

# Absolute encoder TBD/TRD with PROFIBUS-DP interface

Document no.: TRD 11868 ME

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- Singleturn and multiturn versions
- Contactless, wear-free sensor system according to the Hall principle
- High vibration and shock resistance thanks to the robust mechanical design
- Resolution up to 8192 steps / 360° (13 bit)
- Measuring range: 4096 revolutions (12-bit)
- Protection type: IP 66, IP 69K (on request)
- Preset button in the connecting cap
- Option: Draw wire version with integrated encoder: TRD125-D

## Design and function

Recording of the angular position and revolutions by means of Hall sensors - multiturn version with absolute transmission for up to 4096 revolutions - data output plus parameterisation and diagnosis via Profibus-DP.

Robust housing manufactured from seawater-proof aluminium or stainless steel - stainless steel shaft - ball bearing with radial shaft seal - sensor circuit consisting of ASIC with Hall elements - electrical connections via the connecting cap with threaded cable connections.

The absolute encoders are designed for direct connection to the PROFIBUS-DP. The interface is implemented with the SPC3 Siemens PROFIBUS controller. The protocol corresponds to DP-Slave Class 2 functionality in accordance with Profibus profile for encoders, No. 3.062, and is described in detail in the [TRD 12770](#) user manual.

The TRD is mechanically and electrically compatible with the electro-optical encoder CRD.

The draw wire version with integrated encoder offers a very compact solution for length measurement up to 10 m. See datasheet [125-D13794](#) for mechanical design.

## Profibus characteristics

- Profibus-DP-V0 slave
- Address and terminating resistors can be set in the connecting cap using DIP switches
- Transmission rate of up to 12 MBaud
- Reference value setting via the control system output data and preset button
- Parameterisable via Profibus

## Absolute encoder TBD/TRD

### Technical Data

#### Input data \*

- 4 bytes position
- 4 bytes velocity (firmware version 1.02 or higher)

#### Output data \*

- 4 bytes preset

#### Electrical data

- Sensor system: ASIC with HALL elements
- Operating voltage: + 13.5 VDC to + 30 VDC (reverse voltage protection)
- Power consumption: < 2 W, switch on current < 250 mA
- Auflösung: Resolution: 4096 steps / 360° (12-bit) or 8192 steps / 360° (13-bit)
- Measuring range: 4096 revolutions
- Total number of steps: Max. 25-bit
- Absolute accuracy: ± 0.2 % (with reference to one revolution), singleturn version ± 0.1 %
- Output code: Binary
- Code path: CW / CCW
- Internal updating time: ≤ 2 ms

#### Mechanical data

- Operating speed: 1000 rpm max. (optionally up to 4000 rpm)
- Angular acceleration: 10<sup>5</sup> rad/s<sup>2</sup> max.
- Moment of inertia (rotor): 20 gcm<sup>2</sup>
- Operating torque: ≤ 8 Ncm (at 500 rpm)
- Starting torque: ≤ 4 Ncm
- Perm. shaft load: 250 N axial  
250 N radial
- Bearing service life \*\*: > 10<sup>9</sup> revolutions
- Weight: ca. 0.450 kg

#### Environmental data

- Operating temperature range: - 40°C to + 85°C
- Storage temperature range: - 20°C to + 60°C  
(due to packaging)
- Resistance:
  - To shock: 500 m/s<sup>2</sup>; 11 ms  
DIN EN 60068-2-27
  - To vibration: 500 m/s<sup>2</sup>; 10 ... 2000 Hz  
DIN EN 60068-2-6
- EMC standards: EN 61000-6-2 (interference immunity)  
EN 61000-6-4 (interference emission)  
(only with shielded connection cables)
- Protection type: IP 66, IP 69K (on request)  
(DIN EN 60529)

#### Electrical connections

- Connecting cap with threaded cable connections for:
  - Supply voltage (+ UB = 24 VDC, - UB = 0 VDC), threaded cable connection M12x1.5
  - Bus in (A, B), threaded cable connection M16x1.5
  - Bus out (A', B'), threaded cable connection M16x1.5

\* From the point of view of the control system.

\*\* These values apply at maximum shaft load. Higher values are achievable at lower loads.

## Absolute encoder TBD/TRD

### Technical Data

#### Bus-specific data

- Specifications: PROFIBUS-DP-V0, slave subscriber SPC3 Siemens PROFIBUS controller
- Interface: Line driver according to RS 485, galvanically separated via magnetic couplers
- Data rate: 9.6 kBaud to 12 MBaud
- Station address: 1 to 126 can be set using DIP switches, default value: 123
- GSD file: According to Specifications for PROFIBUS Device Description and Device Integration  
Volume 1: GSD PNO-Order No: 2.122
- Freeze-mode: Is supported
- Sync-mode: Is supported
- Automatic baud rate search: Is supported
- Diagnosis bytes
 

Class 2:	63 diagnosis bytes *
Class 1:	16 diagnosis bytes
- User-Parameterbytes
 

Class 2:	32 bytes
Class 1:	2 bytes
- Configuration options: See table below

#### Configuration options in accordance with PROFIBUS profile for encoders No. 3.062

Configuration	Class	Data	Identifier byte
Class 2 32 bit in/out 32 bit velocity	2	64 bit in/output data	F3
Class 2 32 bit in/out	2	32 bit in/output data	F1
Class 2 16 bit in/out	2	16 bit in/output data	F0
Class 1 32 bit in	1	32 bit input data	D1
Class 1 16 bit in	1	16 bit input data	D0

#### Programmable parameters

Parameter	Value range	Parameter description
Code sense	CW / CCW	CW (clockwise): ascending values on rotation clockwise CCW (counter clockwise): descending values on rotation clockwise (viewed looking at the shaft)
Scaling function	disable / enable	Enablement of the parameters of resolution and total number of steps
Velocity unit	Steps/10 ms, Steps/100 ms	Only with firmware version 1.02 or higher
Shortened diagnosis	no / yes	Reduction of the number of diagnosis bytes to 16 bytes
Resolution [steps/360°]	1 ... 4096 (8192)	Steps per revolution (360°)
Total number of steps [steps]	1 ... 16,777,216 (33,554,432) singleturn version: 4096 (8192)	Overall measuring range
Reference value	0 ... total number of steps -1	(Programming is done via the output data)

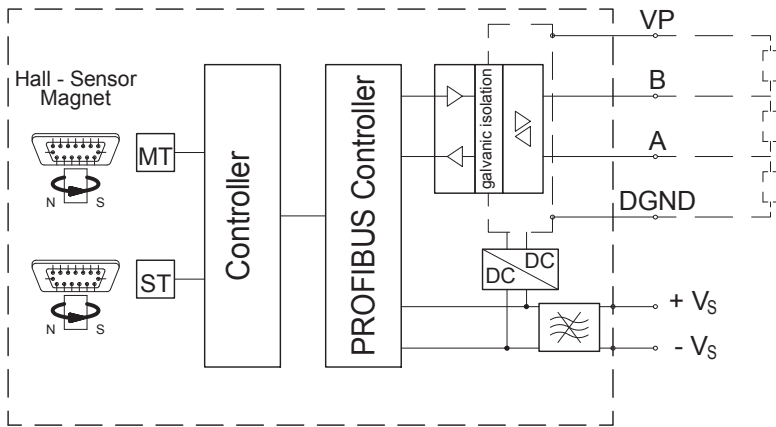
(The values in brackets apply to the TRDxx-xx8192R4096C2ZDxx)

\* Shortened diagnosis (16 bytes) can be set.

**Absolute encoder TBD/TRD**

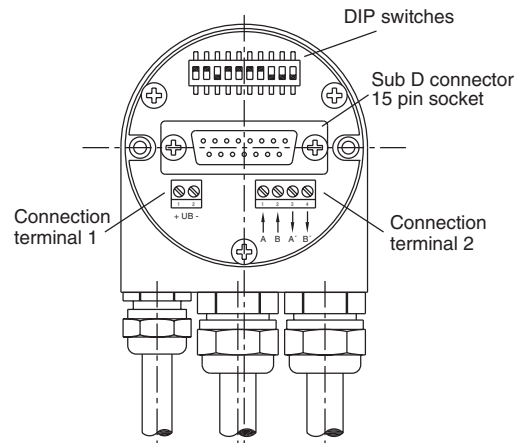
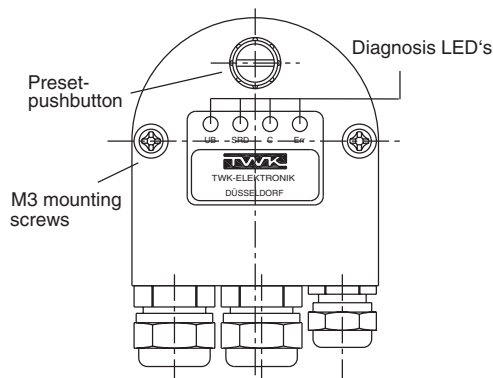
**Electrical connection**

**Principle circuit diagram**



**Connecting cap ZKD**

The cap is listed and supplied as a separate order item. It can be separated from the absolute encoder for setting purposes by releasing two screws.



Connection terminal 1:

Designation	Signal
UB+	Supply voltage (24 VDC)
UB-	GND (0 VDC)

Connection terminal 2:

Designation	Signal
A	RXD/TXD-N
B	RXD/TXD-P
A'	RXD/TXD-N
B'	RXD/TXD-P

**Absolute encoder TBD/TRD**

**Electrical connection**

Status-LEDs:

Status	UB	SRD	C	Err
Incorrect configuration	x	x		x
Impermissible parameters	x		x	x
Coding error (see diagnosis bytes 62 - 63)	x			x
Class 1 device configuration OK	x	x		
Class 2 device configuration OK	x	x	x	
UB - operating voltage, SRD - data transfer, C - class membership, Err - error message				

Address setting / terminating resistors:

Switch	1	2	3	4	5	6	7	8	9	10
ON = 1	2 <sup>0</sup> 2 <sup>1</sup> ... 2 <sup>7</sup>							n.c.	Terminating resistors: on	
OFF = 0	Adresses 1 - 126 can be set (123: default adress)								Terminating resistors: off	

Absolute encoder TBD/TRD

Order number

Absolute encoder

<b>TRD</b>	<b>58</b>	<b>-</b>	<b>K</b>	<b>A</b>	<b>4096</b>	<b>R</b>	<b>4096</b>	<b>C2</b>	<b>Z</b>	<b>D</b>	<b>01</b>	→ standard version
												Electrical and / or mechanical variants *
												01 Standard
												02 Compatible with the encoder model KRD **
												D PROFIBUS-DP-V0
												Electrical connection:
												Z Connecting cap
												Profil:
												C2 Class 2 according to encoder profile No. 3.062
												Measuring range:
												4096 Revolutions
												10 Length in meter for draw wire version. Possible values: 6 and 10
												Output code:
												R Binary
												Resolution:
												4096 Steps / 360° or at draw wire: steps / drum circumference (248 mm)
												8192
												Housing material:
												A Aluminium
												S Stainless steel 1.4305
												V Stainless steel 1.4404
												Flange:
	58		K									Clamped flange, shaft 10 mm with flat
			KF									Clamped flange, shaft 10 mm with woodruff key
			KP									Clamped flange, shaft 10 mm with parallel key (recommended for safety)
			KZ									Clamped flange, shaft for play-compensating toothed gear ZRS
			S									Synchro flange, shaft 6 mm
			SR									Synchro flange, clamping shaft 12 mm (torque plate see accessories)
			ST									Synchro flange, shaft 6 mm with flat
	64		NZ									Cam switch flange, shaft for ZRS
	65		S									Synchro flange, shaft 12 mm
			SP									Synchro flange, shaft 12 mm with parallel key
	66		K									Clamped flange, shaft 10 mm with flat
			KP									Clamped flange, shaft 10 mm with parallel key
	90		MP									Mounting flange, shaft 12 mm with parallel key
	105		M									Mounting flange, shaft 12 mm
			MP									Mounting flange, shaft 12 mm with parallel key
	125		D									Draw wire version with integrated TRD rotary encoder, see datasheet <a href="#">125-D13794</a>
												Design form
												Model:
												TBD Singleturn encoder
												TRD Multiturn encoder

\* The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented in the factory.

\*\* The compatibility is only valid for the position value.  
The speed value of the TRD is based on a 12 bit position value, but on a 16 bit position value in the KRD.

**Absolute encoder TBD/TRD**

**Order number**

**Connecting cap**

<b>ZKD - D 01</b>	
	Electrical and / or mechanical variants *
	01 Standard
	34 Housing and cable glands from stainless steel (1.4305) without preset button, protection class IP 68
	D PROFIBUS-DP-V0
ZKD	Connecting cap for KRD / TRD absolute encoders

**Accessories**

**Accessories** (to be ordered separately)

- Documentation on CD
  - TWK-CD-01** CD-ROM with documentation, device description file, bitmap and example programme
- Couplings
  - BKK** Folding bellows coupling, large, see data sheet [BKK11840](#)
  - BKM** Folding bellows coupling, small, see data sheet [BKM11995](#)
  - KK14S** Clamp coupling, see data sheet [KK12301](#)
- Measuring gear
  - ZRS** Play compensating measuring gear [ZRS11877](#)
- Torque plate
  - ZMS** See data sheet [ZMS12939](#)
- Further installation accessories and securing clamps are available according to data sheet [MZ10111](#) .

**Documentation, GSD file, etc.**

The following documents plus the GSD file, a bitmap and example programmes can be found in the Internet under [www.twk.de](http://www.twk.de) in the documentation area, model TRD

- Data sheet No. TRD11868
- User manual No. [TRD12770](#)

Optionally, a CD-ROM can be supplied. (Please specify article No. TWK-CD-01 on ordering.)

\* The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented in the factory.

Absolute encoder TBD/TRD

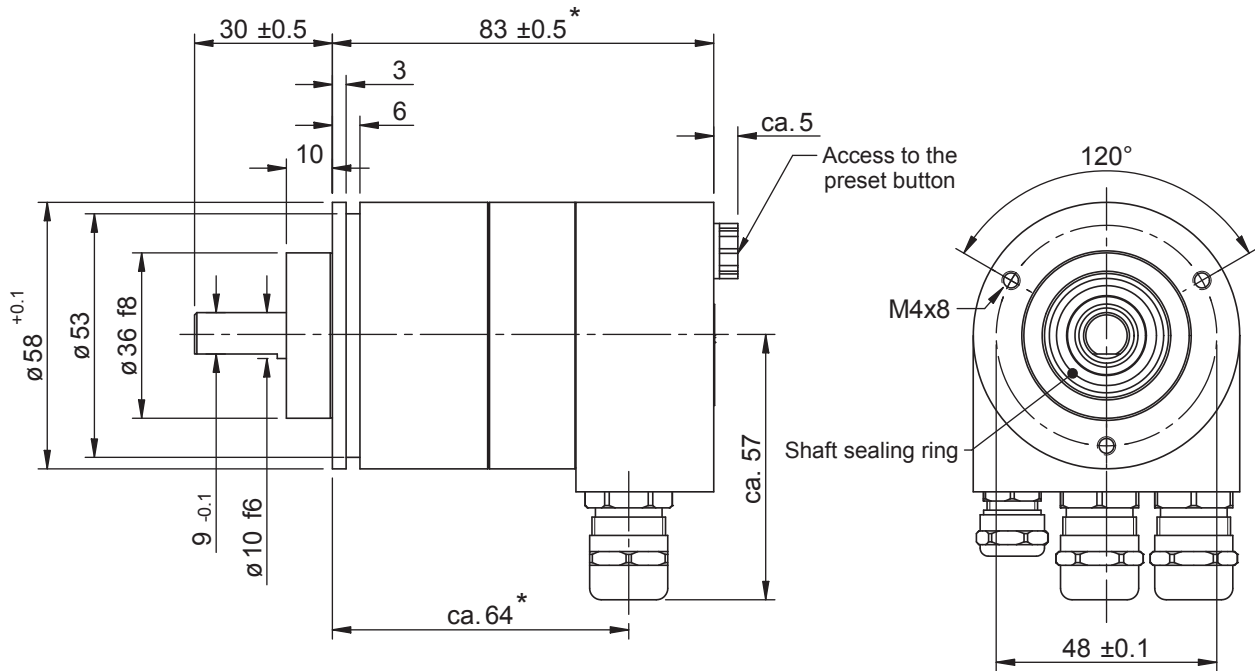
Installation drawing

Standard design

Design form 58 with **clamped flange**, Order name: TRD58-KA4096R4096C2ZD01

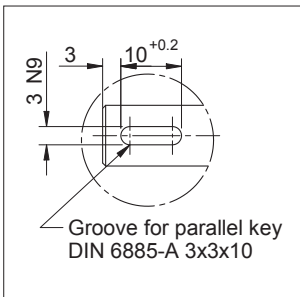
Shaft  $\varnothing$  10 mm

Dimensions in mm

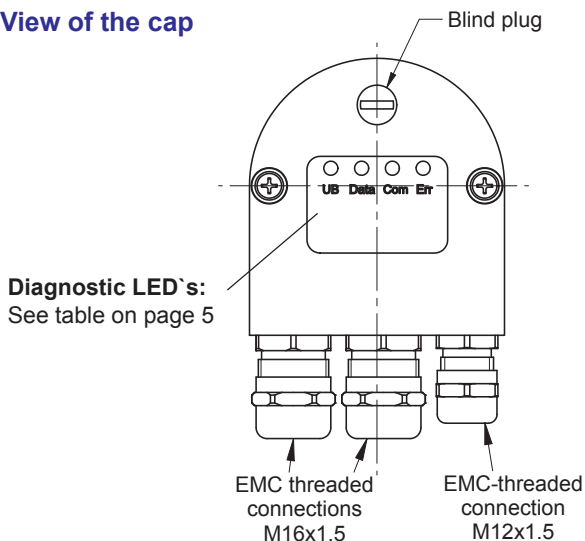


\* singleturn version 14 mm shorter

- Optional: Shaft "P" groove and parallel key



View of the cap





Absolute encoder TBD/TRD

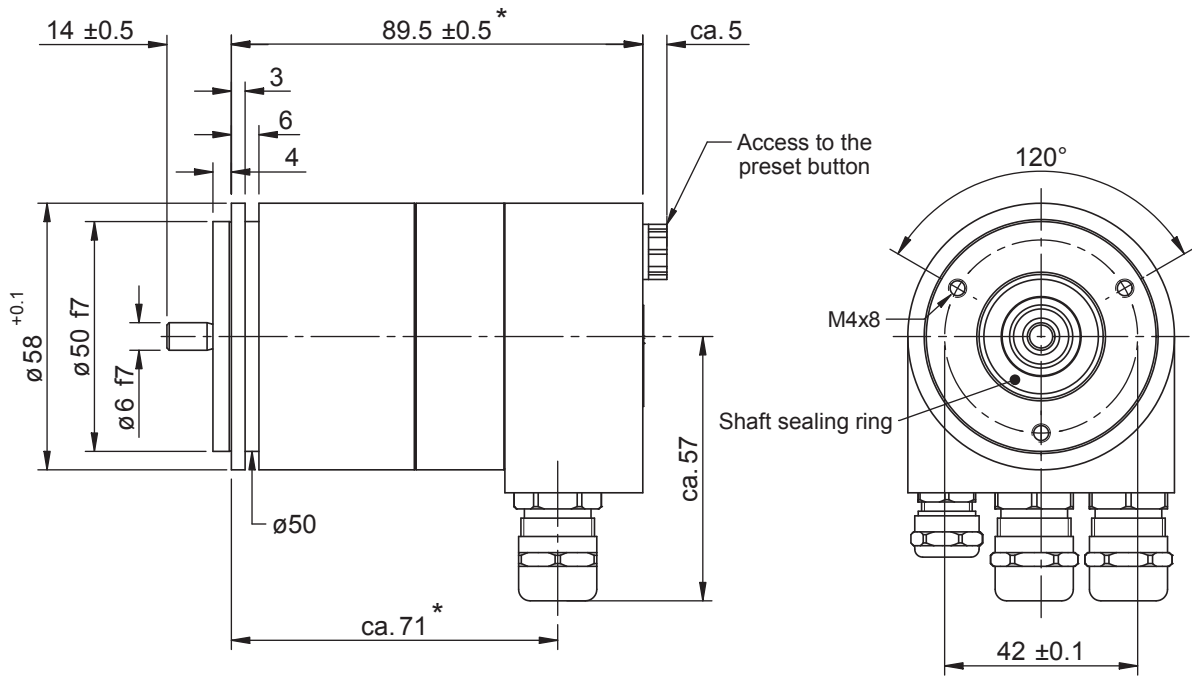
Installation drawing

Other possible design forms

Design form 58 with **synchroniser flange**, Order name: TRD58-SA4096R4096C2ZD01

Shaft  $\varnothing$  6 mm

Dimensions in mm



\* singleturn version 14 mm shorter

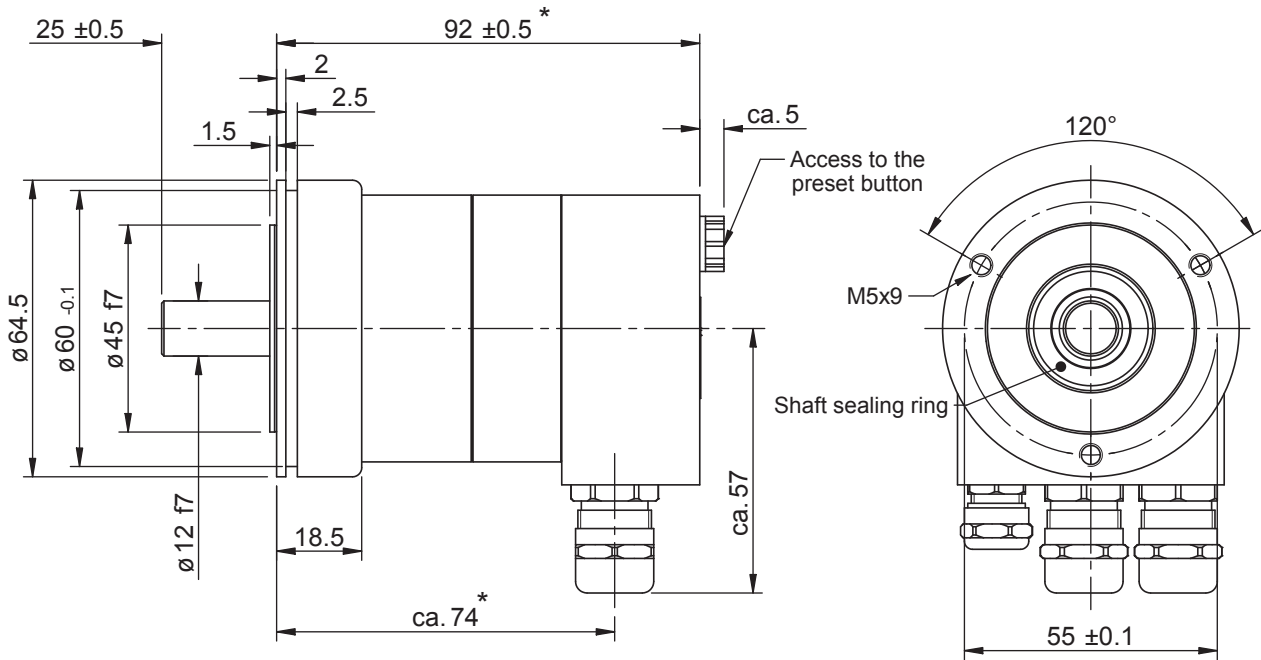
**Absolute encoder TBD/TRD**

**Installation drawing**

**Design form 65 with synchroniser flange, Order name: TRD65-SA4096R4096C2ZD01**

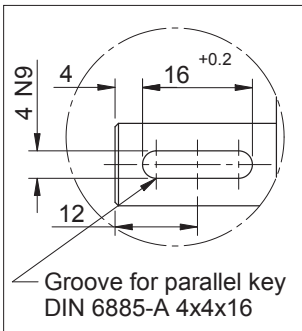
Shaft  $\varnothing$  12 mm

**Dimensions in mm**



\* singleturn version 14 mm shorter

■ Optional: Shaft "P" groove and parallel key



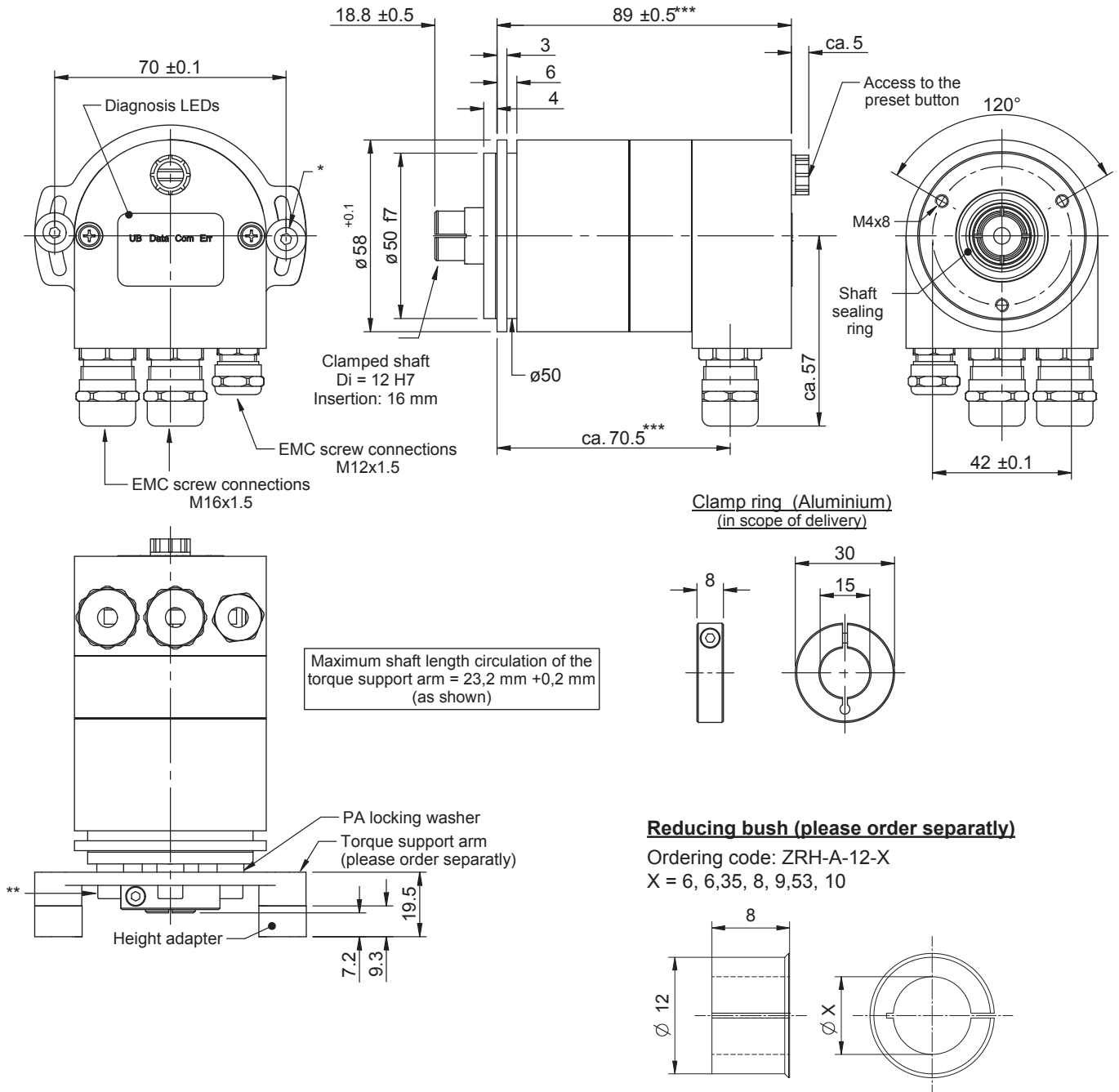
**Absolute encoder TBD/TRD**

**Installation drawing**

**Design form 58 with synchroniser flange and campled shaft, Order name: TRD58-SRA4096R4096C2ZD01**

Shaft  $\varnothing$  12 mm (other shaft diameters on request)

**Dimensions in mm**



\* 2x screws DIN 912 M4x30 (VA) plus 2x lock washer (VA) plus 2x washer DIN 9021-4.3.

\*\* 3x screws DIN 912 M4x10 (VA) plus 3x lock washer (VA).

\*\*\* singleturn version 14 mm shorter

Absolute encoder TBD/TRD

Installation drawing

Design form 105, Order name: TRD105-MA4096R4096C2ZD01

Shaft  $\varnothing$  12 mm

Dimensions in mm

