

- SIL3 / PLe (CAT4) certification
- UL® certification on request
- Robust mechanical construction with high vibration and shock resistance
- Housing: Design form 58, aluminium, coated zinc alloy
- Shaft type: Solid shaft, AISI 303 stainless steel, 6 or 10 mm diameter
- Output:
 - Digital TTL (RS422) or HTL
 - SIN/COS 1 Vpp
- Resolution: 250 to 2500 counts / 360°
- Operating temperature: - 20 °C to + 85 °C
- Protection grade: IP65
- Suitable for safe motor feedback systems

INCREMENTAL SAFETY

SIL3 FUNCTIONAL SAFETY SENSOR
IEC 61508

PLe FUNCTIONAL SAFETY SENSOR
ISO 13849

KEY INFORMATION OVERVIEW

DESIGN & FUNCTION

Sensing the angle position and signal processing including the generation of the SIN/COS signals or the square-wave pulses respectively. Digital signals TTL and HTL are computed from sine/cosine signals.

The safety function ensured by the device is to convert a mechanical rotation into secured electrical information readable by electronics.

Functional safety design due to IEC 61508: SIL3 and ISO 13849: PLe (CAT4) in a robust housing made of aluminium and coated zinc alloy with protection grade IP65.

Optionally a UL® certificate can be provided.

- Design form 58 with solid shaft and various flanges
- Suitable for safe motor feedback according to IEC 61800-5-2
- Electrical connection via connectors M12, M23 or cable

INTERFACE FEATURES

- Output: square-wave pulses A, A/, B, B/, Z, Z/
- Level: TTL (RS422) or HTL
- Output: Sine / Cosine S, S/, C, C/, Z, Z/
- Level SIN/COS: 1 Vpp
- 250 to 2500 counts per 360°

TECHNICAL DATA
ENVIRONMENTAL DATA

Operating temperature	-20 to +85 °C (encoder T°)
Storage temperature	-20 to +85 °C
Humidity	93 % @ 65 °C (EN 60068-2-38)
Resistance against shock	≤ 500 m/s ² (EN 60068-2-27, during 6 ms)
Resistance against vibration	≤ 200 m/s ² (EN 60068-2-6, 10 ... 2000 Hz)
Protection grade	IP65
Isolation	1000 V _{eff}
EMC immunity test	EN 61000-6-2, increased levels
EMC emission test	EN 61000-6-4, increased levels
Salt spray test	96 h (EN 60068-2-11, part 2)

SAFETY DATA

Z and Z/ are not safety signals (@ pulses and SIN/COS)

Applied functional safety standards	IEC 61508 IEC 62061 ISO 13849-1 IEC 61800-5-2
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Maximum operating life 20 years

Further safety data See handbook [SOI17141](#)

OUTPUT: SQUARE-WAVE PULSES FOR POSITION SENSING APPLICATIONS (@+40 °C, SINGLE CHANNEL)

Time for output signal initialization after power on	~30 ms
Time for internal monitoring activation after power on	250 ms (560 ms max.)
Time to switch off outputs in case of error	< 200 ms
High impedance output leakage current	±10 µA

V_s = 5 VDC (± 5 %):

PFD (IEC 61508, 1/h)	7.51x10 ⁻⁵
PFH (IEC 61508, 1/h)	8.58x10 ⁻¹⁰
MTTFd (ISO 13849, years)	1331
DC	99 %

V_s = 11 to 30 VDC:

PFD (IEC 61508, 1/h)	9.52x10 ⁻⁵
PFH (IEC 61508, 1/h)	1.09x10 ⁻⁹
MTTFd (ISO 13849, years)	1050
DC	99 %

OUTPUT: SINCOS FOR POSITION SENSING APPLICATIONS (@+40 °C, SINGLE CHANNEL)

Time for output signal initialization after power on	~30 ms
Time for internal monitoring activation after power on	~30 ms
Time to switch off outputs in case of error	< 50 µs
High impedance output leakage current	±1 µA

V_s = 5 VDC (± 5 %):

PFD (IEC 61508, 1/h)	4.29x10 ⁻⁵
PFH (IEC 61508, 1/h)	4.90x10 ⁻¹⁰
MTTFd (ISO 13849, years)	2328
DC	99 %

V_s = 11 to 30 VDC:

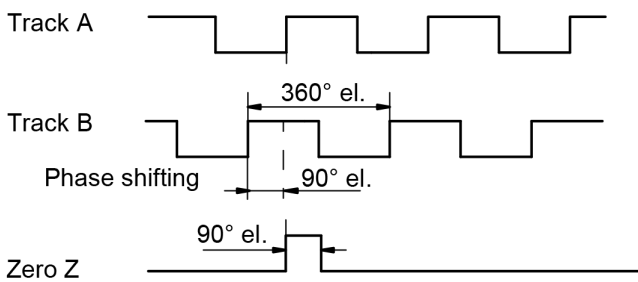
PFD (IEC 61508, 1/h)	6.60x10 ⁻⁵
PFH (IEC 61508, 1/h)	7.53x10 ⁻¹⁰
MTTFd (ISO 13849, years)	1515
DC	99 %

PRODUCT CHARACTERISTICS - SIGNAL OUTPUT

First safety channel with signal A or S and inverted signal A/ or S/. Second safety channel with signal B or C and inverted signal B/ or C/. Third channel not for safety with signal Z and inverted signal Z/.

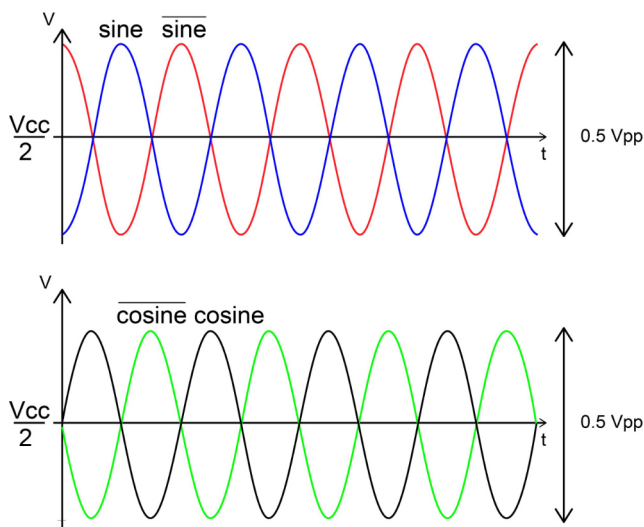
SQUARE-WAVE PULSES

Channel 2 (B) before channel 1 (A) (90° period phase shift), clockwise shaft rotation viewed from flange side.



SIN/COS

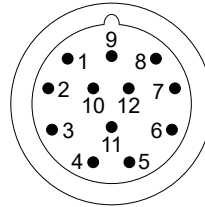
Channel 2 (cosine) before channel 1 (sine) (90° period phase shift), clockwise shaft rotation viewed from flange side.



ELECTRICAL CONNECTION - PINOUT

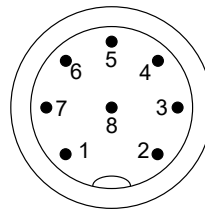
CONNECTOR OUTPUT M23, 12-PIN, MALE, CCW

PIN	Function
1	A/ or S/
2	+ V _S
3	Z
4	Z/
5	B or C
6	B/ or C/
7	n.c.
8	A or S
9	n.c.
10	- V _S (0 V / GND)
11	- V _S (0 V / GND)
12	+ V _S
Connector body	Ground



CONNECTOR OUTPUT M12, 8-PIN, MALE, A-CODED

PIN	Function
1	- V _S (0 V / GND)
2	+ V _S
3	A or S
4	B or C
5	Z
6	A/ or S/
7	B/ or C/
8	Z/
Connector body	Ground



ELECTRICAL CONNECTION CABLE OUTPUT - PVC, 8-WIRES, 8230 / 020 (FURTHER CABLES ON REQUEST)

Colour	Function
WH white	- V _S (0 V / GND)
BN brown	+ V _S
GN green	A or S
YE yellow	B or C
GY grey	Z
PK pink	A/ or S/
BU blue	B/ or C/
RD red	Z/
General shielding	Ground

ORDER CODE FORMAT
SOI | **58** | **K** | **10** | **1** | **1** | **0** | **A** | **1024** | **2** | **6** | **S3** | **H** | **01** | **STANDARD VERSION**

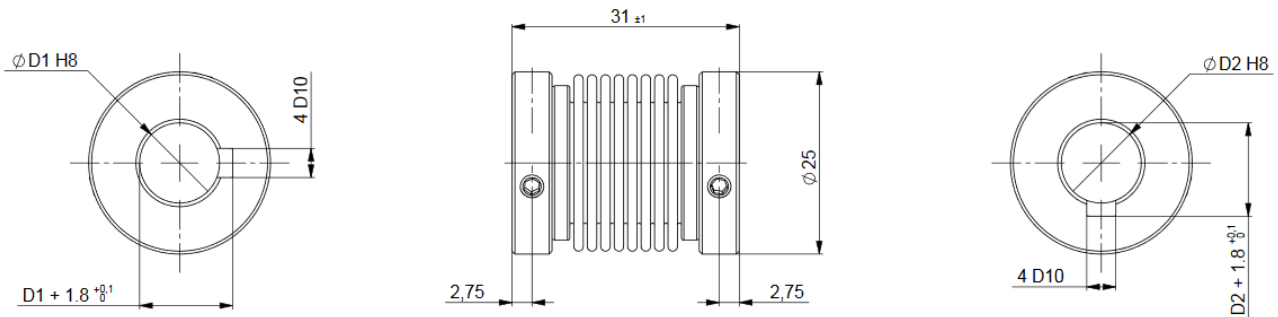
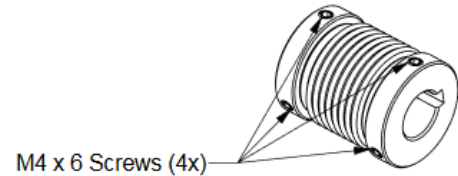
SOI	Incremental rotary encoder - SIL3 / PLe/CAT4		
58	Design form Ø	58	Design form 58
K	Flange	K S	Clamped flange with solid shaft 10 mm with feather key Synchro flange with solid shaft 6 mm with flattening
10	Solid shaft Ø	6 10	6 mm with flattening, only at flange S 10 mm with feather key, only at flange K (other values, e.g. 9.52 mm on request)
1	Protection grade	1	IP65
1	Electrical connection	1 2 3 4 5 6	1 x connector M23, CCW, radial 1 x connector M23, CCW, axial 1 x cable, PVC, 8-wire, axial (further cables on request) 1 x cable, PVC, 8-wire, radial (") 1 x connector M12, radial 1 x connector M12, axial
0	Cable length	0 2 5 10	Insert 0 at connector output 2 m 5 m 10 m (e.g. 0,15 for 15 cm or 1,5 for 1.5 m)
A	Housing material	A	Aluminium, coated zinc alloy
1024	Resolution	250 256 360 500 512 1000 1024 1500 2000 2048 2500	Square-wave pulses or nr. of SIN/COS per 360°
2	Supply voltage	1 2	5 VDC (±5 %) 11 to 30 VDC
6	Output signal	6	A, A/, B, B/, Z, Z/ (signal form T or H) or S, S/, C, C/, Z, Z/ (signal form S)
S3	Profile (Certificate)	S3	SIL3 and PLe/CAT4 certified as specified in this data sheet
H	Signal form	T H S	TTL (RS422) HTL (only at Vs = 11 to 30 VDC) SIN / COS (1 Vpp)
01	Electrical and mechanical variants*	01	Standard version

* 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.

ACCESSORIES (SELECTION)

SAFETY BELLOWS COUPLING FOR 10 MM SHAFT SSK31/10-10-A01

Bore diameter	D1 = D2 = 10 mm (6 mm on request)
Fixing of shaft	via screws (2 on each side)
Max. speed	10,000 min ⁻¹
Max. torque	200 Ncm
Radial misalignment	±0.35 mm
Axial misalignment	±0.45 mm
Angular misalignment	±4°
Torsional spring stiffness	183 Nm/rad
Moment of inertia	17.8 gcm ²
Max. clamping torque	150 Ncm
Temperature range	-30 to +120 °C
Mass	18 g



CONNECTING CABLE FOR CONNECTORS M12, 8-PIN, A-CODED AND M23, 12-PIN, CCW - ON REQUEST

DOCUMENTATION

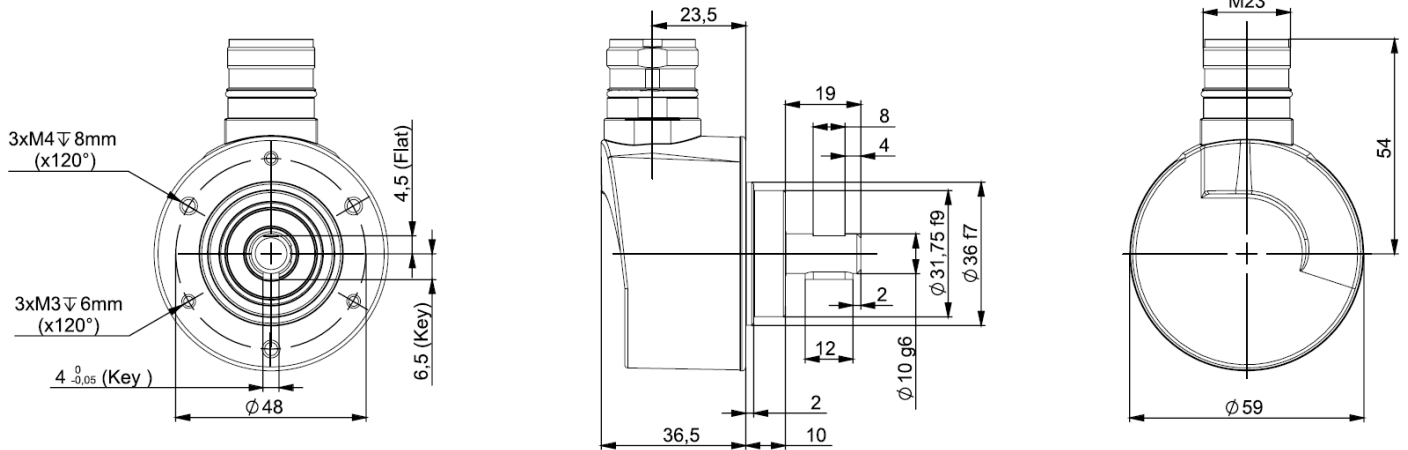
The following documents can be found in the Internet under www.twk.de in the documentation area, model SOI58/S3.

Data sheet	SOI17171
Manual	SOI17141
Installation instructions	AN16169
SIL3 / PLe certificate	SOI17204
EC Declaration of Conformity	ZE17199
Reach compliant	QS15286
RoHS compliant	QS13284

INSTALLATION DRAWINGS

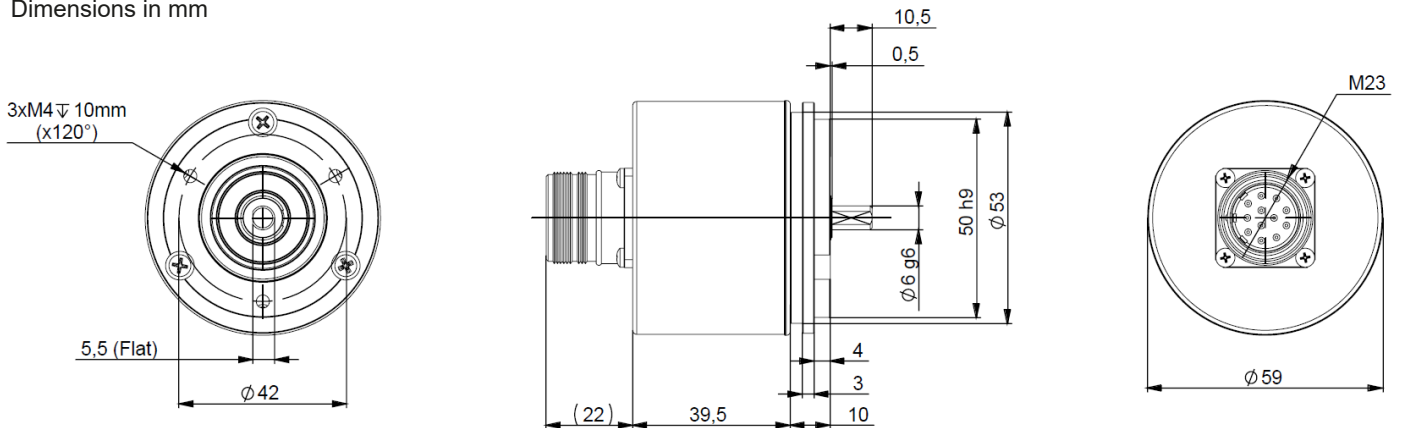
MODEL SOI58K10110A102426S3H01

Dimensions in mm



MODEL SOI58S6120A102426S3H01

Dimensions in mm



Further drawings on request (e.g. encoder with M12 connector or cable outlet).