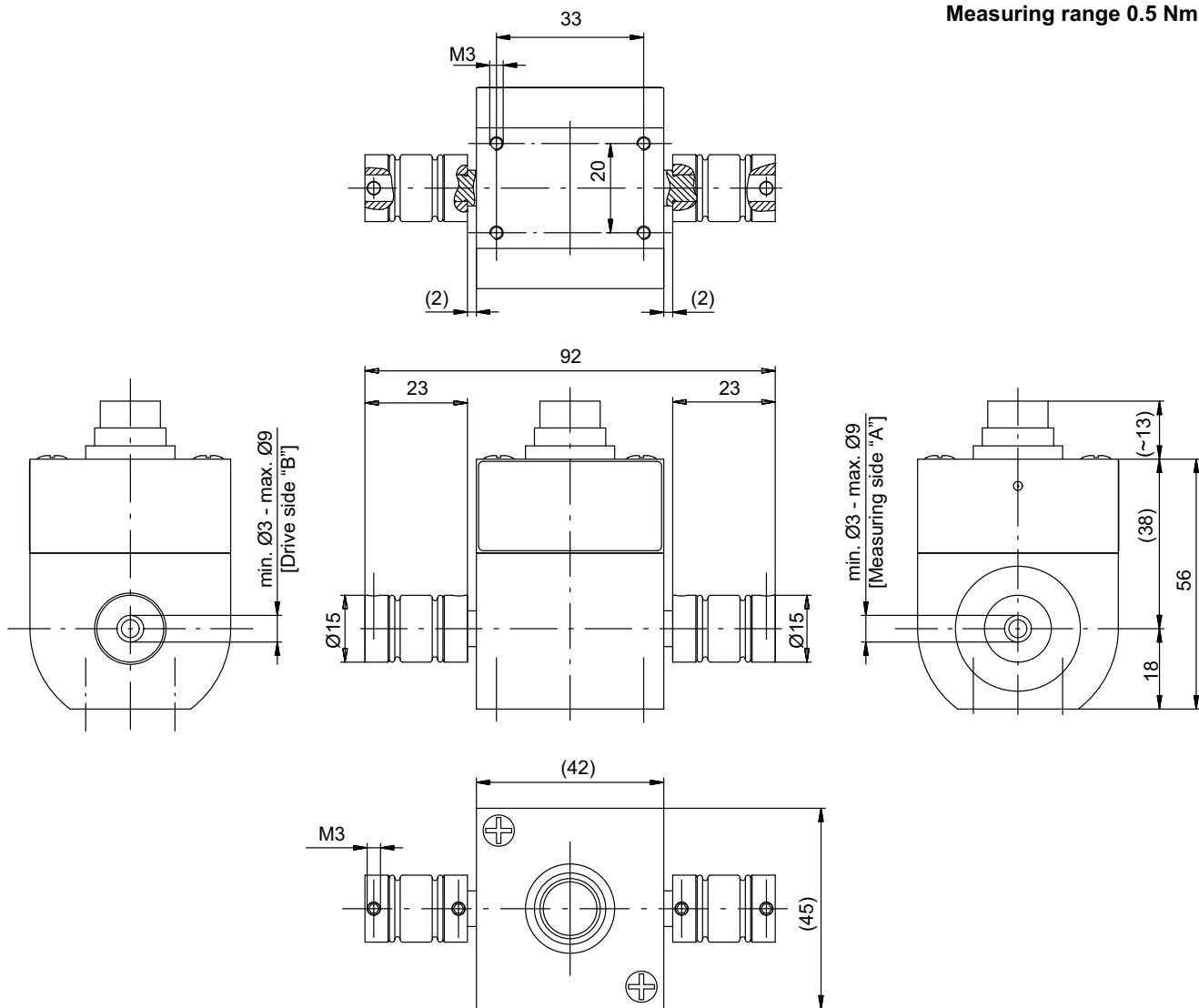
Measuring range 5 Nm ... 1 kNm



Measuring range (N·m)	Dimensions (in mm)												
	a	b	c	e	f	g	h ±0.05	(k)	l	Ød <sub>1</sub> g6	Ød <sub>2</sub> ±0.1	Y	X
5	39	31	80	15	48	72	28	44	52.75	15	70	M4	6
10													
20													
50	42	35	90	18	52	77.5	30	47.5	53	24	75	M4	6
100													
200													
500	50	55	120	26	65	97.5	40	57.5	75.5	40	105	M5	10
1k													

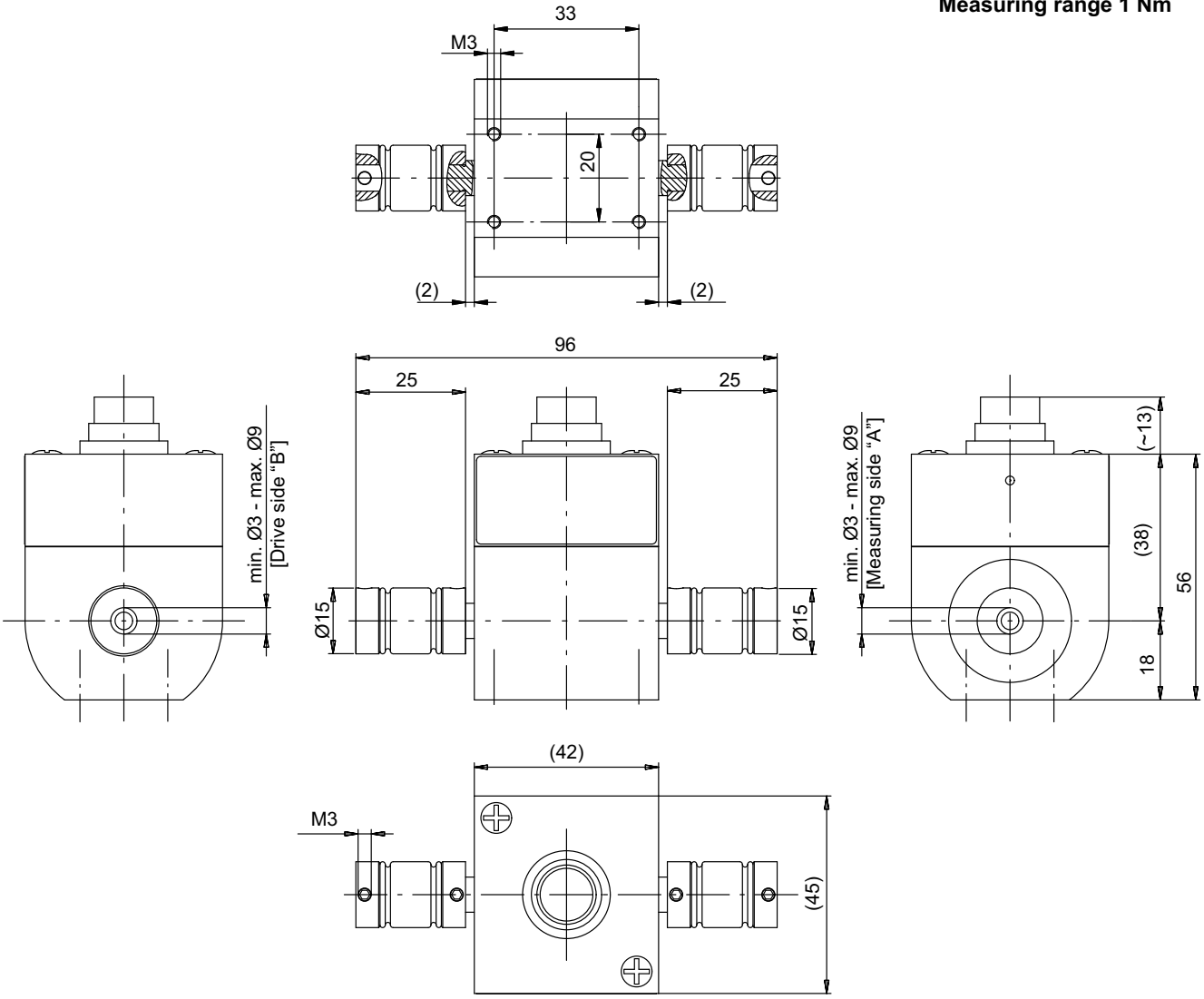
# Dimensions bellows couplings

Measuring range 0.5 Nm



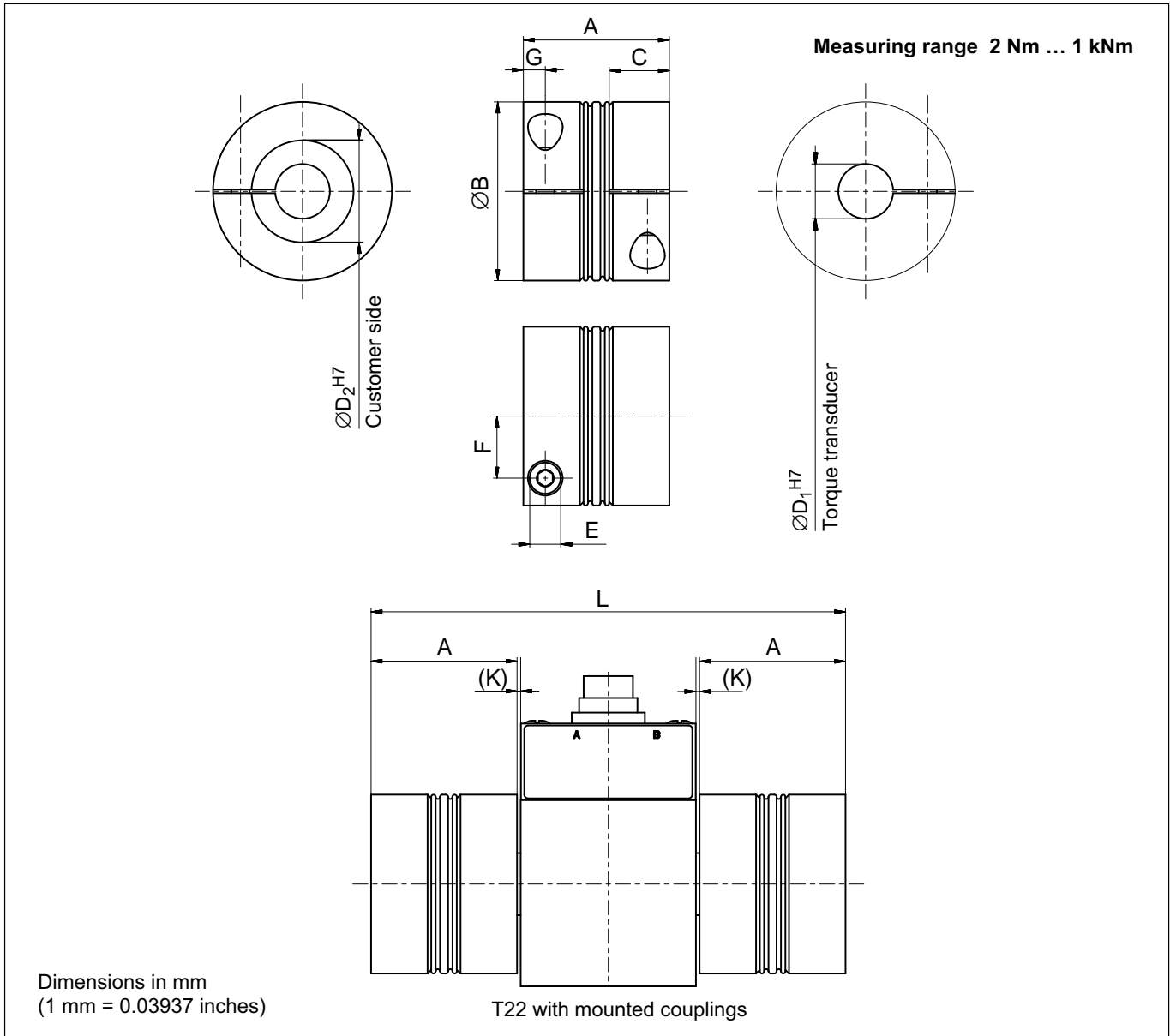
Dimensions in mm  
(1 mm = 0.03937 inches)

Measuring range 1 Nm



Dimensions in mm  
(1 mm = 0.03937 inches)



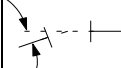




Measuring range (N.m)	Part no.	Dimensions (in mm)									
		A	$\varnothing B$	C	$\varnothing D_1$	$\varnothing D_2$ variable from-to	E	F	G	L	(K)
0.5	3-4412.0001	See figure									
1	3-4412.0002	See figure									
1	3-4413.0003	40	25	13	6	3 ... 12.7	M3	8	4	124	1
5	3-4412.0020	40	49	16.5	15	15-28	M5	17	6	130	1
10											
20											
50	3-4412.0021	59	66	23	24	24-35	M8	23	9.5	172	1
100											
200											
500	3-4412.0022	89	110	34	40	40-60	M12	39	13	246	1.5
1k											

When ordering, please specify: connection holes  $D_2$  as requested by the customer within specified limits; boring tolerance H7.

## Specifications

Measuring range (N·m)	Torque coupling $T_{Kmax}$ (N·m)	Mass moment of inertia ( $10^{-3}$ kg·m <sup>2</sup> )	Weight (g)	Torsional stiffness (kN·m/rad)	Max. permissible offset			Spring stiffness		Material hub and fixing ring	Tightening torque for clamping bolts (N·m)
					axial (mm) 	radial (mm) 	angular (degree) 	axial (N/mm)	radial (N/mm)		
0.5	0.5	0.00012	6	0.21	0.5	0.2	1.5	13.4	32	aluminum	1.3
1	1	0.00018	7	0.38				27.4	84.3		
2	2	0.0027	38	1.3				0.6	20.6		88
5	20	0.05	130	41.9	1.0	0.06	0.5	55.8	3710		8
10											
20											
50	200	0.18	400	138	1.0	0.08	0.5	153	11000	40	
100											
200											
500	1000	7.2	3500	570	1.5	0.1	0.5	148	9010	steel	130
1k											

## General instructions

- Only tighten the clamping bolts of the couplings when the shafts are mounted in the coupling hubs!
- The bellows coupling must not be overstretched beyond the specified permissible flexibility limits.
- Drive and output shafts must be free from grease and burrs.
- Implement a tolerance of j6 for the shaft diameter, to produce the preferred fit of H7/j6.

## Mounting position

The T22 torque transducer can be operated with bellows couplings in any mounting position (horizontally, vertically or at an angle). When mounting vertically or at an angle, please make sure that the additional elements are adequately supported.

## Delivery condition

The couplings and the torque transducer are delivered as separate items.

## Accessories for the T22, to be ordered separately

Transducer connection cable, 5 m long, order no. 3-3301.0158

Transducer connection cable, 10 m long, order no. 3-3301.0159

Cable socket, 12-pin (Binder), order no. 3-3312.0268

Bellows couplings

Junction box, order no. 1-VK20A

## Accessories for junction box VK20A, to be ordered separately

Connection cable, 1.5 m long (D-Sub, 15-pin - free ends), order no. 1-Kab151-1.5

Connection cable, 1.5 m long (SUBCON5 - free ends), order no. 1-Kab152-1.5

Subject to modifications.

All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability.

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