

Absolute encoder TBD/TRD with PROFIBUS-DP interface

Document no.: TRD 11868 KE

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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)
- Dual-chamber system to separate the rotor and electronics
- Protection type: IP 66, IP 69K (on request)
- Operating temperature range: - 40°C to + 85°C
- Preset button in the connecting cap

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.

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)
- 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: 10⁵ rad/s² max.
- Moment of inertia (rotor): 20 gcm²
- Operating torque: ≤ 8 Ncm (at 500 rpm)
- Starting torque: ≤ 4 Ncm
- Perm. shaft load: 250 N axial
250 N radial
- Bearing service life **: > 10⁹ 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/s²; 11 ms
DIN EN 60068-2-27
 - To vibration: 500 m/s²; 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.

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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)

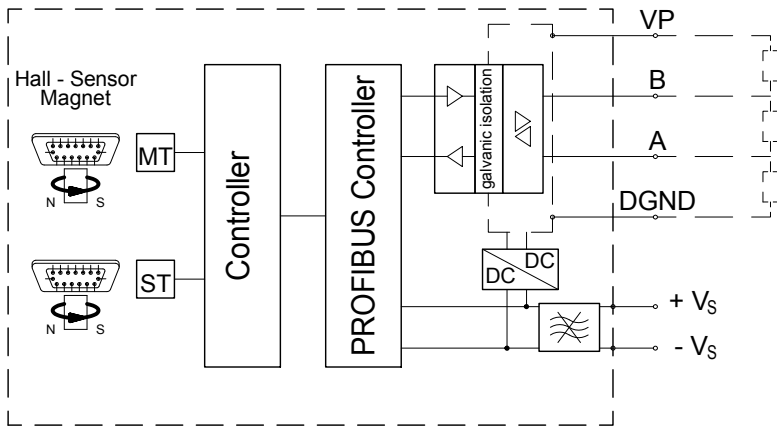
(The values in brackets apply to the TRDxx-xx8192R4096C2ZDxx)

* Shortened diagnosis (16 bytes) can be set.

Absolute encoder TBD/TRD

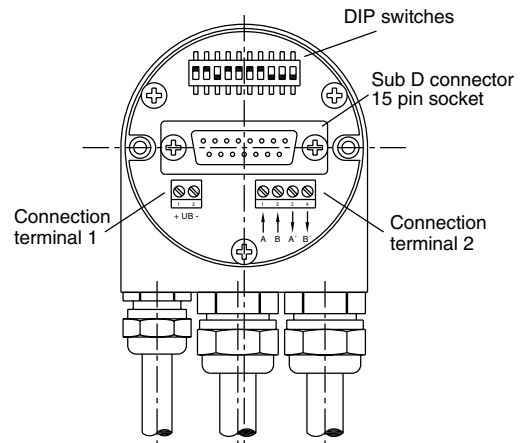
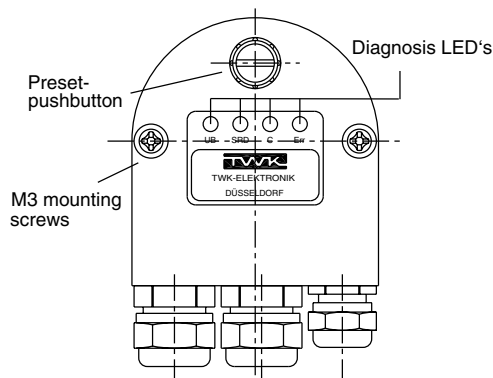
Electrical connection

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 ⁰ 2 ¹ ... 2 ⁷							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

TRD	58	-	K	A	4096	R	4096	C2	Z	D	01
<p>Electrical and / or mechanical variants *</p> <p>01 Standard</p> <p>02 Compatible with the encoder model KRD **</p> <p>D PROFIBUS-DP-V0</p> <p>Electrical connection:</p> <p>Z Connecting cap</p> <p>Profil:</p> <p>C2 Class 2 according to encoder profile No. 3.062</p> <p>Measuring range:</p> <p>4096 Revolutions</p> <p>Output code:</p> <p>R Binary</p> <p>Resolution:</p> <p>4096 Steps / 360°</p> <p>8192 Steps / 360°</p> <p>Housing material:</p> <p>A Aluminium</p> <p>S Stainless Steel</p> <p>Flange:</p> <p>58 K Clamped flange, shaft 10 mm with flat</p> <p>KF Clamped flange, shaft 10 mm with woodruff key</p> <p>KP Clamped flange, shaft 10 mm with parallel key (recommended for safety)</p> <p>KZ Clamped flange, shaft for play-compensating toothed gear ZRS</p> <p>S Synchro flange, shaft 6 mm</p> <p>SR Synchro flange, clamping shaft 12 mm (torque plate see accessories)</p> <p>ST Synchro flange, shaft 6 mm with flat</p> <p>64 NZ Cam switch flange, shaft for ZRS</p> <p>65 S Synchro flange, shaft 12 mm</p> <p>SP Synchro flange, shaft 12 mm with parallel key</p> <p>66 K Clamped flange, shaft 10 mm with flat</p> <p>KP Clamped flange, shaft 10 mm with parallel key</p> <p>90 MP Mounting flange, shaft 12 mm with parallel key</p> <p>105 M Mounting flange, shaft 12 mm</p> <p>MP Mounting flange, shaft 12 mm with parallel key</p> <p>Design form</p> <p>Model:</p> <p>TBD Singleturn encoder</p> <p>TRD Multiturn encoder</p>											

* 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

ZKD - D 01	
	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 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.

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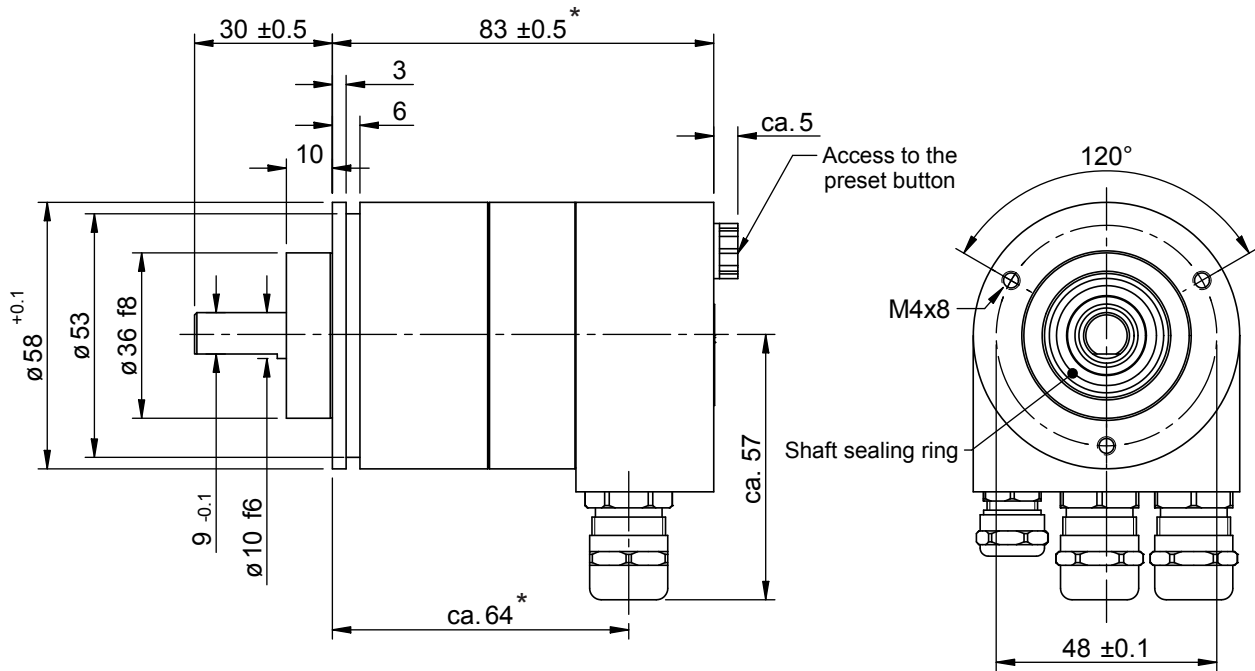
Installation drawing

Standard design

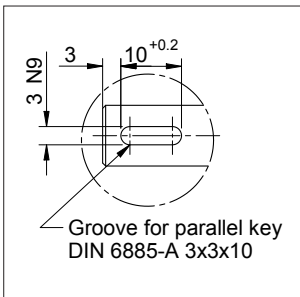
Design form 58 with **clamped flange**, Order name: TRD58-KA4096R4096C2ZD01

Shaft \varnothing 10 mm

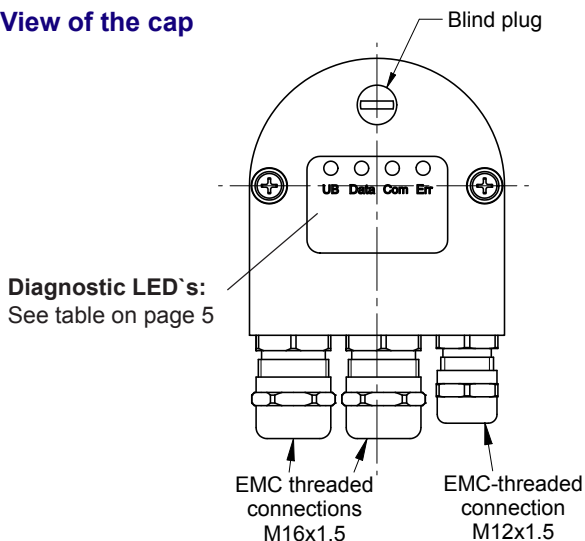
Dimensions in mm



- Optional: Shaft "P" groove and parallel key



View of the cap



Absolute encoder TBD/TRD

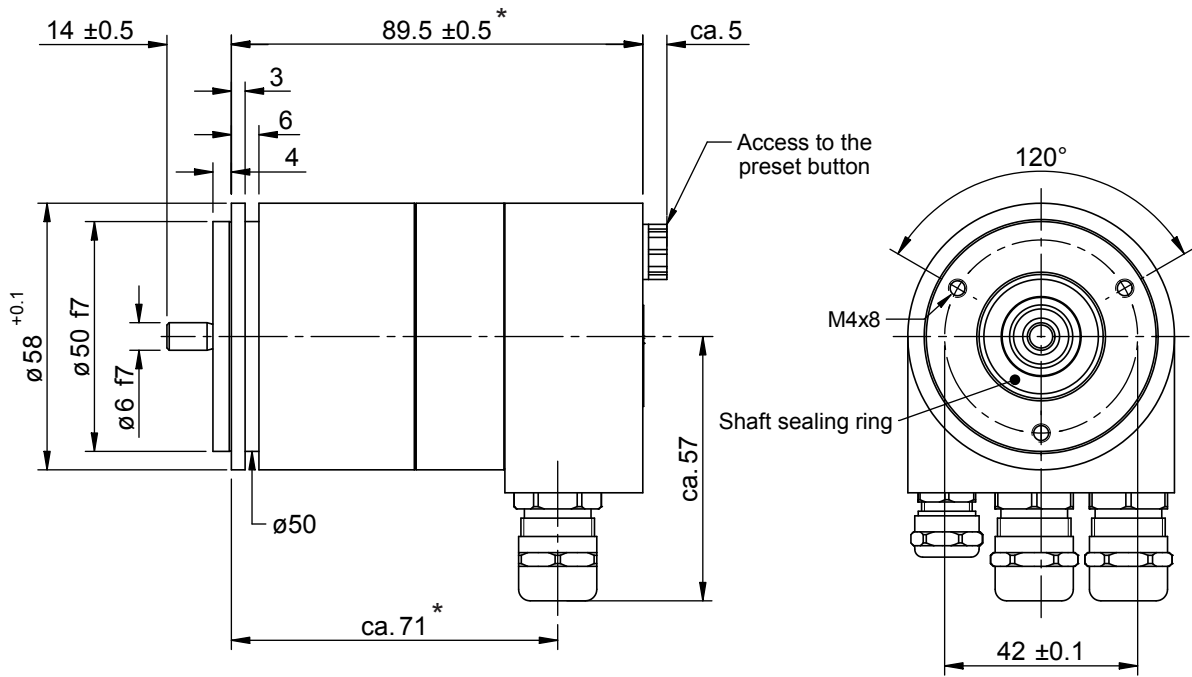
Installation drawing

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

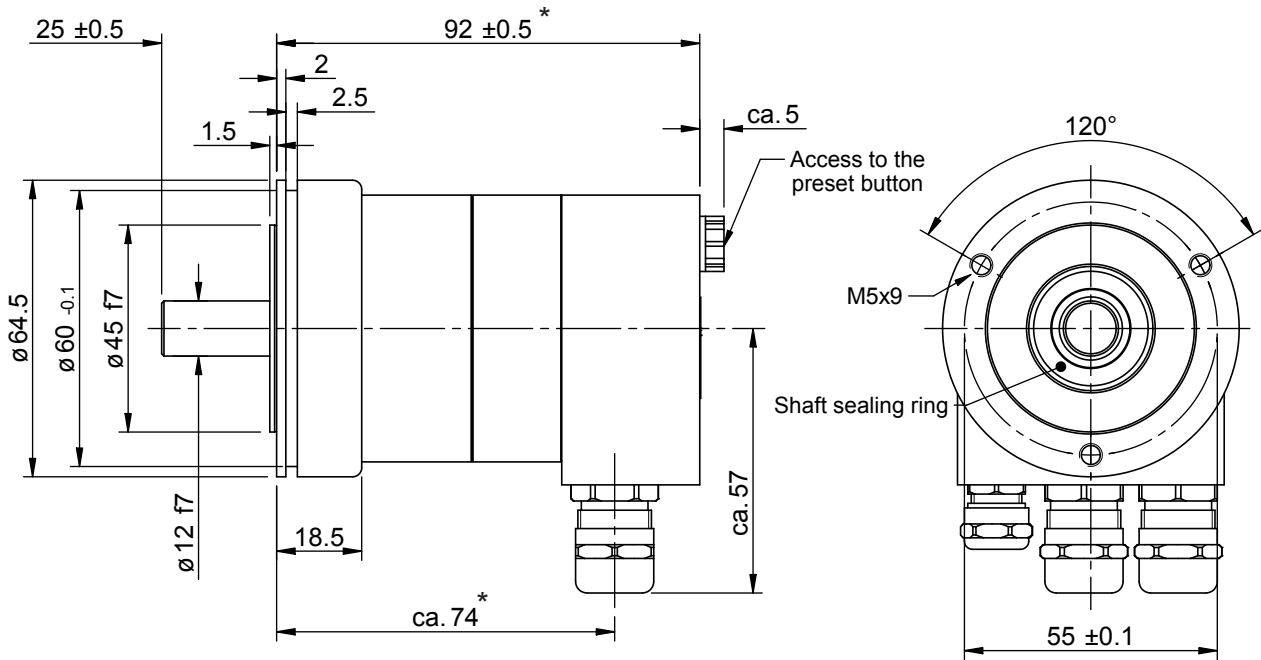
Absolute encoder TBD/TRD

Installation drawing

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

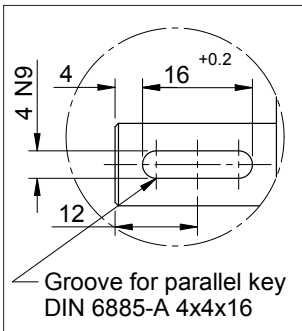
Shaft \varnothing 12 mm

Dimensions in mm



* singleturn version 14 mm shorter

■ Optional: Shaft "P" groove and parallel key



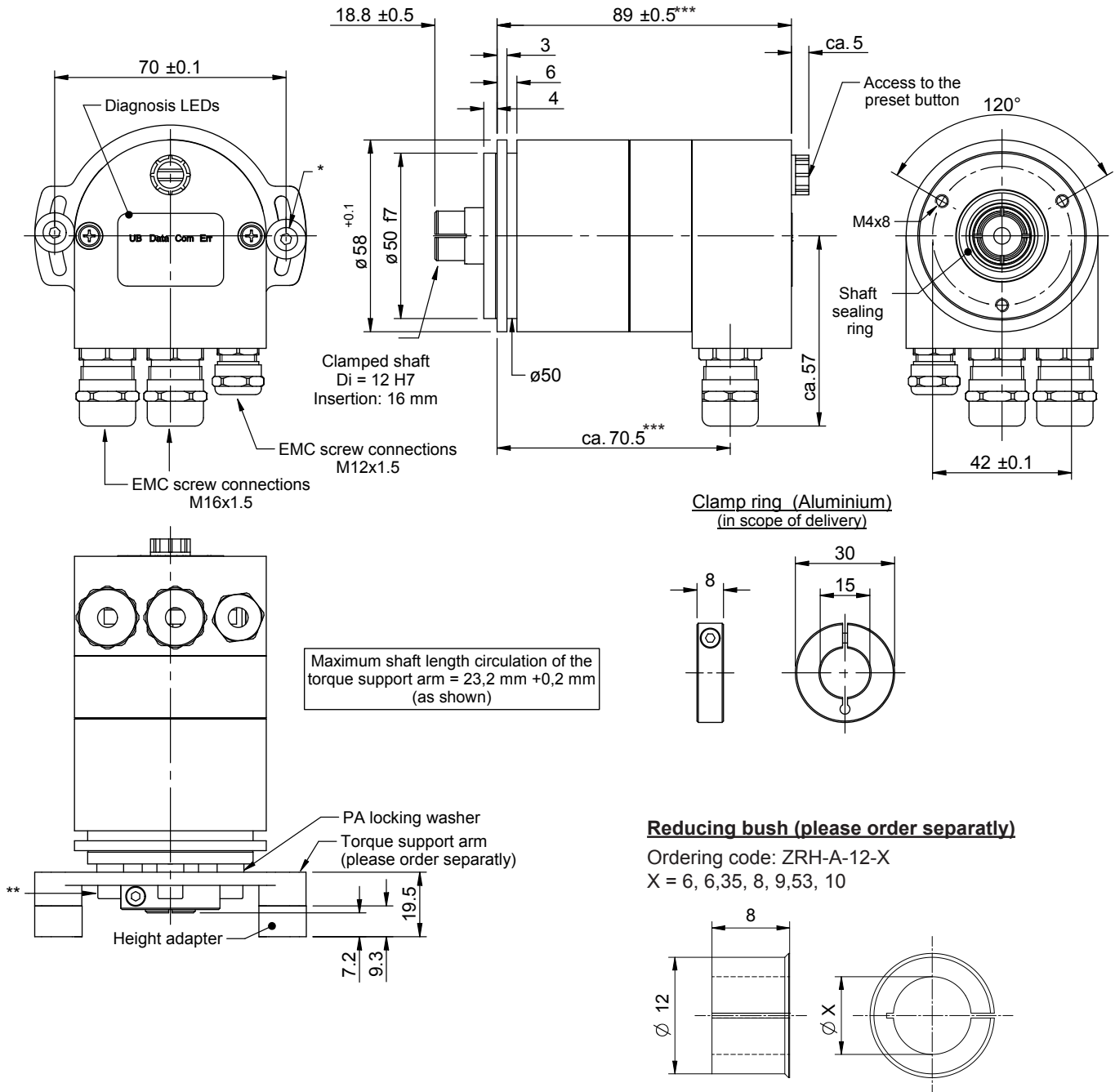
Absolute encoder TBD/TRD

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

