T21WN

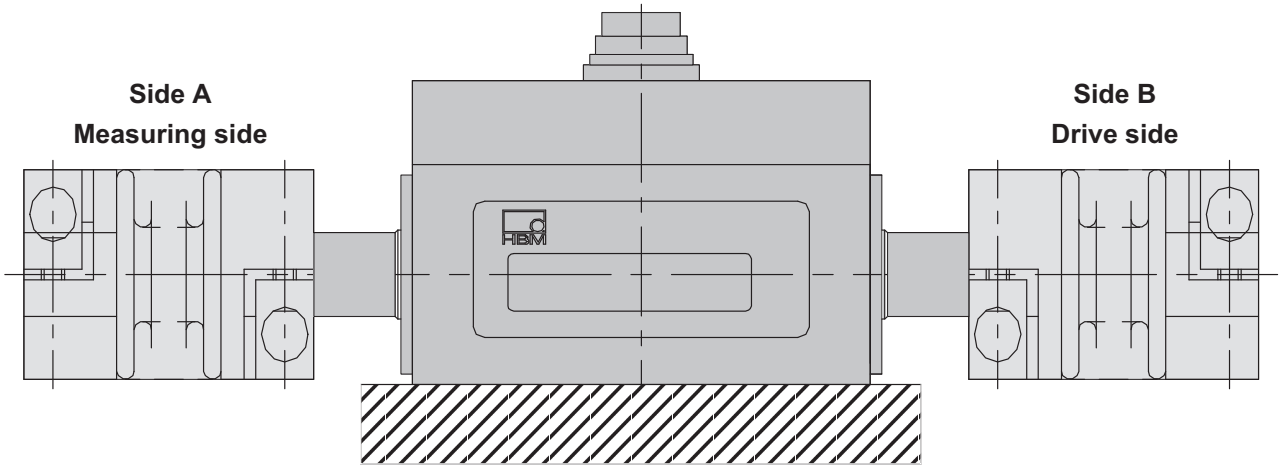
Torque transducers

Special features

- **Nominal (rated) torques 0.1 N·m, 0.2 N·m, 0.5 N·m, 1 N·m, 2 N·m, 5 N·m, 10 N·m, 20 N·m, 50 N·m, 100 N·m, 200 N·m**
- **Non-linearity including hysteresis ≤0.1%**
- **Non-contacting transmission of measured values**
- **High speeds for angle of rotation measurements up to 20,000 rpm**
- **Cylindrical shaft ends for friction fits**
- **Integrated measurement system for rotational speed and angle of rotation**
- **Torque output signal ±10 V, 10 kHz ±5 kHz**

Data sheet

Installation example with bellows couplings



Two of the couplings provided are needed for this example

Specifications for T21WN

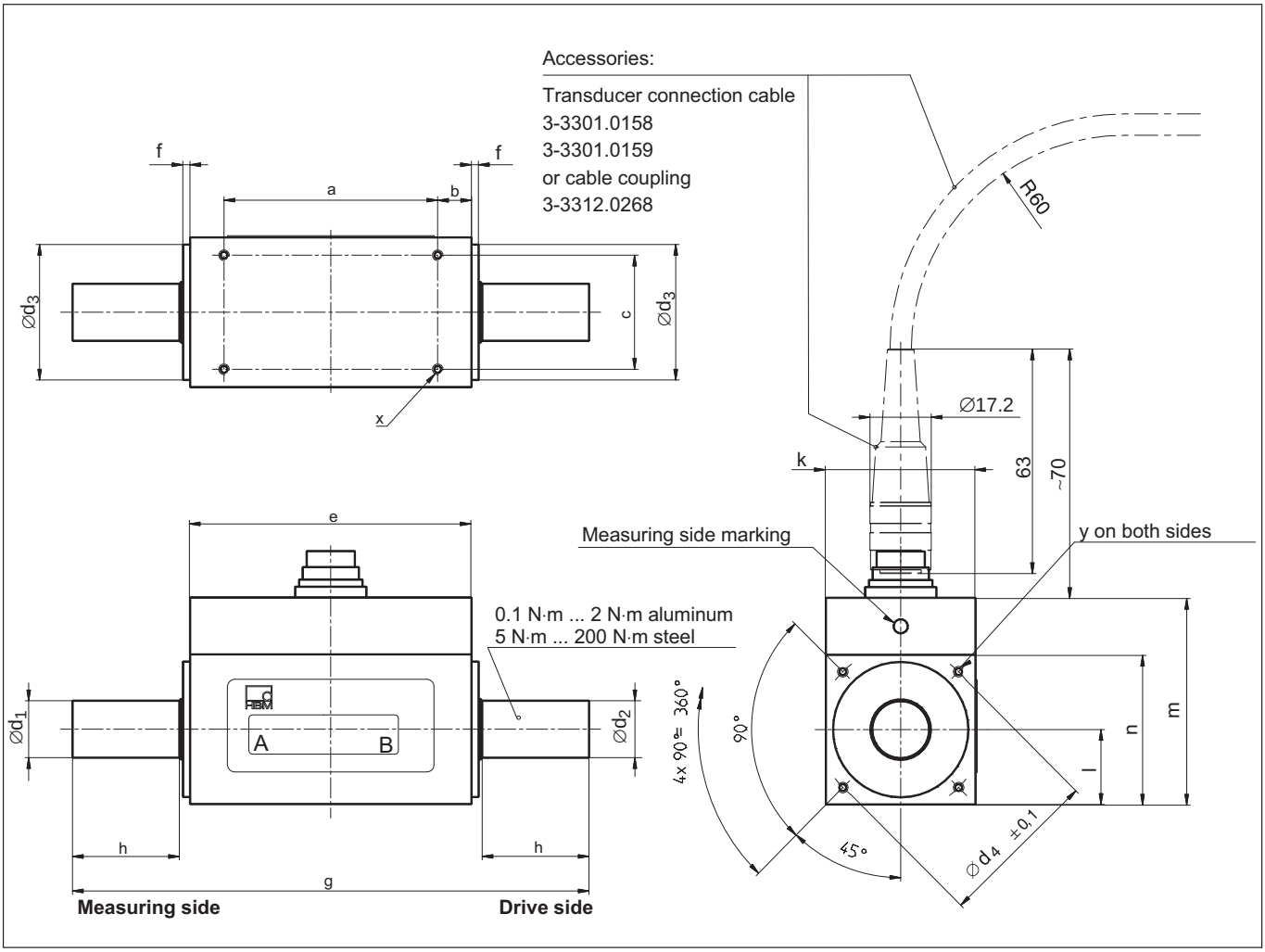
Type		T21WN										
Accuracy class		0.2										
Nominal (rated) torque M_{nom}	N·m	**0.1**	**0.2**	**0.5**	**1**	**2**	**5**	**10**	**20**	**50**	**100**	**200**
Nominal (rated) rotational speed	rpm	20,000					19,000			13,500		
Non-linearity including hysteresis relative to the nominal (rated) sensitivity	%	<±0.1										
Rel. standard deviation of repeatability per DIN 1319 relative to the variation of the output signal	%	< ± 0.05										
Temperature effect per 10 K in the nominal (rated) temperature range												
on the output signal relative to the actual value of the signal span												
Frequency output	%	<±0.1										
Voltage output	%	≤±0.1										
on the zero signal relative to the nominal (rated) sensitivity												
Frequency output	%	<±0.2										
Voltage output	%	<±0.2										
Nominal (rated) sensitivity (nominal (rated) signal range between torque = zero and nominal (rated) torque)												
Frequency output 10 kHz	kHz	5										
Voltage output	V	10										
Sensitivity tolerance (deviation of actual output quantity at M_{nom} from the nominal (rated) signal range)	%	±0.2										
Nominal 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										
Load resistance	MΩ	> 1										
Long-term drift over 48 h	mV	<±50										
Cut-off frequency (-3 dB)	kHz	1										
Residual ripple (voltage output)	mV_{SS}	< 100										
Group delay	ms	< 1.0										
Maximum modulation range												
Frequency output	kHz	3.7 … 16.3										
Voltage output	V	-11 … +11										
Resolution												
Frequency signal	Hz	0.19										
Voltage signal	mV	0.38										
Energy supply												
Nominal (rated) supply voltage (safety extra-low voltage (SELV))	V (DC)	10 … 28.8										
Calibration signal triggering	V	5 … 24										
Current consumption in measuring mode	A	with U_b 12V <0.2										
Nominal (rated) power consumption	W	< 2.4										
Permissible residual ripple of supply voltage	mV_{ss}	200										
Calibration signal	V	+10 ± 0.2%										
Output signal at torque = zero	V	0 ±0.05										
	Hz	10,000 ±50										

Nominal (rated) torque M_{nom}	N·m	**0.1**	**0.2**	**0.5**	**1**	**2**	**5**	**10**	**20**	**50**	**100**	**200**
Measurement system for rotational speed/angle of rotation												
Measurement system		Optical										
Pulses per revolution	Number	360										
Output signal	V	5 (unbalanced); two square wave signals phase shifted by approx. 90°										
Minimum rotational speed for sufficient pulse stability	rpm	0										
Load resistance	kΩ	>10										
Group delay	µs	<3 for 1.5 m cable between T21WN and VK20A junction box (without VK20A, the group delay is dependent on the connected impedance / cable & analysis device)										
Max. measurable rotational speed	rpm	20,000[1)]										
General information												
EMC												
Immunity to interference (per EN61326-1, table A.1)												
Electromagnetic field	V/m	10										
Magnetic field	A/m	30										
Electrostatic discharge (ESD)												
Contact discharge	kV	4										
Air discharge	kV	4										
Fast transients (burst)	kV	2										
Impulse voltage (surge)	kV	1										
Conducted interference	V	10										
Emission (per EN 61326-1, table 3)												
RFI voltage		Class B										
RFI power		Class B										
RFI field strength		Class B										
Degree of protection per EN 60 529		IP40										
Weight, approx.	kg	0.17					0.60			1.3		
Nominal (rated) temperature range	°C	+5 … +45										
Operating temperature range	°C	0 … +60										
Storage temperature range	°C	-5 … +70										
Mechanical shock and impact testing per EN 60068-2-27; IEC 68-2-27-1987												
Number	n	1000										
Duration	ms	3										
Acceleration (half sine)	m/s^2	650										
Vibration testing per EN 60068-2-6: IEC 68-2-6-1982												
Frequency range	Hz	5 … 65										
Duration	h	1.5										
Acceleration (amplitude)	m/s^2	50										
Load limits [2)]												
Torque limit relative to M_{nom}	%	200[3)]										
Breaking torque relative to M_{nom}	%	> 280										
Longitudinal limit force	kN	0.2		0.34	0.5	1.1	1.75	2.75	5.3	7.6	12.5	
Lateral limit force	N	3.6		5.7	8.3	18.2	29	46	88	127	207	
Bending moment limit	N·m	0.12		0.23	0.4	0.93	1.9	3.7	10	17	36	
Oscillation bandwidth per DIN 50 100 (peak-to-peak)[4)]	%	80										

Nominal (rated) torque M_{nom}	N·m	**0.1**	**0.2**	**0.5**	**1**	**2**	**5**	**10**	**20**	**50**	**100**	**200**
Mechanical values												
Torsional stiffness c_T	kN·m/ rad	0.03			0.05	0.07	0.91	1.9	3.25	14	21.9	32.6
Torsion angle at M_{nom}	degrees	0.2	0.38	0.96	1.1	1.7	0.32	0.3	0.35	0.2	0.26	0.35
Max. limits for relative shaft vibration (peak-to-peak) [5]	µm	$s_{max} = \frac{4500}{\sqrt{n}}$										
Effective vibration rate in the enclosure area per VDI 2056	mm/s	$v_{eff} = \frac{\sqrt{n}}{3}$										
Mass moment of inertia of the rotor (around rotary axis) with rotational speed measuring system ($x10^{-3}$)	gm^2	0.06			0.063	0.068	6.10	6.13	6.23	53.7	54.6	57.2
Balance quality level per DIN ISO 1940	-	G 6.3										

1) Dependent on the nominal (rated) torque
2) 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 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 30% of the bending limit moment and lateral limit force occur at the same time, only 40% of the axial 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.
3) Note the maximum torque (T_{Kmax}) of the coupling.
4) The nominal (rated) torque must not be exceeded.
5) Relative undulations, following DIN 45670/VDI 2059.

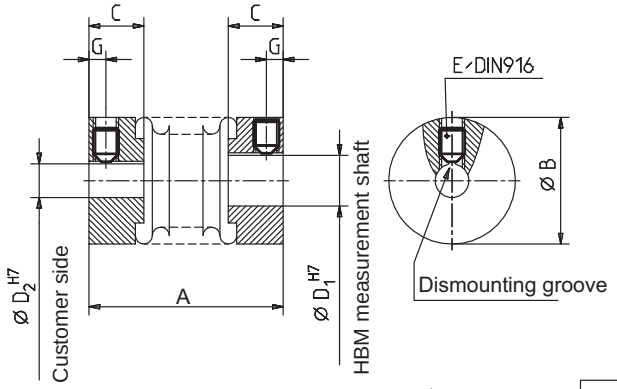
Dimensions of T21WN



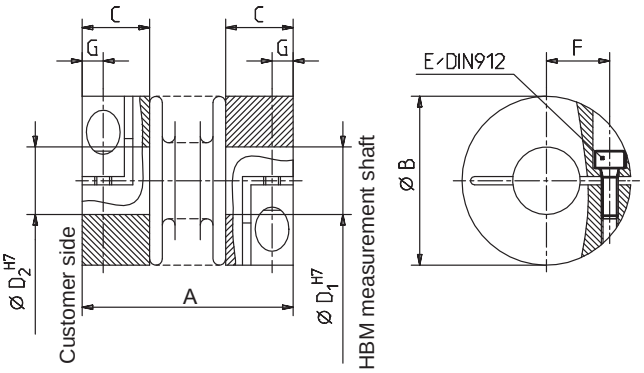
Measuring range (N·m)	Dimensions (in mm)																
	a	b	c	$e_{\pm 1}$	f	g	h	$k_{\pm 1}$	l	$m_{\pm 1}$	n	$Ød1_{g6}$	$Ød2_{g6}$	$Ød3_{-0.1}$	$Ød4_{\pm 0.1}$	y	x
0.1	40	11	22	62	2	95	14	28	14	54	30	6	8	27	32	M3/6 deep	M3/5 deep
0.2	40	11	22	62	2	95	14	28	14	54	30	6	8	27	32	M3/6 deep	M3/5 deep
0.5	40	11	22	62	2	95	14	28	14	54	30	6	8	27	32	M3/6 deep	M3/5 deep
1	40	11	22	62	2	95	14	28	14	54	30	6	8	27	32	M3/6 deep	M3/5 deep
2	40	11	22	62	2	95	14	28	14	54	30	6	8	27	32	M3/6 deep	M3/5 deep
5	60	9.5	32	79	2	145	30	42	21	58	42	16	16	38	46	M3/6 deep	M3/6 deep
10	60	9.5	32	79	2	145	30	42	21	58	42	16	16	38	46	M3/6 deep	M3/6 deep
20	60	9.5	32	79	2	145	30	42	21	58	42	16	16	38	46	M3/6 deep	M3/6 deep
50	42	15	40	72	3	170	45	56	28	73	56	26	26	54	65	M4/8 deep	M4/8 deep
100	42	15	40	72	3	170	45	56	28	73	56	26	26	54	65	M4/8 deep	M4/8 deep
200	42	15	40	72	3	170	45	56	28	73	56	26	26	54	65	M4/8 deep	M4/8 deep

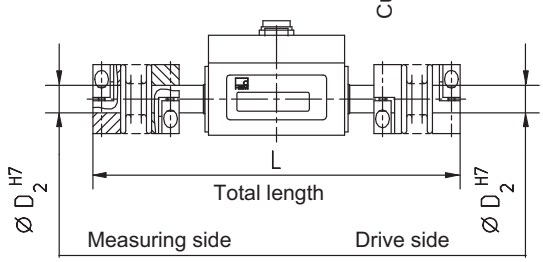
Bellows couplings

For measuring ranges 0.1 N·m … 1 N·m



For measuring ranges 2 N·m … 200 N·m





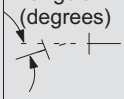
Dimensions

Measuring range (N·m)	Part no.	Dimensions in mm (1 mm = 0.03937 inches)									
		A	∅B	C	∅D_1		∅D_2	E	F	G	L
					Measuring side T21WN	Drive side T21WN	Variable from-to				
0.1	3-4412.0001	23_{-1}	15	6.5	6	8	3-9	M3	-	2	128
0.2											
0.5											
1	3-4412.0002	25_{-1}	15	6.5	6	8	3-9	M3	-	2	132
2	3-4412.0003	40_{-1}	25	13	6	8	3-12.7	M3	8	4	149
5	3-4412.0004	50_{-1}	40	16	16	16	5-22	M4	15	5	213
10											
20	3-4412.0005	69_{-2}	56	21	16	16	10-32	M6	19	7.5	241
50	3-4412.0006	80_{-2}	66	23.5	26	26	12-32	M8	23	9.5	283
100	3-4412.0007	93_{-2}	82	28	26	26	19-40	M10	27	11	300
200	3-4412.0008	109_{-2}	110	35	26	26	24-56	M12	39	13	318

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

When using just **one** bellows coupling, specify the mounting side of the coupling:
Measuring side = 6 mm / drive side = 8 mm

Specifications

Measuring range	Torque coupling T_{Kmax}	Mass moment of inertia	Weight	Torsional stiffness	Maximum permitted offset			Spring stiffness		Material of hub and mounting ring	Tightening torque for clamping bolts
(N·m)	(N·m)	(kg·cm^2)	(g)	(kN·m/rad)	axial (mm) 	radial (mm) 	angular (degrees) 	axial (N/mm)	radial (N/mm)		(N·m)
0.1	0.5	0.012	6	0.21	0.5	0.2	1.5	13.4	47.7	Aluminum	0.35
0.2											
0.5											
1	1	0.018	7	0.38	0.5	0.2	1.5	27.4	84.3		0.75
2	2	0.27	38	1.3	0.6	0.2	1.5	20.6	88		0.75
5	10	1.6	120	9.05	1	0.2	1.5	33.3	389		1.5
10											
20	30	1.2	300	31	1	0.15	1.5	50	366		14
50	60	2.0	400	72	1.5	0.15	1.5	67	679		35
100	150	20	1600	141	2	0.15	1.5	77	960	Steel	75
200	300	40	3800	157	2	0.15	1.5	124	2940		120

General instructions

- Do not tighten the clamping bolts of the couplings until 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 T21WN 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.

Condition at the time of delivery

The couplings and the torque measurement shaft are delivered as separate items.

Accessories for T21WN, to be ordered separately

- Transducer connection cable, 5 m long, ordering code. 3-3301.0158
- Transducer connection cable, 10 m long, ordering code 3-3301.0159
- Cable socket, 12-pin (binder), ordering code 3-3312.0268
- Junction box, ordering code 1-VK20A
- Bellows couplings

Accessories for junction box VK20A, to be ordered separately

- Connection cable, 1.5 m long (D-Sub, 15-pin - free ends), ordering code 1-KAB151A-1.5
- Connection cable, 1.5 m long (SUBCON5 - free ends), ordering code 1-KAB152-1.5

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