CE

NCTE TEST. ACT. WIN.

Rotary Torque Sensor Series 2000

Data sheet

PREMIUM QUALITY
MADE IN GERMANY

ISO 9001

Version 21/02 – State October 2021

Technical data

- Nominal torque: 2,5 Nm to 500 Nm, bidirectional
- Rotational speed: ≤ 5.000 rpm
- Accuracy: ≤ ±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, 0-10V, ±5V and ±10V output signals.

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

Data sheet

1 Key Facts

Technical	Distinctive features
• Nominal torque: up to 500 Nm, bidirectional • Speed: ≤ 5000 rpm • Accuracy: ≤ ±1 % • Operating temperature: -30 °C to +85 °C • Protection class: IP50 • Output signal: +/-10V, +/-5V, 0-10V or 0-5V • Cut-off frequency: 1.000 Hz	• Made in Germany • Short delivery time (< two weeks) • Excellent price/performance ratio • No external measuring amplifier necessary (Plug & Play) • Completely contactless measuring system • Delivery including 5 m cable and calibration certificate • Suitable accessories (bracket, readout unit, couplings)

2 Torque ranges

Model line Series 2100 Square shaft	Nominal torque bidirectional (+/-) [Nm]	Limit torque unidirectional [Nm]	Limit torque bidirectional (+/-) [Nm]	RPM [rpm]
¼ inch	2.5	2.5	2.5	1000 (A higher speed is possible with backlash-free adaptation)
	5.0	5.0	5.0	
	7.5	7.5	7.5	
	15	15	10	
⅜ inch	60	60	40	
½ inch	140	140	85	
¾ inch	400	400	270	

Note: Series 2100 sensor versions are calibrated to nominal torque. However, the absolute operating limits are as shown in the table above. Do not exceed the specified magnitude of the limit torques for unidirectional and bidirectional loading.

Model line Series 2200 Round shaft	Nominal torque bidirectional (+/-) [Nm]	Limit torque unidirectional [Nm]	Limit torque bidirectional (+/-) [Nm]	RPM [rpm]
Ø 9 mm	2.5	3.25	3.25	5000
	5	6.5	6.5	
	7.5	9.75	9.75	
	17.5	19.5	19.5	
Ø 14 mm	75	97.5	97.5	
Ø 19 mm	175	227.5	227.5	
	250	325	325	
Ø 25 mm	500	650	650	

Note: In case of overload, the sensor leads to a measurement offset. In this case the sensor must be recalibrated at NCTE AG. The sensor may only be operated within the specified nominal torque range.

3 Load characteristics

Model line Series 2100 Measuring range	Axial force [N][1]	Limit transverse force [N]	Limit bending moment [Nm]
2.5 and 5	1000	20	2.5
7.5	1000	30	3.7
15	1000	100	12.5
60	2600	300	41.7
140	4000	500	89.5
400	7000	800	176

Model line Series 2200 Measuring range	Axial force [N][2]	Limit transverse force [N]	Limit bending moment [Nm]
2.5 and 5	1000	20	2.5
7.5	1000	30	3.7
17.5	1000	100	12.5
75	2600	300	41.7
175 and 250	4000	500	89.5
500	7000	800	176

Any irregular stress (bending moment, transverse or axial force, exceeding the nominal torque) up to the specified static load limit is only permissible as long as none of the other stresses can occur. Otherwise the limit values must be reduced. If 30 % of the limit bending moment and 30 % of the limit transverse force are present in each case, only 40 % of the axial force is permissible, whereby the nominal torque must not be exceeded.

4 Technical characteristics

No.	Accuracy class[3]		1,0
	Description	**Unit**	**Value**
1	Linearity deviation incl. hysteresis	%ME[4]	< ±1.0
2	Rotational Signal Uniformity (RSU)		< ±1.0
3	Repeatability		< ±0.05
	Output signal general	**Unit**	**Value**
4	Cut-off frequency, -3dB point, Bessel characteristic	Hz	1000
5	Analog signal	V	+/-10, +/-5, 0-10 or 0-5
6	Signal at torque = zero [5]	V	0, 5 or 2.5
7	Signal at positive nominal torque [5]	V	9 or 4.5
8	Signal at negative nominal torque[5]	V	-9, -4,5, 1 or 0,5
9	Calibration parameter (normed)[5]	mV/Nm	Refer to calibration certificate
10	Output resistance	Ω	50

[1] Specified values only apply to direct axial force on the shaft. If the axial force acts on the circlip, only 50 % of the force is permissible.
[2] Specified values only apply to direct axial force on the shaft. If the axial force acts on the circlip, only 50 % of the force is permissible.
[3] The accuracy class means that the linearity deviation as well as the circulation modulation, individually, are each less than or equal to the value specified as the accuracy class. The accuracy class must not be confused with a classification according to DIN 51309 or EA-10/14.
[4] %ME: Related to the measuring range.
[5] The exact sensor-specific values can be found in the calibration certificate supplied.

	Effect of temperature	Unit	Value						
11	Zero point drift over temperature	%/10 K	< 0.5						
12	Signal drift over temperature within nominal temperature range	%/10 K	< 0.5						
	Power supply	**Unit**	**Value**						
13	Supply voltage	VDC	6 … 15						
14	Current consumption (max.)	mA	10						
15	Start-up peak	mA	< 40						
16	Absolute max. supply voltage	VDC	18						
	General information	**Unit**	**Value**						
17	Protection class according to EN 60529[6]	IP	50						
18	Reference temperature	°C	+15 … +35						
19	Operation temperature range	°C	-40 … +85						
20	Storage temperature range	°C	-40 … +85						
	Nominal torque (bi-directional) Square shaft	**Nm**	**2.5**	**5**	**7.5**	**15**	**60**	**140**	**400**
21	Weight	g	395		401	414	652	754	878
22	Moment of inertia	g mm²	582		648	904	3.339	13.294	57.770
	Nominal torque (bidirectional) Round shaft	**Nm**	**2.5**	**5**	**7.5**	**17.5**	**75**	**175**	**250**	**500**
23	Weight	g	386		392	400	685	856		1.230
24	Moment of inertia	g mm²	597		662	1.073	4.922	19.126		79.754

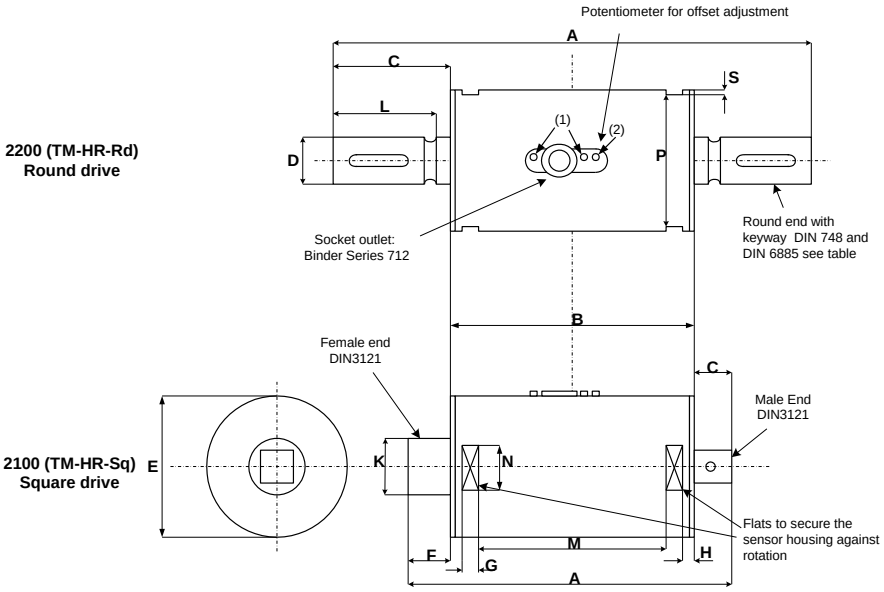
5 EMV Emission data

EMV immunity and emitted interference (DIN EN IEC 61000-6-2 / DIN EN IEC 61000-6-4 / DIN EN 61326-1)

Examination	Test specification	Admission	Evaluation criteria
Discharge of static electricity (ESD)	IEC 61000-4-2	± 4 kV Contact discharge	**B** passed
Electromagnetic HF-field	IEC 61000-4-3	80 - 1000 MHz; 10 V/m; 80% AM	**A** passed
Rapid transients	IEC 61000-4-4	± 1 kV	**B** passed
High frequency, asymmetrical	IEC 61000-4-6	0.15 - 80 MHz; 10V; 80% AM	**A** passed
Examination	**Test specification**	**Admission**	**Evaluation criteria**
Interference voltage 0.15 - 30 MHz	CISPR 11:2015 + A1:2010	**Class B**	Limit values observed
Radio interference field strength 30 - 1000 MHz	CISPR 11:2015 + A1:2010	**Class B**	Limit values observed

[6] Wiring connected.

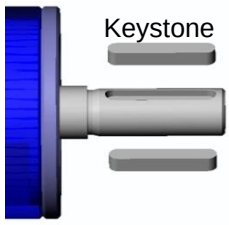
6 Dimensions



Dimensions	Series 2100 Square shaft				Series 2200 Round shaft			
Shaft size	1/4 inch	3/8 inch	1/2 inch	3/4 inch	Ø 9 mm	Ø14 mm	Ø19 mm	Ø25 mm
Nominal torque [Nm]	2.5/5/ 7.5/15	60	140	400	2.5/5/ 7.5/17.5	75	175-250	500
A	95.5	107	123.5	146	125	139	179	220
B	70	70	70	87	70	70	70	87
C	9.5	13	18,5	29.6	27.5	34.5	54.5	66.6
D	-	-	-	-	9g6	14g6	19g6	25g6
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	-
M	43.9	43.9	43.	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

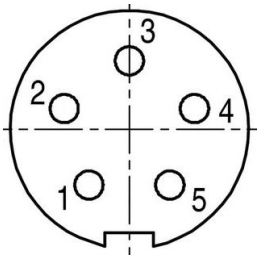
Series 2200

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



For high alternating loads, torque transmission by positive and frictional locking via a suitable fit or coupling is recommended.

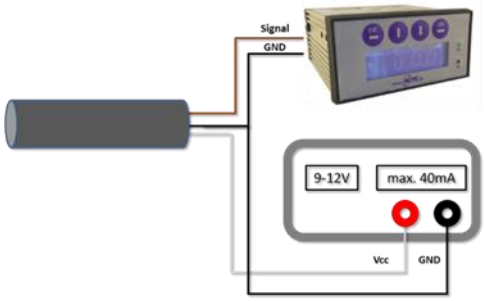
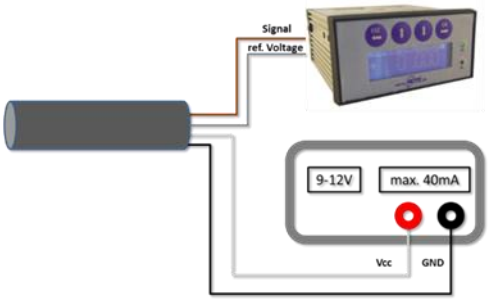
7 Wiring diagram



Connector
Power supply and outputs

Type:	Binder Plug Series 712-M9 IP67 (Colour coding acc. to DIN 47100)		
Pin	**Colour**	**Description**	**Value**
1	White	Supply voltage V_{CC}	6 V – 15 V
2	Brown	Output signal analogue	-
3	Black	Supply voltage GND	-
4	Blue	Not required	-
5	Grey	Reference voltage V_{ref}	2.5 V
The output V_{ref} is a constant 2.5 V output and represents the virtual zero point for direct +/- torque measurement.			

8 Sensor wiring

Wiring for measurements between 0.5 V … 4.5 V approx. 2.50 V correspond to 0Nm **The grey and blue wires are not required.**	Wiring for measurements between -2.0 V … +2.0 V approx. 0 V correspond to 0 Nm **The blue wire is not required.**
	

9 Order options

Series 2100 (Square shaft)			
	Measuring range [Nm]		
	2.5	including 5m cable and calibration certificate	
	5	including 5m cable and calibration certificate	
	7.5	including 5m cable and calibration certificate	
	15	including 5m cable and calibration certificate	
	60	including 5m cable and calibration certificate	
	140	including 5m cable and calibration certificate	
	400	including 5m cable and calibration certificate	
		Output signal analog	
		A1	Voltage output +/-10V
		A2	Voltage output +/-5V
		A3	Voltage output 0-10V
		A4	Voltage output 0-5V
2100	15	A1	Example sensor configuration

Series 2200 (Round shaft)			
	Measuring range [Nm]		
	2.5	including 5m cable and calibration certificate	
	5	including 5m cable and calibration certificate	
	7.5	including 5m cable and calibration certificate	
	17.5	including 5m cable and calibration certificate	
	75	including 5m cable and calibration certificate	
	175	including 5m cable and calibration certificate	
	250	including 5m cable and calibration certificate	
	500	including 5m cable and calibration certificate	
		Output signal analog	
		A1	Voltage output +/-10V
		A2	Voltage output +/-5V
		A3	Voltage output 0-10V
		A4	Voltage output 0-5V
2100	15	A1	Example sensor configuration

We would be pleased to provide you with further information about serial products in a personal contact under
Phone: +49 (0)89 66 56 19 30 or by e-mail: sales@ncte.de.

10 Accessories

Bracket 		
1	2.5 – 17.5 Nm (Art. No.: 400006081)	
2	75 – 250 Nm (Art. No.: 400006082)	
Readout unit 		
1	Order number 400010-ATS001 (Art. No.: 400010005)	The NCTE readout unit is a multifunctional readout unit for the NCTE torque sensors. Torque, angle or speed can be displayed. The measured data can be stored on an inserted SD flash memory card or sent directly to a PC in real time via a USB interface.
Couplings 		

coupling types	Used for	D2 max.
KB2/45-41-9-D2	2000 – D9	16
KB2/100-47-9-D2	2000 – D9	25
KB4C/18-59-9-D2	2000 – D9	25.4
KB4C/80-78-14-D2	2000 – D14	42
KB4C/200-83-19-D2	2000 – D19	45
KB4C/300-94-19-D2	2000 – D19	60
KB4C/500-100-25-D2	2000 – D25	70

You can obtain further or additional accessories and special requests in a personal discussion with your contact person for series products by calling +49 (0)89 66 56 19 30 or by e-mail: sales@ncte.de.

Your experts for magnetostrictive sensors