Electromagnetic CANopen multiturn rotary encoder
Model TRN58

TWK ELEKTRONIK

Data sheet No.: TRN 13872 AE
Date: 25.07.2016

- **Robust design for use in stationary and mobile machines, for industrial applications and automation projects**
- **CANopen interface regarding CiA Encoder profile 406, No. 4.0.1**
- **Protection type IP 67 (optionally IP69k)**
- **Play-free measurement gear ZRS (option)**

Design

Robust aluminium housing (wall thicknesses 3 mm) (optionally: stainless steel) - a common drive shaft (measurement axis) and ball bearing with Nilos ring - rotor with shaft, transmission and permanent magnet mounted in pre-chamber - sensor circuit consisting of ASICs with Hall elements and interface electronics in enclosed main chamber - registration of revolutions through absolute multiturn transmission - electrical connection via two connectors M12x1, Bus in, Bus out, 5-pin/ socket, A-coded.

Function

The CANopen interface is designed according to the CANopen Application Layer and Communication Profile, CiA Draft Standard 301, according to the "Device Profile for Encoders CiA Draft Standard Proposal 406 Version 4.0.1" and the CANopen Layer Setting Services and Protocol (LSS), CiA DSP 305.

In addition to the position signal, a speed signal is available for each node. The gate time for registering the speed signal is defined as 1000 ms as standard. 14-bit position data are used for calculating the speed signal, and sliding averaging of the speed signal is performed.

Depending on use case, a play-free measurement gear can be mounted on the rotary encoders.

The technical data for the play-free measurement gears are according to data sheet ZRS 11877.

TWK-ELEKTRONIK GmbH
Heinrichstrasse 85
D-40041 Düsseldorf
Postbox 10 50 63
Tel. +49 211 96117-0
Fax +49 211 637705
info@twk.de
www.twk.de

Electromagnetic rotary encoder
TRN58

Technical data

Electrical data/nodes

- Sensor system: ASICs with Hall elements
- Accuracy: ± 0.2% (with reference to 360°)
- Reproducibility: ± 0.02% (with reference to 360°)
- Temperature drift: < 0.1% (with reference to 360° over the entire temperature range)
- Operating voltage range: + 9 VDC to + 36 VDC
- Power consumption: < 2 W
- Switch-on current: < 500 mA
- Resolution: 4096 steps / 360° (12-bit)
  (13-bit optional)
- Measuring range: 4096 revolutions
- Output code: Binary
- Speed signal: Digits/gate time/basis 14-bit, sliding averaging
- Gate time for speed signal: 1000 ms
- Code path: CW / CCW - parametrisable
- Reference value: 0 - (total No. of steps -1)
- CAN interface: According to ISO/DIS 11898
- Address setting: Via LMT/LSS or SDO
- Terminating resistor: To be implemented separately
- Max. transmission length: 200 m*

* No galvanic separation between supply voltage and bus lines (see also CiA DS301).

Mechanical data

- Operating speed: 1000 rpm max.
- Angular acceleration: 10^5 rad/s² max.
- Moment of inertia (rotor): 20 gcm²
- Operating torque: ≤ 8 Ncm (with rotational speed 500 rpm)
- Starting torque: ≤ 4 Ncm
- Perm. shaft load: 250 N axially, 250 N radially
- Bearing service life: ≥ 10^9 Revolutions
- Weight: Approx. 0.5 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: 250 m/s²; 6 ms
    DIN EN 60068-2-27
  - To vibration: 200 m/s²;10 Hz ... 2000 Hz
    DIN EN 60068-2-6
- EMC standards: DIN EN 61000-6-2 Immission (ESD)
  DIN EN 61000-4-4 Immission (Burst)
  DIN EN 61000-4-5 Immission (Surge)
  DIN EN 61000-6-4 (Emission)
- Protection types (DIN EN 60529): IP 67
  IP 69K on housing side (optional)

Reliability data

- $MTTF_d$: 188.4 years @ + 25°C
- Diagnostic coverage of overall system DC: Low
- Performance level PL: d

Electromagnetic rotary encoder
TRN58

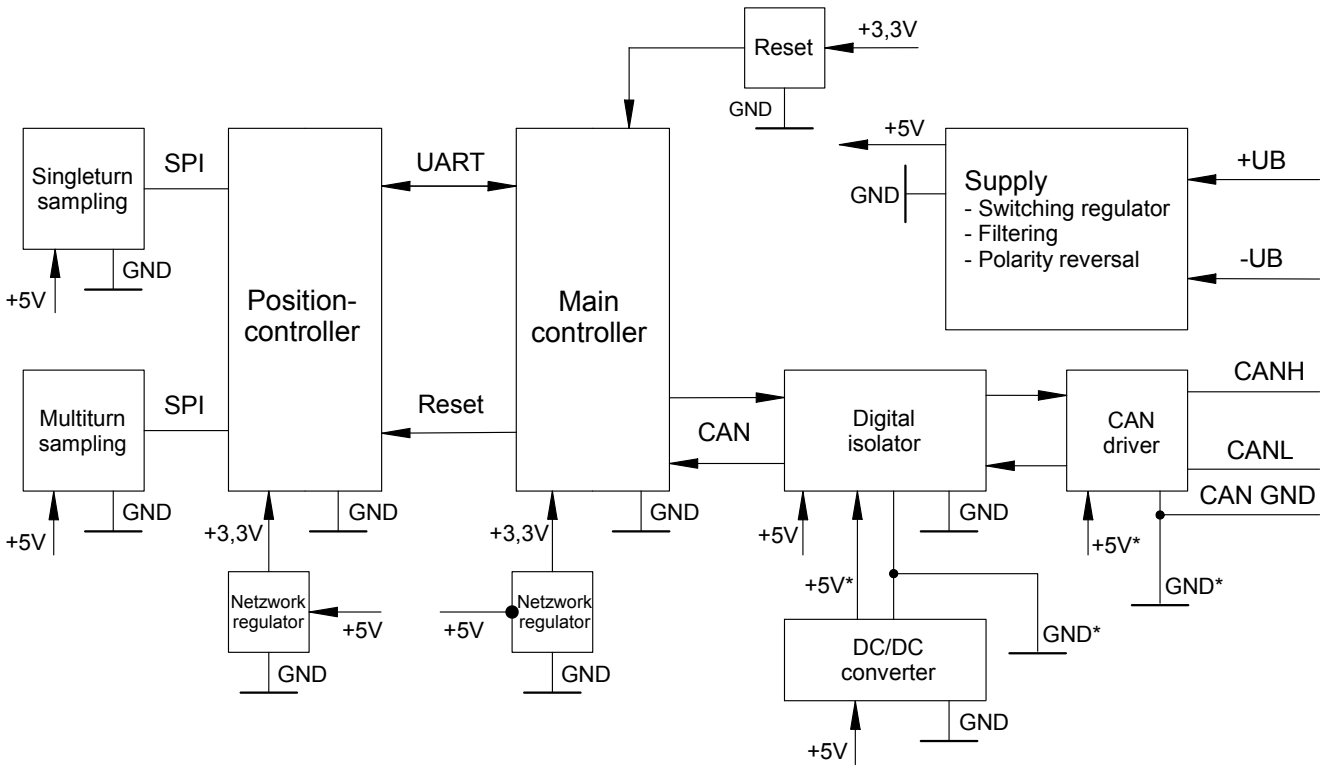
CANopen features

CANopen features

- NMT master: No
- NMT slave: Yes
- Maximum boot-up: No
- Minimum boot-up: Yes
- COB ID distribution: Default, SDO
- Node ID distribution: Via Index 2000 or LSS
- No. of PDOs: 2 Tx
- PDO modes: Sync, async, cyclic, acyclic
- Variable PDO mapping: No
- Emergency message: Yes
- Heartbeat: Yes
- No. of SDOs: 1 Rx / 1 Tx
- Device profile: CiA DSP 406 version 4.0.1

The details of the profile are described exhaustively in the NOC 13100 user manual.

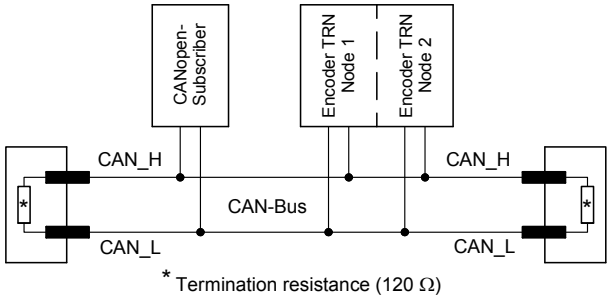
Principle circuit diagram



Electromagnetic rotary encoder
TRN58

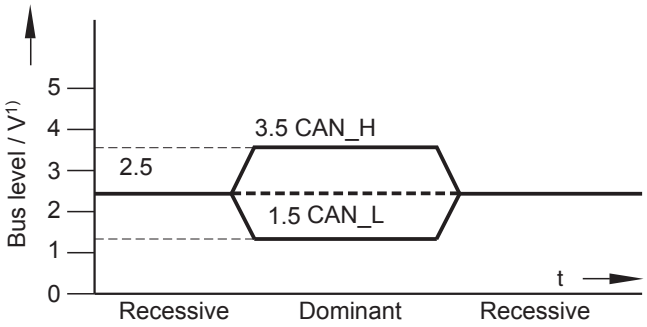
Bus activation, output level, connector pin diagrams and data profile

Bus activation according to ISO / DIS 11898



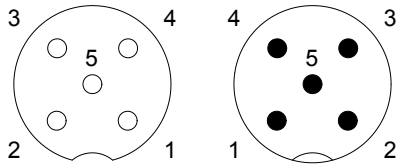
* Termination resistance (120 Ω)

Output level according to ISO/DIS 11898



1) With common mode voltage = 0 V

Connector pin diagram, design M12 x1 (view of connector side)

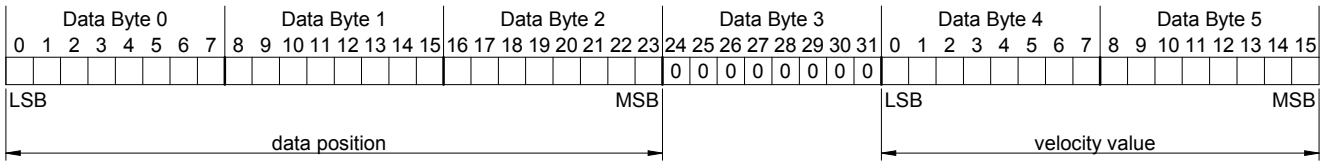


Socket, 5-pin, A-coded

Pin, 5-pin, A-coded

Data profile CANopen

PDO 1 / PDO 2



Electromagnetic rotary encoder
TRN58

Connector assignment and versions of galvanic separation

Example is valid for standard version

Attention: The description of the different versions of galvanic separation, V1 to V3, refers only to the relationships of the individual potentials (-UB, CAN_GND and housing/shield) to one another. I.e. whether they are galvanically connected or not. The connection plug pin assignments shown below are independent of this and only describe the standard pin assignment. Other variants may reveal a different pin assignment. The connection assignment (TYxxxx) which is enclosed with each device or can be requested must always be observed.

Note: The recommended version is V1 with full galvanic separation. This offers maximum EMC resistance, maximum CANopen data transfer security and thus maximum operating safety.

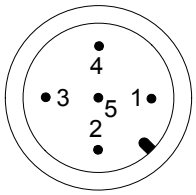
Versions V2 and V3 are special versions which must be compatible with the structure (topology) of the CANopen bus system in the customer application (→ control system and other CANopen subscribers). Operating safety or data transfer security may otherwise be affected.

For the following description and pictorials is valid:

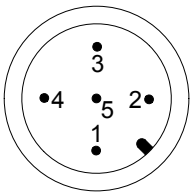
Viewed looking at the PIN side of the connector installed in the TRN.

V1: CAN_GND and U_B galvanically separated (≠). Screening/housing galvanically separated (≠)

This version is recommended and provides complete galvanic separation. Power supply and CAN_GND is galvanically separated. The housing and the screening of the cable is galvanically separated as well. The screening of the cable comes to the housing of the TRN via the housing of the mating plug.



female

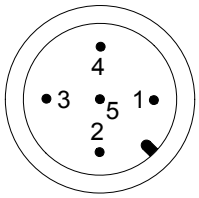


male

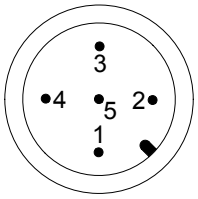
PIN	Function for standard version
1	CAN GND
2	Operating voltage **+ U_B**
3	Operating voltage **- U_B**
4	CAN_H
5	CAN_L

V2: CAN_GND and U_B not galvanically separated (=). Screening/housing galvanically separated (≠)

This version provides partly galvanic separation. Power supply and CAN_GND are not galvanically separated. The housing and the screening of the cable are galvanically separated from power supply and CAN_GND. The screening of the cable comes to the housing of the TRN via the housing of the mating plug and/or Pin 1 of the connector.



female



male

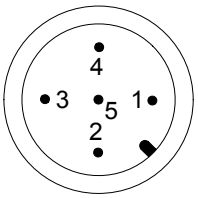
PIN	Function for standard version
1	Screen (Cable / housing)
2	Operating voltage **+ U_B**
3	Operating voltage **- U_B** and CAN_GND
4	CAN_H
5	CAN_L

Connector assignment and versions of galvanic separation

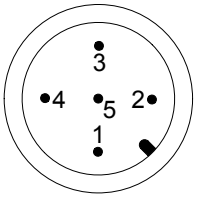
Example is valid for standard version

V3: CAN_GND and U_B not galvanically separated (=). Screening/housing not galvanically separated (=)

This version provides no galvanic separation. Power supply and CAN_GND are not galvanically separated. The housing and the screening of the cable are not galvanically separated from power supply and CAN_GND. The screening of the cable comes to the housing of the TRN via the housing of the mating plug and/or Pin 1 of the connector.



female



male

PIN	Function for standard version
1	Screen (Cable / housing) - *shorted to pin 3* -
2	Operating voltage **+ U_B**
3	Operating voltage **- U_B** and CAN_GND *- shorted to pin 1 -*
4	CAN_H
5	CAN_L

Electromagnetic rotary encoder
TRN58

Order number

TRN	58	- KZ	A	4096	R	4096	C2	S	V1	N	01

01 Electrical and mechanical variants*

Output:
N CANopen

Galvanic separation ǂ:
V1 $-V_S$ ǂ CAN_GND ǂ screening/housing → Recommended
V2 $-V_S$ = CAN_GND ǂ screening/housing
V3 $-V_S$ = CAN_GND = screening/housing

Electrical connections:
S Device connector, radial, M12x1, A-coded, pin, for sensors 1, 2
T Device connector, axial, M12x1, A-coded, pin, for sensors 1, 2
K Cable - option (2 x 1 m, radial)
L Cable - option (2 x 1 m, axial)
Other cable lengths on request

Profile:
C2 CANopen according to CiA, DS 406 revision 4.0.1

Measuring range
4096 Revolutions

Output code:
R Binary

Resolution:
Steps / 360°
4096 12-bit
8192 13-bit

Housing material:
A Aluminium
S Stainless steel(1.4305, optionally 1.4404)

Flange type:
K Clamped flange, shaft 10 mm - with flattened area
KP Clamped flange, shaft 10 mm - with feather key
KZ Clamped flange, shaft for measurement gear ZRS
SN Synchroniser flange, clamped shaft, 12 mm inside diameter - with groove
S Synchroniser flange, shaft 6 mm

Design form:
58 Housing diameter Ø 58 mm

Model series:
TRN TRN multiturn rotary encoder with CANopen interface

* 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.

Scope of delivery

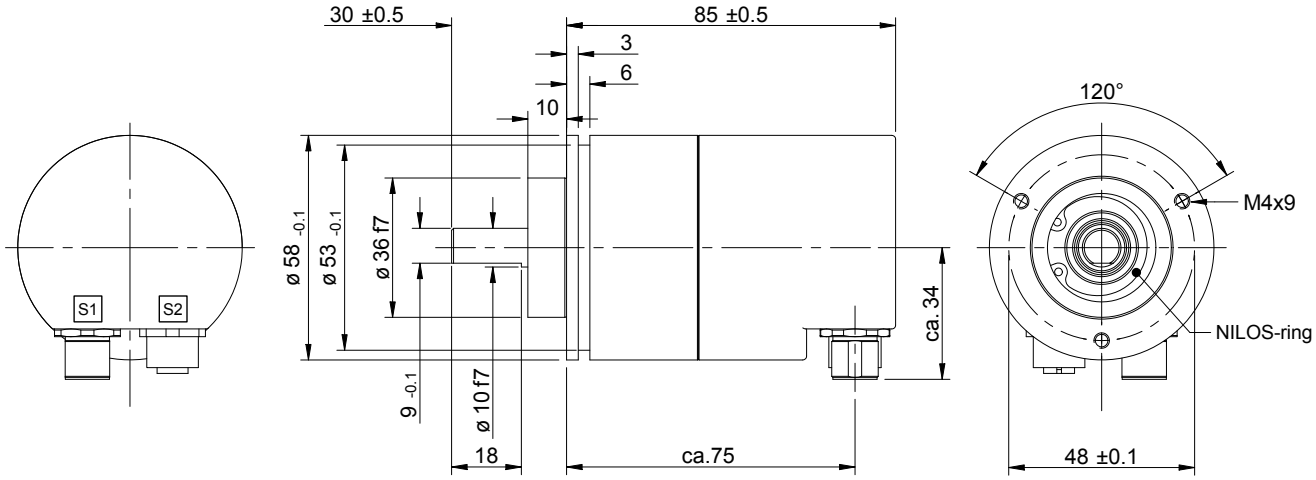
- A connection assignment is enclosed with each device.
- The EDS file, data sheet and manual are available at www.twk.de

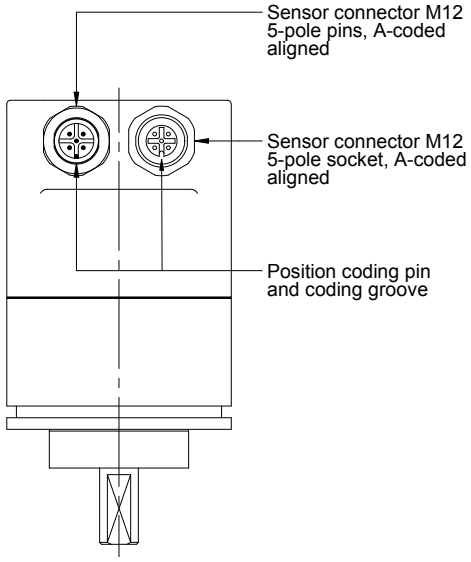
Electromagnetic rotary encoder
TRN58

Installation drawing

Dimensions in mm

Model TRN-K with shaft 10 mm - with flattened area



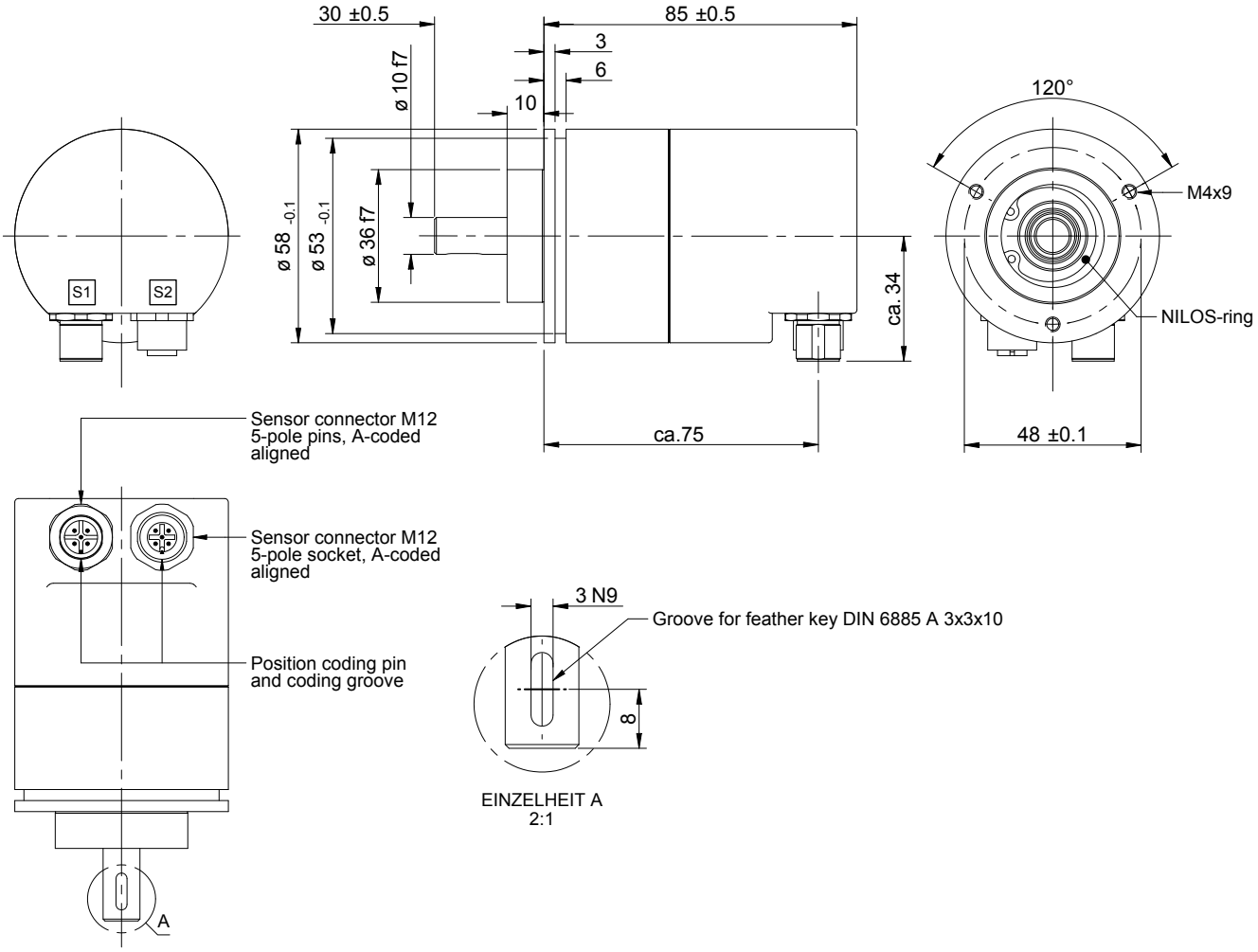


Electromagnetic rotary encoder
TRN58

Installation drawing

Dimensions in mm

Model TRN-KP with shaft 10 mm - with feather key

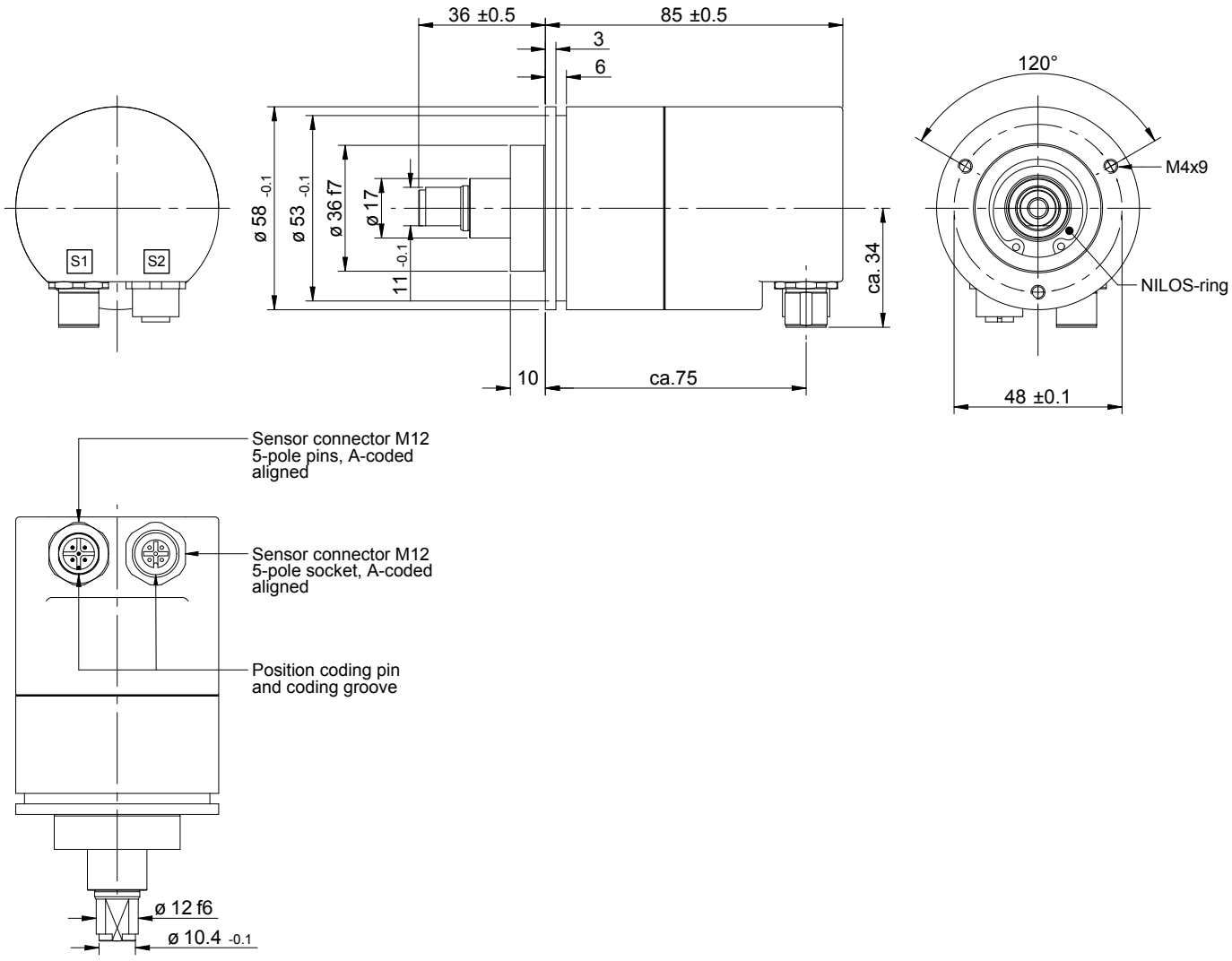


Electromagnetic rotary encoder
TRN58

Installation drawing

Dimensions in mm

Model TRN-KZ with shaft for measurement gear

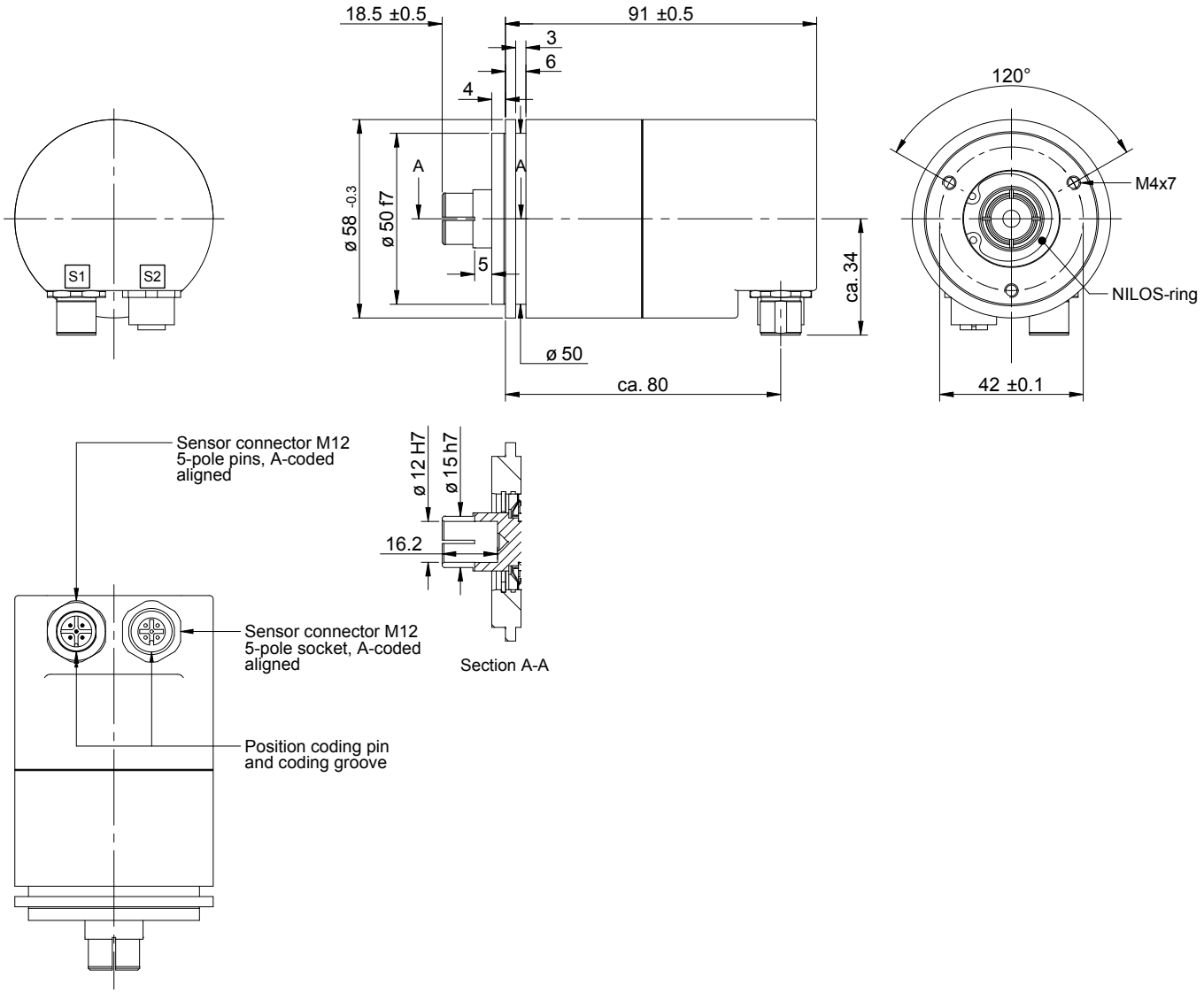


Electromagnetic rotary encoder
TRN58

Installation drawing

Dimensions in mm

Model TRN-SN with clamped shaft, 12 mm inside diameter - with groove

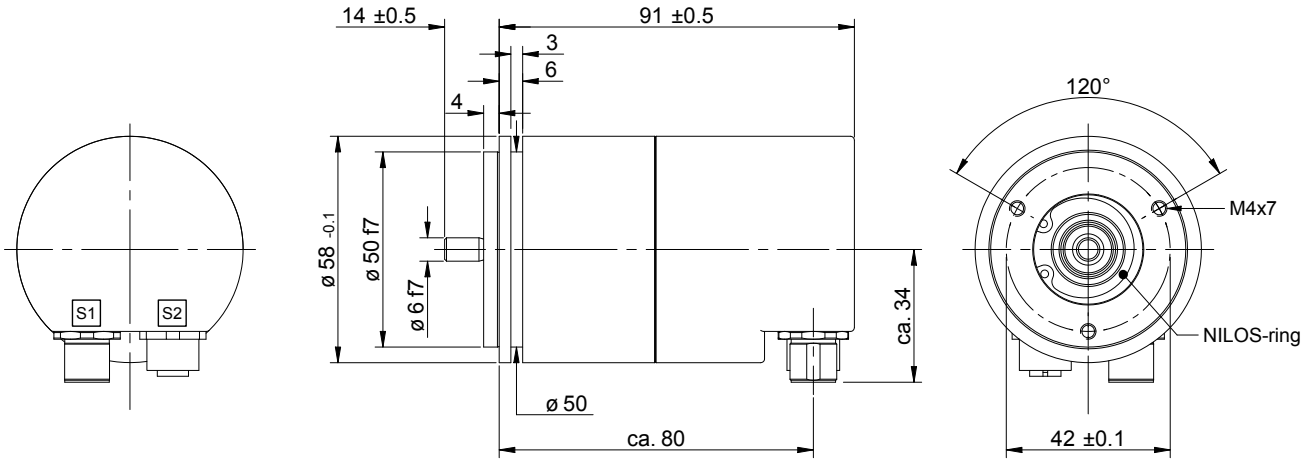


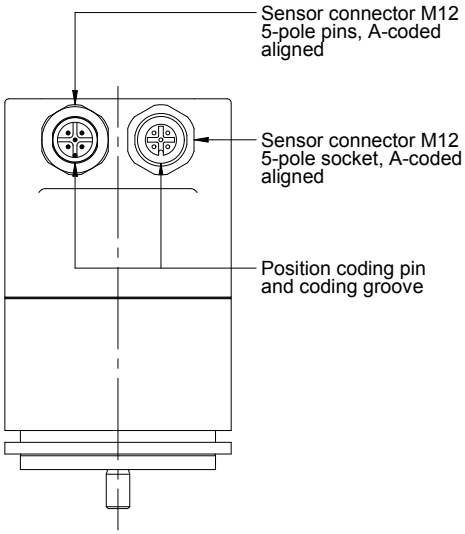
Electromagnetic rotary encoder
TRN58

Installation drawing

Dimensions in mm

Model TRN-S with shaft 6 mm





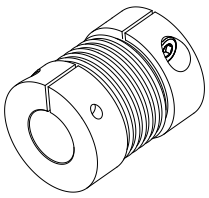
Electromagnetic rotary encoder
TRN58

Accessories

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

x and y: hole diameter for shaft mounting

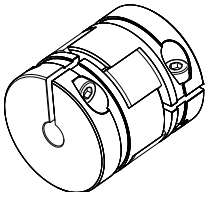
See data sheet BKK 11840



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

x and y: hole diameter for shaft mounting

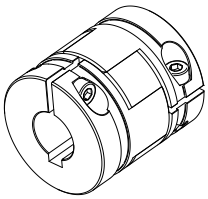
See data shee KK 12301



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

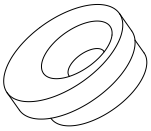
x and y: hole diameter for shaft mounting

with groove for feather key according to DIN 6885 page 1 – JS9.
See data sheet KK 12301



KL 66-2-S

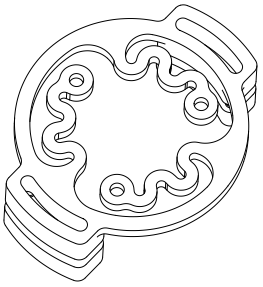
Fastening clamps for rotary encoder installation.
See data sheet MZ 10111



ZMS58

Torque support/stator coupling. Can be used as rotary encoder bracket for shaft version 'clamped shaft' to compensate drive shaft radial and axial play.

See data sheet ZMS 12939

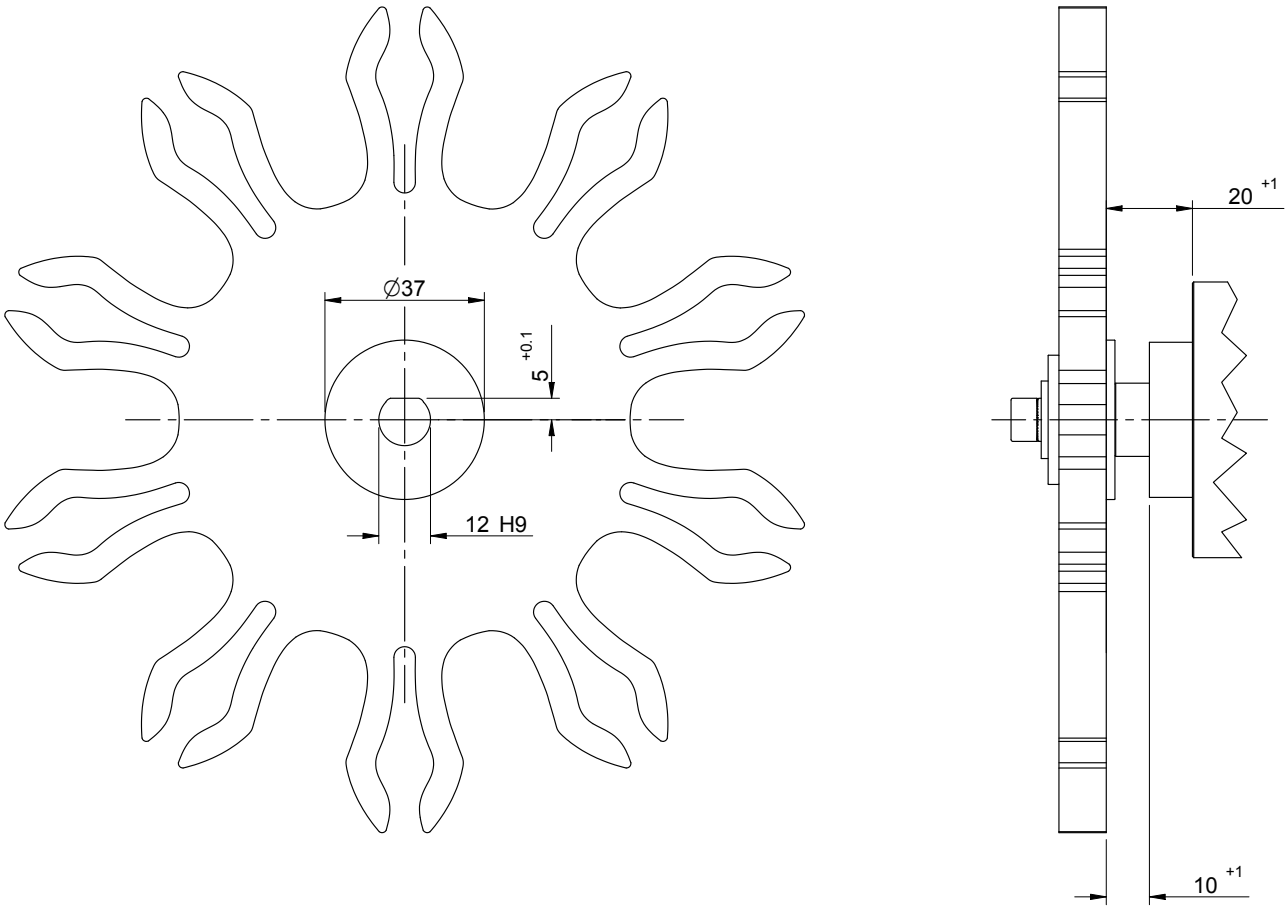


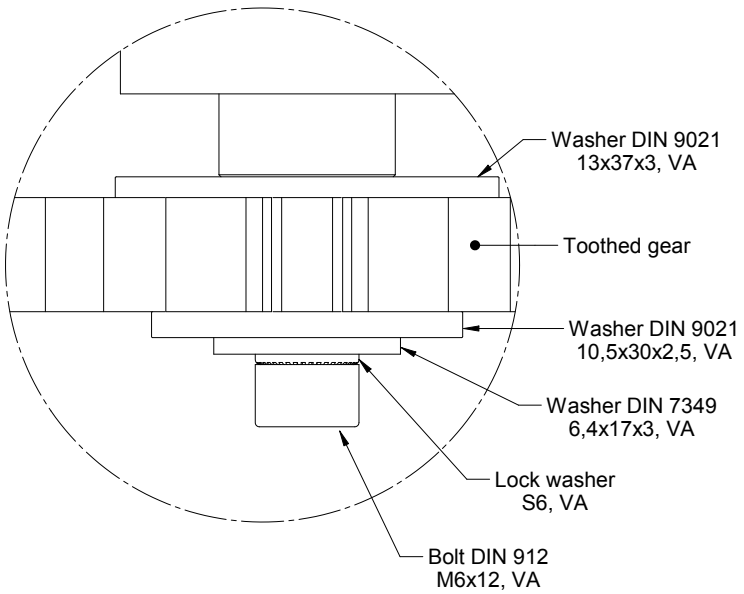
Electromagnetic rotary encoder
TRN58

Play-compensating measurement gear ZRS (Subject to TWK utility model protection)

'Play-compensating measurement gear' ZRS can be used for mechanically driving the rotary encoder shaft without play on a slewing ring/toothed rack. Different modules and numbers of teeth are available. ZRS material: polyamide. See also data sheet ZRS 11877. The mechanical connection necessitates shaft design 'KZ', see order number.

Installation recommendation: tighten bolt M6x12 to a torque of 6 Nm and secure with Loctite (medium adhesive strength).





Order code number

ZRS	-	12	-	10	-	A 01

Variants **:

A 01 Standard

Teeth:

10 No. of ZRS teeth *

Module:

12 5 to 24 *

Model:

ZRS toothed gear, play-compensating model

* Other values on request

** Please contact our technical support to select the required measuring gear.