



Technical data

- Nominal torque: up to 5.000 Nm
- Rotational speed: ≤ 3.600 rpm
- Accuracy: $\leq \pm 0,5$ %
- Temperature range: -40 °C to $+85$ °C
- Protection class: IP50, IP65
- Output signal options: 0-10 V/4-20 mA/CAN-Bus/USB
- Cut-off frequency: 2.500 Hz

Your advantages

- Made in Germany
- Short lead time (< two weeks)
- Best price-performance ratio
- Integrated electronic (Plug & Play)
- Contactless measurement system
- Including 5 m cable and calibration certificate
- Suitable accessories (PTO shafts, PTO bushes, Readout unit)

Short description

The 7000 series opens up the segment of extremely robust and extremely resilient torque sensors in high nominal torque ranges (up to 5,000 Nm).

This series 7000 is mainly used in test facilities, automotive engineering (agriculture and off-highway), process monitoring and quality control.

With the series Transmitted torque can be measured statically and dynamically in real time. This series offers a lot of different connection possibilities used in agriculture or off-highway for instance PTO shaft. Also a flange system is available. Each sensor can be configured individually with a lot of extras, such as angle sensor and speed sensor.

Series 7000 offers a wide range of output signals such as 0-10 V, 4-20 mA, Can-Bus or USB. USB is offered including a special NCTE software enables to show data in real time.

The sensor is provided as a complete unit including 5 m connection cable and calibration certificate.

Model series 7000

Model Series 7000	Nominal torque bidirectional (+/-) [Nm]	Rotational speed [rpm]
NCTE Flange	3.000	3.600
NCTE Flange	5.000	
Customised Flange	Customised up to 5.000	

The maximum permissible dynamic axial tensile load is 10.000 Nm.

Note: This Sensor does not facilitate overload and should be operated only within the mentioned Nominal torque range. In case of overload, the sensor needs to be recalibrated at NCTE AG.

Technical characteristics

No.	Model	Unit	Series 7000	
	Accuracy class ¹		0,5	
			Value	
1	Linearity deviation incl. hysteresis	%ME ²	< ±0,5	
2	Rotational Signal Uniformity (RSU)		< ±0,5	
3	Repeatability		< ±0,05	
Output signal in general		Unit	Value	
4	Frequency range, -3dB point, Bessel characteristics	Hz	2.500	
5	Analog signal	V mA	0 ... 10	4 ... 20
6	Signal at torque = Zero ³	V mA	5	12
7	Signal at positive nominal torque ³	V mA	9	20
8	Signal at negative nominal torque ³	V mA	1	4
9	Calibration parameter (normed) ³	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)	kΩ	≥ 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	
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 ⁴	IP	50/65	
20	Reference temperature	°C	+15 ... +35	
21	Operational temperature range	°C	-40 ... +85	
22	Storage temperature range	°C	-40 ... +85	
23	EMV	-	EN 61000/EN 55011	
23	Weight	g	min. 8.000	

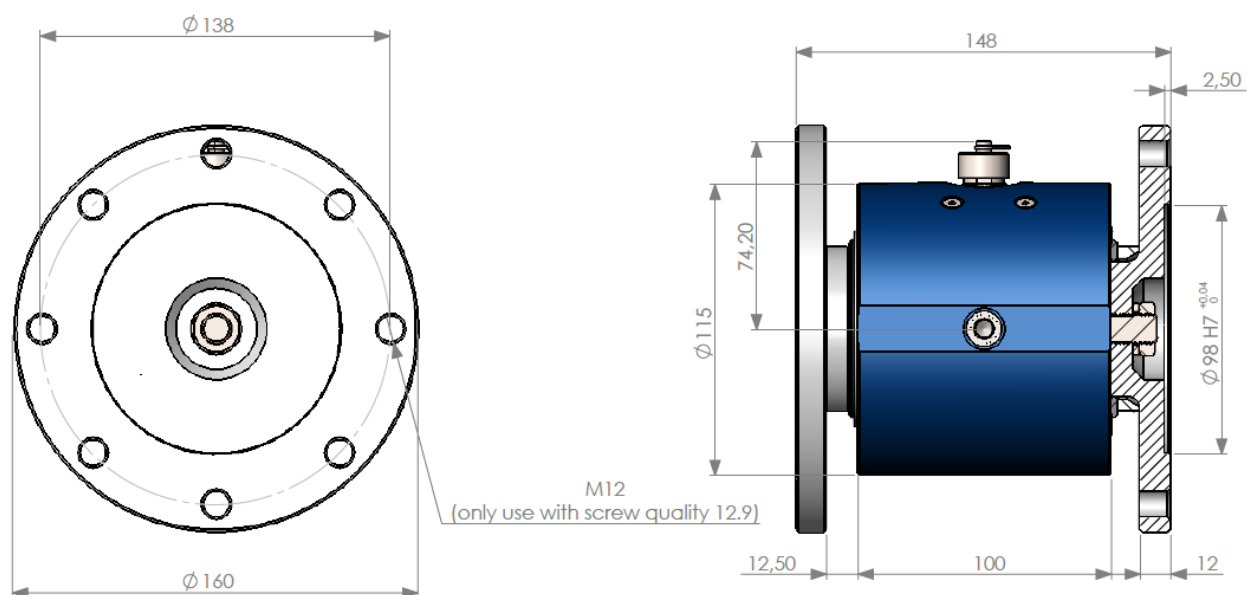
¹ The accuracy class implies that taken separately both the linearity deviation as well as the rotational signal uniformity are either lower than or equal to the value of the accuracy class.

² %ME: related to a full scale measurement range.

³ Please check the exact data at the sensors calibration certificate.

⁴ Wiring connected.

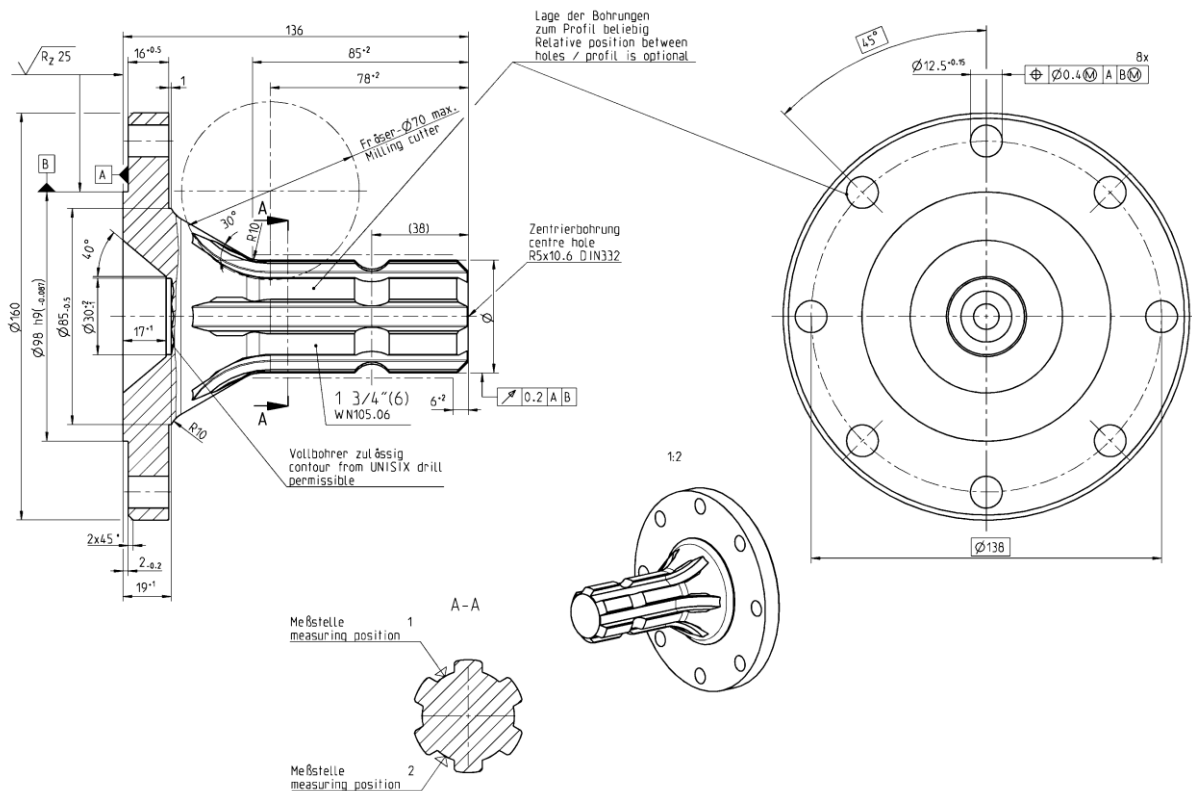
Dimensions



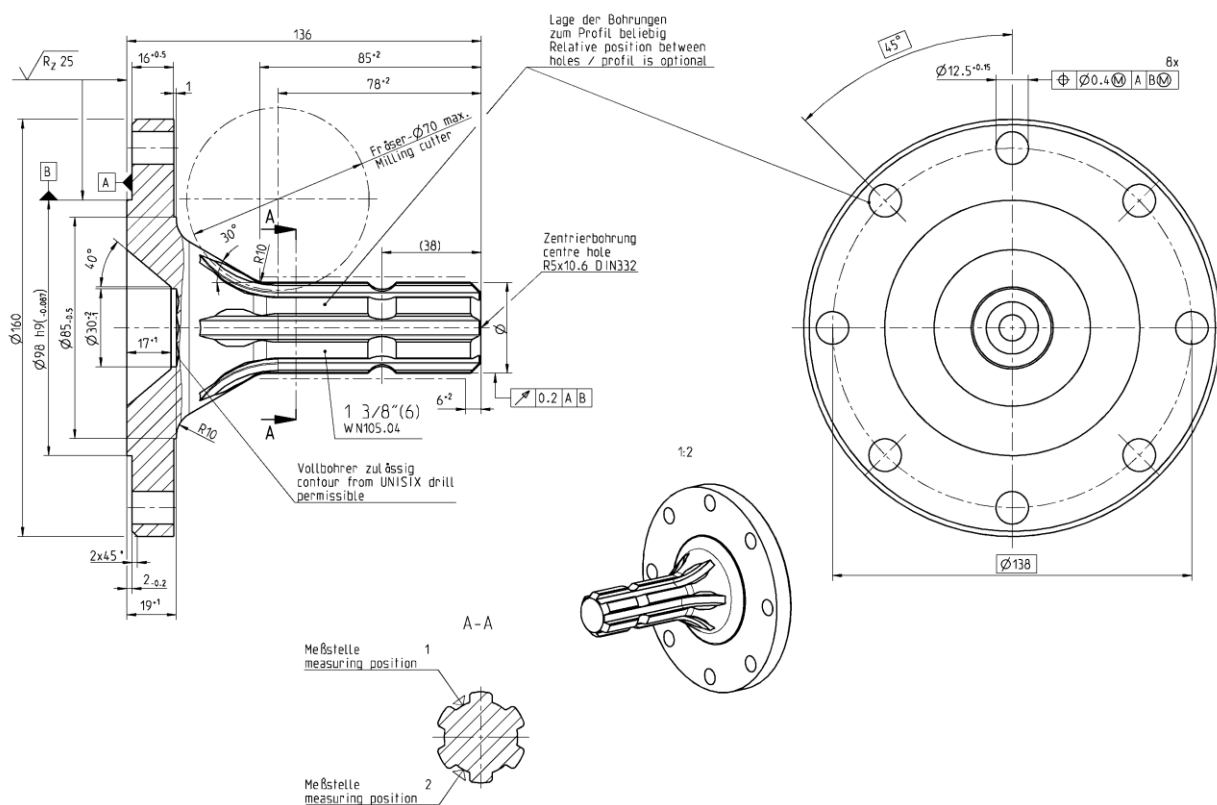
Flange has to be fixed by eight screws M12 steel grade 12.9 and 155 Nm.
The screws must be checked before each use.

Additional shafts for NCTE-Flange sensors (Accessories)

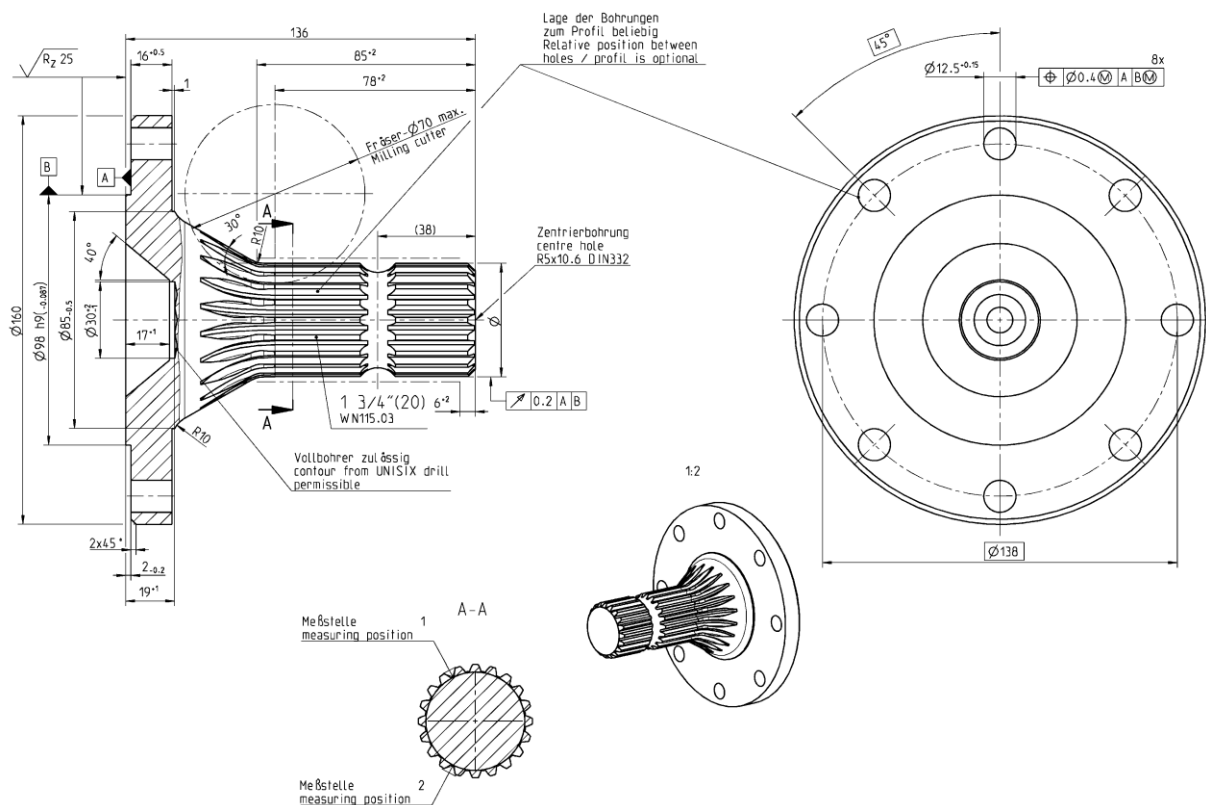
PTO shaft 6 teeth (1 3/4"), ≤ 4.500 Nm maximum dynamic constant load



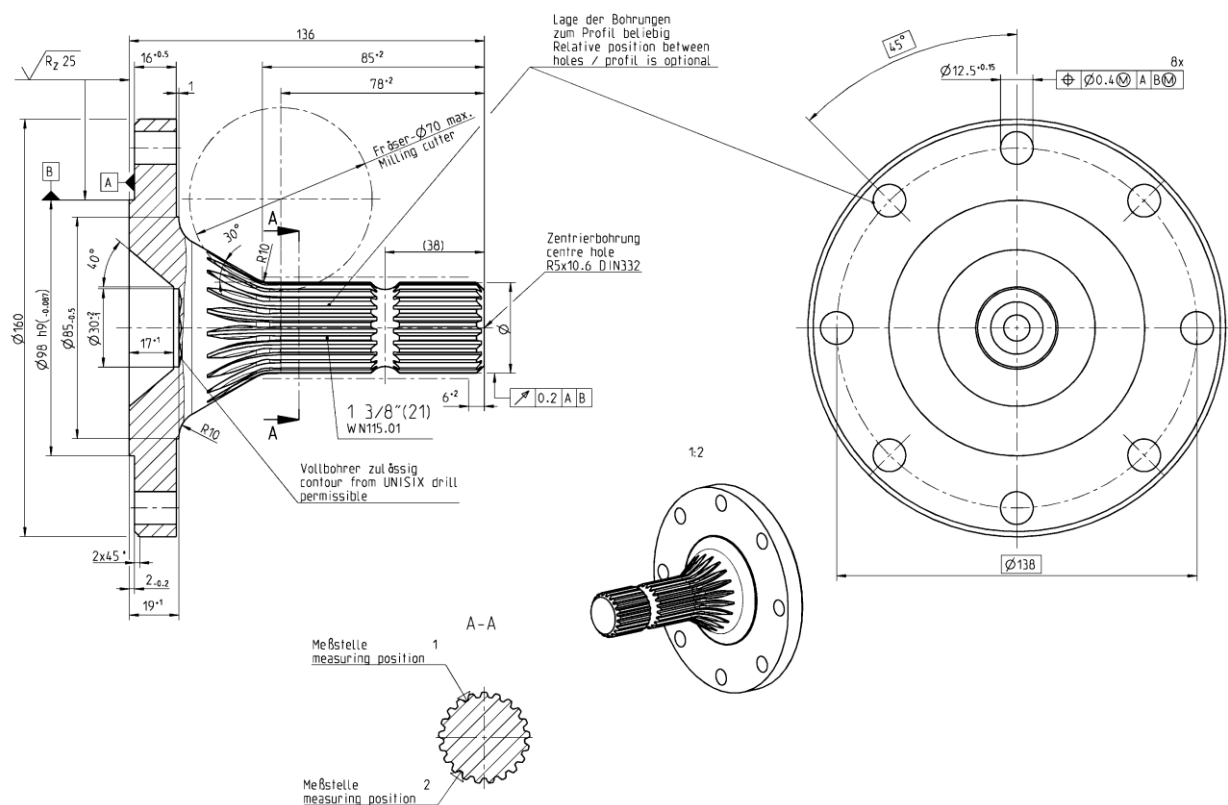
PTO shaft 6 teeth (1 3/8 inch), ≤ 2.500 Nm maximum dynamic constant load



PTO shaft 20 teeth (1 3/4"), ≤ 5.000 Nm maximum dynamic constant load

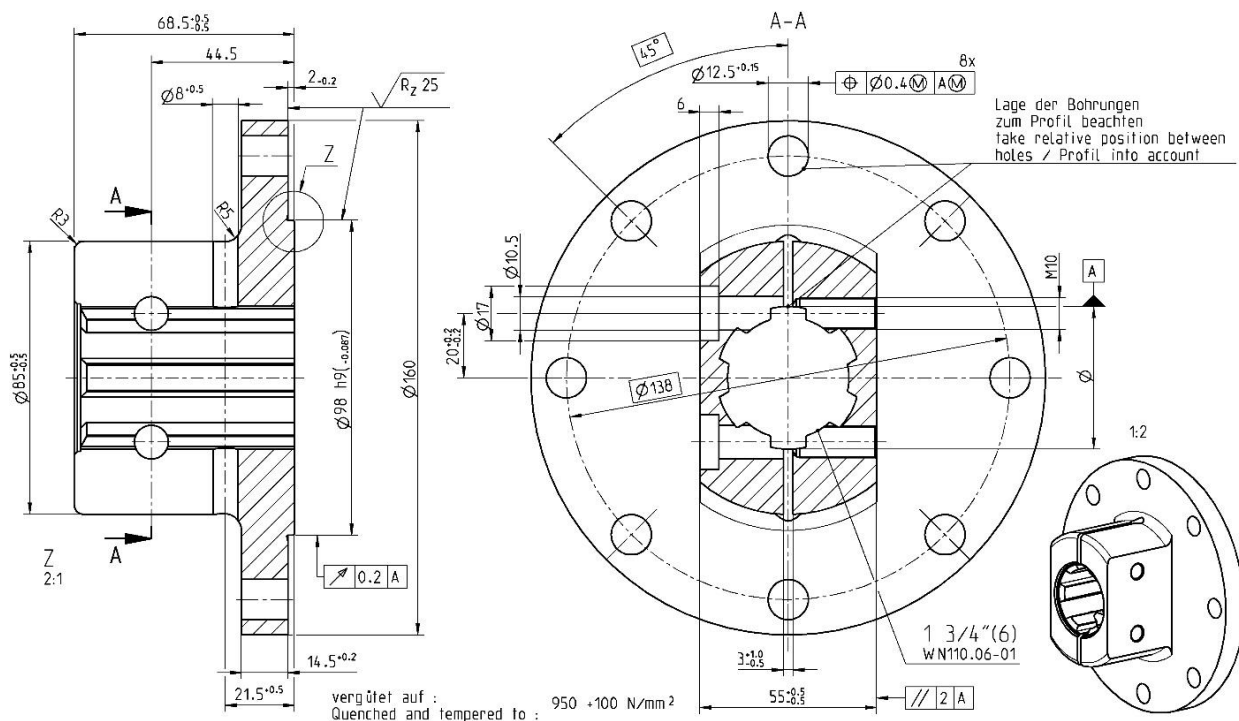


PTO shaft 21 teeth (1 3/8"), ≤ 3.000 Nm maximum dynamic constant load

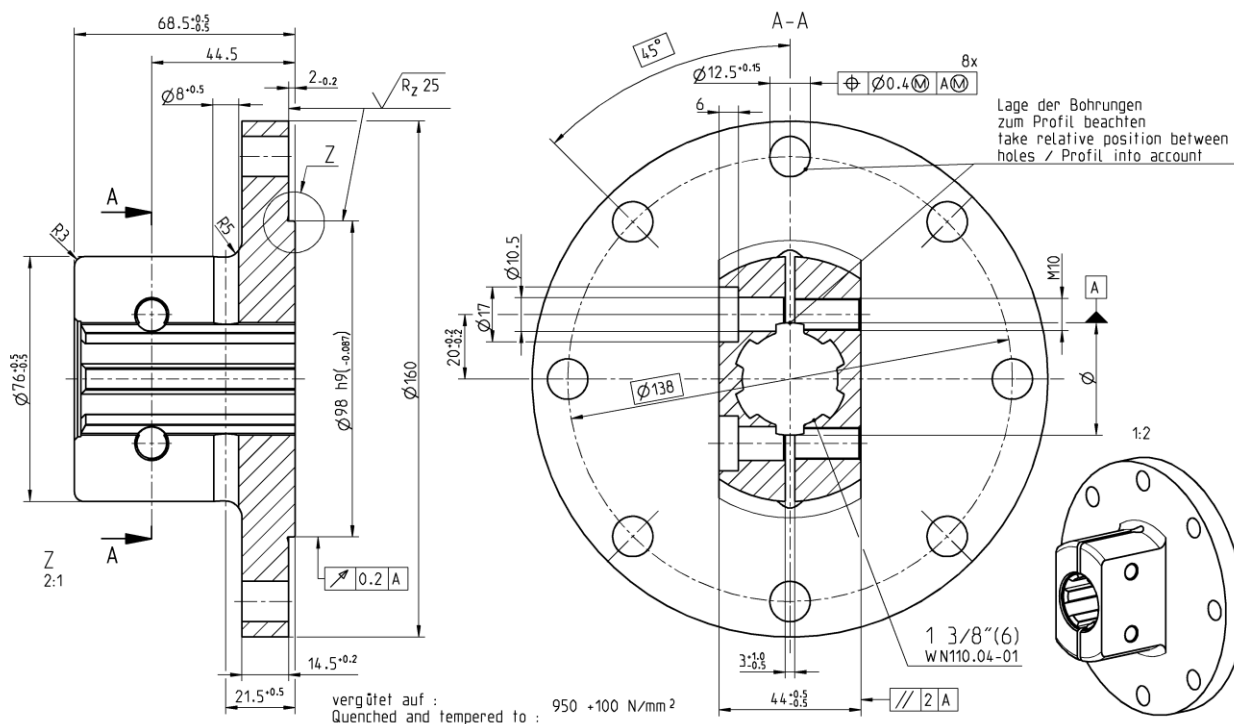


Additional bushes for NCTE-Flange sensors (Accessories)

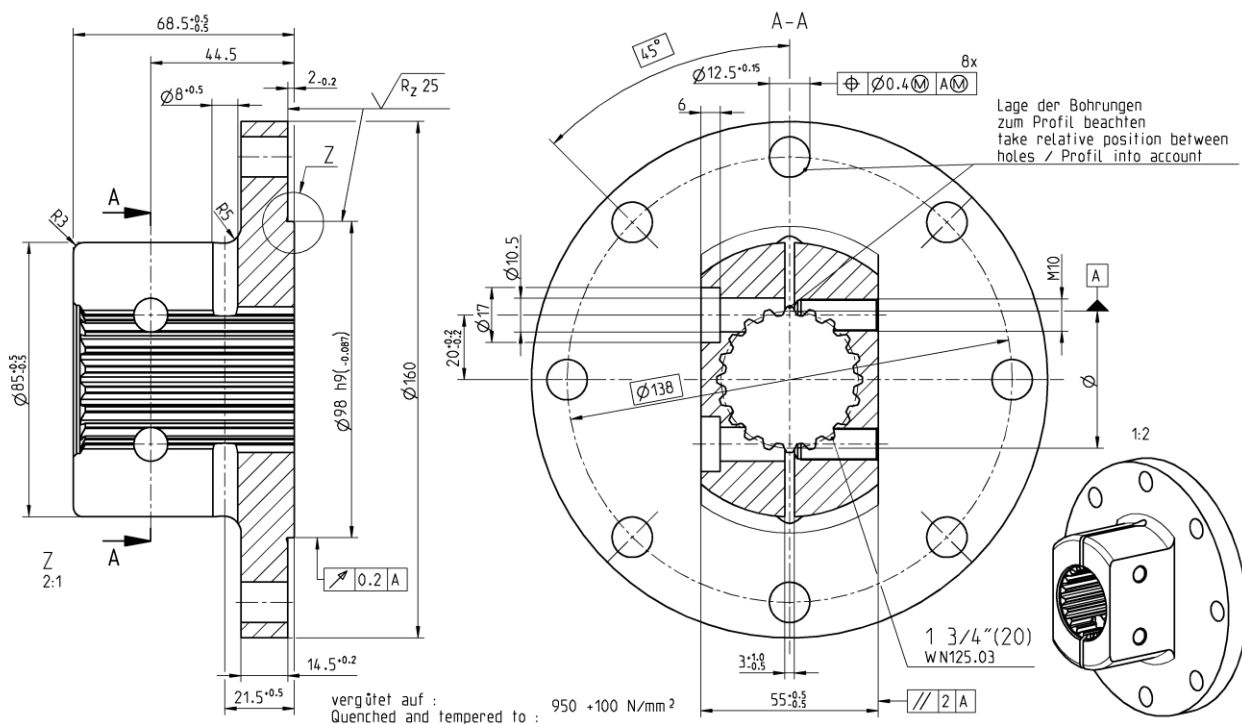
PTO bush 6 teeth (1 3/4"), ≤ 5.000 Nm maximum dynamic constant load



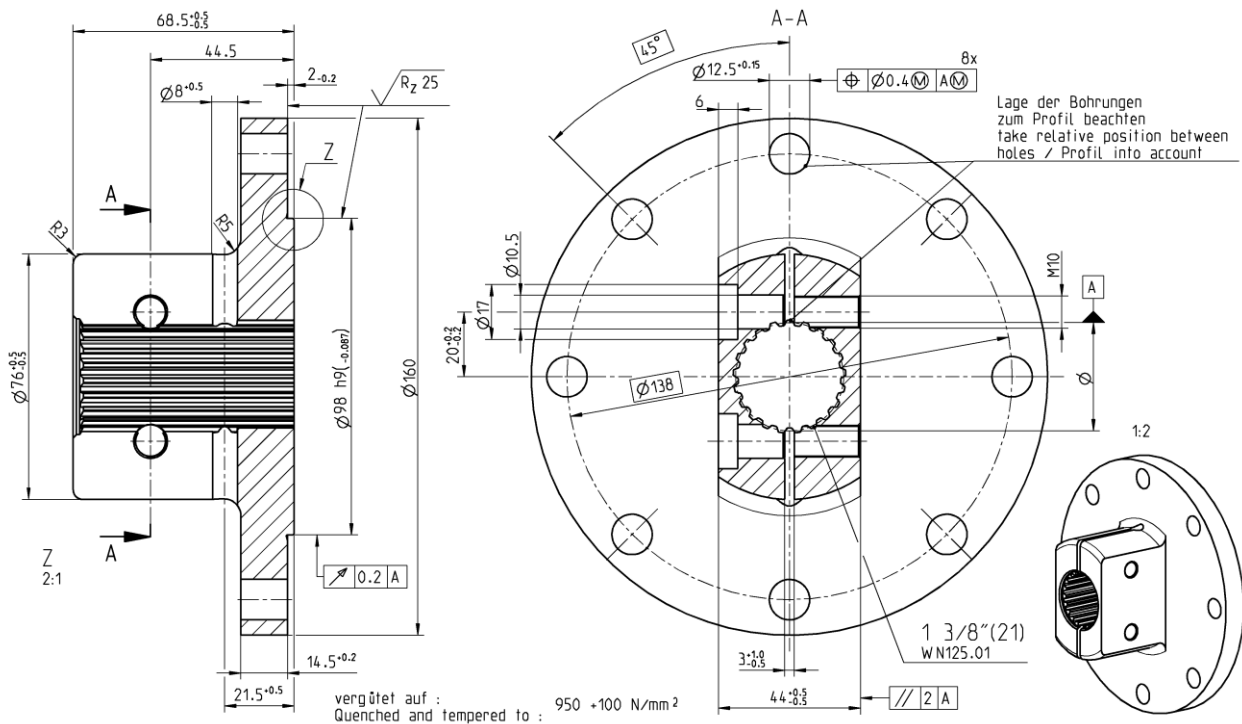
PTO bush 6 teeth (1 3/8 inch), ≤ 5.000 Nm maximum dynamic constant load



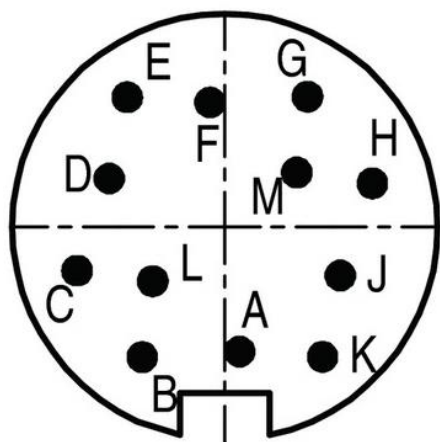
PTO bush 20 teeth (1 3/4"), ≤ 5.000 Nm maximum dynamic constant load



PTO bush 21 teeth (1 3/8"), ≤ 5.000 Nm maximum dynamic constant load



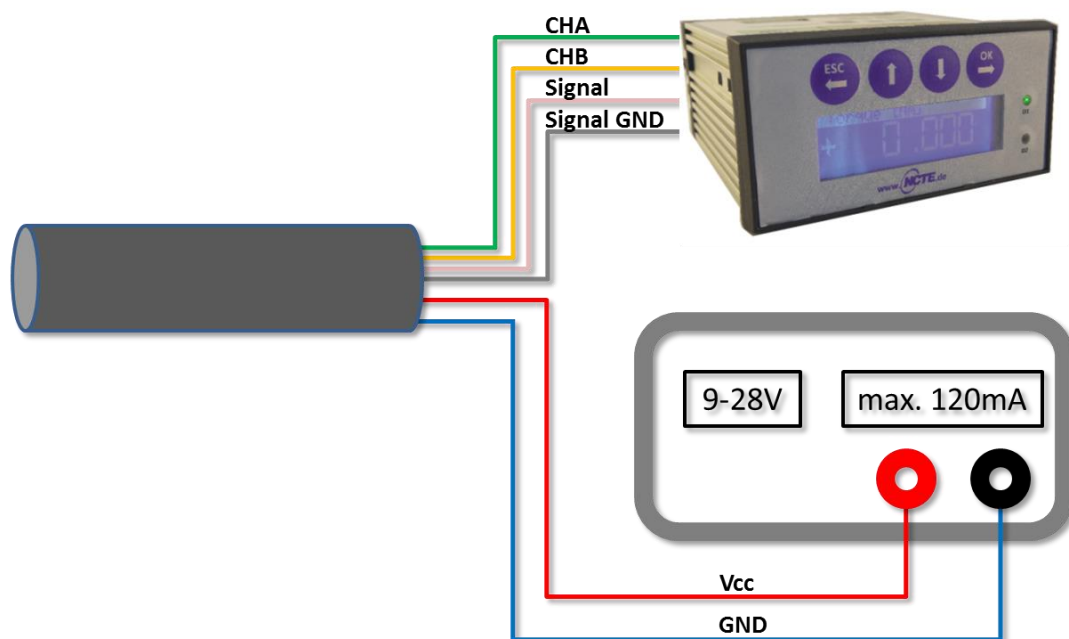
Connection plan



Connector
Power supply and outputs

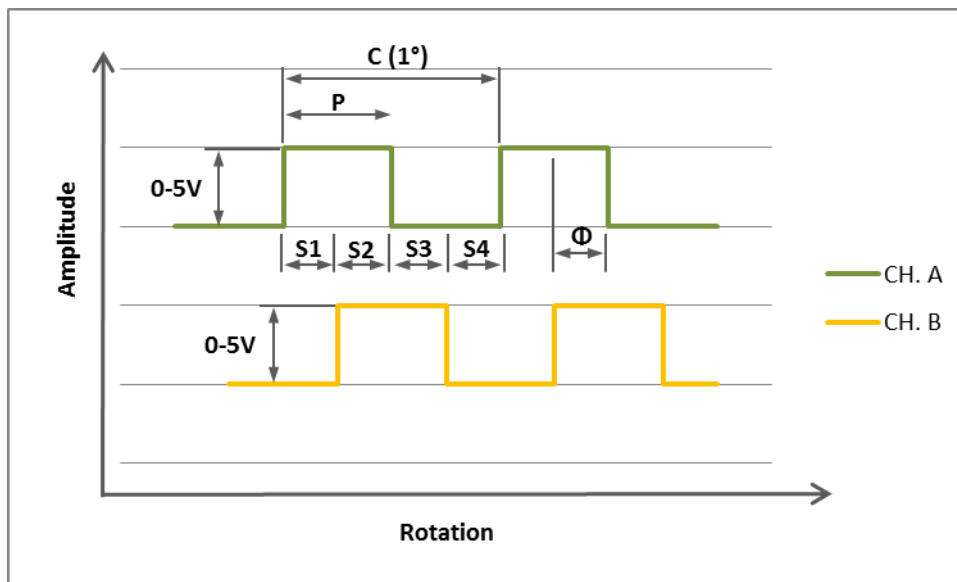
Typ	Binder series s712-M9 connector IP67 colour coding according to DIN 47100		
Pin	Colour	Description	Value
A	White	CAN / USB	H/D-
B	Brown	CAN / USB	L/D+
C	Green	Angle channel A	0 V ... 5 V
D	Yellow	Angle channel B	0 V ... 5 V
E	Grey	Analog GND	-
F	Pink	Analog voltage Analog current	0 V ... 10 V 4 mA ... 20 mA
G	Blue	Ground GND	-
H	Red	Supply voltage VCC	9 V ... 28 V
J	Black	USB GND	-
K	Violet	-	-
L	Grey-Pink	USB	+5 V
M	Red-Blue	-	-

Connection example:



Angle sensor

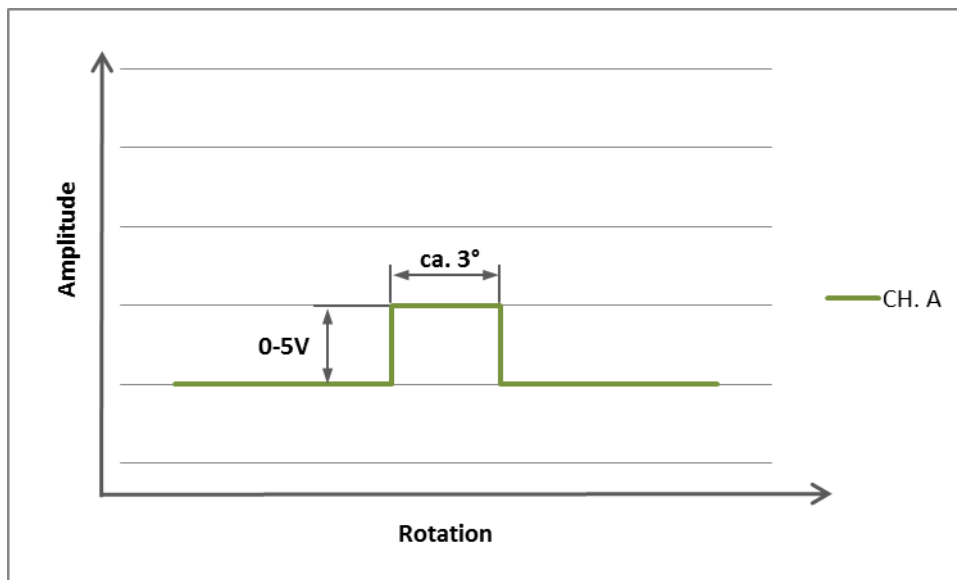
Optical angle sensor with 360 CPR.



Parameter	Min.	Typ.	Max.	Units
High Level Output Voltage	2,4	5	-	V
Low Level Output Voltage	0	-	0,4	V
Parameter	Description			
C	One cycle of 360 CPR (degrees)			
P	The duration of high state of the output within one cycle			
S	The number of electrical degrees between a transition in Channel A and the neighbouring transition in Channel B			
Φ	The number of electrical degrees between the centre of high state of Channel A and the centre of high state of Channel B			

Speed sensor

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



Parameter	Min.	Typ.	Max.	Unit
Operating frequency	0	-	8.000	Hz
Analog band width	20	40	-	kHz
High Level Output Voltage	2,4	5	-	V
Low Level Output Voltage	-	0	0,4	V

Order options

Series 7000 accuracy 0,5 %											
Measurement range											
3.000	Nm including 5 m cable and calibration certificate										
5.000	Nm including 5 m cable and calibration certificate										
XXXX	Customised calibration up to 5.000 Nm including 5 m cable and calibration certificate										
7000	0	1 st Shaft end									
		0	NCTE-Flange (bolt circle 138 mm with 8 x M12)								
	X	Customized flange									
		2 nd Shaft end									
	0	NCTE-Flange (bolt circle 138 mm with 8 x M12)									
	X	Customized flange									
		Angle or Speed sensor									
		0	Without angle sensor								
		1	Angle sensor 360CPR (only with IP50)								
	2	Speed sensor 1CPR									
	3	Speed sensor 60CPR									
	A	Analog output									
		A	Voltage output 0-10 V								
	S	Current output 4-20 mA									
		Digital output (optional)									
	U	USB incl. NCTE Software and 2,8 m cable									
	C	CAN-Bus (not offered with angle sensor)									
	I	Inverted output signal (optional)									
		I	All output signals inverted								
	1	Protection class according to EN 60529									
0		IP50									
	1	IP65									
7000	5.000	0	0	1	S	C	I	1	Example Sensor configuration		

Accessories series 7000

Readout unit



A	Torque sensor input: Voltage output 0-5 V and 0-10 V Order number: 400010-ATS001 1 angle encoder input, A/B USB interface, Software for Windows included SD card slot to use for data logging
S	Torque sensor input: current output 4-20 mA Order number: 400010-ATS002 1 angle encoder input, A/B USB interface, Software for Windows included SD card slot to use for data logging
Additional shafts for NCTE-Flange sensors	
1	400012-ATM224 PTO shaft 6 teeth (1 3/4")
3	400012-ATM220 PTO shaft 6 teeth (1 3/8")
5	400012-ATM226 PTO shaft 20 teeth (1 3/4")
7	400012-ATM222 PTO shaft 21 teeth (1 3/8")
Additional bushes for NCTE-Flange sensors	
2	400012-ATM225 PTO bush 6 teeth (1 3/4")
4	400012-ATM221 PTO bush 6 teeth (1 3/8")
6	400012-ATM227 PTO bush 20 teeth (1 3/4")
8	400012-ATM223 PTO bush 21 teeth (1 3/8")

1	2	Example accessory configuration
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Additional shafts and bushes for NCTE-Flange sensors (Accessories)

Additional PTO shafts for NCTE-Flange sensors	Order number	screws / steel grade	Max. dynamic constant load [Nm]
Shaft 6 teeth (1 3/4")	400012-ATM224	8 x M12 steel grade 12.9	4.500
Shaft 6 teeth (1 3/8")	400012-ATM220	8 x M12 steel grade 12.9	2.500
Shaft 20 teeth (1 3/4")	400012-ATM226	8 x M12 steel grade 12.9	5.000
Shaft 21 teeth (1 3/8")	400012-ATM222	8 x M12 steel grade 12.9	3.000

Additional bushes for NCTE- Flange sensors	Order number	screws / steel grade	Max. dynamic constant load [Nm]
Bush 6 teeth (1 3/4")	400012-ATM225	8 x M12 steel grade 12.9	5.000
Bush 6 teeth (1 3/8")	400012-ATM221	8 x M12 steel grade 12.9	5.000
Bush 20 teeth (1 3/4")	400012-ATM227	8 x M12 steel grade 12.9	5.000
Bush 21 teeth (1 3/8")	400012-ATM223	8 x M12 steel grade 12.9	5.000

Please feel free to contact your Sales Manager Serial products for additional information.
Phone: +49 89 66 56 19 30 or Email: sales@ncte.de.

Instructions for use

Scope of delivery

The torque sensor set consists of the calibrated sensor itself (signal pick-up and signal processing integrated into sensor housing), one connecting cable 5 m with a soldered plug (binder plug no. 99-5630-15-12) and the calibration certificate.

USB-cable will be delivered in 2.80 m length, if USB option is ordered.

Datasheets and instruction manuals are available at <https://ncte.com/en/standard-products/#>.

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 by NCTE, or a similar cable that is of a different length may affect the overall performance of the sensor.

The security against rotation may only occur via the M8 thread (screws M8 steel grade 12.9) on the flattening of the housing. Maximum load at the thread is 25 Nm.

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

Offset adjustment

If required the zero point output signal (5 V/12 mA) can be adjusted by pressing the Tare-button. By factory default the sensor is set to 5 V or 12 mA at zero torque.

Interface description

Mechanical connection:

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

Electrical connector:

On the sensor housing there is a 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 NCTE 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.

Handling and transportation

While handling, storage and transportation keep the sensor away from magnetic or electromagnetic fields which may exceed the maximal intensity defined from EMC (chapter technical characteristics) for instance degaussing machines.

Precautions

- Opening the sensor is generally not permitted.
- The fastening nut of the plug and the screw plugs must not be loosened or tightened.
- Only use voltage supplies that are separate from the mains voltage.
- With regard to the electrical and mechanical load on the sensor, the specifications in the table in Chapter: Technical characteristics must be observed.
- The sensor must not be exposed to electrical or magnetic fields that are outside the permissible range according to electromagnetic compatibility (chapter: Technical characteristics).
- The sensor is not to be used as a support bearing. The existing mounting options serve only to prevent the housing from rotating.
- To protect your system, we recommend increasing the torque over several stages.

Service and maintenance

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

Recommended NCTE maintenance plan

Recalibration	12 month
Control of wiring, plug and shaft	12 month

Service-Hotline: Phone: +49 89 66 56 19 30
Email: sales@ncte.de

Disposal

For disposal the Sensor has to be returned to **NCTE AG, Raifeisenallee 3, 82041 Oberhaching, Germany.**