



### Technical data

- Nominal torque: 2,5 Nm to 500 Nm, bidirectional
- Rotational speed:  $\leq 5.000$  rpm
- Accuracy:  $\leq \pm 1$  %
- Temperature range:  $-30$  °C to  $+85$  °C
- Protection class: IP50
- Output signals: 0-5 V
- Output frequency: 1.000 Hz



### Your advantages

- Made in Germany (nearby Munich, Bavaria)
- Delivery ex warehouse (< two weeks)
- Best price-performance ratio
- Integrated electronic (Plug & Play)
- Contactless measurement system
- Including 5 m cable and calibration certificate

### Short description

The series 2000 is the most easy and affordable entry into torque measurement technology.

This series is mainly used in testing facilities, automation process, production lines e. g. end-of-line tests and Research and Development.

Transmitted torque can be measured statically and dynamically in real time. Shaft is available as Round shaft and Square shaft. Series 2000 offers a 0-5 V output signal.

The sensor is provided as a complete unit with integrated evaluation electronic, including 5 m cable, keystones (Round shaft) and calibration certificate.

**Model series 2000**

Model series 2200 round shaft	Unit	Nominal torque bidirectional (+/-)	Max. load bidirectional (+/-)	Rotational Speed [rpm]
Ø 9 mm	[Nm]	2,5	5	5.000
		5	10	
		7,5	15	
		17,5	35	
Ø 14 mm		75	150	
Ø 19 mm		175	350	
		250	350	
Ø 25 mm		500	750	

Model series 2100 square shaft	Unit	Nominal torque bidirectional (+/-)	Max. load bidirectional (+/-)	Rotational Speed [rpm]
¼ inch	[Nm]	2,5	5	1.000 <sup>1</sup>
		5	10	
		7,5	15	
		17,5	35	
⅜ inch		75	150	
½ inch		175	350	
		250	350	
¾ inch		500	750	

### Load characteristics

Model series 2100 square shaft	Unit	Axial force [N] <sup>2</sup>	Lateral limit force [N]	Bending limit moment [Nm]
2,5 und 5	[Nm]	1.000	20	2,5
7,5		1.000	30	3,7
17,5		1.000	100	12,5
75		2.600	300	41,7
175 und 250		4.000	500	89,5
500		7.000	800	176

Each type of irregular stress can only be permitted with its given limit value (bending moment, lateral force or axial force, exceeding the nominal torque) if none of the others can occur. Otherwise the permitted limits must be reduced. If for instance 30 % of the limited bending moment and also 30 % of the limited lateral force are present, only 40 % of the limited axial force are permitted, provided that the nominal torque is not exceeded.

### Technical characteristics

No.	Model	Unit	Series 2000
	Accuracy class <sup>3</sup>		Value
1	Linearity deviation incl. hysteresis	%ME <sup>4</sup>	< ±1,0
2	Rotational Signal Uniformity (RSU)		< ±1,0
3	Repeatability		< ±0,05
Output signal in general		Unit	Value
4	Frequency range, -3dB point, Bessel characteristics	Hz	1.000
5	Analog signal	V	0 ... 5
6	Signal at torque = Zero <sup>5</sup>	V	2,5
7	Signal at positive nominal torque <sup>5</sup>	V	4,5
8	Signal at negative nominal torque <sup>5</sup>	V	0,5
c	Calibration parameter (normed) <sup>5</sup>	V/Nm	Identification label
10	Output resistance	Ω	50

<sup>2</sup> Direct acting axial force on the shaft. If the force affects the snap ring, just 50 % of the force is permitted.

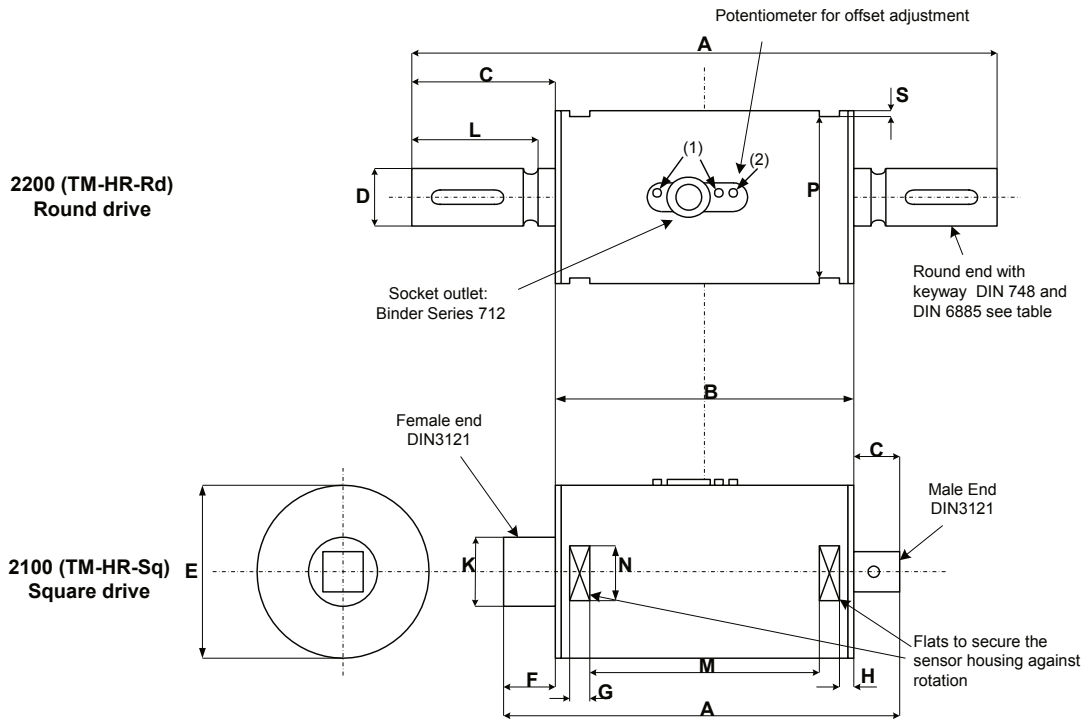
<sup>3</sup> The accuracy class implies that taken separately both the linearity deviation as well as the rotational signal uniformity are either lower than or equal to the value of the accuracy class.

<sup>4</sup> %ME: related to a full scale measurement range.

<sup>5</sup> Please check the exact data at the sensors calibration certificate.

Effect of temperature		Unit	Value							
12	Zero point drift over temperature	%/10 K	< 0,5							
13	Signal drift over temperature within nominal temperature range	%/10 K	< 0,5							
Power supply		Unit	Value							
14	Supply voltage	VDC	9 ... 12							
15	Current consumption (max.)	mA	10							
16	Start-up peak	mA	< 40							
17	Absolute max. supply voltage	VDC	13770							
General information		Unit	Value							
18	Protection class according to EN 60529 <sup>6</sup>	IP	50							
19	Reference temperature	°C	+15 ... +35							
20	Operational temperature range	°C	-40 ... +85							
21	Storage temperature range	°C	-40 ... +85							
22	Bearing operating hours	h	approx. 20.000							
Nominal rated torque M (bi-directional)		Nm	2,5	5	7,5	17,5	75	175	250	500
23	Weight	Rd	g		386	392	400	685	856	1.230
		Sq	395	401	414	652	754	878		
24	Moment of inertia	Rd	g mm <sup>2</sup>		597	662	1.073	4.922	19.126	79.754
		Sq	582	648	904	3.339	13.294	57.770		

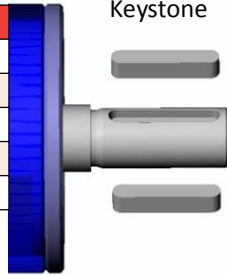
**Dimensions**



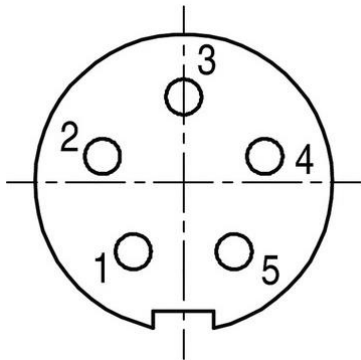
Do not loosen or tighten the mounting nuts of the socket and the lock screws

Dimensions	Round shaft nominal torque [Nm]				Square shaft minal torque [Nm]			
	∅ 9 mm	∅ 14 mm	∅ 19 mm	∅ 25 mm	1/4 inch	3/8 inch	1/2 inch	3/4 inch
Nominal torque [Nm]	2,5 - 5 - 7,5 - 17,5	75	175 - 250	500	2,5 - 5 - 7,5 - 17,5	75	175 - 250	500
A	125	139	179	220	95,5	107	123,5	146
B	70	70	70	87	70	70	70	87
C	27,5	34,5	54,5	66,6	9,5	13	18,5	29,6
D	9k6	14k6	19k6	25k6	-	-	-	-
E	40	50	50	60	40	50	50	60
F	-	-	-	-	16	24	35	29,6
G	8	8	8	10,5	8	8	8	10,5
H	5	5	5	2	5	5	5	2
K	-	-	-	-	12	18	24	33,5
L	23	30	50	△ C	-	-	-	-
M	43,9	43,9	43,9	61,4	43,9	43,9	43,9	61,4
N	15	18	18	19	15	18	18	19
P	37	47	47	57	37	47	47	57
S	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5

Dimensions keyway [mm]				Keystones		
Round shaft	Width	Depth	Length	Height	Length	Amount
∅ 9 mm	3	1,8	18,5	3	18	1
∅ 14 mm	5	3	25,5	5	25	1
∅ 19 mm	6	3,5	45,5	6	45	1
∅ 25 mm	8	4	50,5	7	50	2



**Connection plan**



Connector  
Power supply and outputs

Typ	Binder series s712-M9 connector IP67 colour coding according to DIN 47100		
Pin	Color	Pin	Color
1	White	Supply Voltage $V_{cc}$	9 V – 12 V
2	Brown	Signal Output analogue	-
3	Black	Ground GND	-
4	Blue	Not used	-
5	Grey	Reference Voltage $V_{ref}$	2,5 V

The output  $V_{ref}$  is a constant 2.5 V and represents the virtual zero point for direct +/- torque measurement.

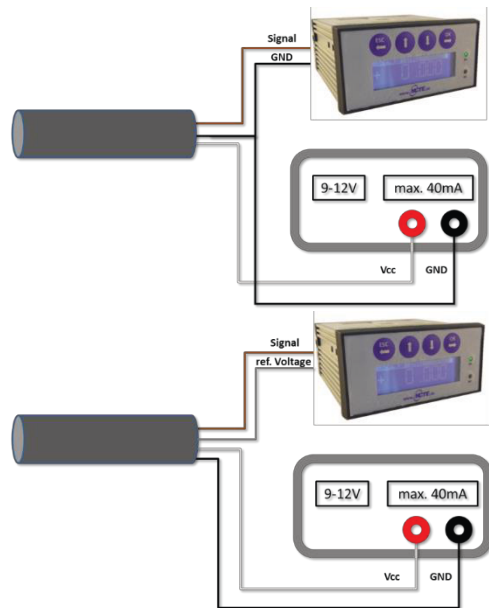
Connection example:

Connection for measurement between 0,5 ... 4,5 V  
e.g. 2.5 V equals to approx. 0 Nm.

**Grey and blue wires are not in use.**

Connection for measurement between - 2,0 ... + 2,0 V  
e.g. 0 V equals to approx. 0 Nm.

**Blue wire is not in use.**



**Order options**

Series 2000 accuracy 1 %		Price
Series 2100 square shaft		
Series 2200 round shaft		
<b>Measurement range</b>		
2,5	Nm including 5 m cable and calibration certificate	
5	Nm including 5 m cable and calibration certificate	
7,5	Nm including 5 m cable and calibration certificate	
17,5	Nm including 5 m cable and calibration certificate	
75	Nm including 5 m cable and calibration certificate	
175	Nm including 5 m cable and calibration certificate	
250	Nm including 5 m cable and calibration certificate	
500	Nm including 5 m cable and calibration certificate	

Please feel free to contact your sales partner for additional information

<b>Series 2000 - accessories</b>		Price
<b>Sensor bracket</b>		
1	2,5 – 17,5 Nm	
2	75 – 250 Nm	
<b>Readout Unit, order number: 400010-ATS001</b>		
1	The NCTE Read Out Unit is a multifunctional readout unit dedicated for the NCTE torque sensors. Torque, angle or speed can be displayed. The measurement data can be stored on an inserted SD flash memory card or sent directly to a PC computer via USB interface in real time.	

Please feel free to contact your sales partner for additional information.

## Instruction manual

### Scope of delivery

The torque sensor set consists of the sensor itself (signal pick-up and signal processing integrated into sensor housing), one **connecting cable** 5 m with a **soldered plug** (binder plug no. 99-0426-10-08), **key stones** (round shaft) and the calibration certificate.

Datasheets and instruction manuals are available on request

### Installation and removal

Make sure to install the sensor shafts exactly with the proper aligned connecting shafts. The key stone adapter/square endings of the connecting shafts are to be attached forceless to the corresponding ones of the sensor. No external axial force should be on the housing of the sensor from distortion. A maximum cable length of 5 m must not to be exceeded. Using a cable or connector other than supplied or a similar cable that is of a different length may affect the overall performance of the sensor.

Do not remove the shaft with torque applied to the sensor.

### Interface description

#### Mechanical connection:

The key stone adapters on both ends of the measurement shaft are intended for torque transmission.

#### Electrical connector:

On the sensor housing there is a 8-pin socket for the power supply and the signal output (see chapter connection plan).

### Operation (in regular case or in optimal case)

Optimal measurement parameters can be achieved if the sensor is applied in accordance to the specification. By compliance with the specification the sensor works generally trouble-free and maintenance-free.

### Irregular operation, measures against disturbance

The mechanical overload on the sensor (e. g. exceeding of maximum allowed torque or severe vibrations) may cause damage to the sensor and in consequence the incorrect signal output. In such cases please do not open the sensor. Contact **yoursalespartner** directly for assistance.

### Commissioning

After sensor installation pay attention to the following:

- Switch on the power supply unit and check the supply voltage. Peak voltage must be avoided! Be sure to verify the power supply voltage before connecting the sensor!
- Connect the sensor to the power supply unit by using the delivered cable.
- Connect the sensor output to a high-resistance device such as an A/D converter, oscilloscope, pc measurement board. The sensor should be in mechanical unloaded state while connecting it.



