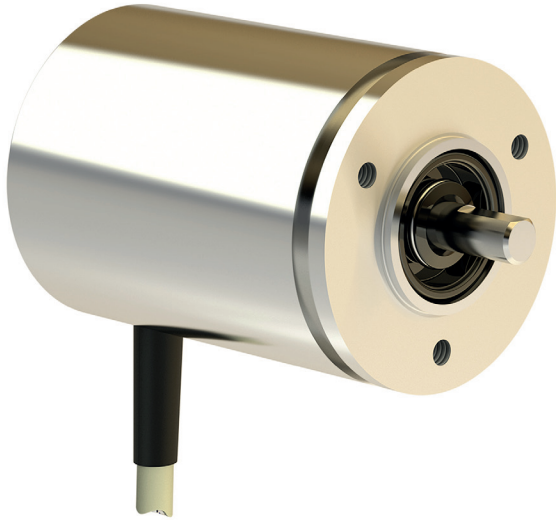


Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Document no.: TBN/TRN 14271 OE
Date: 23.04.2021



- **Sturdy design for tough applications, e.g. crane technology, construction machinery and mobile working equipment**
- **Miniature version in flange diameter Ø 42 mm**
- **Measuring range**
TBN: max. 65,536 steps/360°
TRN: max. 65,536 steps/rev. x 4096 revolutions
- **Protection grade IP65/IP66 (IP69K with optional housing potting)**
- **Interfaces:**
CANopen Safety SIL2,
CANopen
(CiA DS 406 Encoder Profile, 4.0.2)



Structure

- Sturdy housing made from seawater-resistant aluminium (AlMgSi1 - 3.2315) or stainless steel (material: 1.4305 or 1.4404) respectively magnetic steel (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 in the TRN model
- Electrical connections via connector M12x1 (Bus In and Bus Out option) or via cable
- Optional housing potting to meet IP69K requirements
- Interface as CANopen Safety SIL2 in accordance with IEC 61508 or as Standard CANopen

Function

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.

With the TBN model, one rotation (max. 65,536 steps) is recorded.

With the subsequent absolute transmission, the TRN shaft encoder reaches a measuring range of up to 4096 rotations

With the CANopen Safety protocol, both the position value and the speed value (SRDO - Safety Relevant Data Object) meet the requirements of SIL2. The values for the redundant system are compared and checked for plausibility. If the check is positive, the output will be normal and bit-inverted.

Comprehensive checks using CRC, timing monitoring, voltage monitoring etc. ensure that reliable position and speed values are output.

The speed value can be parameterised via the gate time (1 to 1000 ms) depending on the specific application.

In the event of a fault, emergency protocols are issued and a fault listing is created. The target function here is to move to a safe state in the event of a fault. This is also referred to as the functional safety of the shaft encoder.

The position and speed values (PDO - Process Data Object) are output via the CANopen protocol.

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Technical data

Electrical data

■ Sensor system:	Magnetic sensor systems
■ Resolution:	TBN: max. 16 Bit (65,536 steps/360°) TRN: max. 16 Bit + 12 Bit (=28 Bit)
■ Speed value:	In addition to the position signal, a digits/gate time speed signal is also generated, which can be adapted by the customer via an adjustable gate time for the application. - Speed value data format: 16 Bit - Gate time: 1 to 1000 ms - Internal sampling frequency: 1ms - Maximum speed: approx. 120 rpm (at 14 Bit and gate time 1000 ms)
■ Total step count:	TBN: max. 65.536 steps/ revolution TRN: max. 268.435.456 steps (65.536 steps/revolution x 4096 revolutions)
■ Operating voltage:	9 to 36 VDC with reverse-polarity protection and short-circuit protection
■ Power consumption:	TBN: < 1 W TRN: < 1.5 W
■ Code sense:	CW* or CCW**, parameterisable
■ Reference value:	0 to (total step count -1)
■ Accuracy TBN:	≤ ± 0.05 %
■ Accuracy TRN:	≤ ± 0.2 %
■ Reproducibility:	≤ ± 0.02 %
■ Temperature drift:	≤ 0.02°/K

*) CW = increasing output value when shaft rotating clockwise

**) CCW = increasing output value when shaft rotating anti-clockwise

CANopen/CANopen Safety SIL2 overview of specifications

CiA DS301	CANopen Application Layer and Communication Profile, Version 4.1
CiA DS406	CANopen - Device Profile for Encoders, Version 4.0.2
CiA DS305	CANopen - Layer Setting Services and Protocol (LSS)
DIN EN 50325-5: 2016-06	Industrial communication sub-system based on ISO 11898 (CAN) - Part 5: Functionally safe communication based on EN 50325-4
■ CAN-Interface:	according to ISO/DIS 11898
■ Address setting:	over LMT/LSS or SDO
■ Terminating resistance:	to be implemented separately
■ Max. transmission length:	30 m
■ Bootloader function:	yes System prerequisites: - PCAN-USB adapter (www.peak-system.com) including USB cable for PC connection - CANopen tester TWK software, hex file for updating - Shaft encoder connecting cable
■ Number of PDOs:	2 Tx
■ Number of SRDOs:	2 Tx (CANopen Safety SIL2)
■ PDO-Modes:	sync, async, cyclic, acyclic
■ SRDO-Mode:	cyclic (CANopen Safety SIL2)
■ Variables PDO-Mapping:	no
■ Emergency Message:	yes
■ Heartbeat:	yes
■ No. of SDOs:	1 Rx/1 Tx
■ Device Profile:	CiA DSP 406 Version 4.0.2

The profile details are described in detail in the user manual TBN/TRN15469. The CRC calculation is carried out using the CRC-Calculator program, which can be provided to the customer on request.

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Technical data

Overall system and safety

- Duty cycle (rise time) supply voltage: 500 ms (10 % to 90 %)
- Information density: up to 10 000 messages/s
- Storage cycle time: 3 s per memory cycle
- Setup Time: ~ 2 s @ T ≥ +20 °C
- Time between the detection of a fault and the output of the emergency message: 100 ms (voltage supply)
5 s (RAM test, all individual bits ok)
2 s (ROM test (within setup time))
- TÜV Certificate Registration No.: 44 799 13172915
- Safety standard: IEC 61508: 2017: Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
- EDS file: The EDS file is available on request.

Mechanical data

- Operating speed: max. 1.000 min⁻¹ (with shaft sealing ring)
max. 10.000 min⁻¹ (with Nilosring)
- Angular acceleration: 10⁵ rad/s² max.
- Moment of inertia (rotor): 20 gcm²
- Operating torque: ≤ 8 Ncm
- Starting torque: ≤ 3 Ncm
- Permissible shaft load: 250 N axial, 250 N radial (Ø 58 and Ø 50 - design)
50 N axial, 50 N radial (Ø 42 - standard design, other values optional)
- Bearing service life: ≥ 10⁹ rotations*
- Mass: TBN Ø 58: Aluminium approx. 0.3 kg, Steel approx. 0.4 kg
TRN Ø 58: Aluminium approx. 0.5 kg, Steel approx. 0.7 kg
TRN Ø 42: Aluminium approx. 0.3 kg, Stainless steel approx. 0.35 kg
Weight specifications for the other constructions on request.

*) This value applies for maximum shaft load

Ambient data

- Working temperature range: - 40 °C to + 82 °C
- Storage temperature range: - 20 °C to + 60 °C (due to packaging)
- Resistance:
 - to shock: 250 m/s², 6 ms, in 3 axes every 100x (higher values optional)
DIN EN 60068-2-27
 - to vibration: 100 m/s², 5 Hz ... 2000 Hz, in 1 h in 3 axes, (higher values optional)
DIN EN 60068-2-6
- Protection grade (DIN EN 60529): Shaft side: IP66 - shaft sealing ring, IP65 - Nilos ring
Housing side: IP67, IP69K optional (housing potting)
(For higher degrees of protection up to IP69K, please contact our technical contact persons)
- Power frequency magnetic field immunity test (EN 6100-4-8): 30 A/m, test criterion A (±16 digit)
100 A/m, test criterion B

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Technical data

Safety data TBN

Service life	20 years	
HFT	0	Hardware fault tolerance
SFF	96.23%	Safe failure fraction
DC	92.64%	Diagnostic Coverage
PFH	6.48003 x10 ⁻⁸ h	Probability of dangerous Failure per hour

Safety data TRN

Service life	20 years	
HFT	0	Hardware fault tolerance
SFF	96.27%	Safe failure fraction
DC	92.95%	Diagnostic Coverage
PFH	7.69932 x10 ⁻⁸ h	Probability of dangerous Failure per hour

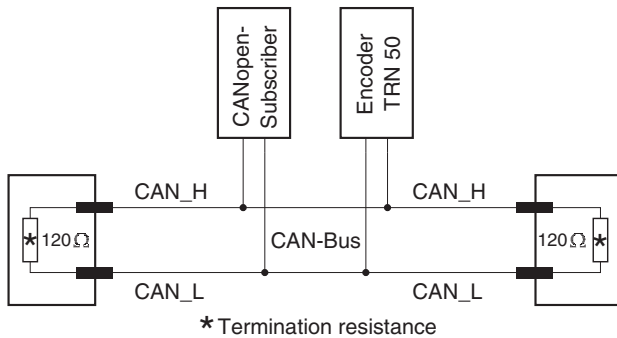
EMC standards

EN 61000-6-4:2006 + A1:2011	EMC Part 6-4: Generic standards-Emission standard for industrial environments
EN 61000-6-2:2005	EMC Part 6-2: Generic standards-Immunity for industrial environments
EN 61000-4-2:2009	EMC Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
EN 61000-4-3:2006 A1:2008 + A2:2010	EMC Part 4-3: Testing and measurement techniques - Radiated, radio frequency, electromagnetic field immunity test
EN 61000-4-4:2004	EMC Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
EN 61000-4-5:2006	EMC Part 4-5: Testing and measurement techniques - Surge immunity test
EN 61000-4-6:2009	EMC Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 61000-4-8:2010	EMC Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
EN 61000-4-29:2000	EMC Part 4-8: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests
IEC 61326-3-2:2018	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 3-2: Immunity for safety-related systems and for equipment intended to perform safety related functions (functional safety) - industrial applications with specified electromagnetic environment

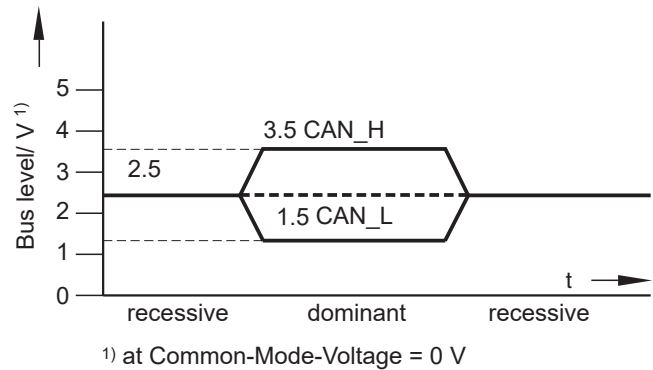
Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Bus connection, output level and data profile

Bus connection as per ISO/DIS 11898



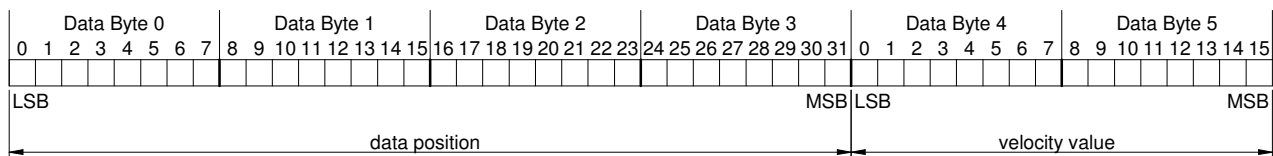
Output level as per ISO/DIS 11898



Data profile CANopen

PDO1/2 (position and speed)

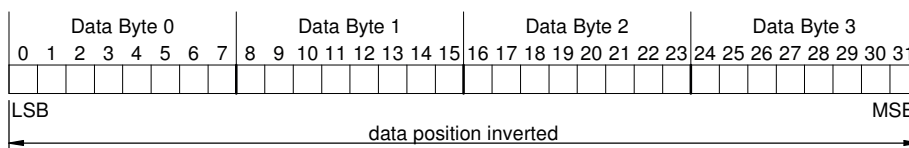
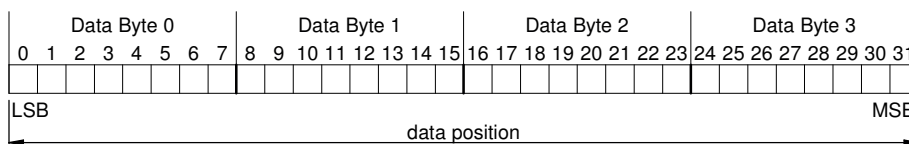
PDO 1 / PDO 2



Data profile CANopen Safety SIL2 (model TRN)

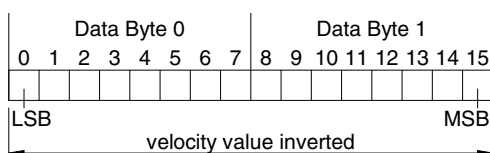
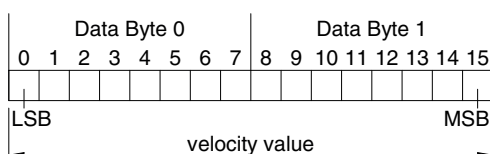
SRDO1 (position) – normal and bit-inverted

SRDO 1



SRDO2 (speed) – normal and bit-inverted (models TRN and TBN)

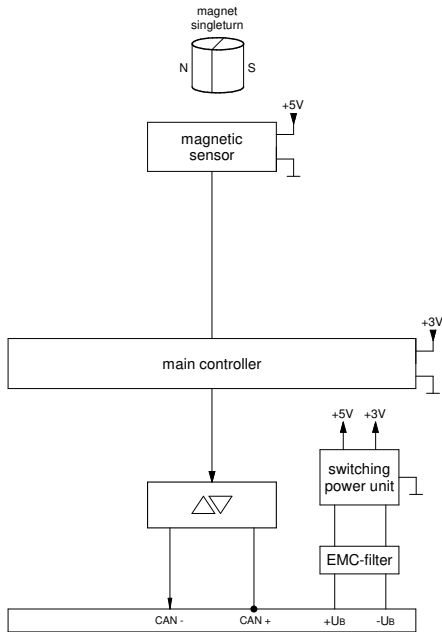
SRDO 2



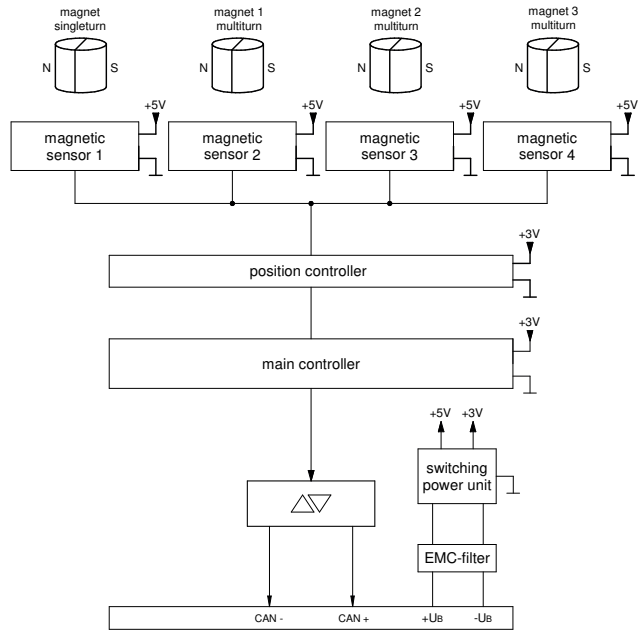
Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Schematic diagrams TBN and TRN (construction Ø 58 – CANopen shown)

Model: TBN



Model: TRN



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Slewing ring software 'S' for TRN Safety encoder

For applications in wind turbines, cranes, transport units, etc. it is desirable to emulate the function of a mechanical gearbox. For example, if the rotary encoder is coupled to the drive axle of a gearbox or if the position of a slewing ring is to be detected using a measuring gear with coupled rotary encoder.

Software version 'S' provides this function. The encoder is located on the fast gear axis (drive wheel) and calculates the position of the slow gear axis (output wheel) via the transmission ratio. The transmission ratio and the resolution of the output axis (digit per revolution) can be freely selected. The output code is consistent beyond the code range of the encoder, regardless of the selected transmission ratio. The transmission ratio can be even or odd.

The user does not have to evaluate the gear revolutions and can run through any number of gear periods in one direction. This means that non-reversing operation is possible.

The slew ring software manages a global offset secured by a CRC algorithm, which ensures that a full gear period is always available, even at the end of the encoder's code range. For the correct function of the module, the encoder may only be rotated a pre-determined number of revolutions (100 revolutions drive side by default) in a de-energised state.

Slewing ring parameter									
Index	Sub	Description	Length		Memory		Range/value	Action	Default
			COM	MEM	Type	Location			
3100	0	largest_supported_sub_index	Byte	Byte	ro	ROM	3	-	3
3100	1	No. of teeth slewing ring, Output wheel	Word	Word	rw	E ² PROM	e.g. 131 teeth	-	131/ 0x0083
3100	2	No. of teeth on the pinion (encoder), Drive wheel	Word	Word	rw	E ² PROM	e.g. 11 teeth	-	11/ 0x000B
3100	3	Resolution of the Output wheel	Word	Word	rw	E ² PROM	360, 3600, 36000	-	360*/ 0xC355 3600*/ B34A 36000*/ 0x8CA0

* Resolutions: 1°, 1/10°, 1/100°

The values must be realisable with the total number of steps (resolution singletour part, maximum number of revolutions, see also SDO objects 0x6501 and 0x6502. Otherwise the parameter set is rejected.

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Control of the slewing ring function and CRC calculation

For the validation of the safe parameters of the slewing ring software there is the object 0x31FE. With the value 0xA5, the slewing ring parameters are switched active and deactivated with the value 0x0.

Validation of the slewing ring parameters									
Index	Sub	Description	Length		Memory		Range/value	Action	Default
			COM	MEM	Type	Location			
31FE	0	Data valid Flag	Byte	Byte	rw	E ² PROM	0/ 0xA5	-	0x0

The CRC calculation is done using the CRC programme 2.0.5 with integrated slewing ring calculation, which is provided to the customer. The calculated CRC values are written to the objects 0x31FF, 0x61FF and 0x13FF. Note the order of execution when enabling via 0xA5:

1. 0x31FE Enable via 0xA5 (slewing ring function)
2. 0x61FE Enable via 0xA5 (Safety position recording)
3. 0x13FE Enable via 0xA5 (SRDO parameter)

and when resetting the flags, each with the value 0x0. Each write access to a safe parameter leads to the resetting of the associated Valid Flag and thus also automatically to the resetting of the SRDO Valid Flag (object 0x13FE).

The valid flags can also be deactivated directly by writing 0x00 to them.

CRC-calculation Slewing ring									
Index	Sub	Description	Length		Memory		Range/value	Action	Default
			COM	MEM	Type	Location			
31FF	0	largest_supported_sub-index	Byte	Byte	ro	ROM	2		2
31FF	1	CRC Slewing ring function	Word	Word	rw	E ² PROM	0 - 0xFFFF	-	0x1C8D

After resetting the gear parameters, the output position is undefined within the code range of the output resolution (object 0x3100/3). By setting a preset value (object 0x6100/2) a defined initial position is set.

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Electrical connection, mating connector, contact configuration M12x1, note

Electrical connection

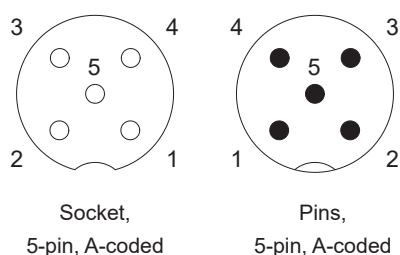
- TBN Ø 58/TRN Ø 58: With connector M12x1, pin, 5-pin, A-coded
With 2 connectors M12x1, pin and socket, 5-pin, A-coded, Bus In and Bus Out
With radial cable, twisted pair, e.g. 2 x 2 x 0.25 mm², shielded (standard)
- The connection assignment TYxxxxx is part of the scope of supply and is included with each device.

Mating connector (to be ordered separately)

Order identification	STK5GS56	STK5GP90	STK5WS58	STK5WP102	STK5GS107	STK5GP106
Type	M12x1	M12x1	M12x1	M12x1	M12x1	M12x1
Pole number	5	5	5	5	5	5
Contact design	Socket, A-coded	Pin, A-coded	Socket, A-coded	Pin, A-coded	Socket, A-coded	Pin, A-coded
Connector design	straight	straight	angled	angled	straight	straight
Housing material	Brass, nickel-plated	Brass, nickel-plated	Brass, nickel-plated	Brass, nickel-plated	stainless Steel 1.4404	stainless Steel 1.4404
Cable ø (mm)	6 - 8	6 - 8	6 - 8	6 - 8	5.5 - 8.6	5.5 - 8.6
Connection type	Screws	Screws	Screws	Screws	Screws	Screws
Degree of protection class	IP67	IP67	IP67	IP67	IP67	IP67
Shielding	On the housing (V3)	On the housing (V3)	On the housing (V3)	On the housing (V3)	On the housing (V3)	On the housing (V3)
Max. wire size (mm ²)	0.75	0.75	0.75	0.75	0.75	0.75

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.

Contact configuration of the M12x1 5-pin connector, connector side view



Note:

The 5-pin M12x1 connector is used as standard. There are three different galvanic concepts for potential isolation (V1-V3) (see also page 8).

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Galvanic potential isolation: $-V_s$, CAN_GND and housing/cable shielding

The description of the different versions of galvanic potential (V1 to V3) relates exclusively to the interrelationships between the individual potentials ($-V_s$, CAN_GND and housing/cable shielding), i.e. whether or not they are galvanically connected. The connection assignment (TYxxxx) should be observed. This connection assignment is included with each device and a copy can be requested as needed.

V1: CAN_GND, $-V_s$ and housing/cable shielding galvanically isolated

This version has complete galvanic isolation. The housing/cable shielding are galvanically isolated from $-V_s$ and CAN_GND, and $-V_s$ and CAN_GND are also galvanically isolated from one another. The cable shielding is galvanically connected to the housing via the connector housing

PIN	Function
1	CAN GND
2	Operating voltage + V_s
3	Operating voltage - V_s
4	CAN_H
5	CAN_L

V2: CAN_GND and $-V_s$ not galvanically isolated, cable shielding galvanically isolated

This version has partial galvanic isolation: The housing/cable shielding are galvanically isolated from $-V_s$ and CAN_GND. But: $-V_s$ and CAN_GND are not galvanically isolated from one another. The cable shielding is assigned to pin 1.

PIN	Function
1	Shielding
2	Operating voltage + V_s
3	Operating voltage - V_s and CAN-GND
4	CAN_H
5	CAN_L

V3: CAN_GND, $-V_s$ and cable shielding/housing not galvanically isolated

This version has no galvanic isolation: The housing/cable shielding are not galvanically isolated from $-V_s$ and CAN_GND, and $-V_s$ and CAN_GND are not galvanically isolated from one another.

PIN	Function
1	Shielding – short-circuited with PIN 3
2	Operating voltage + V_s
3	Operating voltage - V_s and CAN-GND, short-circuited with PIN 1
4	CAN_H
5	CAN_L

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Order identification for design Ø 58

TRN	58 -	KP	A	16384	R	4096	S4	S1	V1	N	01
										01	Electrical and mechanical versions*
											Output signal:
										N	CANopen-Interface
											Galvanic Isolation (see also page 8)
									V1		-V _s ≠ CAN_GND ≠ Shield/housing
									V2		-V _s = CAN_GND ≠ Shield/housing
									V3		-V _s = CAN_GND = Shield/housing
											Electrical connection (see also page 8)
											→ Combine S, T, K or L and quantity
									1		1 x Device connector or cable
									2		2 x Device connector or cable (Bus In/Bus Out)
									S		Device connector M12, 5-polig, radial
									T		Device connector M12, 5-polig, axial
									K		Cable, 1m, radial (other lengths on request)
									L		Cable, 1m, axial (other lengths on request)
											CANopen-Interface-Version:
									C3		Standard CANopen, Profile version 4.0.2
									S4		CANopen Safety SIL2, Profile version 4.0.2
											Measuring range:
				4096							Rotations (not applicable for TBN)
											Output code:
									R		Binary
											Resolution:
				4096							Steps/resolutions - 12 Bit
											...
				65536							Steps/resolutions - 16 Bit
											Housing material:
			A								Aluminium AlMgSi1 - 3.2315
			S								Stainless steel - 1.4305
			V								Stainless steel - 1.4404
			B								Magnetic steel
											Flange and shaft:
									K		Clamp flange, shaft Ø 10 mm with flattened areas**
									KF		Clamp flange, shaft Ø 10 mm with woodruff key**
									KP		Clamp flange, shaft Ø 10 mm with feather key**
									KZ		Clamp flange, shaft for measurement gear ZRS see data sheet ZRS 11877 (design Ø 58)**
									S		Synchro flange, shaft Ø 6 mm
									SR		Synchro flange, clamp flange for Ø 12 mm and for torque support ZMS 12939 (design Ø 58)
									SP		Synchro flange, shaft Ø 12 mm with feather key
											Design form:
									58		Design form Ø 58 mm
											Model:
TBN											Monotour rotary encoder with CANopen-Interface
TRN											Multitour rotary encoder with CANopen-Interface

* According to the datasheet, the basic (standard) versions are indicated by the number 01. Deviations are indicated by a version number and are documented at the factory.

** Standard version with shaft sealing ring

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Order identification for design Ø 50

TRN	50 -	S	A	16384	R	4096	C3	S1	V1	N	01
-----	------	---	---	-------	---	------	----	----	----	---	----

01 **Electrical and mechanical versions***

Output signal:

N CANopen-Interface

Galvanic Isolation (see also [page 8](#), only S4)

V1 $-V_s \neq \text{CAN_GND} \neq \text{Shield/housing}$

V2 $-V_s = \text{CAN_GND} \neq \text{Shield/housing}$

V3 $-V_s = \text{CAN_GND} = \text{Shield/housing}$

Electrical connection (see also [page 8](#))

→ Combine S, T, K or L and quantity

- 1 1 x Device connector or cable
- 2 2 x Device connector or cable (Bus In/Bus Out)
- S Device connector M12, 5-polig, radial
- T Device connector M12, 5-polig, axial
- K Cable, 1m, radial (other lengths on request)
- L Cable, 1m, axial (other lengths on request)

CANopen-Interface-Version:

C3 Standard CANopen, Profile version 4.0.2

S4 CANopen Safety SIL2, Profile version 4.0.2

Measuring range:

4096 Rotations (not applicable for TBN)

Output code:

R Binary

Resolution:

4096 Steps/resolutions - 12 Bit

...

65536 Steps/resolutions - 16 Bit

Housing material:

A Aluminium AlMgSi1 - 3.2315

S Stainless steel - 1.4305

V Stainless steel - 1.4404

B Magnetic steel

Flange and shaft:

S Synchro flange, shaft Ø 12 mm with flattened area**

Design form:

50 Design form Ø 50 mm

Model:

TBN Monotour rotary encoder with CANopen-Interface

TRN Multitour rotary encoder with CANopen-Interface

* According to the datasheet, the basic (standard) versions are indicated by the number 01. Deviations are indicated by a version number and are documented at the factory.

** Standard version with shaft sealing ring

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Order identification for design Ø 42

TRN	42 -	S	S	16384	R	4096	S4	K	N	01
										01 Electrical and mechanical versions*
										Output signal: N CANopen-Interface
										Electrical connection: K Cable, 1m, radial (other lengths an request) L Cable, 1m, axial (other lengths an request)
										CANopen-Interface-Version: C3 Standard CANopen C3, Profile version 4.0.2 S4 CANopen Safety SIL2, certified, Profile version 4.0.2
										Measuring range: 4096 4096 rotations (not applicable for TBN)
										Output code: R Binary
										Resolutions: 4096 Steps/resolution - 12 Bit ... 65536 Steps/resolution - 16 Bit
										Housing material: A Aluminium - 3.2315 S Stainless steel 1.4305 V Stainless steel 1.4404 B Magnetic steel
										S Flange and shaft: Synchro flange, shaft Ø 6 mm
										Design form: 42 Design form Ø 42
										Model: TBN Monotour rotary encoder with CANopen-Interface TRN Multitour rotary encoder with CANopen-Interface

* According to the datasheet, the basic (standard) versions are indicated by the number 01. Deviations are indicated by a version number and are documented at the factory.

Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Allocation of flange type, bearing sealing, speed and degree of protections (Design Ø58)

Flange	Performance	rpm	Protection grade
Clamp flange K, KF, KP	Sealing ring	max. 1000 min ⁻¹	IP67
			IP69K - housing side (optional)
Clamp flange KZ	Sealing ring	max. 1000 min ⁻¹	IP67
			IP69K - housing side (optional)
Synchro flange S, SP	Sealing ring	max. 1000 min ⁻¹	IP67
	Nilos ring	max. 10.000 min ⁻¹	IP65

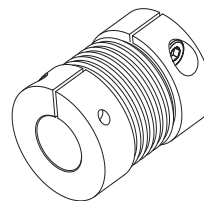
Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Accessories (please note the shaft encoder version)

Play-free bellows coupling BKM 26 / x - y

x and y: Bore diameter for shaft support

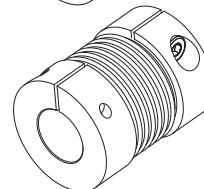
See data sheet [BKM 11995](#)



Play-free bellows coupling BKK 32 / x - y

x and y: Bore diameter for shaft support

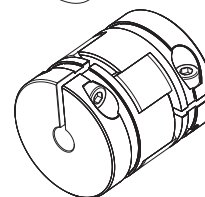
See data sheet [BKK 11840](#)



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

x and y: Bore diameter for shaft support

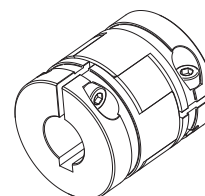
See data sheet [KK 12301](#)



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

x and y: Bore diameter for shaft support

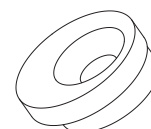
See data sheet [KK 12301](#)



Mounting brackets KL 66-2-S

Mounting brackets for shaft encoder assembly.

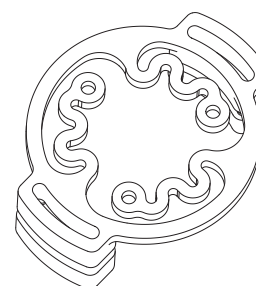
See data sheet [MZ 10111](#)



Torque support ZMS58

Torque support/stator coupling. Suitable for use as a shaft encoder bracket for the clamping shaft 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

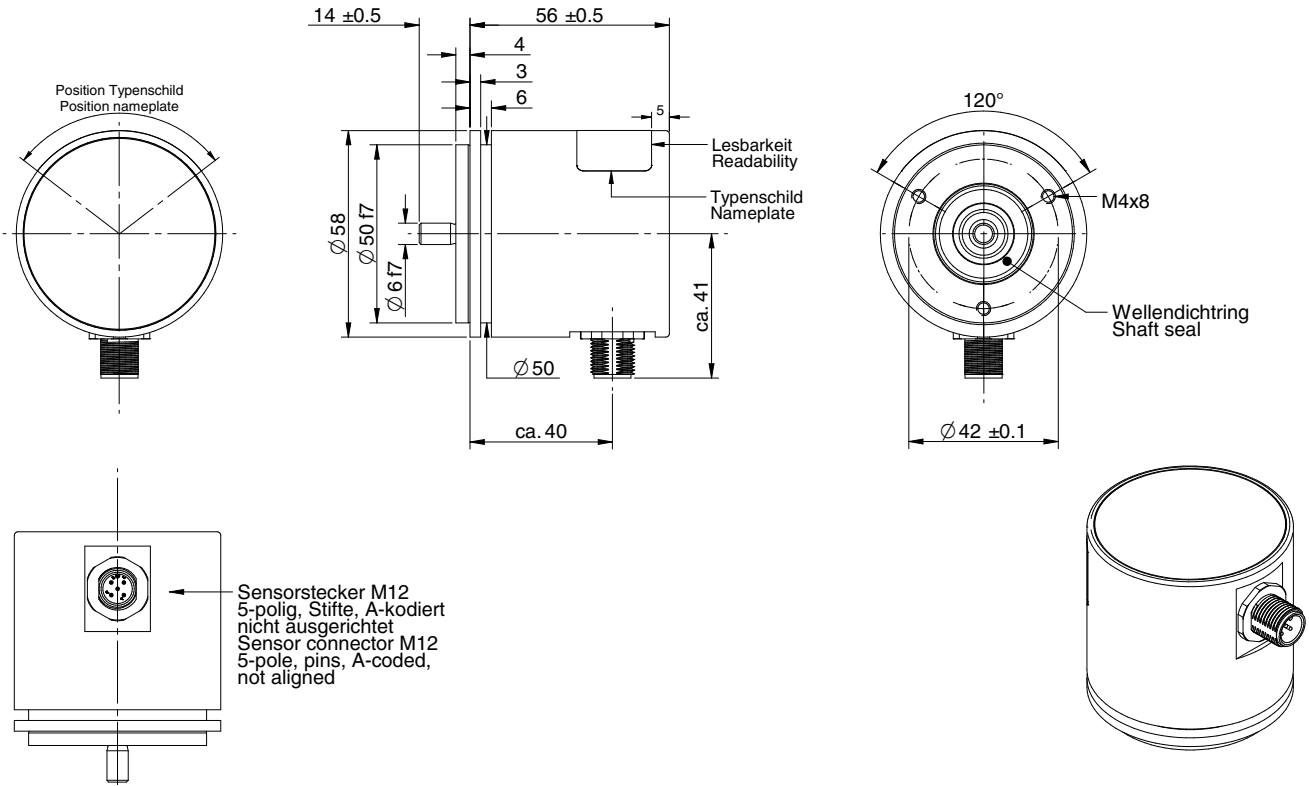
Play-free measuring wheel ZRS for Ø 58 mm shaft encoders for live ring applications.

See data sheet [ZRS 11877](#)

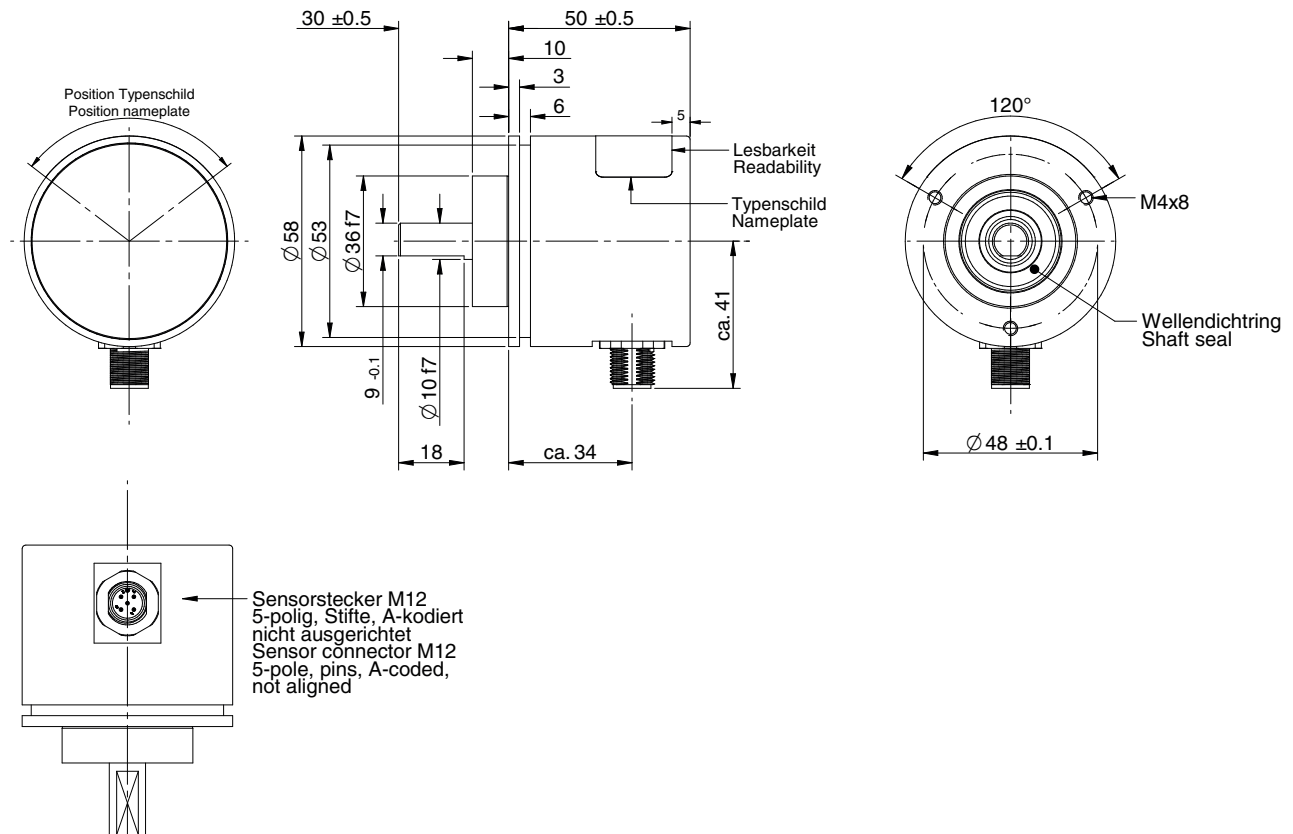
Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

Order identification: e.g. TBN58 - SA 65536 R S4 S1 V1 N01



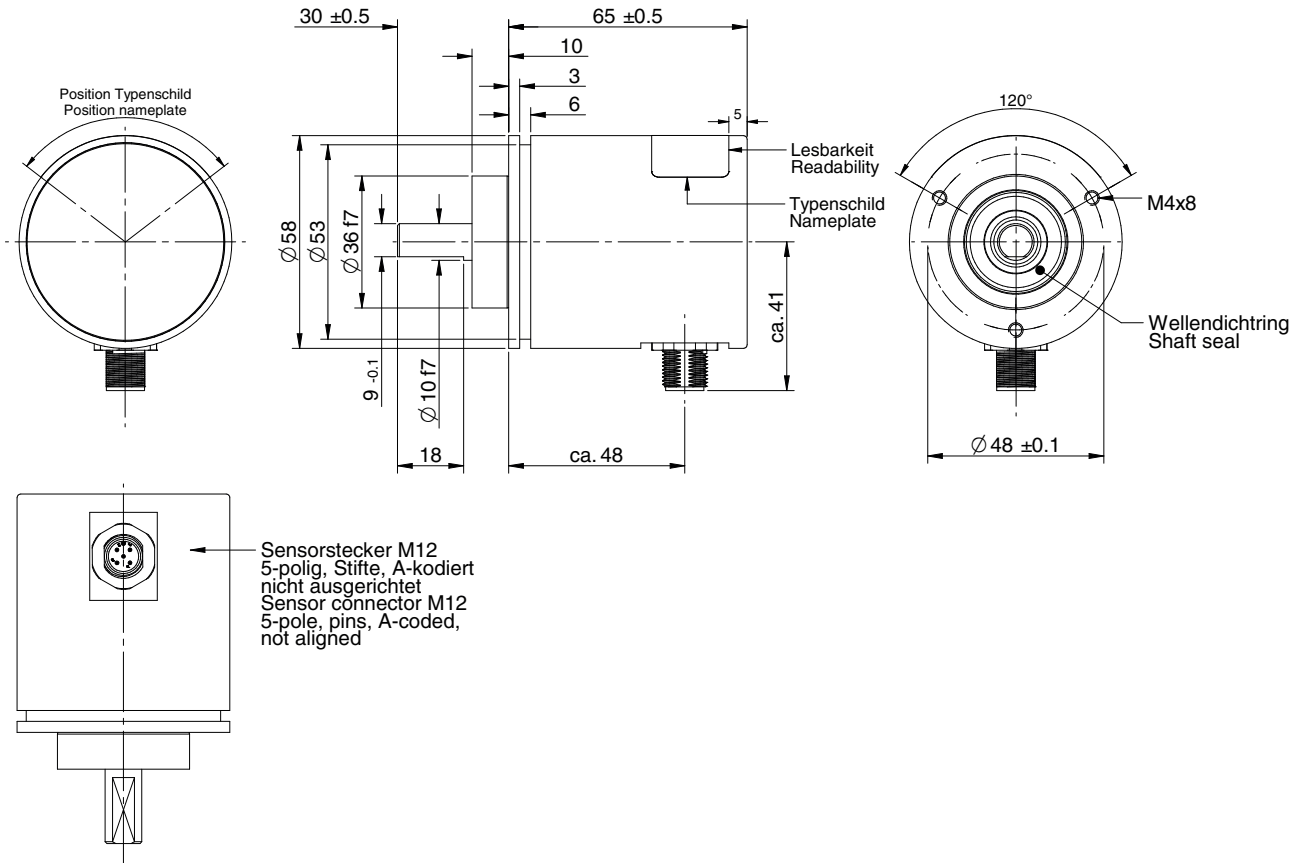
Order identification: e.g. TBN58 - KA 65536 R S4 S1 V1 N01



**Absolute Monotour/Multitour shaft encoder
models TBN/TRN with CANopen Safety SIL2 and CANopen**

Installation drawings (dimensions in mm)

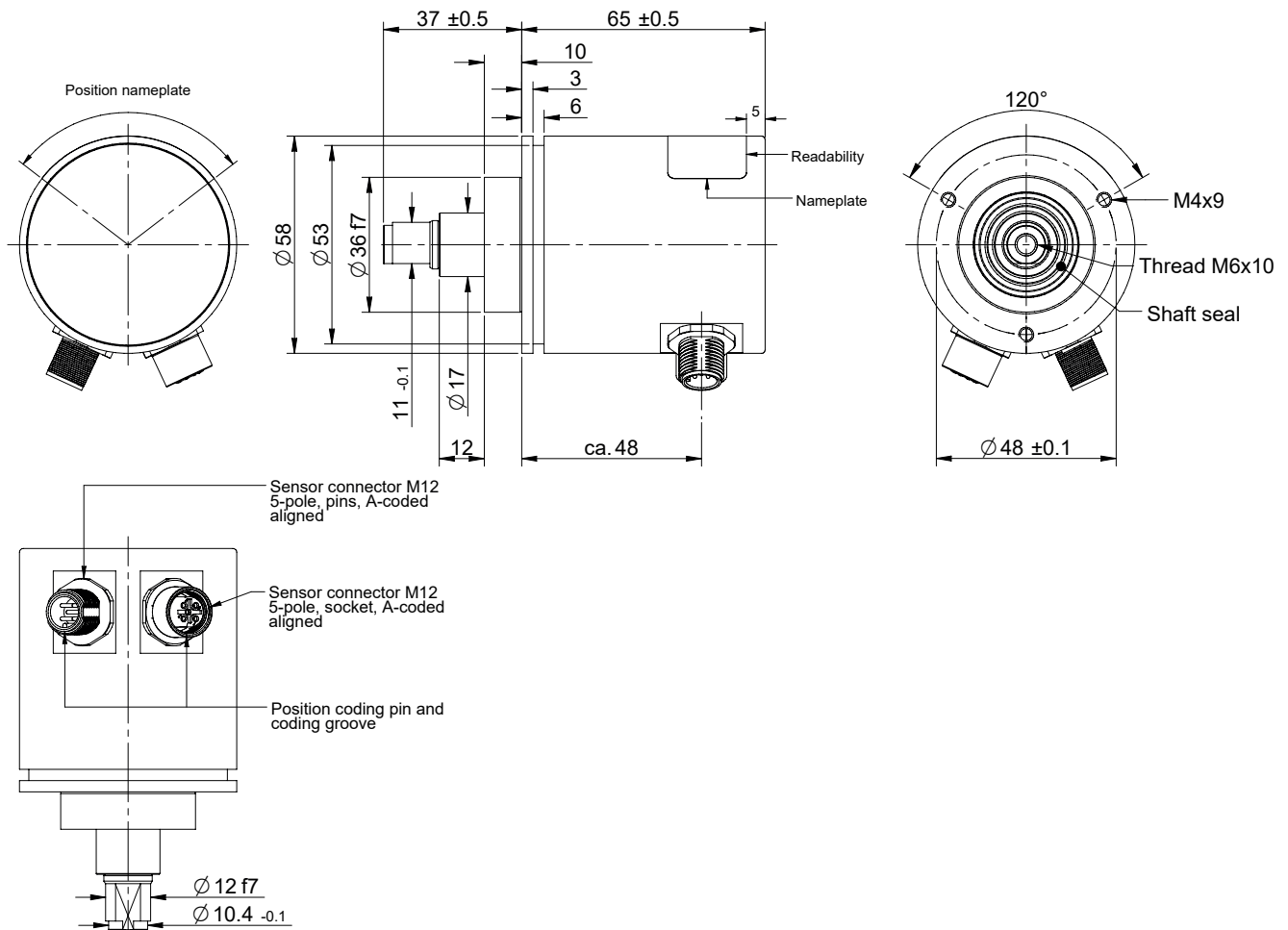
Order identification: e.g. TRN58 - KA 65536 R 4096 S4 S1 V1 N01



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

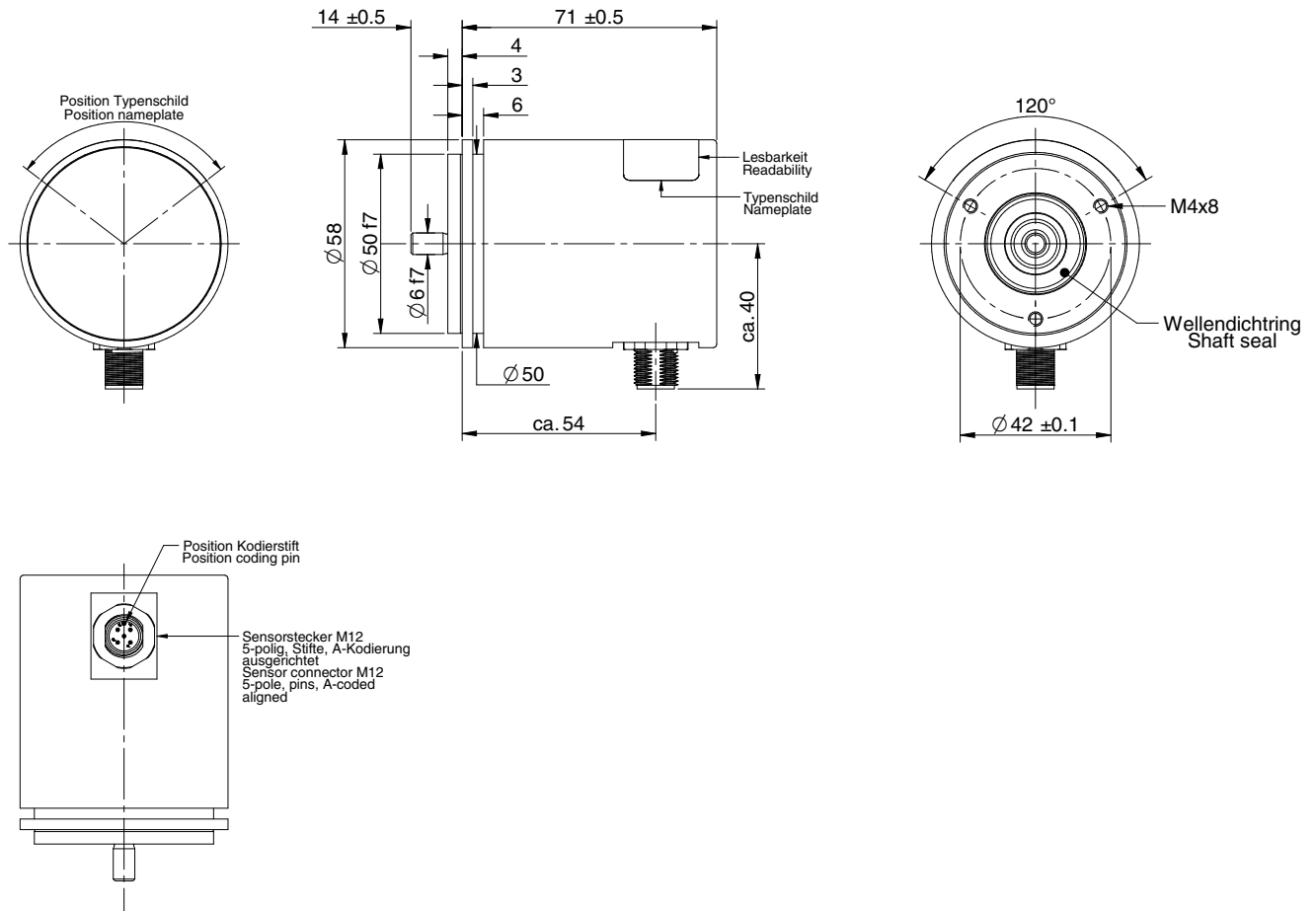
Order identification: e.g. TRN58 - KZA 8192 R 4096 S4 S2 V1



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

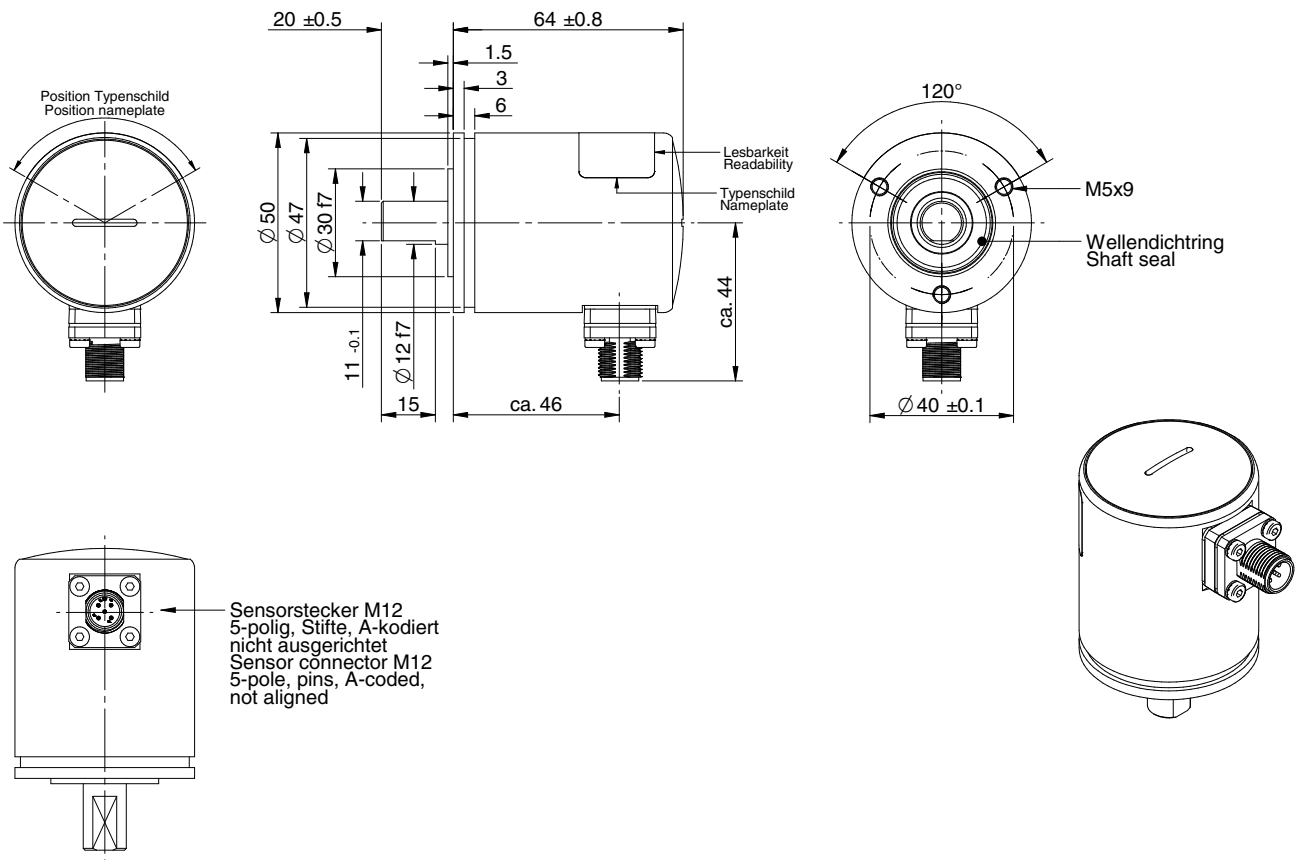
Order identification: e.g. **TRN58 - SA 8192 R 4096 C3 S1 N01**



**Absolute Monotour/Multitour shaft encoder
models TBN/TRN with CANopen Safety SIL2 and CANopen**

Installation drawings (dimensions in mm)

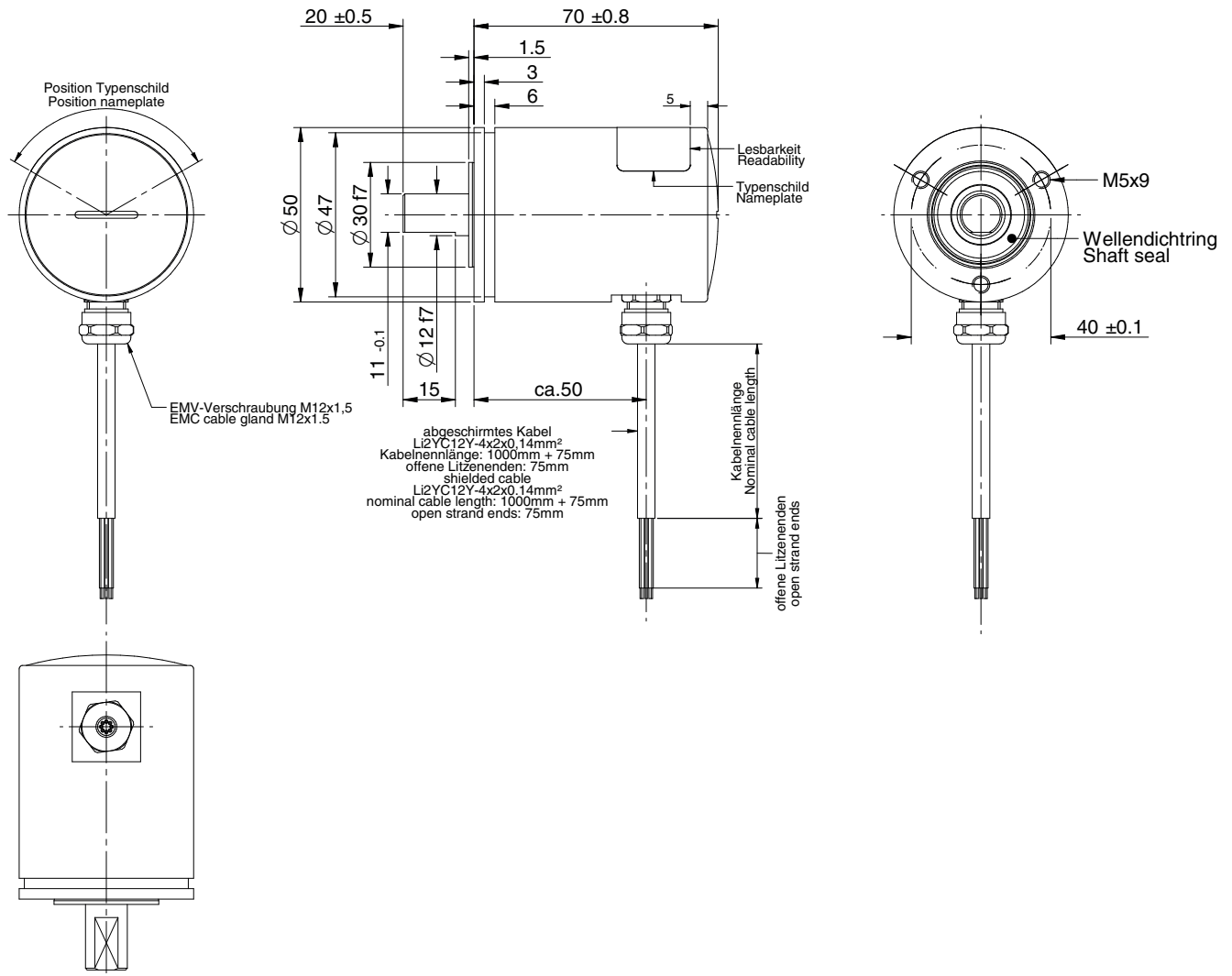
Order identification: e.g. TBN50 - SA 65536 R C3 S1 V1 N01



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

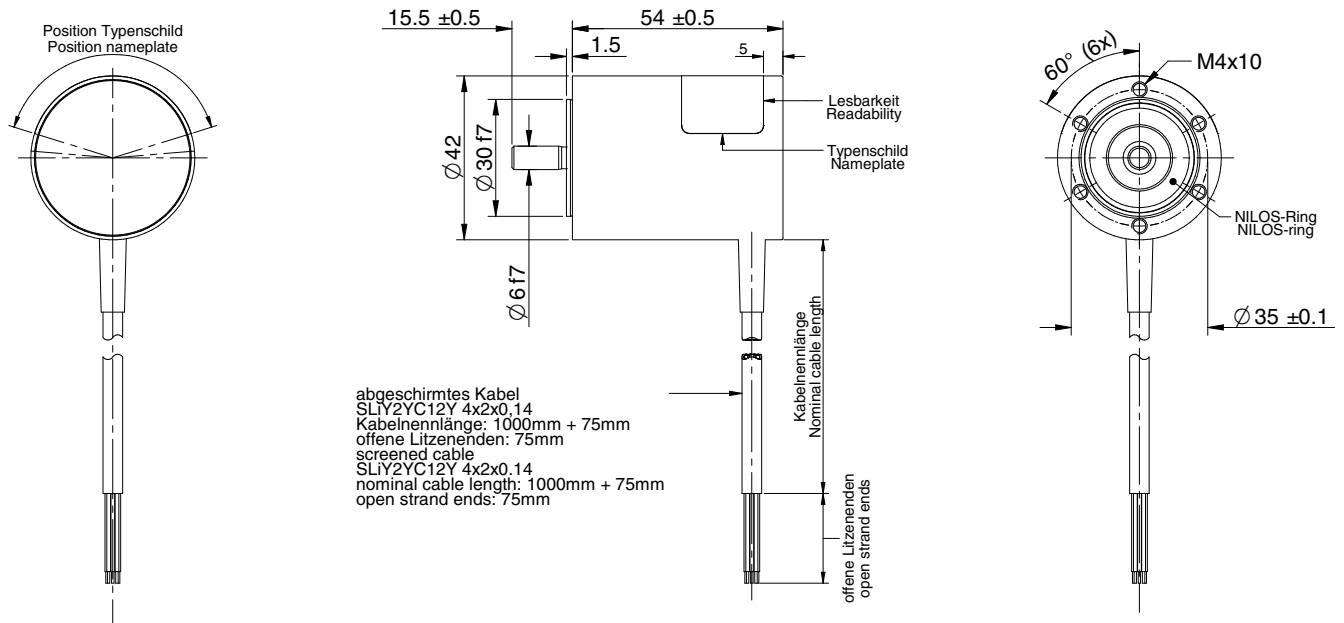
Order identification: **e.g. TRN50 - SA 65536 R 4096 C3 K1 V1 N01**



**Absolute Monotour/Multitour shaft encoder
models TBN/TRN with CANopen Safety SIL2 and CANopen**

Installation drawings (dimensions in mm)

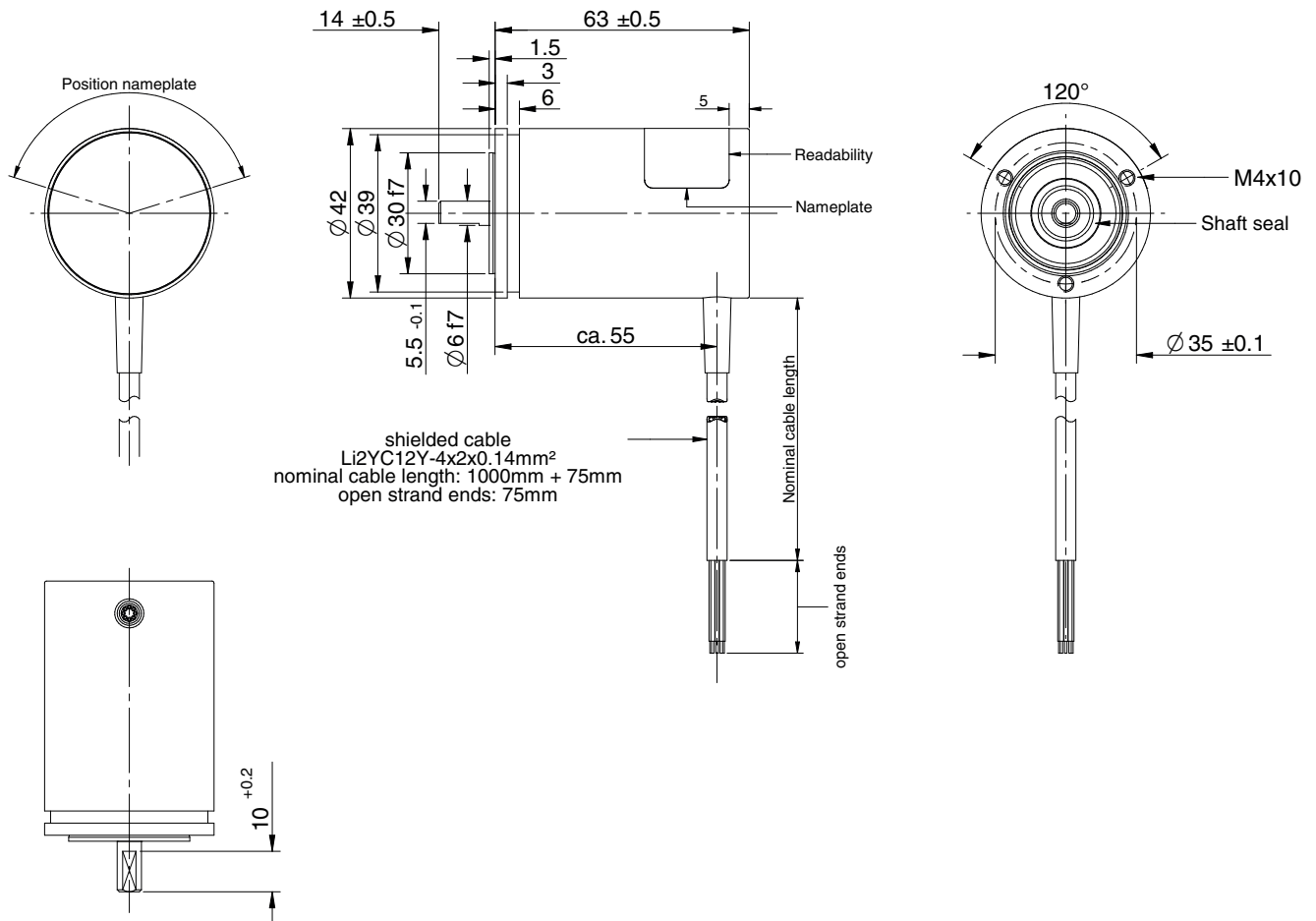
Order identification: e.g. TRN42 - SV 16384 R 4096 S4 K1 Nxx - Stainless steel 1.4404



**Absolute Monotour/Multitour shaft encoder
models TBN/TRN with CANopen Safety SIL2 and CANopen**

Installation drawings (dimensions in mm)

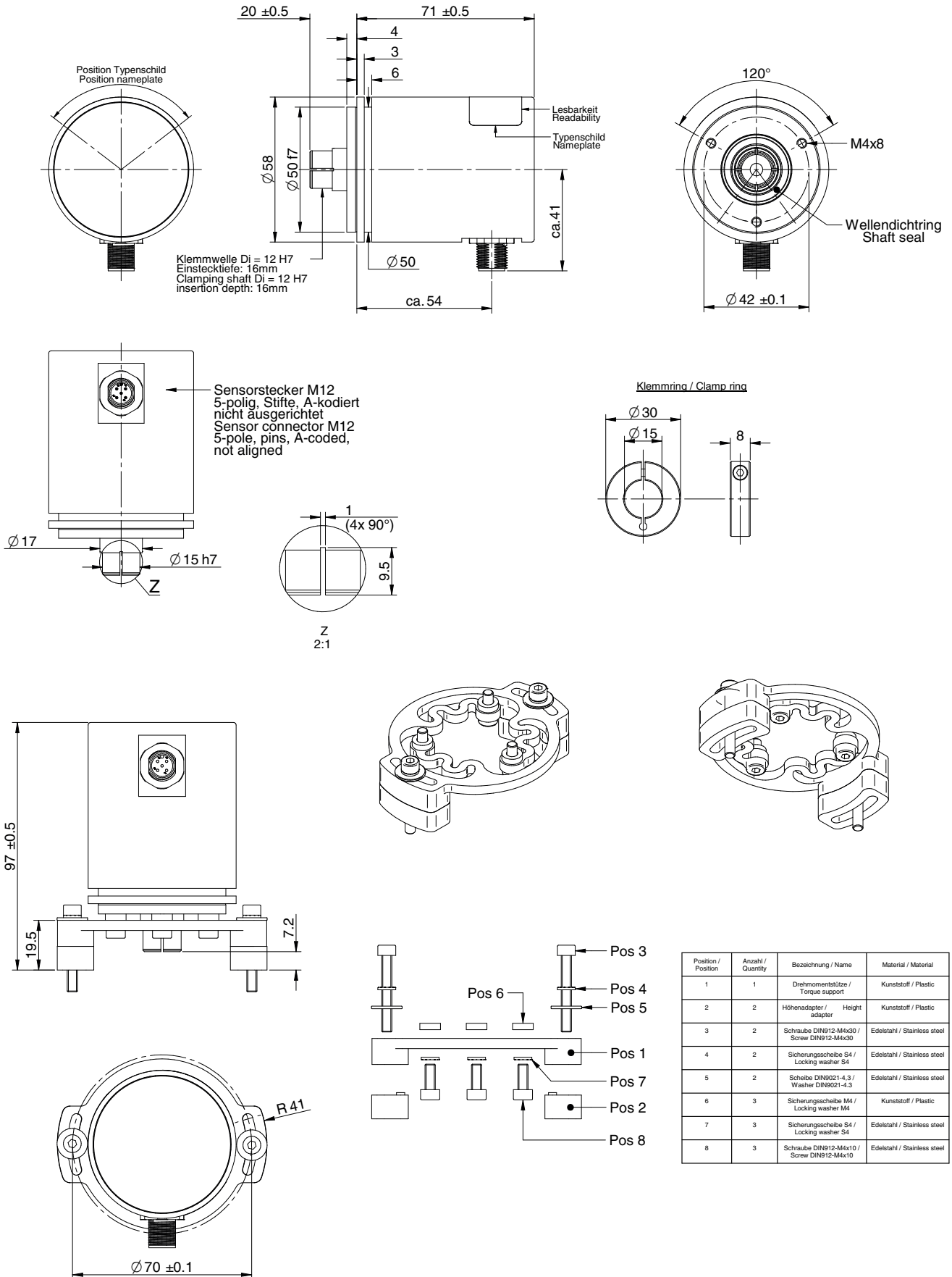
Order identification: e.g. TRN42 - SA 16384 R 4096 S4 K1 N01 - Aluminium AIMgSi1



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

Order identification: e.g. TRN58 - SRA 16384 R 4096 S4 S1 N01 and ZMS58-S-H1-K01



Absolute Monotour/Multitour shaft encoder models TBN/TRN with CANopen Safety SIL2 and CANopen

Installation drawings (dimensions in mm)

Order identification: e.g. **TBN58 - SRA 16384 R 4096 S4 S1 N01** and **ZMS58-S-H1-K01**

