

- For use in construction machines and systems, e.g. industrial plants engineering and for rough operating conditions
- Magnetic sensor system
- Resolution / measuring range
 - TBE: max. 65,536 steps / 360°
 - TRE: max. 268,435,456 steps (65,536 steps / 360° x 4096 revolutions)
- Protection grade IP65 / IP67 (Higher protection classes up to IP69K are available as an option)
- Redundant design of the SSI-Interface optional, see notes on pages [3](#) and [15](#)



KEY INFORMATION OVERVIEW

DESIGN & FUNCTION

With the TBE model, one rotation (max. 65,536 steps) is recorded. With the subsequent absolute transmission, the TRE shaft encoder reaches a measuring range of up to 4096 rotations.

- Sturdy housing made from seawater-resistant aluminium (AlMgSi1 - 3.2315) or stainless steel (material: 1.4305 or 1.4404) respectively magnetic stainless steel 1.4104 (for high requirements of interference resistance against magnetic fields, DIN EN 61000-4-8)
- Constructions with Ø 42, Ø 50 and Ø 58 mm as well as special constructions (application-dependent)
- Magnetic sensor systems for position detection
- Recording of rotations via an absolute multitour transmission gear in the TRE model
- Electrical connections via connector M12x1 (Bus In and Bus Out option), M23-CCW or via cable
- Optional housing potting to meet IP69K requirements

A positive-locking mechanical connection between the customer's shaft and the sensor shaft ensures that the magnet in the sensor shaft precisely reflects the rotation of the customer's shaft.

FEATURES INTERFACE

Models TBE / TRE are equipped with the SSI interface which can be read out with up to 2 MHz CLOCK frequency.

The absolute angle information derived by the encoder is converted into serial information by an internal serial converter and the transmitted to a receiving electronic circuit in synchronism with a clock. Important advantages are:

- Low number of data lines
- High reliability
- High interference immunity by differential signal transmission (RS422).

A detailed description can be found in the [TWK-SSI 10630](#) brochure.

Via the inputs 'Set input' and 'Code sense' (in each case input circuit E1) can be set and changed the reference value '0' and the code sense (CW or CCW).

TECHNICAL DATA

ELECTRICAL DATA

Sensor system	magnetic
Operating voltage	Ø 58: 9 to 36 VDC, polarity-safe and short circuit proof Ø 42, Ø 50: 18 to 28 VDC, polarity-safe and short circuit proof
Power consumption	TBE: < 1 W TRE: < 1.5 W
Total of measuring steps	TBE: max. 65,536 steps TRE: 268,435,456 steps (65,536 steps / revolution x 4096 revolutions)
Code sense	CW* or CCW**, adjustable
SET input	set zero (0) point (other values from '1' to 'Total measuring range-1' optional ex factory)
Absolute accuracy	TBE: ± 0.1 % TRE: ± 0.25 %
Repeatability	± 0.02 %
Temperature drift	< 0.02° / K

SSI DATA

Input data CLOCK IN	Differential-Clock input (optocoupler) for data driver acc. RS 422 standard
Output data DATA OUT	Differential-data output for data driver acc. RS 422 standard
Max. clock frequency	2 MHz (at transmission length ca. 10 m, see page 4) Note: cable specification, use of shielded twisted-pair cable, terminating resistor
Mono flop time	16 ± 10 µs
Protocol lengths TBE	≤ 13 Bit. 13 Bit Protocol > 13 Bit 25 Bit Protocol
Protocol lengths TRE	≤ 25 Bit. 25 Bit Protocol > 25 Bit 32 Bit Protocol

MECHANICAL DATA

Operating speed	max. 1000 rpm with sealing ring, max.10,000 rpm with Nilos ring
Angular acceleration	10 ⁵ rad/s ² max.
Moment of inertia (shaft)	20 gcm ²
Operating torque	≤ 8 Ncm (at speed 500 rpm and with sealing ring)
Starting torque	≤ 4 Ncm
Perm. shaft load	250 N axial and radial
Bearing service life	≥ 10 ⁹ revolutions***
Weight	TBE Ø 58: Aluminium ca. 0.3 kg, stainless steel ca. 0.4 kg TRE Ø 58: Aluminium ca. 0.5 kg, stainless steel ca. 0.6 kg

ENVIRONMENTAL DATA

Operating temperature range	- 40 °C to + 85 °C
Storage temperature range	- 20 °C to + 60 °C (packaging-related)
Resistance:	To shock 250 m/s ² , 6 ms, 100 x each in 3 axes, DIN EN 60068-2-27 To vibration 100 m/s ² , 5 Hz to 2000 Hz, 1 h in 3 axes, DIN EN 60068-2-6 (larger values optionally)
EMC standards	DIN EN 61 000-6-2 Immission (Burst/ ESD/ etc.) DIN EN 61 000-6-4 Emission
Protection grade (DIN EN 60529)	shaft-side IP66 with shaft sealing ring, IP65 with Nilos ring housing-side IP67, IP69K (option: potting, contact us for further information)

MTTFD RELIABILITY VALUES

MTTFd calculation basis	HRD 5- Handbook of Reliability Data for Electronic Components used in Telecommunication Systems (Quality factor: 2)
+25 °C	354.8 years
+55 °C	194.6 years
+70 °C	127.9 years

*) CW = increasing output signal for clockwise sensor shaft rotation, viewed looking towards the shaft
 **) CCW = increasing output signal for counter clockwise sensor shaft rotation, viewed looking towards the shaft
 ***) This value applies at the maximum shaft load

PRODUCT CHARACTERISTICS

NOTES AND ADDITIONAL TECHNICAL DATA FOR TBE / TRE REDUNDANT

With the TBE / TRE series, the SSI interface can optionally be designed redundantly.

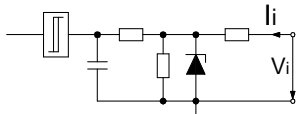
In general, the technical data in this data sheet apply with some additional information.

These include the following points:

- The SSI interfaces are designed twice in the redundant version, where Sensor1: SSI-1 and Sensor2: SSI-2 are each autonomous (see article description below)
- There are two options for the power supply
 - Common power supply for sensor1,2 (electrical connection via M12 plug, 12-pin)
 - Separate power supply for sensor1 and sensor2 (electrical connection via cable LiYCY 8x2x0,14mm²)
- Extension of the parameterization for sensor1 and sensor2
- Code sense CW / CCW (optional)
- Reference value ≠ 0 for sensor 1, 2 via factory programming or via PMU (Data sheet: [PMU12005](#)) by customer
- Extensive protocol options such as:
 - Bit length (>32 bit) of the SSI protocol
 - Error bit related to the respective sensor system
 - 8-bit CRC sum according to generator polynomial: $x^8 + x^5 + x^4 + 1$
 - Customer-specific requirements
- Accuracy data for the 2 sensors:
 - Synchronisation of the systems: static ≤ 1 % or dynamic ≤ 5 % (at 3000 rpm)
- See [Page 15](#) for an installation drawing for a redundant encoder TRN Ø 58
- Example of an redundant article designation: TRE58-KA 65536 R 4096 W **R2** S Exx
R2: redundant version for sensor 1 and sensor 2

INPUT CIRCUIT FOR SET INPUT UND CODE SENSE

Input E1 active "high"



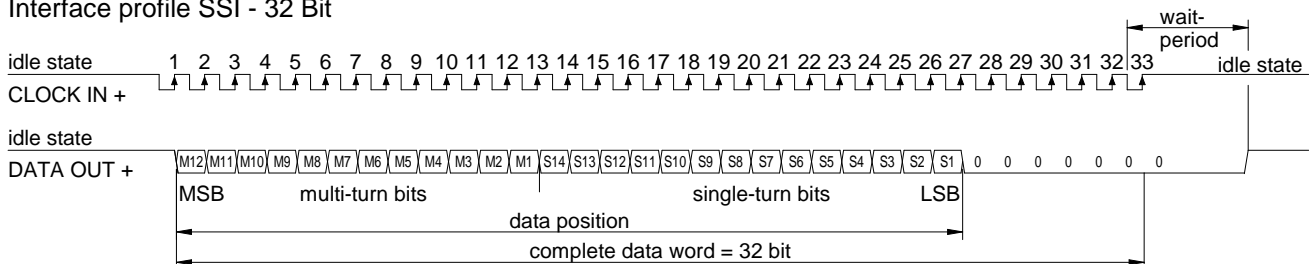
Log 0 < 5V or not connected
Log 1 = V_s min. ... V_s max.
E1 specification

SET inactivated at V_i = 'Log 0' or not connected
SET activated at V_i = 'Log 1'

Code CW at V_i = 'Log 0' or not connected
Code CCW at V_i = 'Log 1'

INTERFACE-PROFILE SSI - 32 BIT / BINARY

Interface profile SSI - 32 Bit



PRODUCT CHARACTERISTICS

MAXIMUM DATA RATES

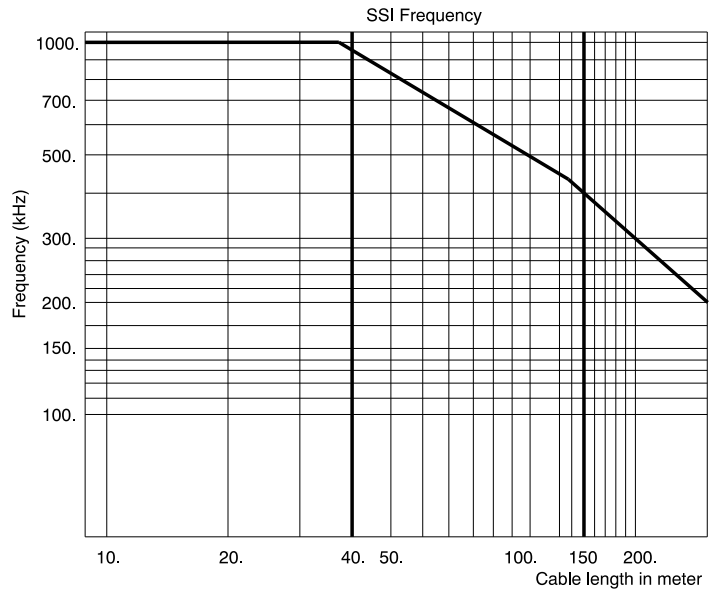
The data rate is limited by the following variables.

- Up to approx. 40 m clock frequency max. 1 MHz
- Between 40 m and 150 m overall electronics delay:
 $t_{GV} = t_C + 2t_K + t_E$
 t_{GV} : Overall delay time
 t_C : Encoder electronics delay time (here e.g. ≤ 300 ns)
 t_K : Cable delay time (depending on cable length and type. Delay time e.g. 6.5 ns/m)
 t_E : Receiver electronics delay time (e.g. 150 ns)

A safety clearance of 50 ns between the cycle duration of cycle t_T and the overall delay time t_{GV} results in
 $t_T = t_{GV} + 50 \text{ ns} = 500 \text{ ns} + 2t_K$

The following context applies on calculation of the max. clock frequency $f_{max.} = 1 / t_T$

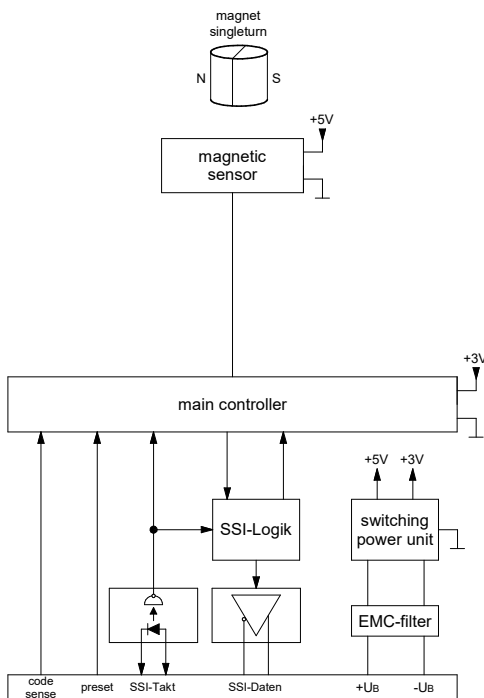
- As of 150 m according to RS 422 specifications



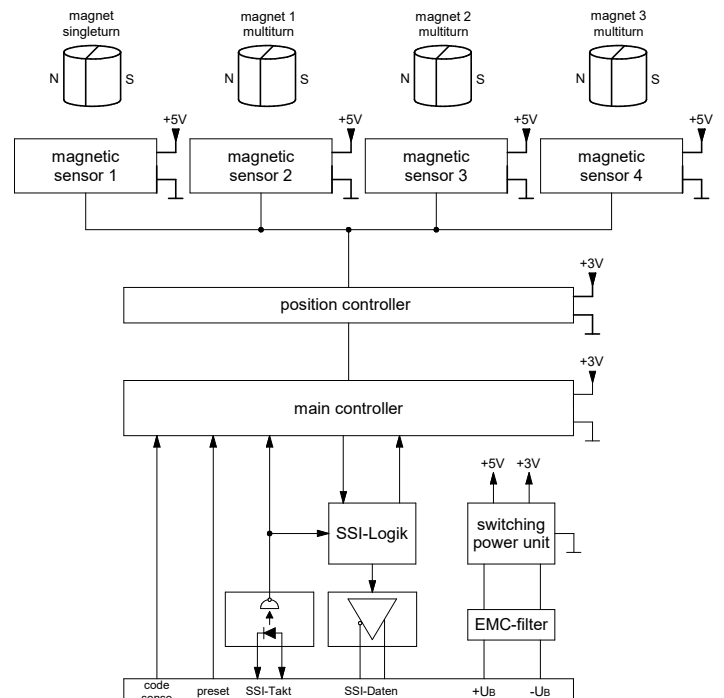
TECHNICAL DATA

PRINCIPLE CIRCUIT DIAGRAM

MODEL TBE58



MODEL TRE58



ELECTRICAL CONNECTION - PINOUT

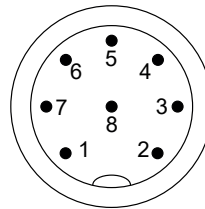
ELECTRICAL CONNECTION

Ø 58. with connector M12, A-coded, 8-pole, male (standard) or
 with connector M23, 12-pole, male, pin assignment counterclockwise or
 with cable radial, twisted pair, 8-wire (4x2), shielded

The connection diagram is included in the scope of delivery and is enclosed with every device.

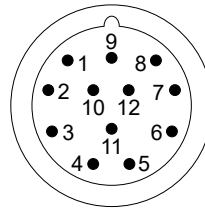
CONNECTOR, M12, A-CODED, MALE (STANDARD)

PIN.	Function
1	+V _S
2	-V _S (0 VDC)
3	CLOCK IN +
4	CLOCK IN -
5	DATA OUT +
6	DATA OUT -
7	SET input (input E1)
8	Code sense (input E1)



CONNECTOR, M23, MALE, CCW

PIN.	Function
1	+V _S
2	-V _S (0 VDC)
3	CLOCK IN +
4	DATA OUT +
5	SET input (input E1)
6	DATA OUT -
7	CLOCK IN -
8	not connected
9	Code sense (input E1)
10	not connected
11	do not connect
12	do not connect



(Other pin assignments on request)

ORDER CODE FORMAT

TRE	58 - K	A	65536	R	4096	W	S	E	01	STANDARD VERSION
TBE TRE	Singleturn rotary encoder with SSI-Interface Multiturn rotary encoder with SSI-Interface									
58 - K	Design form (Ø), flange and shaft	58 - K 58 - KF 58 - KP 58 - KZ 58 - S 58 - SR	Clamped flange, shaft Ø 10 mm with flattened area Clamped flange, shaft Ø 10 mm with woodruff key Clamped flange, shaft Ø 10 mm with feather key Clamped flange, shaft Ø 12 mm for play-compensating toothed gear ZRS Synchro flange, shaft Ø 6 mm Synchro flange, clamping shaft Ø 12 mm (torque support ZMS recommended, see page 8)							
A	Housing material	A B S V W	Aluminium 3.2315 - (AlMgSi1) Burnished steel for shielding strong magnetic fields Stainless steel - 1.4305 (AISI 303) Stainless steel - 1.4404 (AISI 316L) Magnetic stainless steel - 1.4104 for shielding magnetic fields							
65536	Resolution in steps/360°	4096 8192 16384 32768 65536	12 bit 13 bit 14 bit 15 bit 16 bit							
R	Code	R G	Binary Gray (optional)							
4096	Measuring range in revolutions	4096	Only for TRE, leave blank for singleturn TBE							
W	Code sense	W C	CW CCW							
S	Electrical connection	S M K1	Device connector M12 Device connector M23 Cable, 1 m							
E	Output	E	SSI-Interface							
01	Electrical and mechanical variants*	01	Standard							

* The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented at TWK. For the redundant version put in „R2“ between ‘Code sense’ and ‘Electrical connection’ (please refer to our technical staff and see [page 3](#)).

ACCESSORIES - SELECTION (TO BE ORDERED SEPARATELY)

MATING CONNECTORS

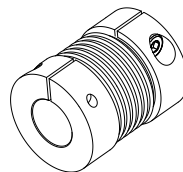
Order number, Datasheet	Type	Design & wire fixing	Housing-material	Cable \varnothing & wire size	Shielding & IP grade
STK8S54 STK14567	M12-A 8-pole, female	Straight, screws	Die cast zinc nickel-plated	6 – 8 mm $\leq 0.5 \text{ mm}^2$	On housing IP67
STK8WS86 -	M12-A 8-pole, female	Angled, screws	Die cast zinc nickel-plated	6 – 8 mm $\leq 0.5 \text{ mm}^2$	On housing IP67
STK8GS105 -	M12-A 8-pole, female	Straight, screws	Stainless steel 1.4404	5.5 – 8.6 mm $\leq 0.5 \text{ mm}^2$	On housing IP67
STR12GS11 -	M23 12-pole, female	Straight, soldering	brass nickel-plated	6 - 10 mm $\leq 1.0 \text{ mm}^2$	On housing IP67

Please note: If angled mating connectors are used, please specify the position of the coding groove so that the device connectors can be aligned accordingly.

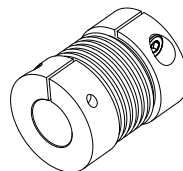
COUPLINGS

x and y: Bore diameter for shaft support

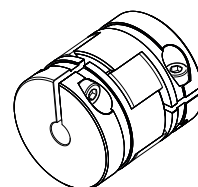
BKM 26 / x - y Play-free bellow coupling
Data sheet [11995](#)



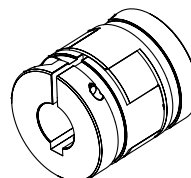
BKK 32 / x - y Play-free bellow coupling
Data sheet [11840](#)



KK14S / x - y Play-free clamp coupling without groove
Data sheet [12301](#)



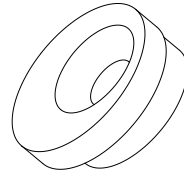
KK14N / x - y Play-free clamp coupling with groove
Data sheet [12301](#)



ACCESSORIES - SELECTION (TO BE ORDERED SEPARATELY)

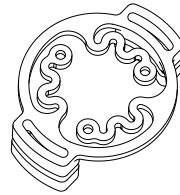
MOUNTING BRACKET

Mounting brackets for shaft encoder assembly
KL 66-2-S Data sheet [10111](#)



TORQUE SUPPORT

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
ZMS58 Data sheet [12939](#)



MEASURING WHEEL

Play-free measuring wheel ZRS for Ø 58 mm shaft encoders for live ring applications
ZRS Data sheet [11877](#)



DOCUMENTATION

DOCUMENTATION

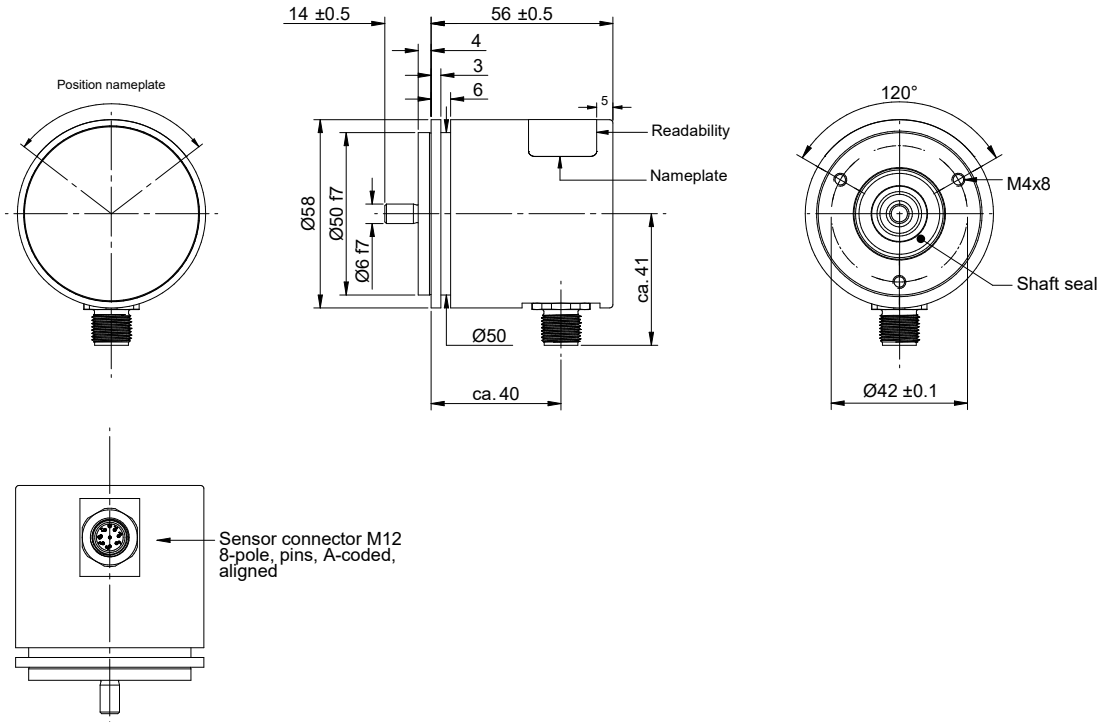
The following documents can be found in the Internet under www.twk.de/en in the documentation area, model TBE/TRE.

- Data sheet [TXE14270](#)
- Installation instructions [AN16169](#)
- Declaration of conformity CE: [ZE12467](#), UKCA: [ZE16569](#)
- Reach compliant [QS15286](#)
- RoHS compliant [QS13284](#)

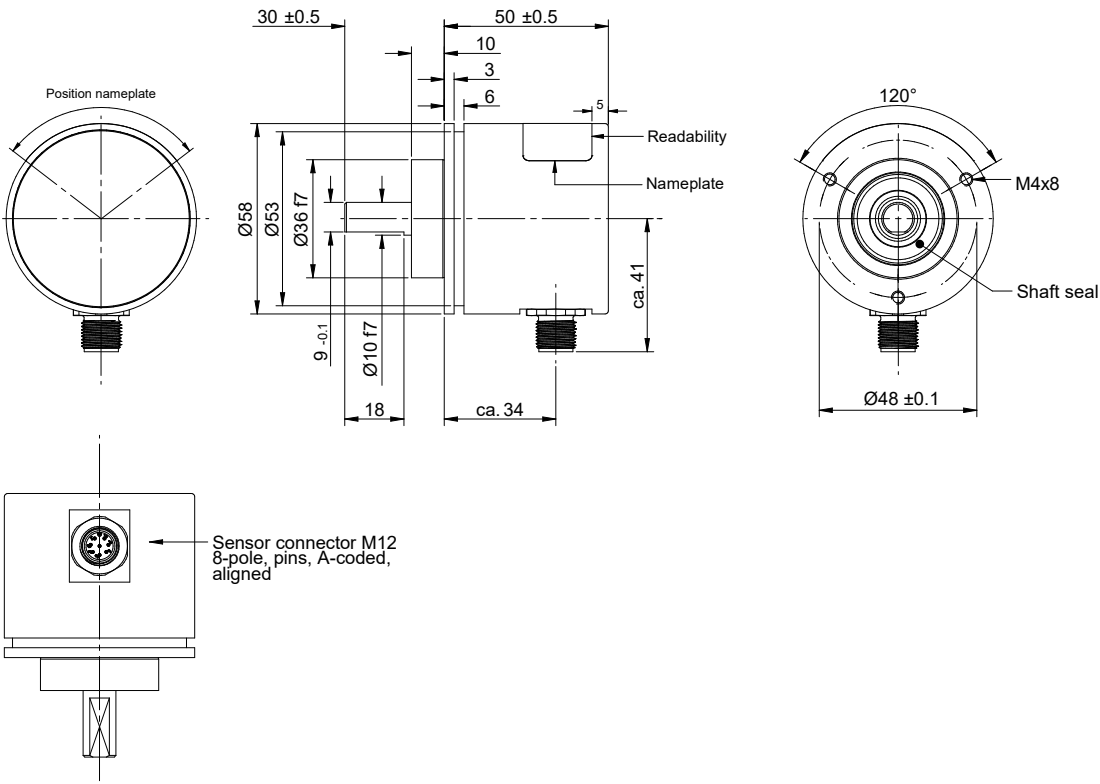
INSTALLATION DRAWINGS

MODEL TBE58 - SA 65536 R W S E01

Dimensions in mm



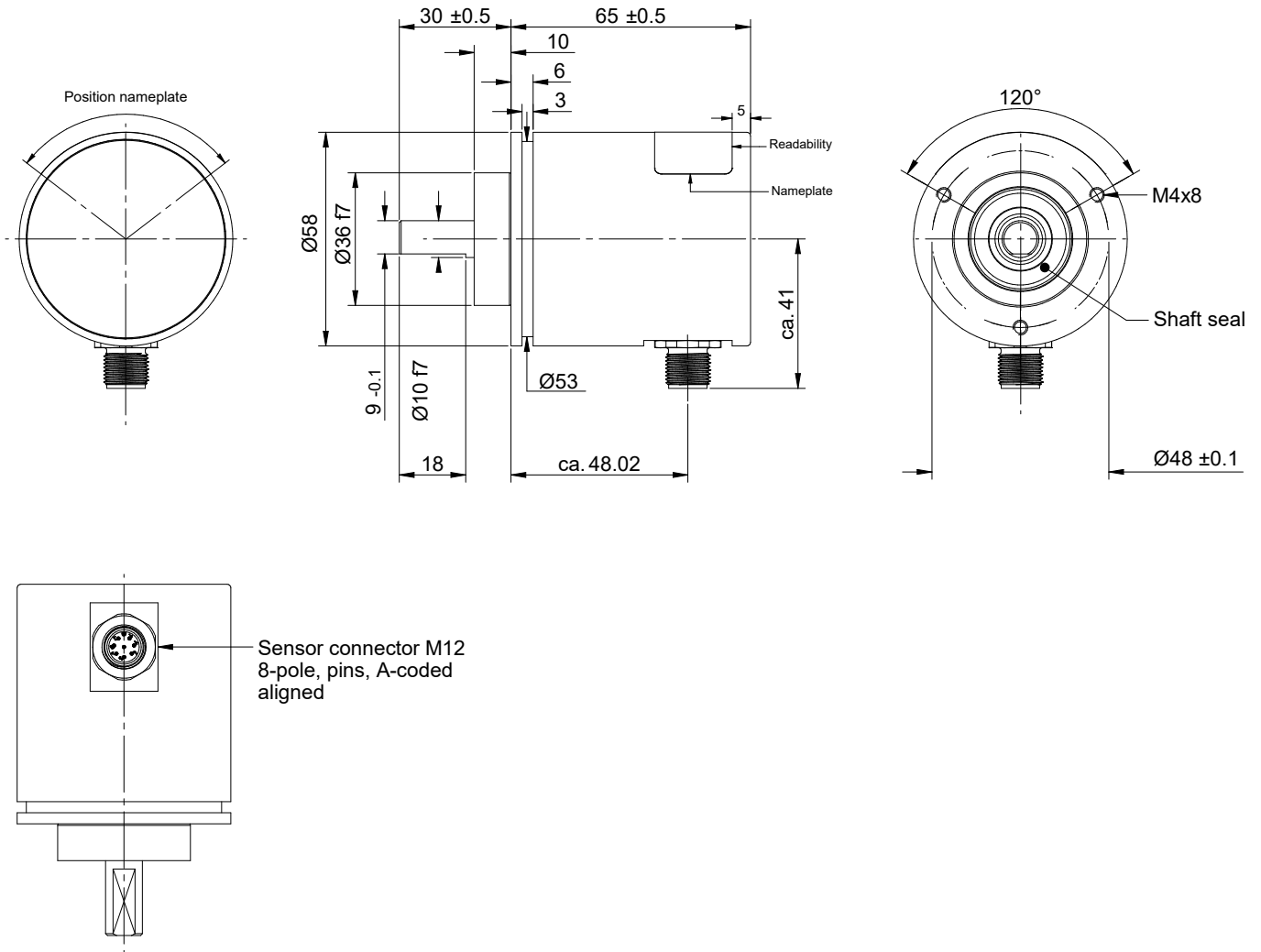
MODEL TBE58 - KA 65536 R W S E01



INSTALLATION DRAWINGS

MODEL TRE58 - KA 65536 R 4096 W S E01

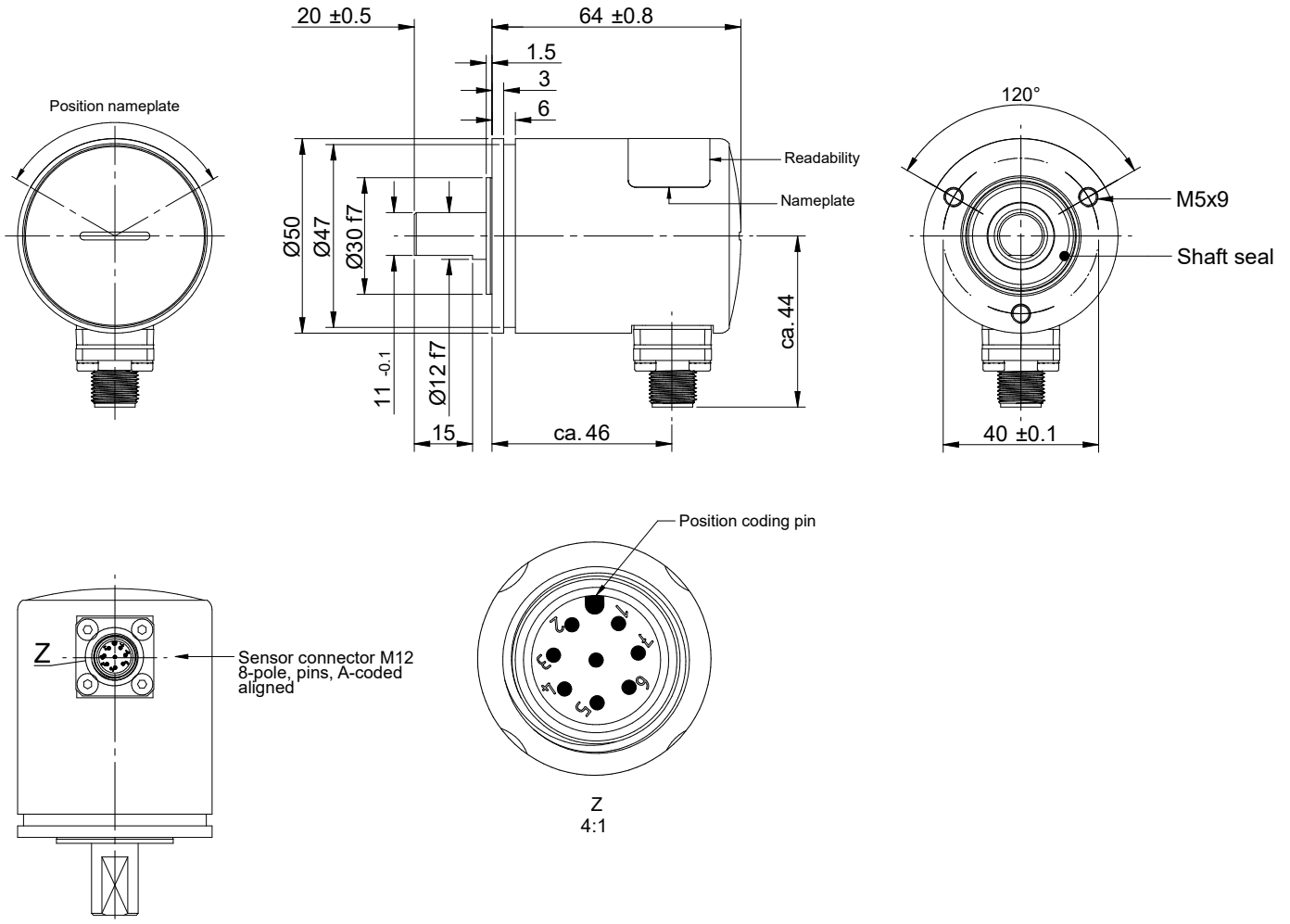
Dimensions in mm



INSTALLATION DRAWINGS

MODEL TRE50 - SA 65536 R 4096 W S E01

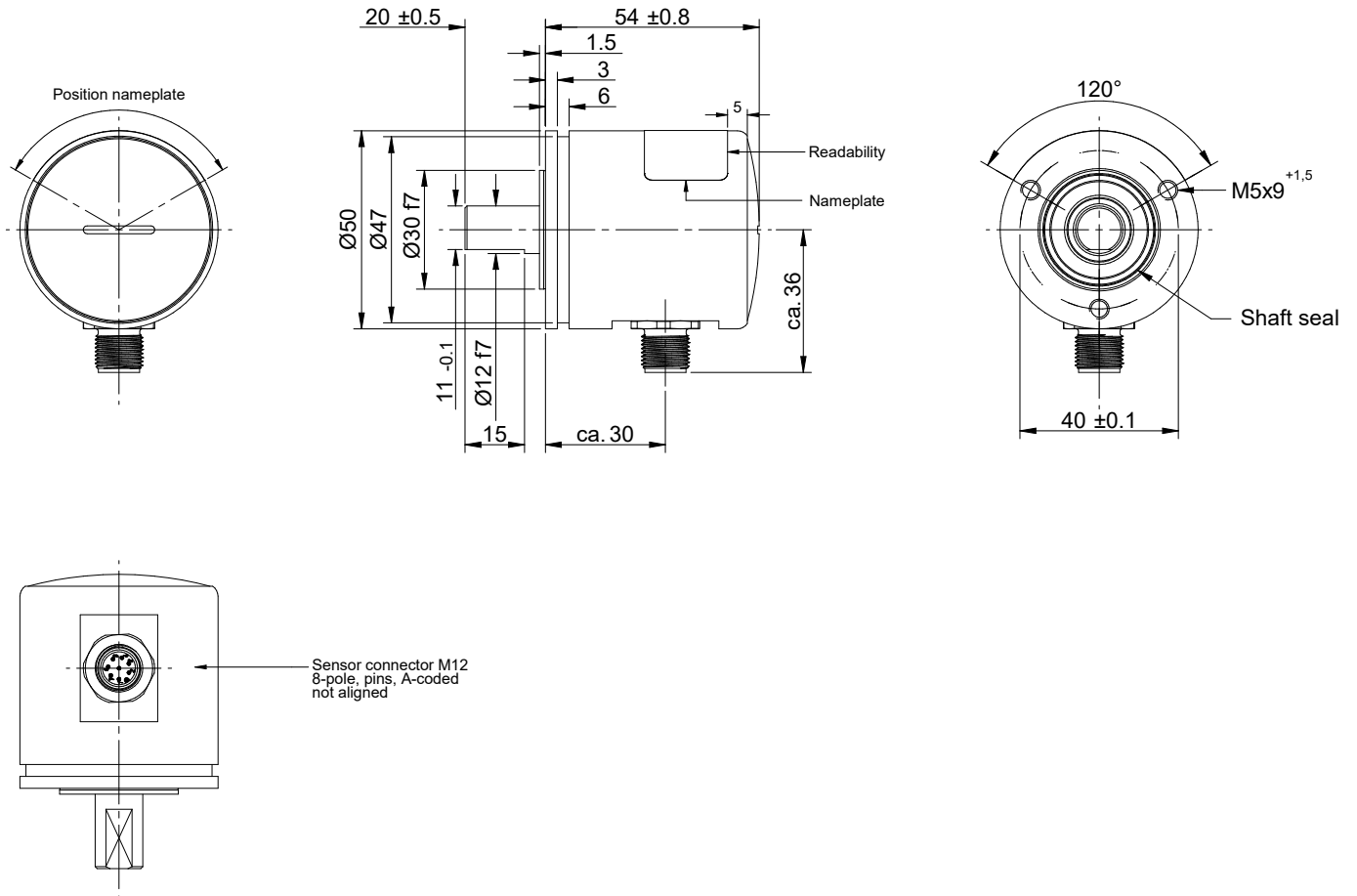
Dimensions in mm



INSTALLATION DRAWINGS

MODEL TBE50 - SA 65536 R W S E01

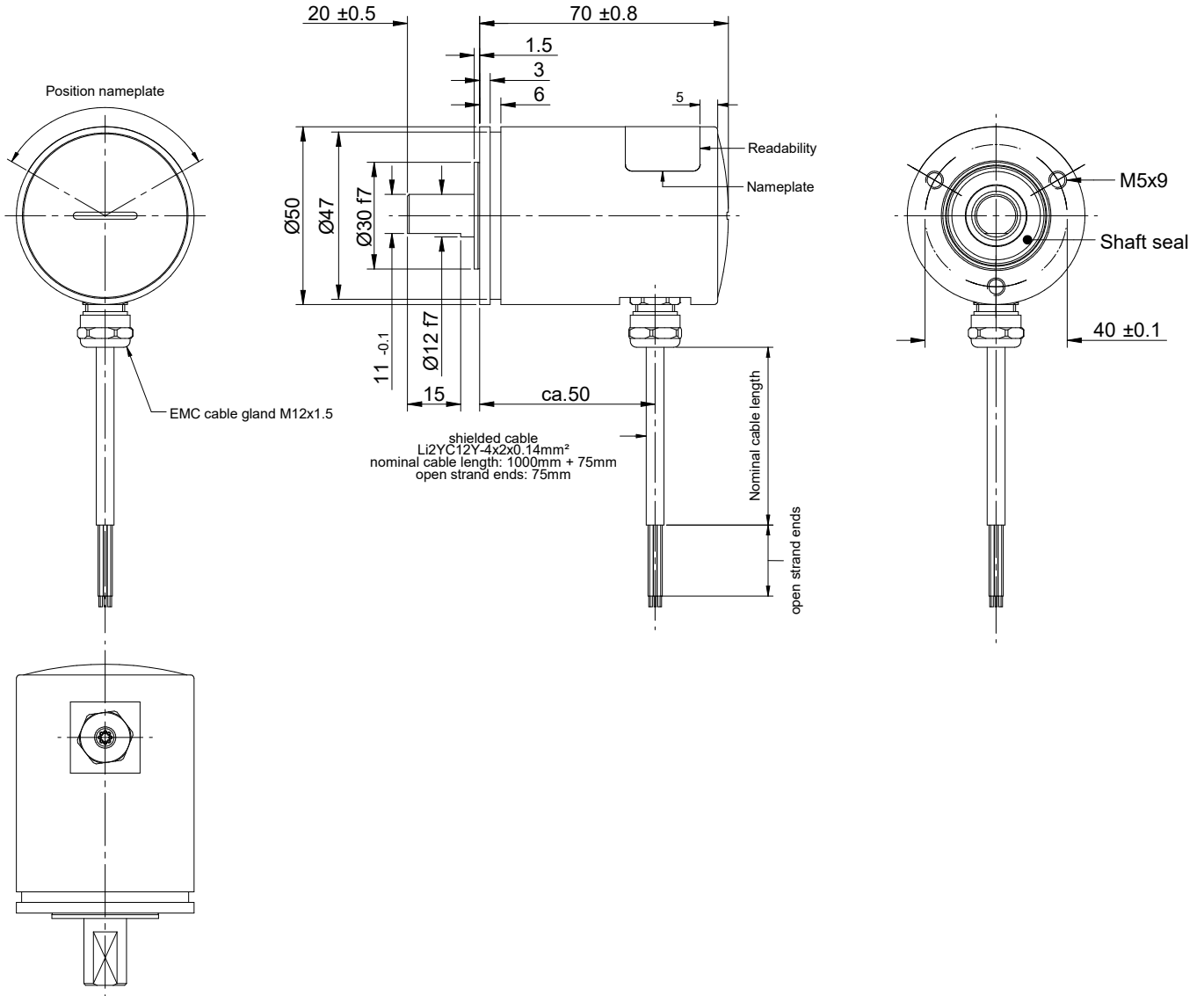
Dimensions in mm



INSTALLATION DRAWINGS

MODEL TRE50 - SA 65536 R 4096 W KX E01

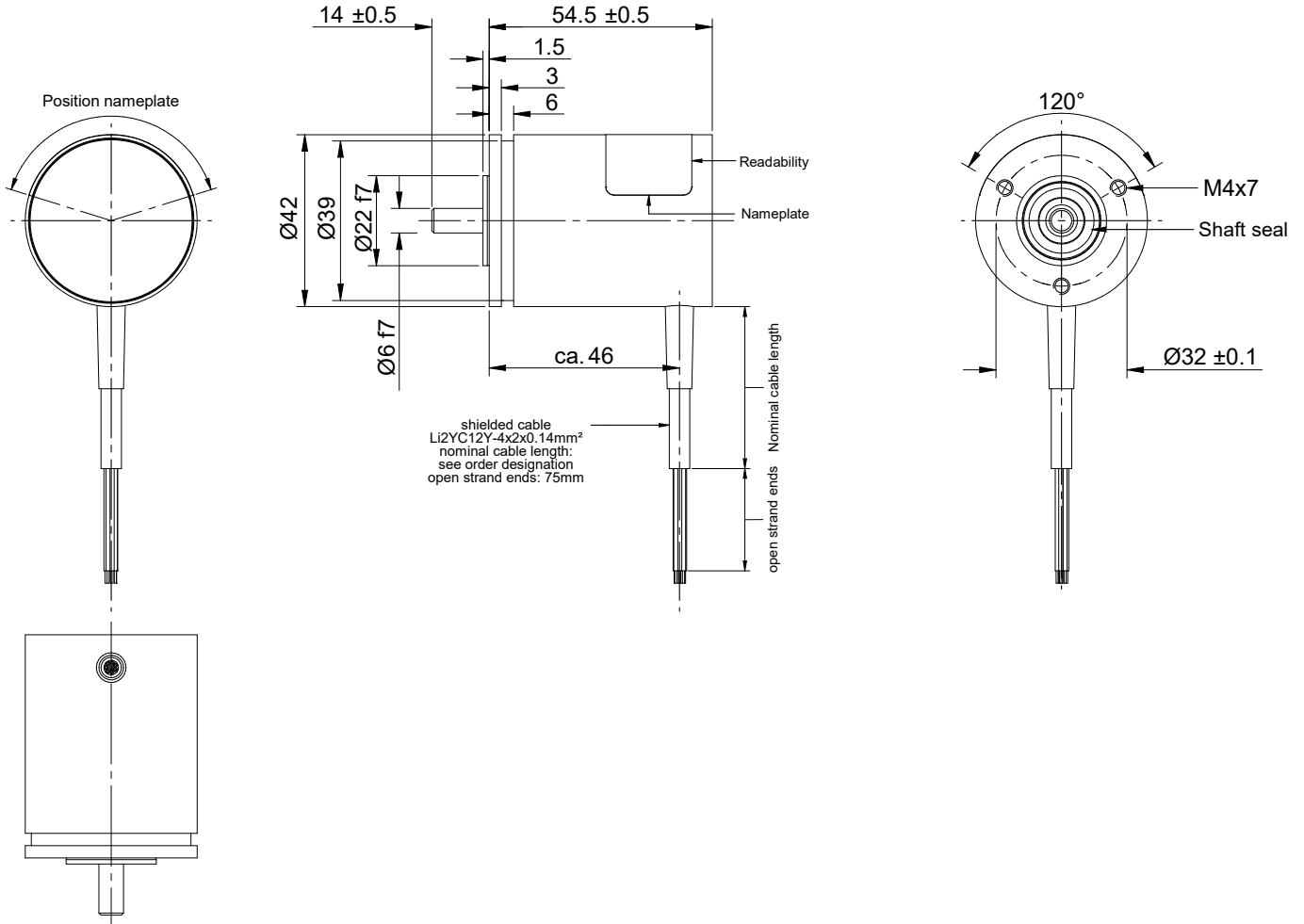
Dimensions in mm



INSTALLATION DRAWINGS

MODEL TRE42 - SA 65536 R 4096 W KX E01

Dimensions in mm



INSTALLATION DRAWINGS

MODEL TRE58-KA 65536 R 4096 W R2 S EXX, REDUNDANT VERSION

Dimensions in mm

