



Instruction manual and data sheet

Torque Sensor Series 7000

PREMIUM QUALITY
MADE IN GERMANY



Copyright ©

NCTE AG® Torque Sensor Series 7000 Instruction Manual and Data Sheet.

This instruction manual is property of NCTE AG®,

D-82041 Oberhaching

Unauthorized duplication, even in part, is not permitted.

State: September 2022

Instruction manual

1	General	5
1.1	Customer service address.....	5
1.2	Warranty.....	5
1.3	Scope of delivery	5
2	Safety.....	6
2.1	Intended use.....	6
2.2	Recalibration and duration of use	6
2.3	Structural change.....	6
2.4	Training of the operating personnel.....	6
2.5	Transport and handling	6
3	Torque Sensor Series 7000	7
3.1	Short description	7
3.2	Assembly and disassembly	7
3.3	Adjustment	7
3.4	Interface description	7
3.5	Starting up	8
3.6	Operation during regular mode.....	8
3.7	Irregular operation, actions in case of failures.....	8
3.8	Safety instructions.....	8
3.9	Service, maintenance and repair	8
3.10	Disposal.....	8

Data sheet

1	Key Facts	9
2	Torque ranges.....	9
3	Load characteristics	10
4	Technical characteristics.....	10
5	EMV Emission data	11
6	Dimensions	12
7	Additional profile shafts for NCTE flange sensors (accessories)	12
8	Additional profile sleeve for NCTE flange sensors (accessory).....	14
9	Wiring diagram	16
10	Sensor wiring	16
11	Speed sensor	17
12	Speed Sensor	17
13	Order options	18
14	Accessories	19

Instruction manual

1 General

Dear customers,

Thank you for your decision to buy our sensor products. You have chosen a high quality and extremely precise torque measuring system.

This manual contains all the information necessary for you and the installation, operating and maintenance personnel to use your measuring system under the intended conditions of use. It contains important information to ensure proper and safe installation and operation.

For these reasons, the Instruction manual must always be available at the place of use of the torque measuring system and always ready to hand.

We reserve the right to make changes in the course of product improvements. We try to maintain compatibility with previous versions. All information without guarantee subject to technical changes.

For further questions, we are of course also available after the purchase at any time.

Please use our contact address.

1.1 Customer service address

NCTE AG
Raiffeisenalle 3
D-82041 Oberhaching

Phone: +49 (0)89 665 619 0

Email: sales@ncte.de

Web: <https://ncte.com/>

1.2 Warranty

The warranty period is 12 months from the date of delivery from the factory, provided that the product is used in accordance with its intended purpose, in compliance with the maintenance and calibration regulations and the General Terms and Conditions of Business.

You can find these, current instruction manuals and data sheets on: <https://ncte.com/serienprodukte/>

1.3 Scope of delivery

The torque sensor system consists of a calibrated sensor, signal acquisition / -processing integrated in the housing, a 5 m long connection cable with plug (Binder plug no. 99-5630-15-12).

Enclosed you will find the corresponding calibration certificate and the warning notes.

2 Safety

Please note the enclosed sheet on the warning notes.

2.1 Intended use

The sensors of the Series 7000 are designed exclusively for measuring torque and/or speed. The respective load range can be taken from the data sheet and must not be exceeded.

Proper use also includes compliance with the commissioning, assembly, operating, ambient and maintenance conditions specified by the manufacturer.

Any use beyond these is considered improper. The manufacturer is not liable for any damage resulting from such use.

2.2 Recalibration and duration of use

A factory recalibration should be executed annually. See the corresponding label on the sensor.

This recalibration can be carried out quickly and easily by NCTE AG.

Please contact us.

If the sensor is used within the limits of its intended use and regularly calibrated, the sensor's operating life is unlimited.

2.3 Structural change

Unauthorized conversions or changes to the torque measuring system are prohibited for safety reasons and lead to the immediate expiration of the warranty claims.

2.4 Training of the operating personnel

Assembly, commissioning and maintenance personnel must have read and understood the complete operating instructions, especially Chapter "2 Safety". The operator is recommended to have this confirmed in writing.

2.5 Transport and handling

During handling, storage and transport, make sure that the sensor is not exposed to strong magnetic or electromagnetic fields (e.g. degaussing coils).

3 Torque Sensor Series 7000

The series 7000 opens up the segment of extremely robust and extremely resilient torque sensors in high nominal torque ranges (up to 5000 Nm).

3.1 Short description

The Series 7000 is mainly used in test benches, automotive engineering (off-highway and agricultural) as well as production monitoring and quality assurance.

With the Series 7000 torques can be measured statically as well as dynamically in real time. The sensor is available for use in the agricultural industry with a wide range of PTO connections, a flange version is available for variable connection. Each sensor can be configured individually, there is also the option of an angle sensor or. Each sensor can be configured individually, there is also the option of an angle sensor or speed sensor.

The Series 7000 also offers a wide range of signal outputs. 0-10 V, 4-20 mA,

CAN bus or USB. The USB output is included with the appropriate NCTE software, enabling plug & play data to be displayed on a screen in real time.

The sensor is supplied as a ready-to-connect unit including 5 m cable and calibration certificate.

3.2 Assembly and disassembly

When mounting the sensor, it must be ensured that the flat surfaces of the flanges are in clean contact. The screws must be tightened crosswise in several steps to the nominal torque. These are cylinder-head screws of quality 12.9 in size M12. The final tightening torque is 155 Nm. When fixing, no force must be exerted on the housing in the axial direction. The sensor is not designed as a support bearing. The cable length must not exceed 5m. If a cable other than the one supplied by NCTE or an identical cable with a different cable length is used, the function of the sensor system may be impaired.

The M8 thread on the flattened side of the housing may only provide an anti-twist protection. The maximum tightening torque for fixing is 25 Nm.

The disassembly may only be carried out without applying torque to the measuring shaft.

3.3 Adjustment

If required, the zero point output signal (5 V or 12 mA) can be adjusted. The sensor is factory set so that 5 V or 12 mA corresponds to a torque of 0 Nm.

3.4 Interface description

Mechanical interfaces:

Flanges are provided at both ends of the sensor for power transmission.

Electrical interface:

A flange socket for power supply and signal output is attached to the top of the housing.
(Pin assignment see Chapter "9 Wiring diagram")

3.5 Starting up

After mounting the sensor, the following must be observed:

- Switch on power supply and check voltage value.
(Voltage peaks at the sensor must be avoided, devices must be checked accordingly before connection to the sensor)
- Connect the sensor to the power supply. (using the cable supplied)
- Record the output signal of the sensor with high resistance. (A/D converter, oscilloscope, PC)
- Record output signal in mechanically unloaded state of the sensor.
- **The first measurement can be taken after the sensor has warmed up for 15 minutes.**

3.6 Operation during regular mode

Optimal measuring values are achieved when the sensor is used while maintaining the specific nominal torque. If the permissible operating conditions are observed, the sensor operates trouble-free and maintenance-free.

3.7 Irregular operation, actions in case of failures

If the sensor is mechanically overloaded (e.g. if the maximum permissible longitudinal force or torque limit is exceeded or if there are strong vibrations), the sensor may be damaged and the signal output may be distorted. In this case do not open the device. Contact NCTE AG directly.

3.8 Safety instructions

The following safety instructions should be followed for smooth operation:

- Opening the sensor or even single screws is not allowed.
- The fastening nut of the plug must not be loosened or tightened.
- Only use power supplies safely disconnected from the mains voltage.
- Regarding the electrical and mechanical load of the sensor, the specifications according to the sensor-specific nameplate and the table in Chapter “4 Technical characteristics” must be observed.
- The sensor is not to be used as support bearing. The existing fastening options serve exclusively to secure the housing against twisting.
- To protect your system, we recommend increasing the torque over several stages.

3.9 Service, maintenance and repair

As part of your test and measurement equipment management, we recommend regular inspection of your test and measurement equipment. Please also observe the relevant standards and guidelines.

Maintenance plan by NCTE AG

Calibration:	Every 12 months
Check the wiring, connectors and shaft:	Every 12 months

Repairs and recalibrations can only be carried out by NCTE AG personnel.

3.10 Disposal

The device must be returned to **NCTE AG, Raiffeisenallee 3, D-82041 Oberhaching** for disposal.

Data sheet

1 Key Facts

Technical	Distinctive features
<ul style="list-style-type: none"> Nominal torque: up to 5000 Nm, bidirectional Speed: ≤ 3600 rpm Accuracy: $\leq \pm 0.5\%$ Operating temperature: $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ Protection class: IP50, IP65 Output signal options: 0-10 V / 4-20 mA / CAN-Bus / USB Cut-off frequency: 2500 Hz 	<ul style="list-style-type: none"> Made in Germany Short delivery time (< two weeks) Excellent price / performance ratio Integrated electronic (Plug & Play) Completely contactless measuring system Delivery including 5 m cable and calibration certificate Suitable accessories (PTO profile shafts, PTO profile sleeve, readout unit)

2 Torque ranges

Model line Series 7000	Nominal torque bidirectional (+/-) [Nm]	RPM [U/min]
NCTE Flange	3000	3600
NCTE Flange	5000	
Customised flange	Customer-specific up to 5.000	

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

3 Load characteristics

Model line Series 7000	Axial force [N] ¹	Limit transverse force [N]	Limit bending moment [Nm]
NCTE	16000	to be avoided	to be avoided
Customer-specific	16000	to be avoided	to be avoided

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 ²		0.5	
	Description	Unit	Value	
1	Linearity deviation incl. hysteresis	%ME ³	< ±0.5	
2	Rotational Signal Uniformity (RSU)		< ±0.5	
3	Repeatability		< ±0.05	
Output signal general		Unit	Value	
4	Frequency range, -3dB point, Bessel characteristics	Hz	2500	
5	Analog signal	V mA	0 ... 10	4 ... 20
6	Signal at torque = Zero ⁴	V mA	5	12
7	Signal at positive nominal torque ⁵	V mA	9	20
8	Signal at negative nominal torque ⁵	V mA	1	4
9	Calibration parameter (normed) ⁵	V/Nm mA/Nm	4 V/ Measurement range	8 mA/ Measurement range
10	Error output	V mA	0/10	<4/20<
11	Output resistance (Voltage output)	Ω	43	
12	Output resistance (Current output)	k Ω	≥ 600	
Effect of temperature		Unit	Value	
13	Zero point drift over temperature	%/10 K	< 0.5	
14	Signal drift over temperature within nominal temperature range	%/10 K	< 0.5	

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 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.

³ % ME: Related to the measuring range.

⁴ Zero point can be set to 5 V using a tare button.

⁵ The exact sensor-specific values can be found in the calibration certificate supplied.

Power supply		Unit	Value	
15	Supply voltage	VDC	9 ... 28	
16	Current consumption (max.)	mA	100	
17	Start-up peak	mA	< 100	
18	Absolute max. supply voltage	VDC	30	
General information		Unit	Value	
19	Protection class according to EN 60529 ⁶	IP	50/65	
20	Reference temperature	°C	+15 ... +35	
21	Operational temperature range	°C	-40 ... +85	
22	Storage temperature range	°C	-40 ... +85	
Nominal torque (bi-directional)		Nm	3000 / 5000	Customer-specific
23	Weight	kg	4.2	-
24	Moment of inertia	kg mm ²	7850	-
Load limits⁷		Unit	Value	
25	Maximum measurable torque	Nm	5000	8000

5 EMV Emission data

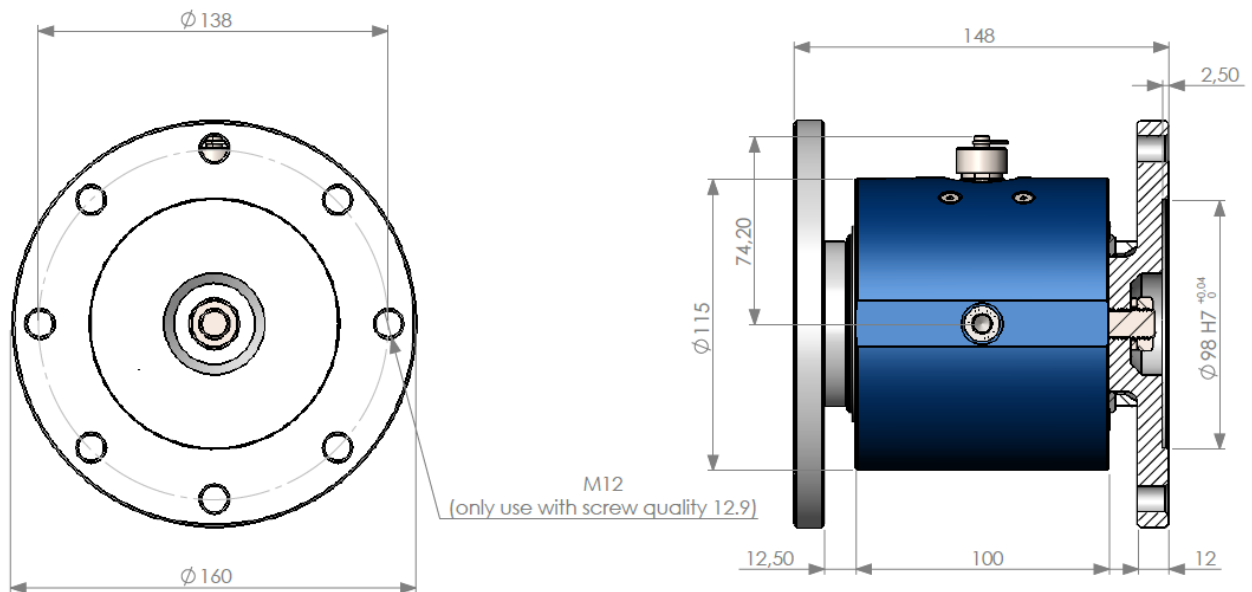
EMV immunity and emitted interference (DIN EN IEC 61000-6-2 / DIN EN IEC 61000-6-4 / DIN EN 61326-1)

Examination	Test specification	Admission	Evaluation criteria
Discharge of static electricity (ESD)	IEC 61000-4-2	± 6 kV Contact discharge	A passed
Electromagnetic HF-field	IEC 61000-4-3	80 - 1000 MHz; 10 V/m; 80% AM	A passed
Rapid transients	IEC 61000-4-4	± 2 kV	A 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 11:2009 + A1:2010	Class B	Limit values observed
Radio interference field strength 30 - 1000 MHz	CISPR 11:2009 + A1:2010	Class B	Limit values observed

⁶ Wiring connected.

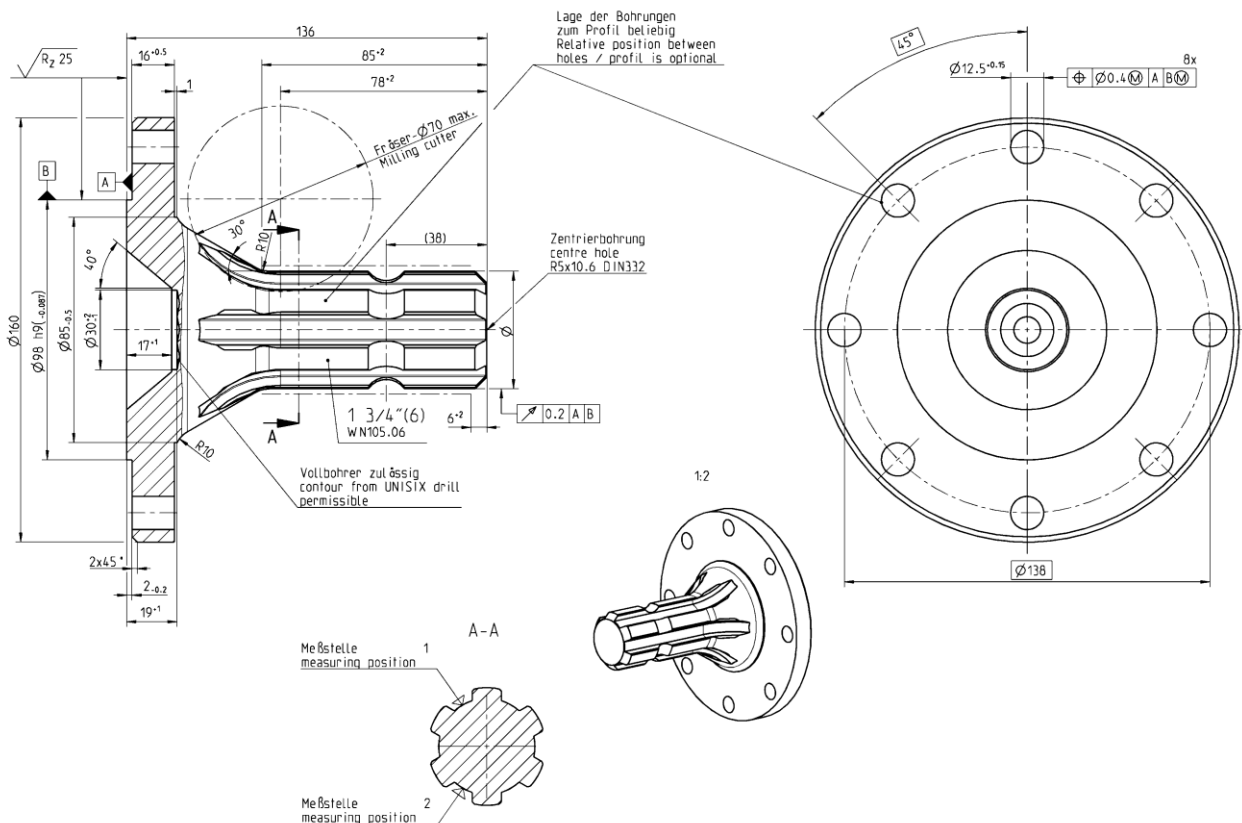
⁷ Based on the non-contact measurement principle the torque sensor is quite insensitive to bending and shearing forces. Self-aligning couplings are recommended in case of dynamic loads.

6 Dimensions

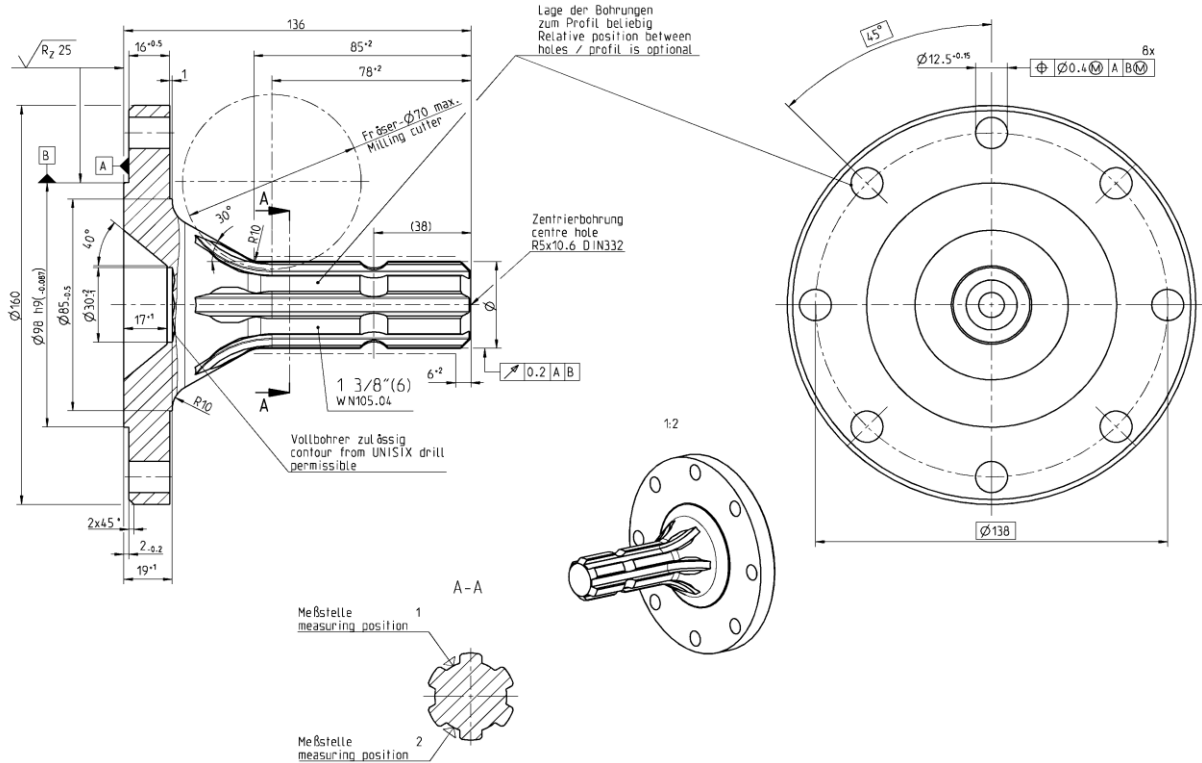


7 Additional profile shafts for NCTE flange sensors (accessories)

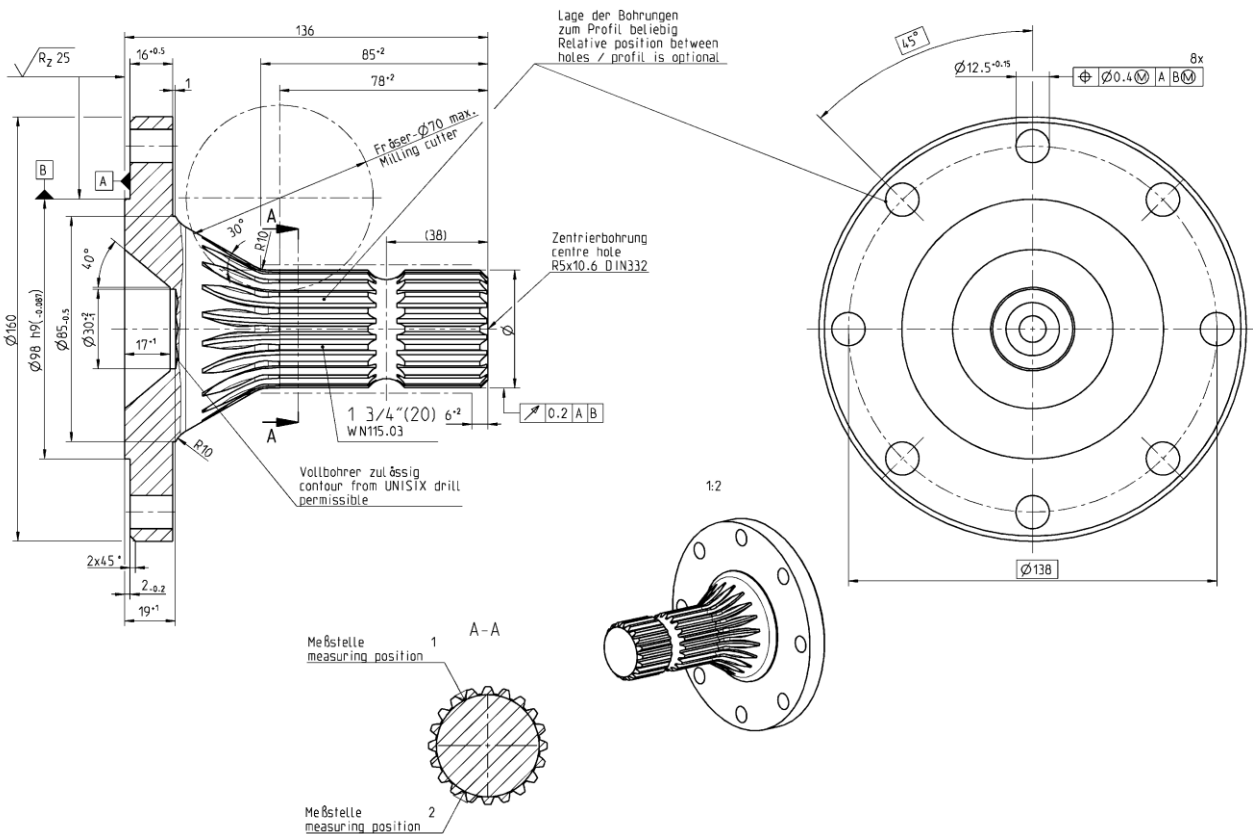
Profile shaft 6 teeth (1 3/4"), $\leq 4500 \text{ Nm}$ continuous dynamic load



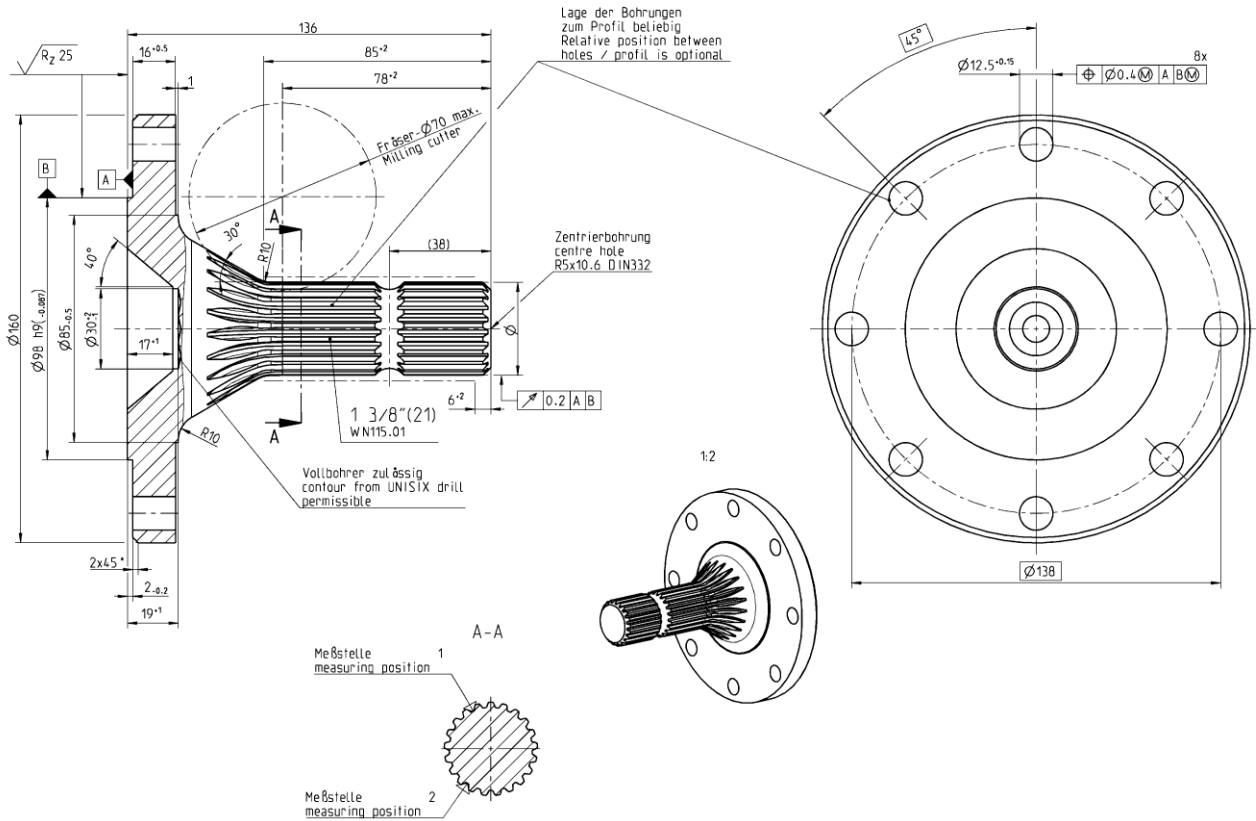
Profile shaft 6 teeth (1 3/8"), ≤ 2500 Nm continuous dynamic load



Profile shaft 20 teeth (1 3/4"), ≤ 5000 Nm continuous dynamic load

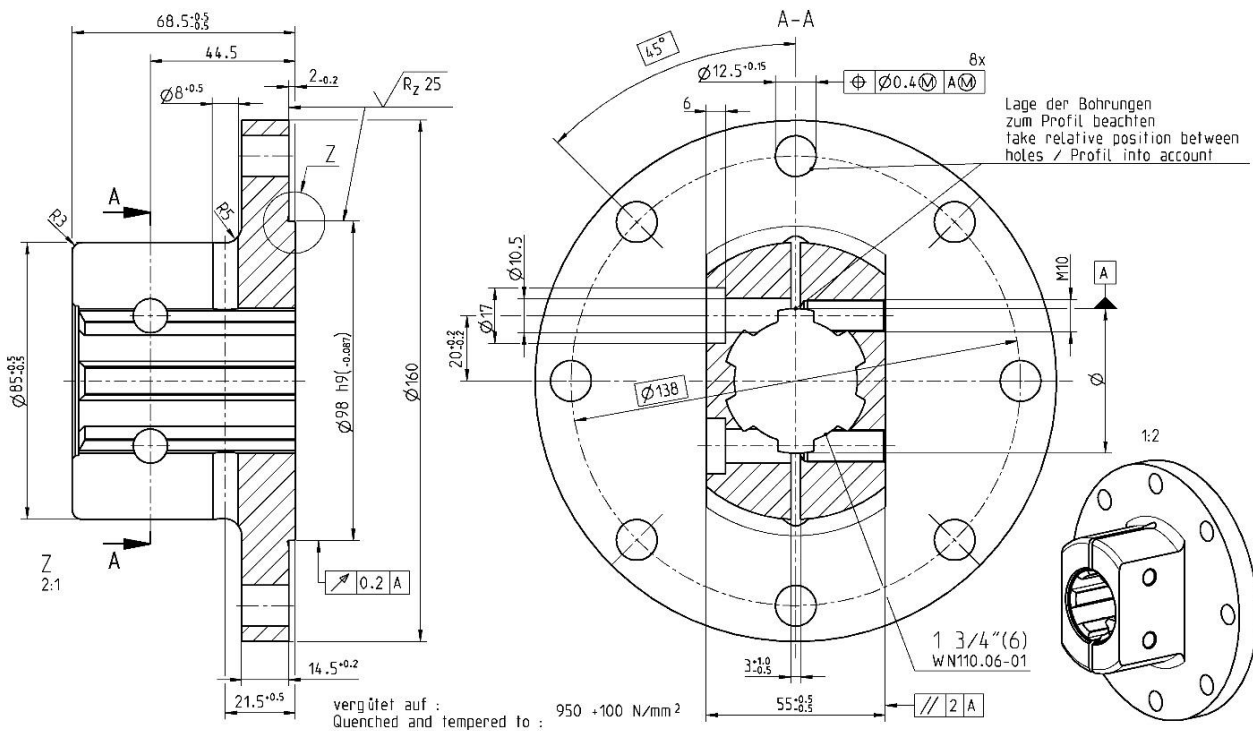


Profile shaft 21 teeth (1 3/8"), ≤ 3000 Nm continuous dynamic load

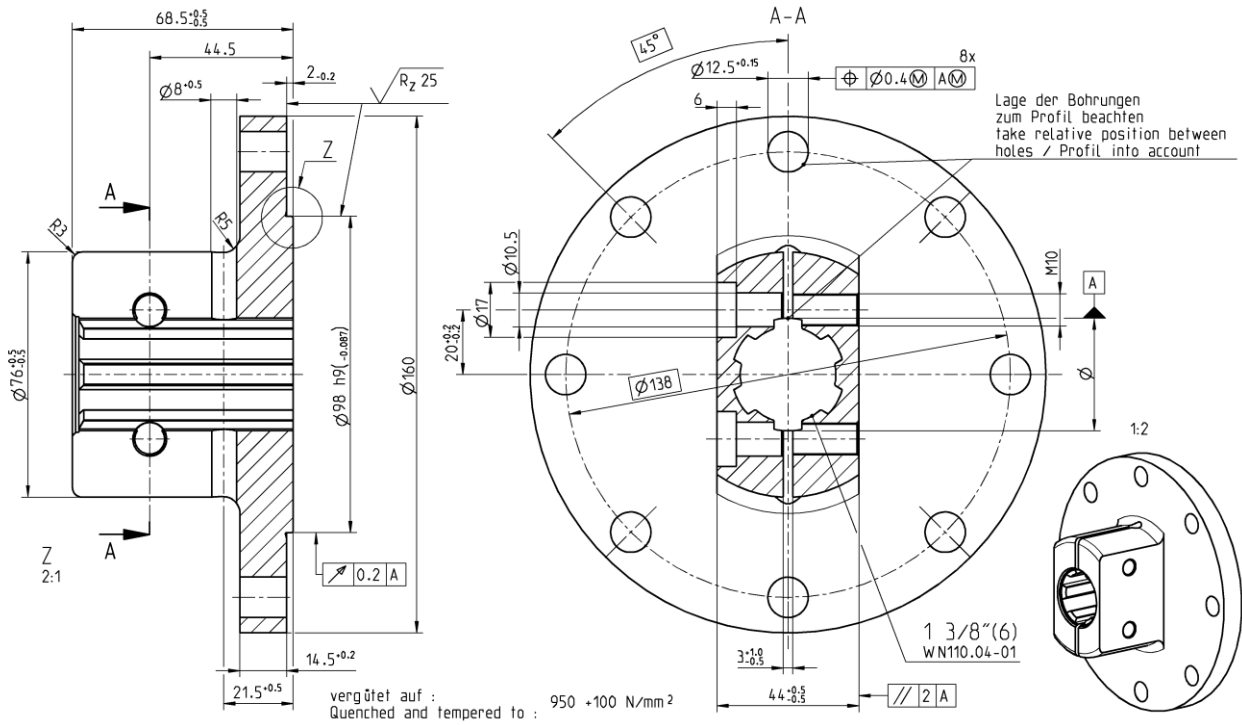


8 Additional profile sleeve for NCTE flange sensors (accessory)

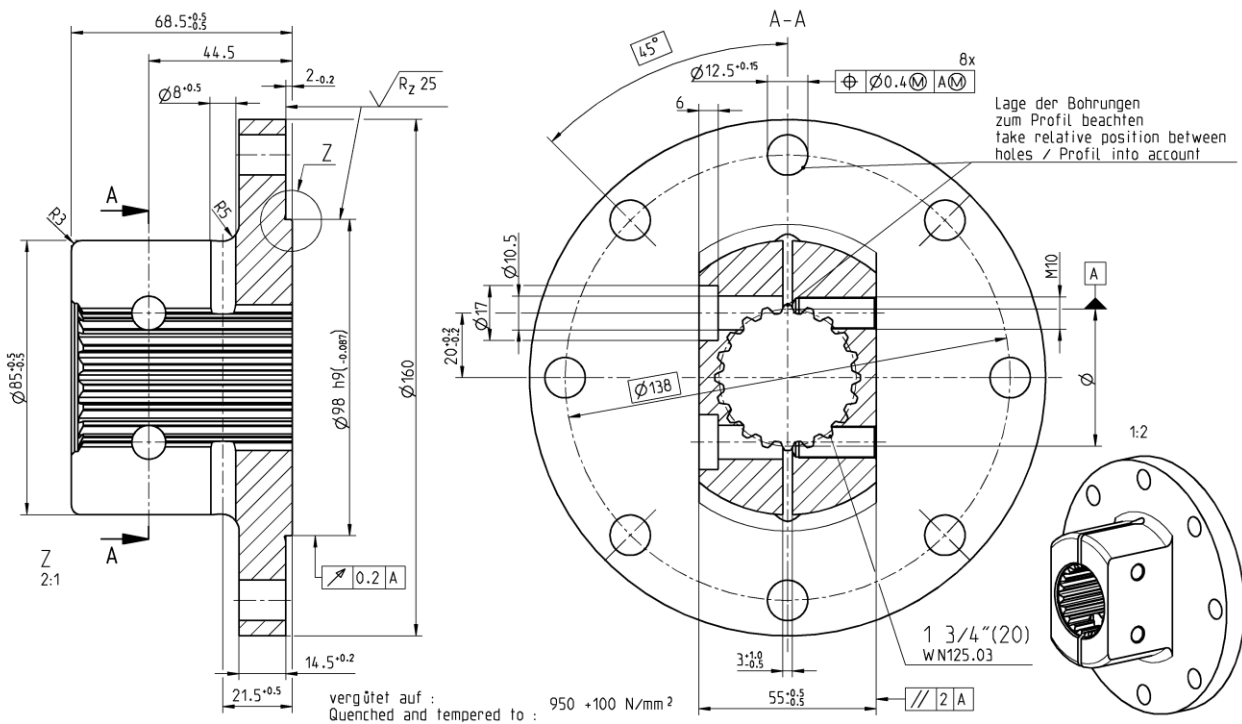
Profile sleeve 6 teeth (1 3/4") ≤ 5000 Nm continuous dynamic load



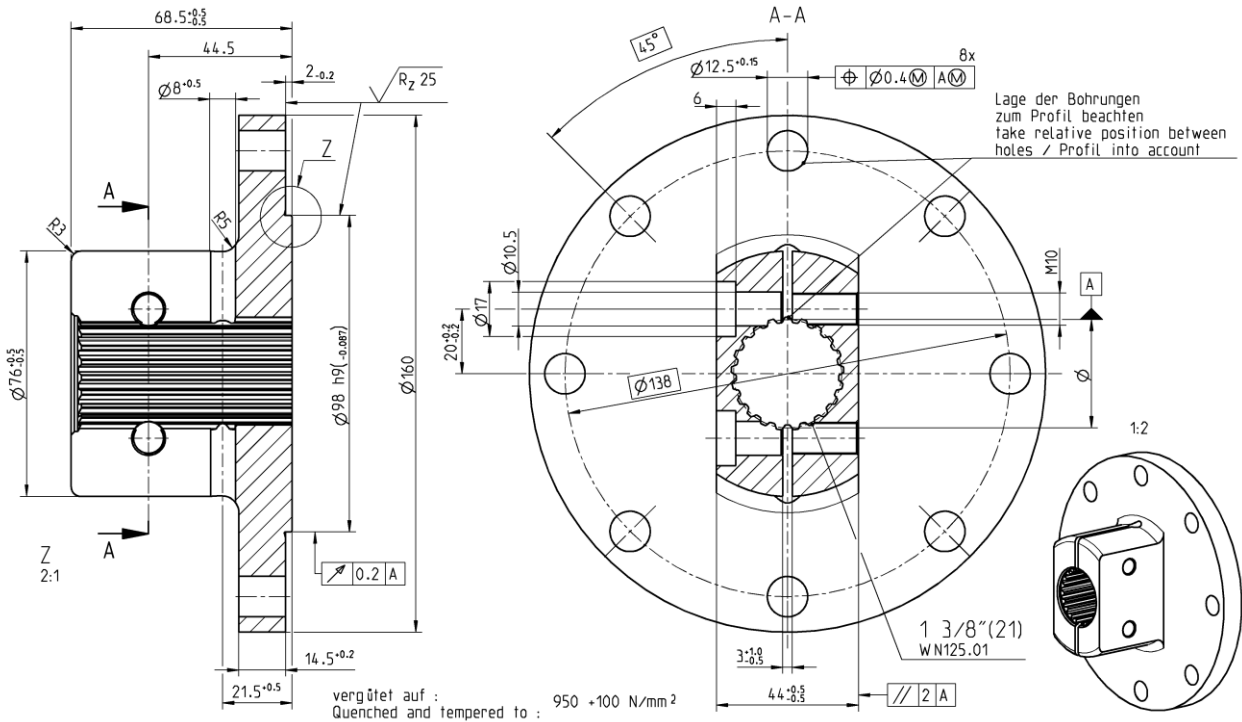
Profile sleeve 6 teeth (1 3/8"), ≤ 5000 Nm continuous dynamic load



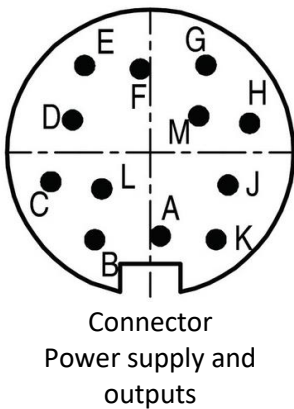
Profile sleeve 20 teeth (1 3/4"), ≤ 5000 Nm continuous dynamic load



Profile sleeve 21 teeth (1 3/8"), ≤ 5000 Nm continuous dynamic load

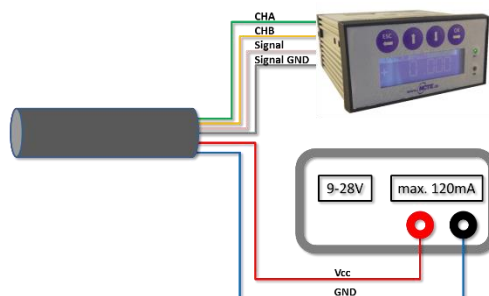


9 Wiring diagram



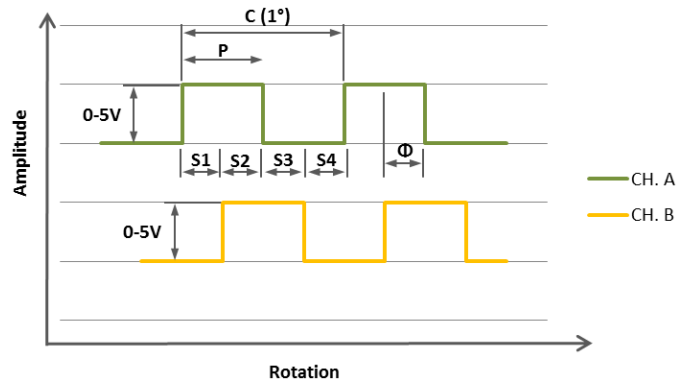
Type	Binder Plug Series 423/723/425 IP67 (Colour coding acc. to DIN 47100)		
Pin	Colour	Description	Value
A	White	CAN / USB	High/D-
B	Brown	CAN / USB	Low/D+
C	Green	Angle channel	0V ... 5V
D	Yellow	Angle channel	0V ... 5V
E	Grey	Analog GND	-
F	Pink	Output signal analogue voltage / current	0V ... 10V 4 ... 20 mA
G	Blue	Supply voltage GND	-
H	Red	Supply voltage V_{CC}	9 ... 28 V
J	Black	USB GND	-
K	Purple	-	-
L	Grey-Pink	USB	+5 V
M	Red-Blue	-	-

10 Sensor wiring



11 Speed sensor

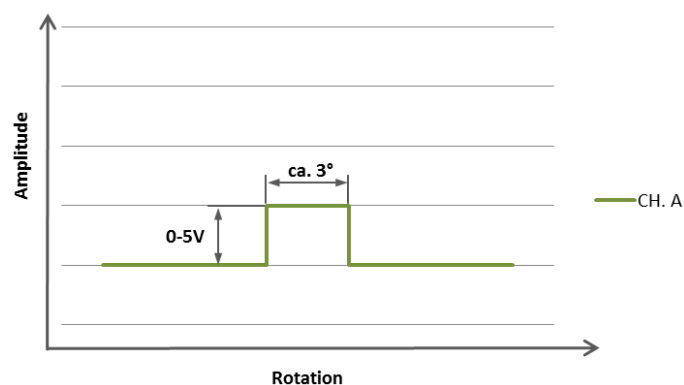
Optical angle sensor with 360 CPR.



Parameter	Min.	Typ.	Max.	Unit
Upper level Output signal	2.4	5	-	V
Lower level Output signal	0	-	0.4	V
Parameter	Description			
C	One cycle (pulse) of 360 CPR			
P	Pulse width, or the length of the upper level of the output signal			
S	Status width, the length of the electrical degrees between a change from CH. A and the adjacent change from CH. B.			
Φ	The number of electrical degrees between the centre of the upper level of CH. A and the centre of the upper level of CH. B.			

12 Speed Sensor

Magnetic (Hall effect) speed sensor with 1 CPR or 60 CPR.



Parameter	Min.	Typ.	Max.	Unit
Operating frequency	0	-	8000	Hz
Analogue signal bandwidth	20	40	-	kHz
Upper level Output signal	2.4	5	-	V
Lower level Output signal	-	0	0.4	V


13 Order options

Series 7000 Accuracy 0,5 %									
Measuring range [Nm]									
3000	including 5m cable and calibration certificate								
5000	including 5m cable and calibration certificate								
customer	Customer-specific up to 5,000 Nm including 5 m cable and calibration certificate								
Shaft end first side									
0	NCTE flange (bolt circle 138 mm with 8 x M12)								
X	Customer-specific								
Shaft end second side									
0	NCTE flange (bolt circle 138 mm with 8 x M12)								
X	Customer-specific								
Angle / speed sensor									
0	Without angle sensor								
1	Angle sensor 360CPR (only with IP50)								
2	Speed sensor 1CPR								
3	Speed sensor 60CPR								
Output signal analogue									
A	voltage output 0-10 V								
S	Current output 4-20 mA								
Digital output signal (optional)									
U	USB incl. NCTE software and 2.8 m cable								
C	CAN bus (not with angle sensor)								
Inverted output signals (optional)									
I	All output signals inverted								
Protection class to EN 60529									
0	IP 50								
1	IP 65								
7000	5000	0	0	1	S	C	0	1	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.

14 Accessories

Readout unit			
			
A	Order number 400010-ATS001 (Art. No.: 400010005)	Sensor input: Voltage output 0-5 V and 0-10 V 1 x angle encoder input, A/B USB interface, Software Windows included SD card slot to use for data logging	
B	Order number: 400010-ATS002 (Art. No.: 400010006)	Sensor input: current output 4-20 mA 1 x angle encoder input, A/B USB interface, Software for windows included SD card slot to use for data logging	
Additional profile shafts for NCTE sensors with flange		Mounting	Max. continuous dynamic load [Nm]
1	400012-ATM224 PTO Profile shaft 6 teeth (1 3/4")	8 x M12, 12.9	4500
3	400012-ATM220 PTO Profile shaft 6 teeth (1 3/8")	8 x M12, 12.9	2500
5	400012-ATM226 PTO Profile shaft 20 teeth (1 3/4")	8 x M12, 12.9	5000
7	400012-ATM222 PTO Profile shaft 21 teeth (1 3/8")	8 x M12, 12.9	3000
Additional profile sleeve for NCTE sensors with flange		Mounting	Max. continuous dynamic load [Nm]
2	400012-ATM225 PTO Profile sleeve 6 teeth (1 3/4")	8 x M12, 12.9	5.000
4	400012-ATM221 PTO Profile sleeve 6 teeth (1 3/8")	8 x M12, 12.9	5.000
6	400012-ATM227 PTO Profile sleeve 20 teeth (1 3/4")	8 x M12, 12.9	5.000
8	400012-ATM223 PTO Profile sleeve 21 teeth (1 3/8")	8 x M12, 12.9	5.000

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

