

TTC - TORQUE SENSORS

DESCRIPTION AND PRODUCTSPECIFICATION

TTC - Telemetric-TorqControl® Sensor Technology - is an extremely robust and reliable torque measuring system for permanent industrial use.

A TTC torque sensor is mounted on existing shafts. No modifications to drive trains are necessary. TTC sensors are based on strain gauge technology to measure the torque proportional to the torsion of a shaft. The use of a telemetric system guarantees a contact-free operation. ACIDA GmbH specialises in providing this measuring technology for medium to very high torque loads under the harshest industrial operating conditions, e.g. rolling mills, vessel propeller shafts, roller presses, hauling engines in mining industry.

A TTC transducer consists of one (type 1) or two rings (type 2) mounted on the rotating shaft which support and protect the rotating system modules. The key function of the ring(s) and the sophisticated sealing system is, however, to protect the strain gauge mounted on the shaft. Only the TTC-rings from ACIDA provide hermetically enclosed strain gauges without altering the torsional stiffness of the shaft.

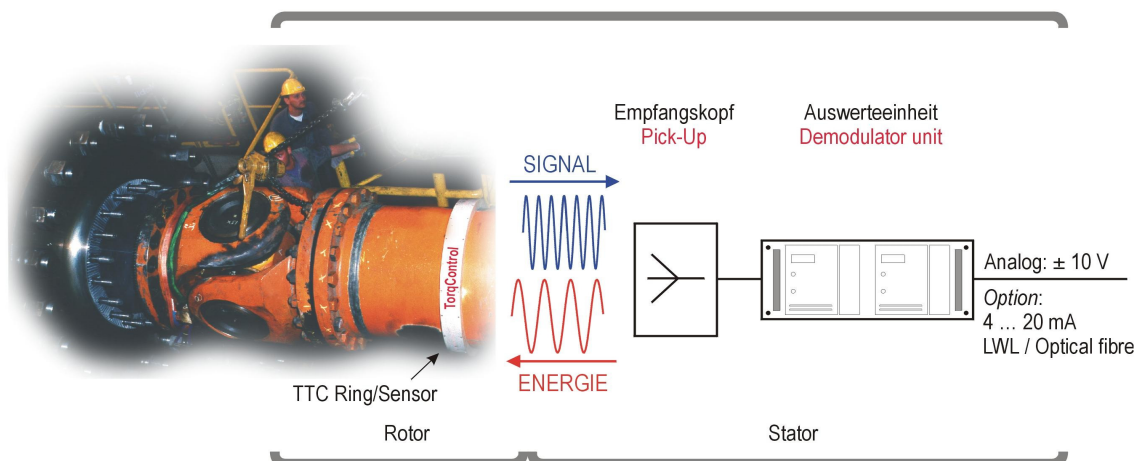
Moreover, TTC incorporates a 1-channel telemetry system with contact-free signal transmission and inductive power supply. The rotor electronics are mounted on the shaft within the TTC-Ring(s). The static components are a pick-up, which receives the torque signal from the ring antenna, and the demodulator which provides the $\pm 10V$ analog torque signal (4...20 mA signal output is an option).

Besides the standard type 1 [TTC-4.1], type 2 [TTC-4.2] offers even higher sensor protection, i.e. a second metal ring as an extra strain gauge safeguard, a double protective housing for the pick-up and an armoured protective tube for the cabling.

A special design allows the installation at axially shifting shafts and spindles.

TTC is exclusively offered and delivered as a turnkey system, i.e. it includes the system components, the installation of the strain gauges by our specialists, mounting and sealing of the system and commissioning.

TTC - Telemetric TorqControl® Drehmomentmeßtechnik TTC - TorqControl® Sensor Technology



TTC torque sensor application on the U-joint shafts of the main drives of an aluminium roughing mill
Schematic view of the signal transmission and system components

Technical specifications for [TTC-4.1] and [TTC-4.2]:

- Shaft diameters 100...1500 mm (4...60 inch)
- Strain gauge is hot-bonded onto the shaft
- Plastic antenna and system protective ring with integrated oscillator for telemetry system (rotor)
- Pick-up for contact-free system operation (mounted at 5...40 mm / 0.2...1.5 inches from the rotor)
- Demodulator (Stator-electronics) with signal conditioning in a 19" rack housing (3 HE, up to 2 TTC units per rack)
- Up to 20 m / 65 ft. special cable between pick-up and demodulator
- Signal output: analogue ± 10 V at the demodulator
- Signal dynamics: 100 or 1000 Hz adjustable
- Integrated low-pass filter: 2-pole Butterworth
- Temperature range: 0...75 °C / 32...167 ° F
- Power supply: 220V/50Hz AC or 24V DC

Options:

- Bending compensation [TTC-O-BEND.1]
- Extended temperature range: -10...120°C / 17...250°F [TTC-O-TEMP.1]
- Electronic compensation of axial shaft shifting [TTC-O-SHIFT.1]
- Signal output: analogue 4...20 mA at the demodulator [TTC-O-CUR.1]
- Signal transmission via optical fibre [TTC-O-LWL.1U] and [TTC-LWL.1K]
- Water and oil-resistant housing for the pick-up (IP65), standard for TTC type 2 [TTC-O-PROT4.1]
- Rev-meter / rotational speed signal output [TTC-O-SPEED.1]

Extra specifications for [TTC-4.2] (type 2):

- Metal protective ring for the strain gauge. The rings may be designed for axially offset or concentric mounting.
- Water and oil-resistant housing for the pick-up (IP65)
- 10 m / 30 ft. protective tube for the cabling between the pick-up and the demodulator

Service included:

- Turnkey installation of the complete measuring system, including the hot-bonding of the strain gauges, mounting of antenna, protective ring(s), pick-up and demodulator as well as the cabling.
- System engineering and commissioning
- Documentation of the measuring system
- Training

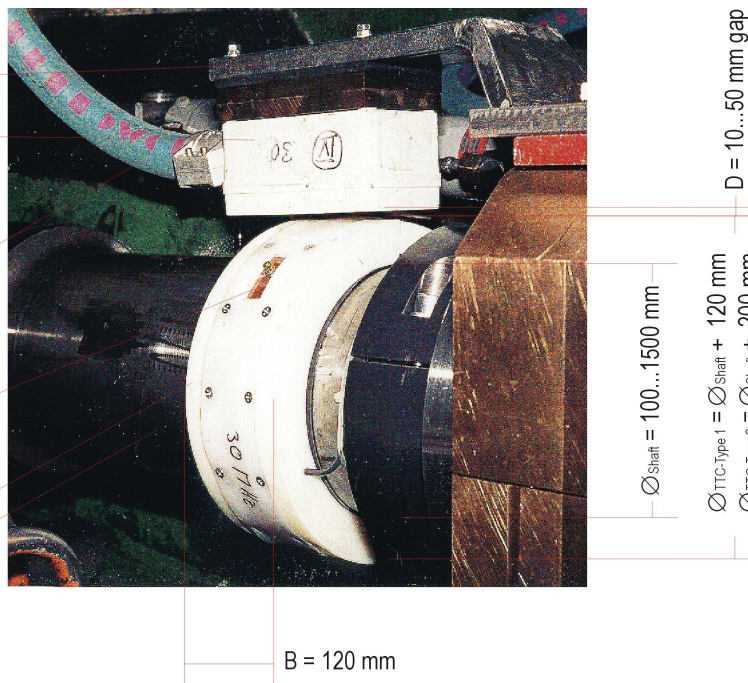
TTC Stator

- Bracket for pick-up
- Pick-up for contact-free signal transmission and inductive power supply
- Cabling and protecting tube
- Demodulator (not in picture)

TTC - Rotor

- Rotor Antenna
- Ring with strain gauge and Telemetry system

Shaft



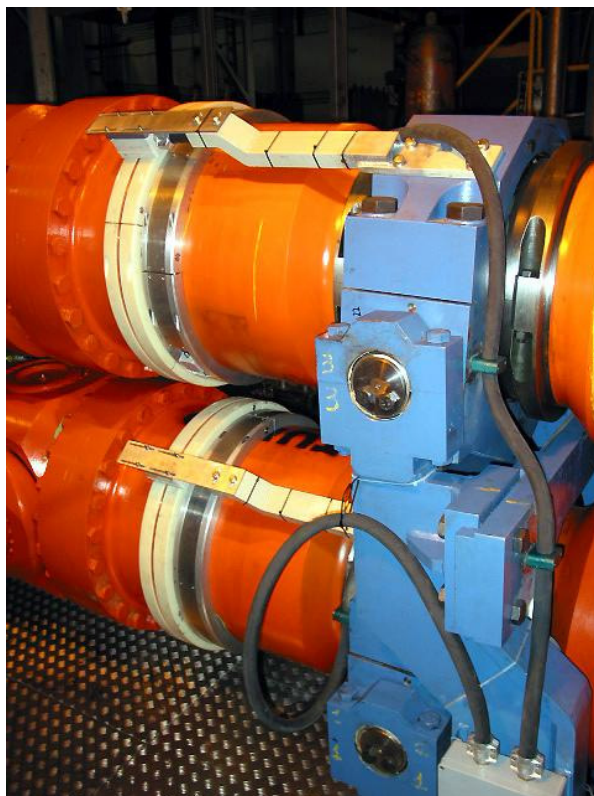
Example: Torque sensor [TTC-4.1] with option [TTC-O-PROT4.1] (pick-up and cabling protection)

Support provided by the customer:

- Shutdown, accessibility to the drive shaft for the duration of the installation (approx. 8 h)
- Technical data of the drive: shaft diameter (outer and inner), material specification (Young's Modulus and Poisson Ratio) and torque range (including dynamic torque overload)
- Providing the bracket for the pick-up

Technical points and conditions of delivery:

- The measuring accuracy depends primarily on the following parameters: material (Young's modulus and Poisson ratio), dimensions of the shaft and a homogenous axial space greater than the shaft diameter. Provided these exact parameters are supplied, we can guarantee a 1% measuring accuracy.
- Training or system instruction is carried out directly after installation and commissioning.

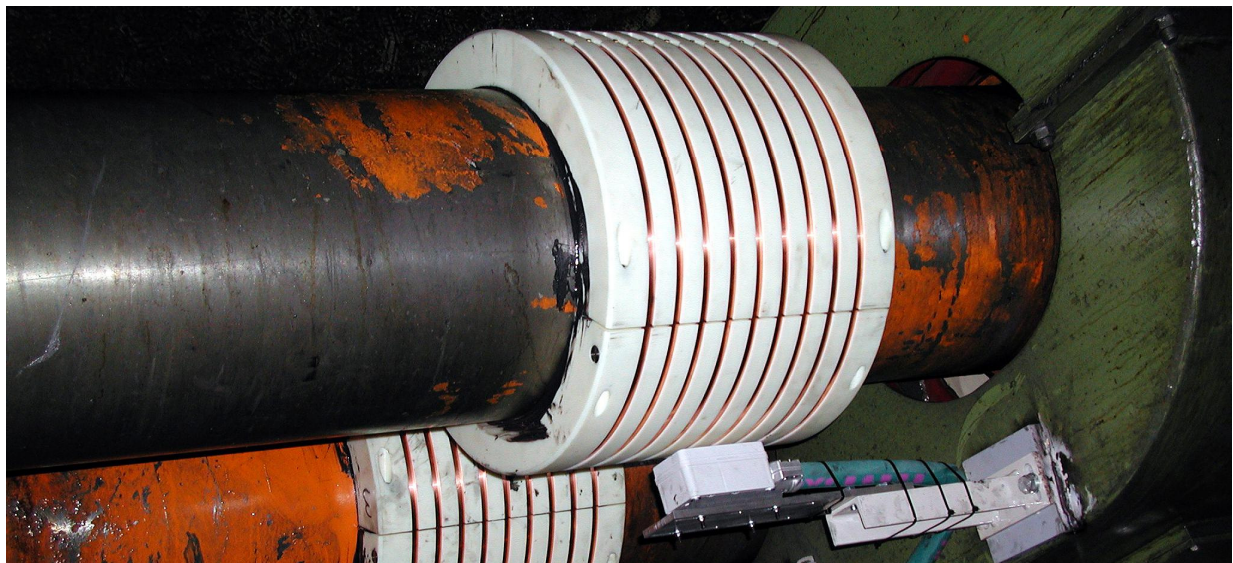


TTC sensor at the main drives of an aluminium rolling mill

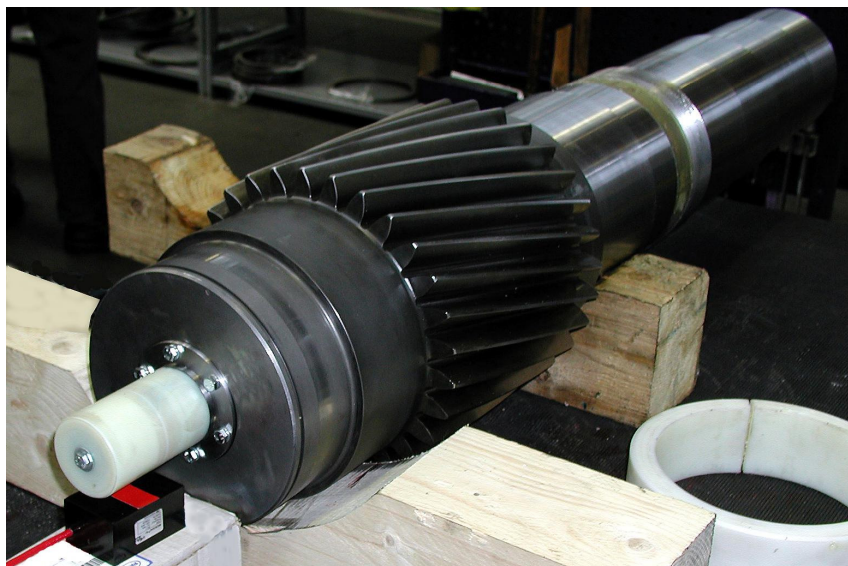
- The system documentation is delivered in English in a paper form or on a CD-ROM as a pdf file.
- An application period of approx. 8 hours must be guaranteed for each TTC sensor application, during which time the machine or plant needs to be shut-down and secured.
- We recommend that all vital sensor or monitoring system components, e.g. the TTC demodulator, be connected to an uninterruptable power supply to prevent system failures.
- The TTC torque sensor telemetry systems for permanent installations use 22.5 kHz for the inductive power supply and the signal carrier frequencies: 10.7, 12.5, 17.0 and 30.0 MHz. For temporary torque measurements ACIDA uses telemetry systems with the carrier frequencies: 153, 164, 181, 209, 237 and 265 ± 1 MHz. Please check possible interferences with your plant radio or other devices.
- Cables incl. the laying of cable sections longer than 20m are not included in the system prices. The cable type: LAPPKABEL: UNITRONIC Li2YCY PiMF 4x2x0.5 is recommended for analogue signals.
- The cable sections for analogue current signals should not exceed 200m /650ft. Analogue voltage signals should not be transmitted over more than 5 m / 15 ft.
- The customer will supply any necessary cable protection piping, cable lines and wall breakthroughs. Any requisite installation scaffolding must also be provided and erected. Cable conduits must match the number and diameter of the cables used. The TTC sensors type 2 include a cable protective piping made of armoured plastic tube between the pick-up and the demodulator.
- If local commissioning cannot be carried out within the working hours listed in the offer for reasons for which ACIDA GmbH cannot be held responsible, the necessary additional work will be invoiced at the following hourly rates (plus travelling and other expenses incurred) by arrangement with the customer. Examples of such reasons include an inadequate plant shut-down for the installation of the measuring systems or a lack of plant operation necessary to set up the system during the commissioning phase.
- All offers are based exclusively on our Purchase, Delivery and General Terms and Conditions.

Further products and services

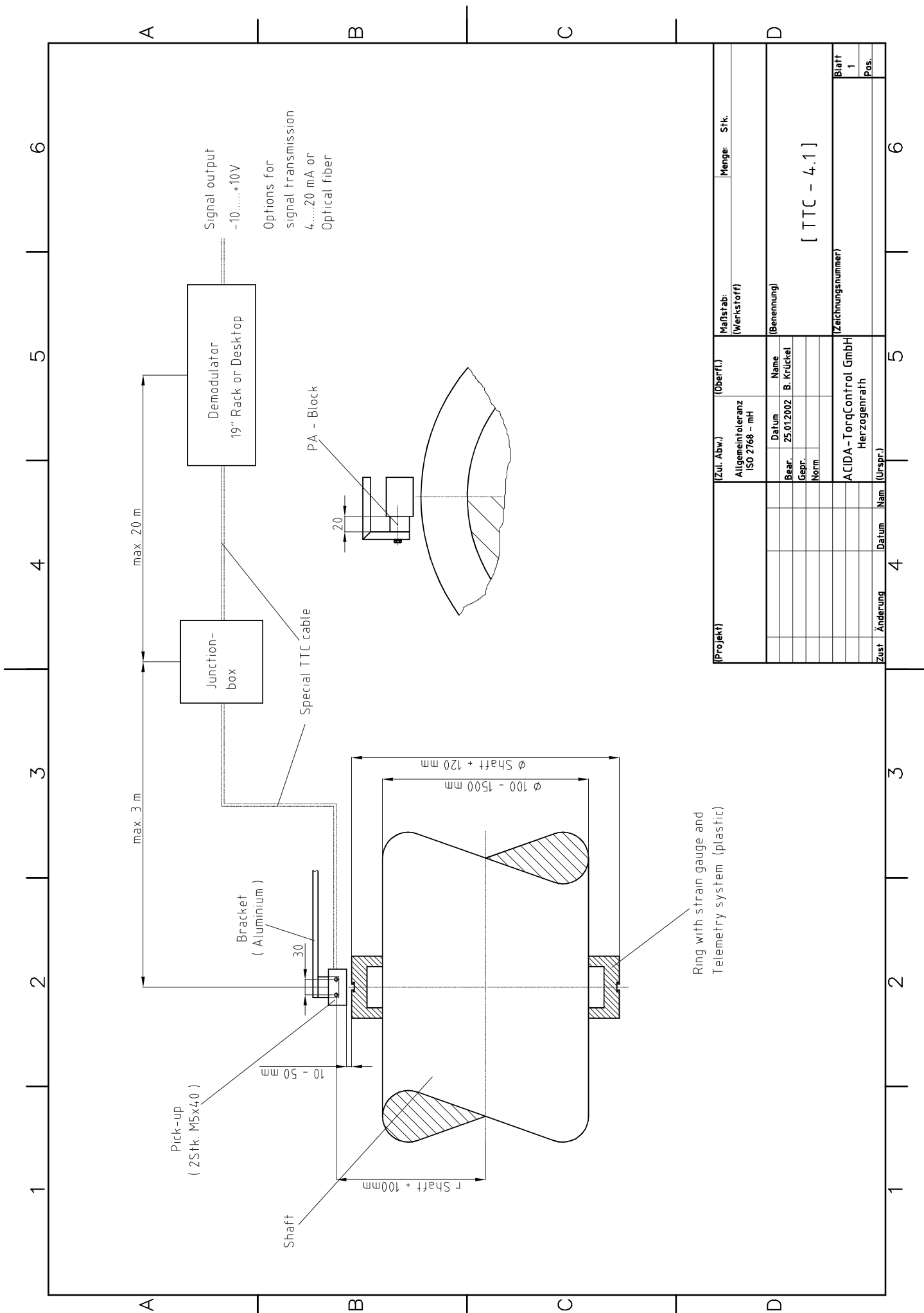
- ACIDA offers a 3rd torque sensor type [TTC-4.3] for temporary measurements at varying shaft diameters. The system components are mounted on the shaft using a flexible chain instead of a ring. The length of the chain can be easily adapted to the shaft diameter. The energy supply for the rotor can be inductive or alternatively using a battery pack. The use of TTC type 3 requires strain gauge application skills.
- Temporary torque measurements can also be carried out by ACIDA as a service. Apart from the torque, additional signals such as rotational speed, vibration, temperature or pressure can also be recorded. The computer for data acquisition, visualisation and signal analysis is included as well as a detailed report of the measurements.



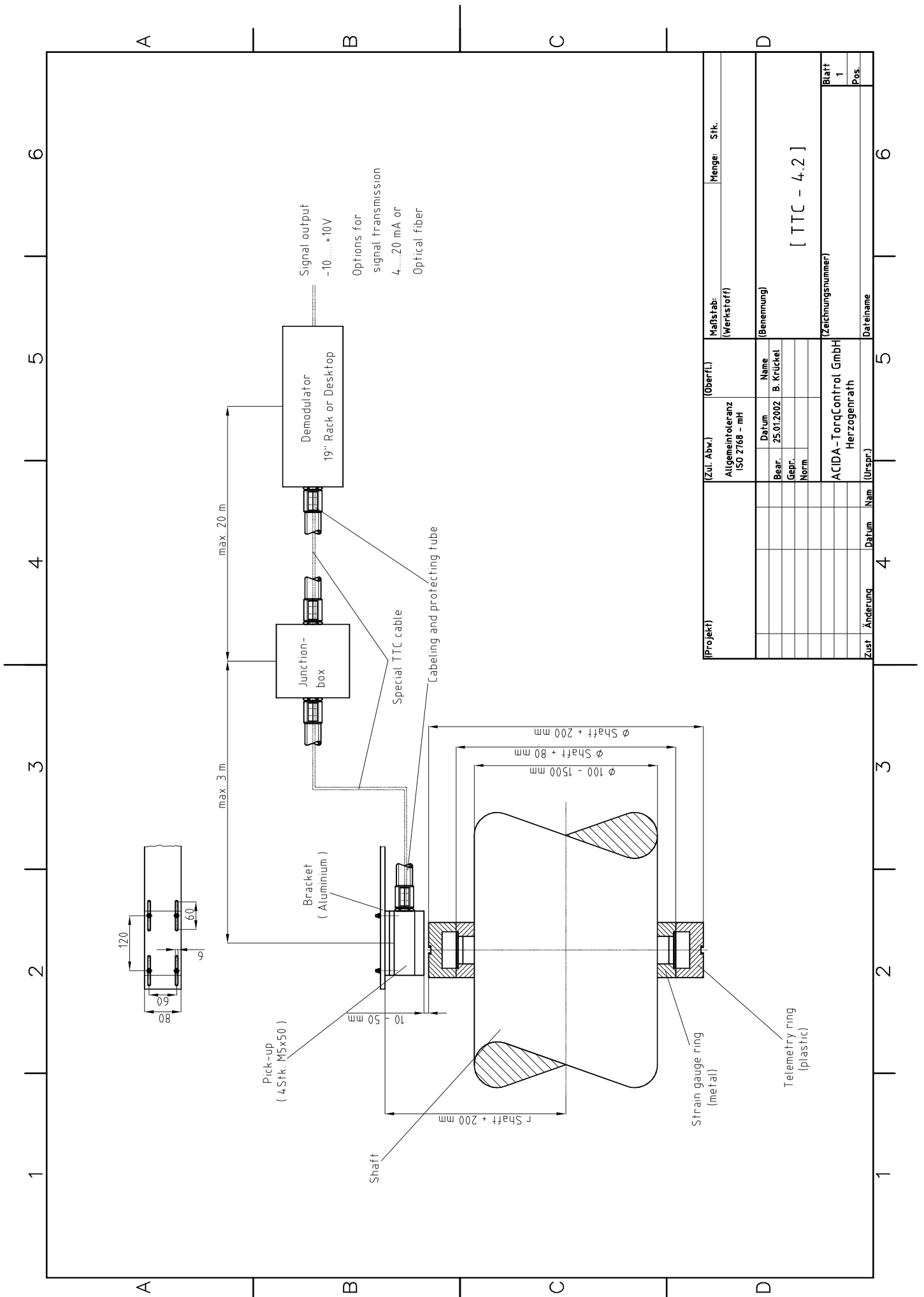
Special version of TTC with enlarged energy supply for axially shifting drive shafts



Special version of TTC with axial signal transmission and power supply



(Projekt)	(Zul. Abw.)	(Oberfl.)	Maßstab: (Werksstoff)	Menge:	Stk.
	Allgemeintoleranz ISO 2768 - mH	Name	(Benennung)	[TTC - 4.1]	
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	Gepr.	Norm		Pos.	
	ACIDA - TorqControl GmbH Herzogenrath				
Zust. Änderung	Datum	Nam	(Urspr.)	4	5
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[Projekt]	(Zul. Abw.)	(Oberfl.)	Maßstab: (Werkstoff)	Menge:	Stk.
	Allgemeintoleranz ISO 2768 - mh	Name	(Benennung)	[TTC - 4.2]	
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		Gepr.	Pos.		
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			[Zeichnungsnummer]		
			ACIDA-TorqControl GmbH		
			Herzogenrath		
Zust.	Änderung	Datum	Dateiname		
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