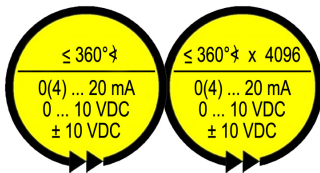


# Absolute electro-magnetic encoder

## Series TBA / TRA Singleturn / Multiturn

### Analogue output



- **Robust design for demanding environmental conditions**  
e. g. cranes and construction machinery
- **Magnetic Sensor system**
- **Measuring ranges**  
TBA:        **360°**  
TRA:        **1,474,560°**  
              (4096 revolutions x 360°)
- **Protection grade IP65 / IP67**  
(IP69K option)
- **Options**
  - **Redundant design**  
(Data sheet 15241)

### Design

- Robust housing (Wall thickness up to 5 mm) manufactured from seawater-proof aluminium (AlMgSi1 - 3.2315) or stainless steel (Material: 1.4305 or 1.4404)
- Shaft fitted with ball bearings hold the magnet for measuring the angular position of the shaft and the multi-turn drive gear for absolute revolution counting
- Design form in Ø 42, Ø 50, Ø 58 mm diameter (other diameters available for customer specific applications)
- Magnetic sensor system(s) for position measurement
- Signal output via 12-Bit D/A converter  
Analogue Signal outputs:  
0 (4) to 20 mA, 0 to 10 VDC or ± 10 VDC available
- Electrical connection via connector M12x1 or via cable

### Function

The rotary encoder has an analogue interface. The D/A converter has a resolution of 12 bits.

The encoder TBA has a maximum measuring range of 360 degrees, which corresponds to one turn.

The encoder TRA is equipped with a gear box to provide the absolute number of up to 4096 revolutions. The maximum measuring ranges for the this encoders is 1,474,560° (360° x 4096 revolutions). The standard measuring range is 3600°.

The output signal can be configured and referenced via by means of two multi-function pins (MFP).

Via the MFPs the following functions can be addressed: Set zero point, set end value, set preset value (middle of the measuring range), code sense (CW or CCW). Also, the default values can be restored.

The gradient of the signal output can be adjusted by using the functions set zero point and set end value.

# Absolute electro-magnetic encoder

## Series TBA / TRA analogue output

### Technical Data

#### Electrical Data

- Sensor system: Magnetic Sensor
- Supply voltage range: 18 to 28 VDC (Output: A, B, C)  
± 13 to ± 16 VDC (Output: D)  
protected against polarity reversal, short-circuit proof
- Power consumption: TBA: < 1 W  
TRA: < 1.5 W
- Measuring range: TBA: 360°  
TRA: 1,474,560° (4096 revolutions x 360°, Default adjustment 3600°)
- D/A-Converter: 12 Bit
- Code sense: CW\* or CCW (adjustment possibility)
- Accuracy TBA: ± 0.15 % of 1 revolution typ.
- Accuracy TRA: ± 0.3 % of 1 revolution typ.
- Repeatability: ± 0.02 % of 1 revolution typ.
- Temperature drift: < 0.01 % / K of 1 revolution typ.

#### Electrical output data

- Current output A, B: A: 0 to 20 mA; B: 4 to 20 mA  
Load resistance: 0 ... 500 Ω
- Voltage output C, D: C: 0 to 10 VDC; D: ±10 VDC  
Output current: max. 5 mA correspond to a load resistance of ≥ 2 kΩ short-circuit proof

#### Mechanical data

- Operating speed: max. 1000 rpm (shaft sealing ring), max. 10,000 rpm (Nilos ring)
- Angle acceleration: 10<sup>5</sup> rad/s<sup>2</sup> max.
- Moment of inertia (Rotor): 20 gcm<sup>2</sup>
- Permanent shaft load: TBN/TRN Ø 58, 50 : 250 N axial, 250 N radial  
TBN/TRN Ø 42 : 50 N axial, 50 N radial
- Bearing service live: ≥ 10<sup>9</sup> revolutions\*\*
- Weight: TBA Ø 58: Aluminium approx. 0.3 kg, Stainless steel approx. 0.4 kg  
TRA Ø 58: Aluminium approx. 0.5 kg, Stainless steel approx. 0.7 kg

\*) CW = Increasing output values when viewing the clockwise rotating shaft

\*\*) This value applies for max. shaft load

#### Environmental data

- Operating temperature range: - 40 °C to + 85 °C
- Storage temperature range: - 20 °C to + 60 °C (depending on packaging)
- Resistance
  - to Shock: 250 m/s<sup>2</sup>, 6 ms, 100 x each in 3 axes (higher values optional, e.g. 5000 m/s<sup>2</sup>)  
DIN EN 60068-2-27
  - to Vibration: 100 m/s<sup>2</sup>, 5 Hz ... 2 kHz, 1 h in 3 axes (higher values optional e.g. 1000 m/s<sup>2</sup>)  
DIN EN 60068-2-6
- EMC-standards: DIN EN 61 000 - 6 - 2 Immission (Burst/ESD/ ...)  
DIN EN 61 000 - 6 - 4 Emission
- Protection grade (DIN EN 60529): Shaft side: IP 66 - Shaft sealing ring, IP65 - Nilos ring  
Housing: IP67, Option IP69K (potting)

(For higher protection grades and technical questions please contact our technical personal.)

## Absolute electro-magnetic encoder Series TBA / TRA analogue output

### Setting of the measuring range

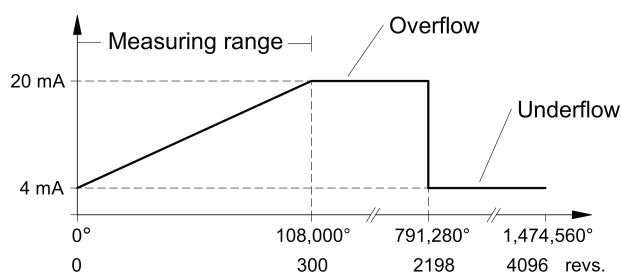
#### Standard measuring range

The encoder TBA has a standard measuring range of 360°. The measuring range can be adjusted in the factory and is specified by the customer through the order code (see page 8).

The encoder TRA has a maximal measuring range of 1,474,560° (360° x 4096 revolutions). The standard setting is 3600° (10 revolutions). With the teach-in functionality (see MFPs) the encoder can be programmed customer specific e.g. to 4096 revolutions or other values.

With the multi-function pins (MFP) the predefined values can be adjusted by the customer. The region outside the measuring range is symmetrically split into an over- and underflow value in the signal output (see Characteristic curve 1).

On request, customer specific signal outputs or outputs without over-/underflow are feasible.



Characteristic curve 1: Measuring range 108,000° respectively 300 revolutions as an example (Output B)

	Parameter	TBA	TRA
<b>Maximum values</b>	Measuring range	360°	1,474,560°
<b>Default values (ex works)</b>	Measuring range*	360°	3600°
	Preset value*	180°	1800°
	Code sense*	CW	CW

\* Other values on request

For simple and fast programming and operation please use the Analogue Hand Programming Device model PMA-05 (see data sheet [PMA 11443](#)).

**Adjustment via Multi-functional pins**

**Adjustment via Multi-functional pins (TBA only for variant 100)**

The customer specific parameter zero point, end value, preset value, code sense and the default values can be set via two Multi-functional pins 'MFP0' and 'MFP1'. The input circuit is E1 (see page 5). The logical levels are '0' : 0 VDC or '1' : 24 VDC.

With the functions set zero point and set the end value the gradient of the signal output can be changed

<b>Table for Multi functional pins (MFP)</b>			
<b>Function</b>	<b>MFP 0</b>	<b>MFP 1</b>	<b>Remark</b>
Set zero point	1	0	Set pin MFP 0 to logical 1 for the duration of ~4 s.
Set end value	0	1	Set pin MFP 1 to logical 1 for the duration of ~4 s.
Set default value	1	1	Simultaneously set pins MFP 0 and MFP 1 to logical 1 for the duration of ~2 s. The default setting is restored.
Changing the signal path CW / CCW	1	0	Attention: Shaft must not be moved during this process! Set pin MFP 0 to logical 1 for the duration of ~4 s.
	0	1	After a pause of at least 0.5 s: Set pin MFP 1 to logical 1 for the duration of ~4 s.
Set preset value (middle of measuring range)	1	0	Attention: Shaft must not be moved during this process! Set pin MFP 0 to logical 1 for the duration of ~4 s.
	1	0	After a pause of at least 0.5 s: Set pin MFP 0 to logical 1 for the duration of ~4 s.
Normal operation	0	0	

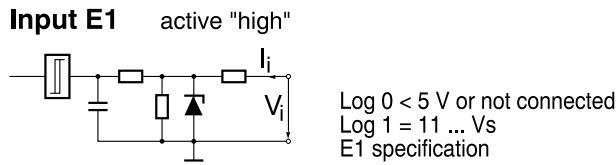
Note:

1. If you can not find the measuring range by turning the shaft please set preset value via the MFPs. It is possible that the output signal is in the Over/Underflow area. In this case the encoder set the Mid-range of the signal output.
2. The zero point and end value of the measuring range need to separated by at least 2.5 °. It is not possible to program these two values at the same position.

# Absolute electro-magnetic encoder Series TBA / TRA analogue output

## Input circuit E1, Timing diagrams and Output circuits

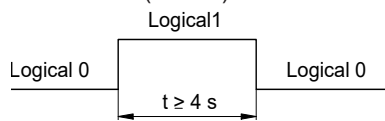
### Input circuit for input E1 (Multi-functional pins MFPs)



### Timing diagrams for the MFP settings

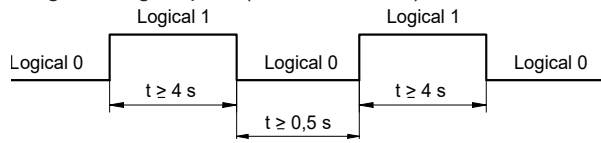
**1. Set MFP 0 or MFP 1 once**

Set zero point (MFP 0)  
Set end value (MFP 1)



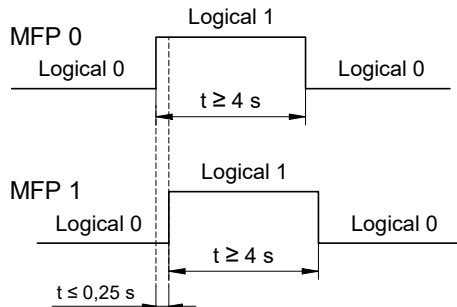
**2. Set MFP 0 and/or MFP 1 twice with the same shaft position**

Set preset value (2 x MFP 0)  
Change the signal path (MFP 0 - MFP 1)



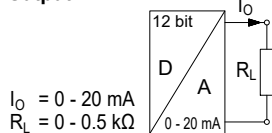
**3. Set MFP 0 or MFP 1 simultaneously**

Time difference between MFP 0 and MFP 1 ≤ 0.25 s.

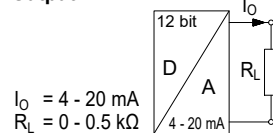


### Output circuit

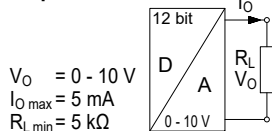
**Output A**



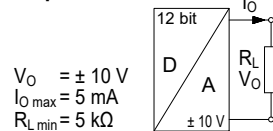
**Output B**



**Output C**

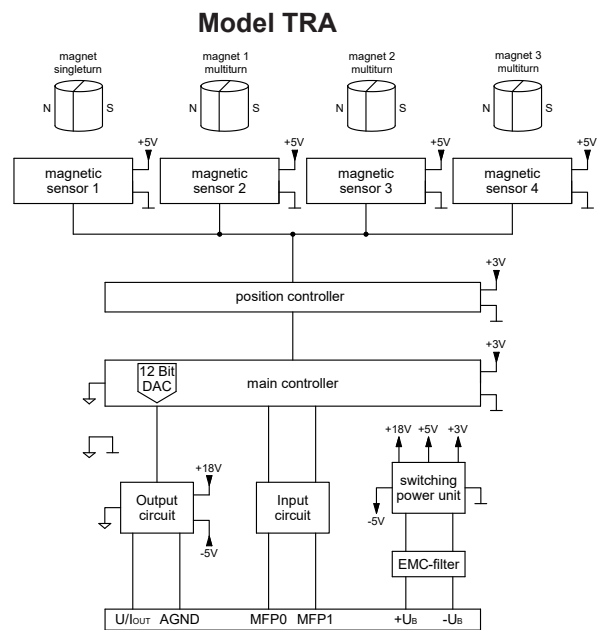
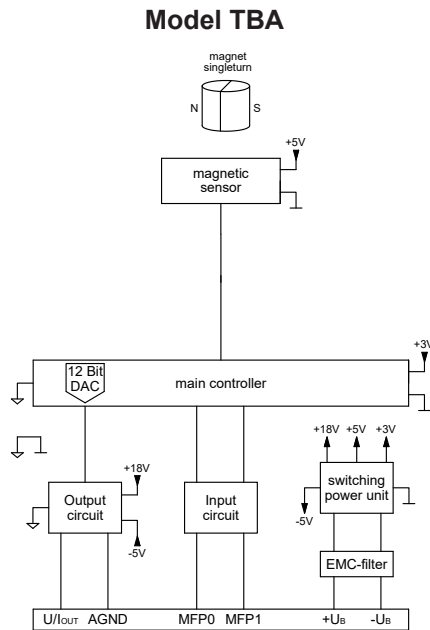


**Output D**



# Absolute electro-magnetic encoder Series TBA / TRA analogue output

## Block diagrams



## Electrical connections

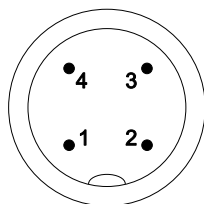
### Electrical connections

- TBA Ø 58, 50: M12x1, Pin, 4-pole, A-coded or radial cable, 4-wire
- TBA Ø 42: Radial cable, 4-wire
- TBA variant 100: M12x1, Pin, 8-pole, A-coded or radial cable, 8-wire
- TRA Ø 58, 50: M12x1, Pin, 8-pole, A-coded or radial cable, 8-wire
- TRA Ø 42: Radial cable, 8-wire

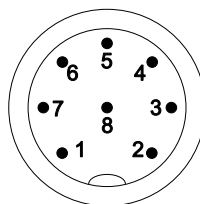
# Absolute electro-magnetic encoder Series TBA / TRA analogue output

## Electrical connection - pinout

### Contact arrangements M12x1



Pins, 4-pole  
A-coded



Pins, 8-pole  
A-coded

The connection diagram is an integral part of the delivery and is enclosed with every device.

### Connection diagram for signal outputs A, B, C

M12x1 8-pole	M12x1 4-pole	Connected with
1	1	$+V_S = 18...28$ VDC, $P_D < 1$ W (TBA) $P_D < 1.5$ W (TRA)
2	2	$-V_S = 0$ VDC
3	3	$I_O = 0$ (4) ... 20 mA (4096 steps = 12 Bit) or $V_O = 0$ ... 10 Volt (4096 steps = 12 Bit)
4	4	0V analogue common
5		Multi-functional pin MFP0 (Input circuit E1)
6		Multi-functional pin MFP1 (Input circuit E1)
7/8		Not connected

### Connection diagram for signal output D

M12x1 8-pole	M12x1, 4-pole	Connected with
1	1	$+V_S = + 13...+ 16$ VDC, $P_D < 1$ W (TBA) $P_D < 1.5$ W (TRA)
2	2	$-V_S = - 13...- 16$ VDC
3	3	$V_O = - 10$ ... + 10 VDC
4	4	0V analogue common / Vs GND
5		Multi-functional pin MFP0 (Input circuit E1)
6		Multi-functional pin MFP1 (Input circuit E1)
7/8		Not connected

Order code number

TRA 58 - K A 3600 W S B 01 → Standardversion

<b>TRA</b>	TBA	Singleturn encoder with analogue output
	TRA	Multiturn encoder with analogue output
<b>58</b>	<b>Design form*:</b>	
	42	Design form Ø 42 mm
	50	Design form Ø 50 mm
	58	Design form Ø 58 mm
<b>K</b>	<b>Flange type*:</b>	
	K	Clamped flange, shaft with flat area
	KF	Clamped flange, shaft with Woodruff key
	KP	Clamped flange, shaft with feather key
	KZ	Clamped flange, shaft with shaft for measuring gear ZRS (data sheet <a href="#">ZRS 11877</a> )
	S	Synchro flange
	ST	Synchro flange, shaft with flattened area
	SR	Synchro flange, clamping shaft (stator coupling ZMS58 according to <a href="#">ZMS 12939</a> )
	SP	Synchro flange, shaft with feather key
<b>A</b>	<b>Housing material:</b>	
	A	Aluminium 3.2315
	S	Stainless steel 1.4305
	V	Stainless steel 1.4404
<b>3600</b>	<b>Measuring range in degrees:</b>	
	360	360° (TBA standard)
	3600	3600° (TRA standard)
<b>W</b>	<b>Code path:</b>	
	W	CW
	C	CCW
<b>S</b>	<b>Electrical connection:</b>	
	S	Device connector M12 (not for design form 42)
	K	Cable length 1m
	Kx	Cable length x m (on request)
<b>B</b>	<b>Output signal:</b>	
	A	0 - 20 mA
	B	4 - 20 mA
	C	0 - 10 VDC
	D	± 10 VDC
<b>01</b>	<b>Electrical and mechanical variants:</b>	
	01	Standard according to this data sheet

(\* Standard combinations of design form, flange type and shaft diameter (mm))

Design form	Flange type							
	K	KF	KP	KZ	S	ST	SR	SP
42					6	6		
50					12**	12**	12	
58	10	10	10	ZRS	6	6	12	10

Other combinations are available on customer request.

\*\* For design form 50 the flange type with the flattened area is designated as S.



Accessories (selection)

**Mating connectors**

Order code number	STK 8GS54	STK 8WS86	STK 8GS105	STK 4GS 60
Type	M12x1	M12x1	M12x1	M12x1
Pole number	8	8	8	4
Version	socket, A-coded	socket, A-coded	socket, A-coded	Socket, A-coded
Connector design	straight	angled	straight	straight
Housing material	brass nickel-plated	brass nickel-plated	stainless steel	metal
Cable ø (mm)	6 - 8	6 - 8	5.5 - 8.6	4 - 6
Connection	with screw	with screw	with screw	with screw
Protection grade	IP 67	IP 67	IP 67	IP 67
Screening	on housing	on housing	on housing	on housing
Max. connection cross section (mm <sup>2</sup> )	0.5	0.5	0.5	0.5

Please note: The position of the coding groove of the angled connector must be defined by the customer.

**Analogue Hand Programming Device Model PMA-05**

To program the encoder TRA/TBA with teach-in functionality

See data sheet [PMA 11443](#)

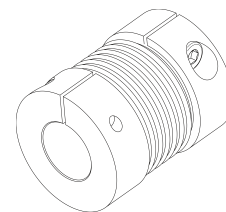
## Absolute electro-magnetic encoder Series TBA / TRA analogue output

### Accessories (selection)

#### Play-free bellows coupling BKK 32 / x - y

x and y: Bore diameter for shaft support

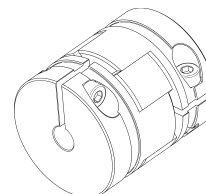
See data sheet [BKK 11840](#)



#### Play-free clamp coupling KK14S / x - y (without groove)

x and y: Bore diameter for shaft support

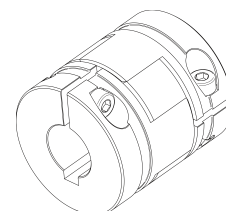
See data sheet [KK 12301](#)



#### Play-free clamp coupling KK14N / x - y (with groove)

x and y: Bore diameter for shaft support

See data sheet [KK 12301](#)



#### Mounting brackets KL 66-2-S

Mounting brackets for shaft encoder assembly.

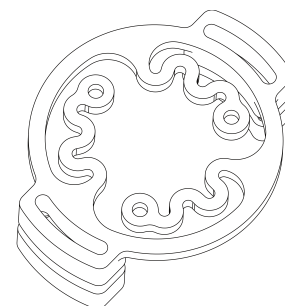
See data sheet [MZ 10111](#)



#### Torque support ZMS58

Torque support/stator coupling. Suitable for use as a shaft encoder bracket for the clamping shaft version, for the offsetting of radial and axial drive shaft play for Ø 58 mm shaft encoders.

See data sheet [ZMS 12939](#)



#### Play free measuring wheel ZRS

Play-free measuring wheel ZRS for slewing ring applications.

See data sheet [ZRS 11877](#)



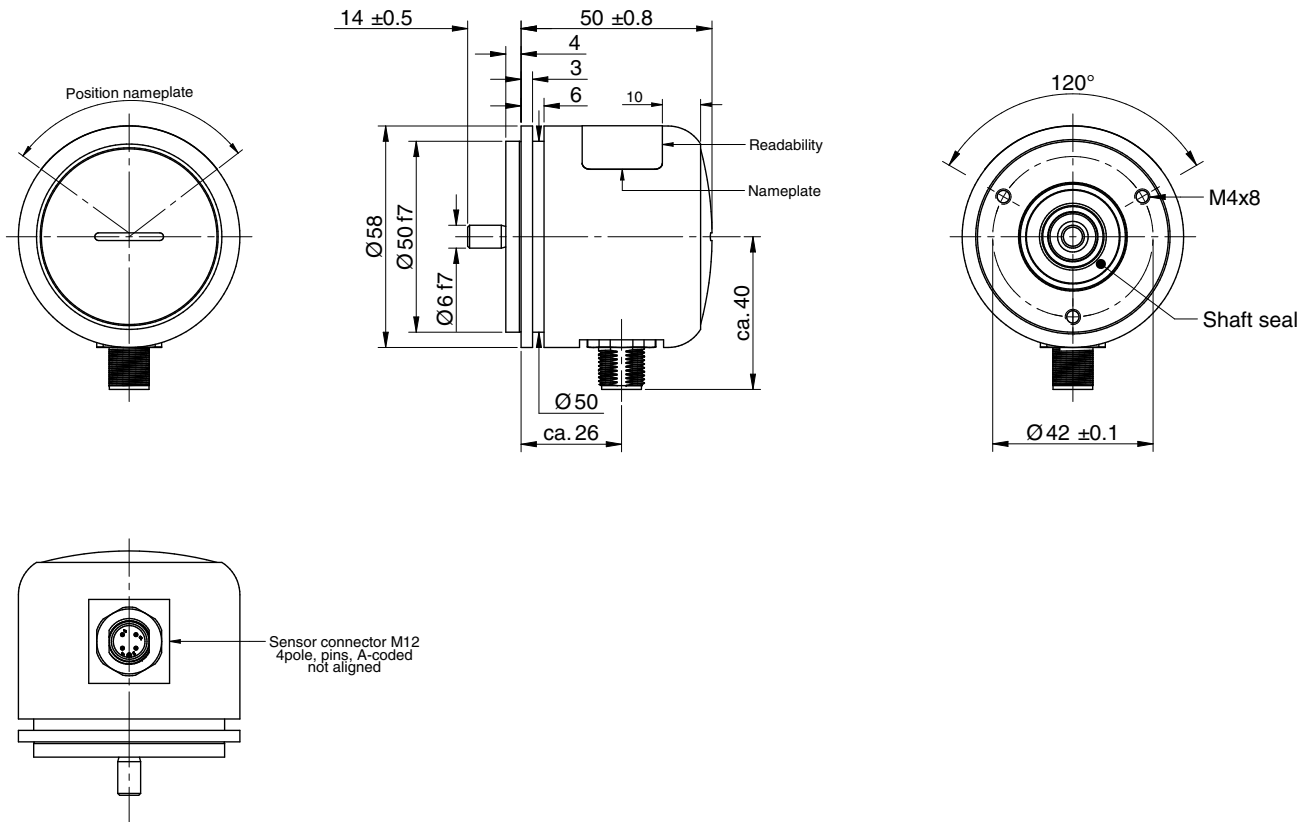
### Documentation

The following documents can be found on the internet under [www.twk.de](http://www.twk.de) in the documents area.

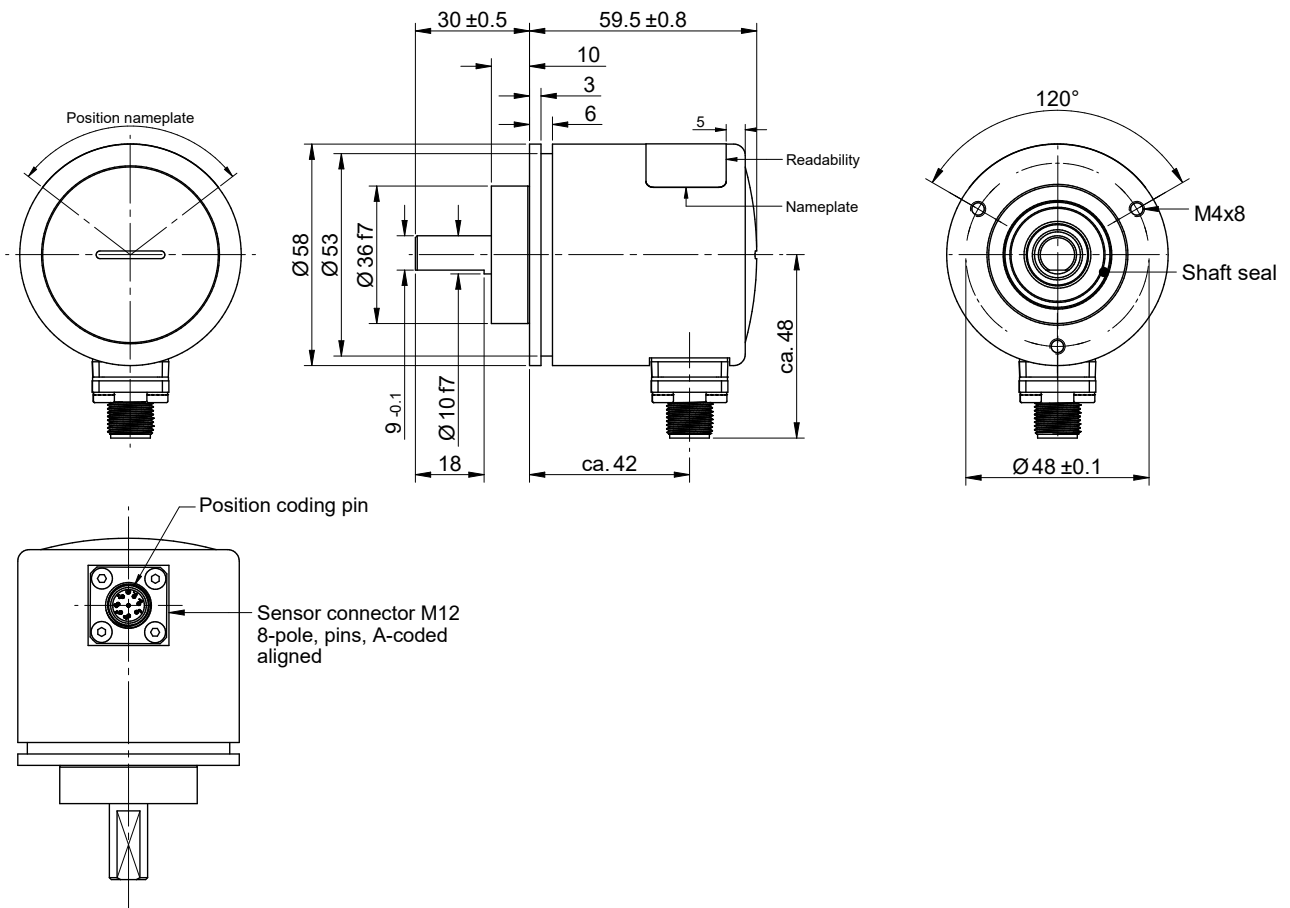
- Data sheet [14269](#)
- Installation instruction [16169](#)

Drawings (data in mm)

Order code number: **TBA58 - Sx xxx x S x01**



Order code number: **TRA58 - Kx xxxx x S x01**

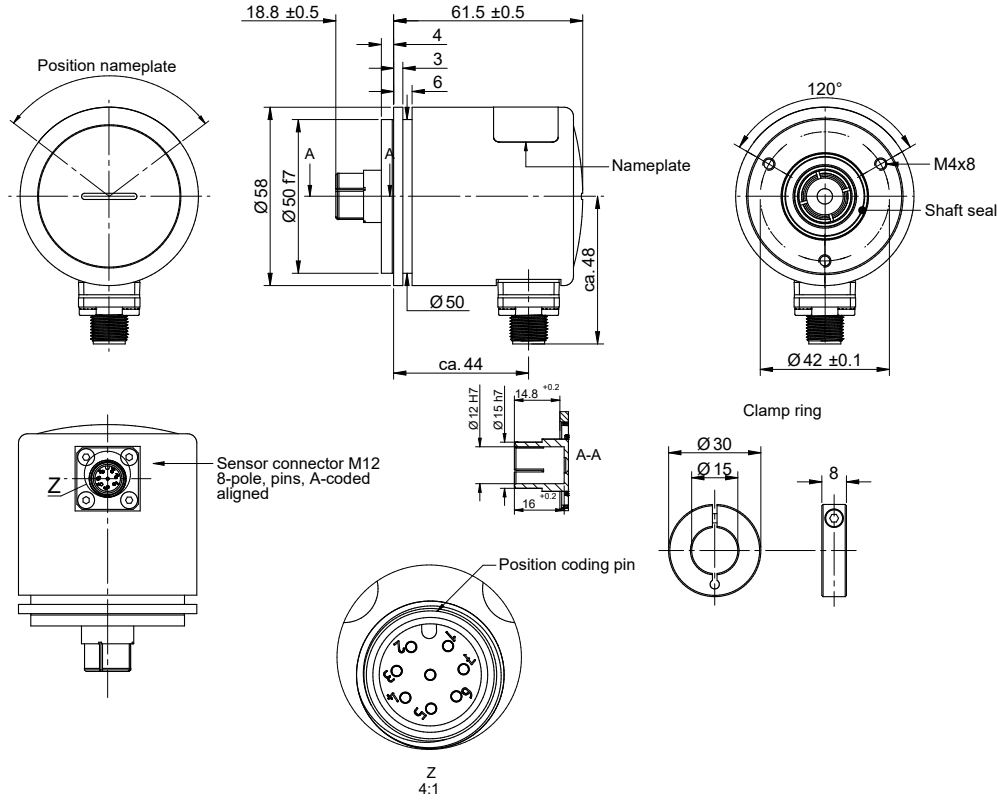


# Absolute electro-magnetic encoder Series TBA / TRA analogue output

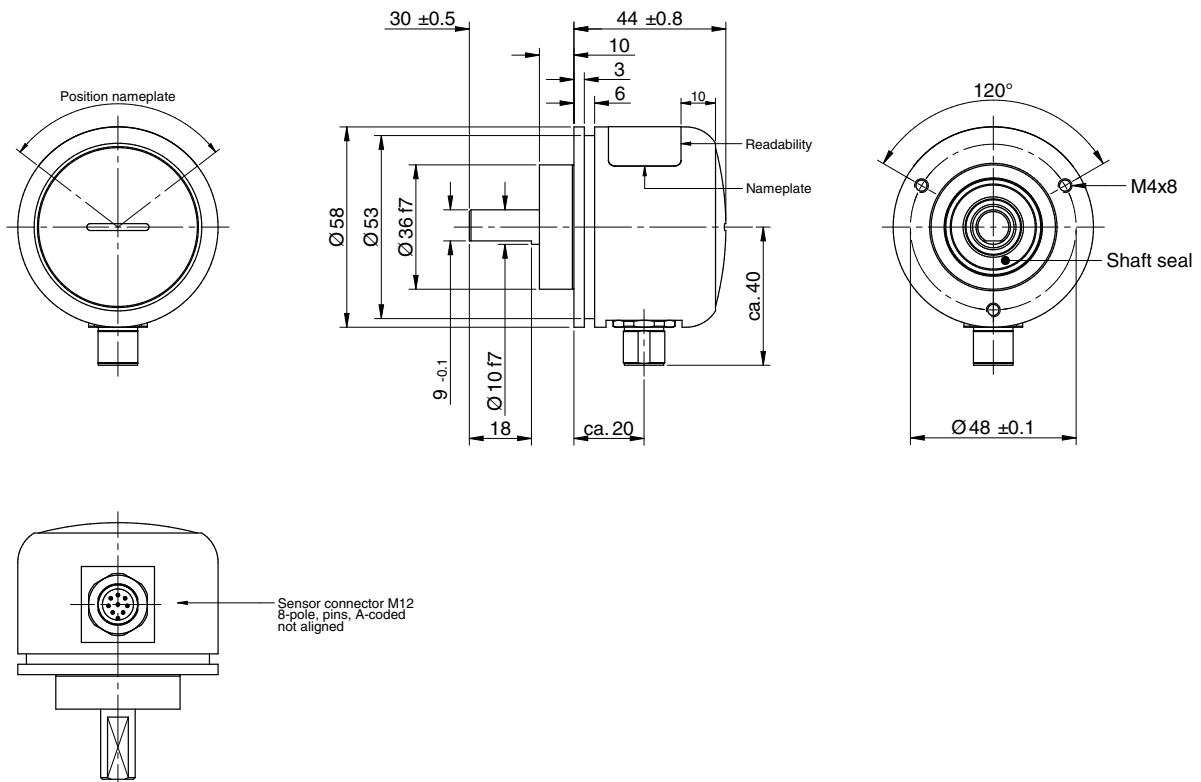
Drawings (data in mm)

Order code number: **TRA58 - SRx xxxx x S x01**

Use torque support [ZMS 12939](#) to avoid over-constraint mechanical fixture.



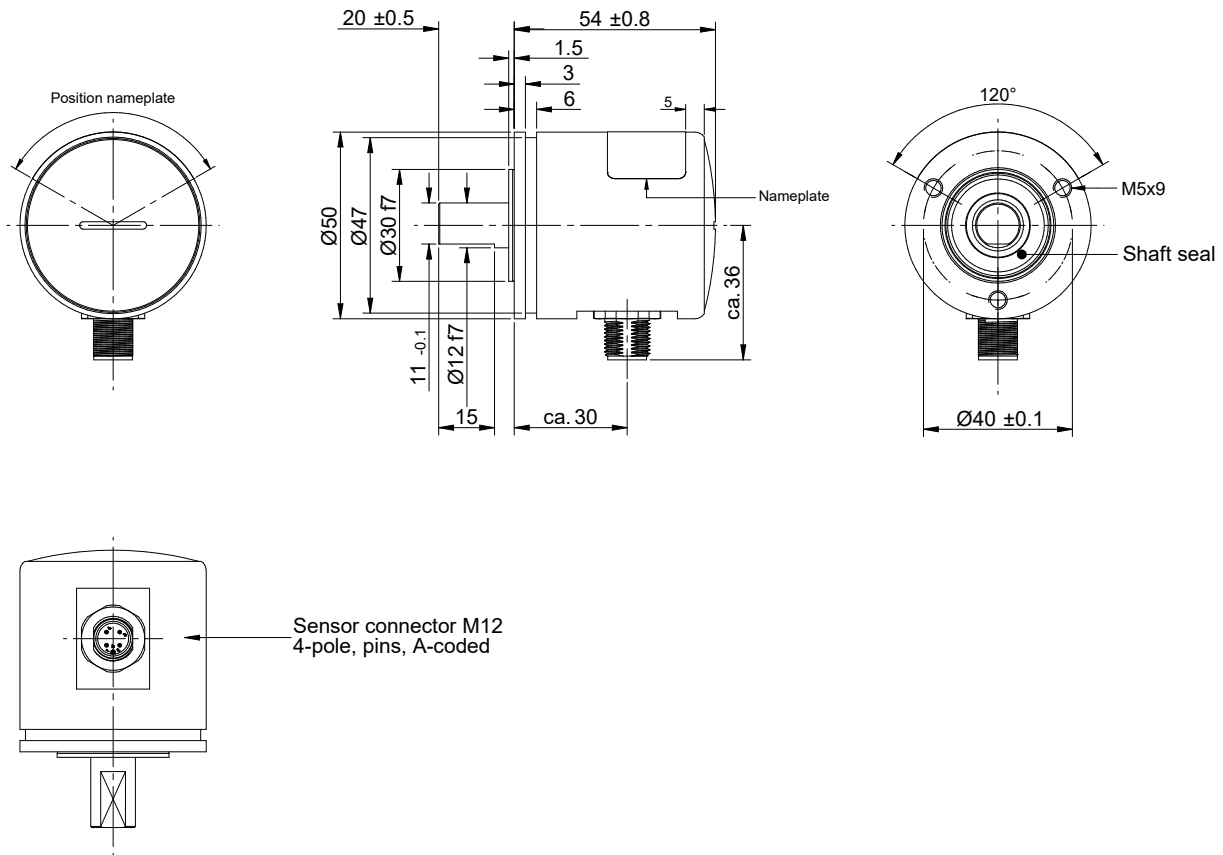
Order code number: **TBA58 - Kx xxxx x S x100**



# Absolute electro-magnetic encoder Series TBA / TRA analogue output

Drawings (data in mm)

Order code number: **TBA50 - Sx xxx x S x01**



Order code number: **TRA42 - Sx xxxx x K x01**

