Model Number

ENA58PL-H12DS5-0013SS2-RAA

Features

- **Industrial standard housing Ø58 mm**
- **Suitable for SIL2/Pld applications**
- **Absolute value data from SSI interface**
- **13 Bit singleturn**
- **Incremental signals from sin/cos output**

Description

This singleturn sin/cos rotary encoder transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). In addition to the postion values also sin/cos incremental signals are transmitted. Hearby a real time control of e. g. a motor is ensured.

The control module sends a clock bundle to the rotary encoder to obtain the position data. The rotary encoder then sends the position data synchronous to the cycles of the control module.

It is possible to select the following items with function inputs

- the counting direction and
- the zero-set function (preset value)

Technical Data

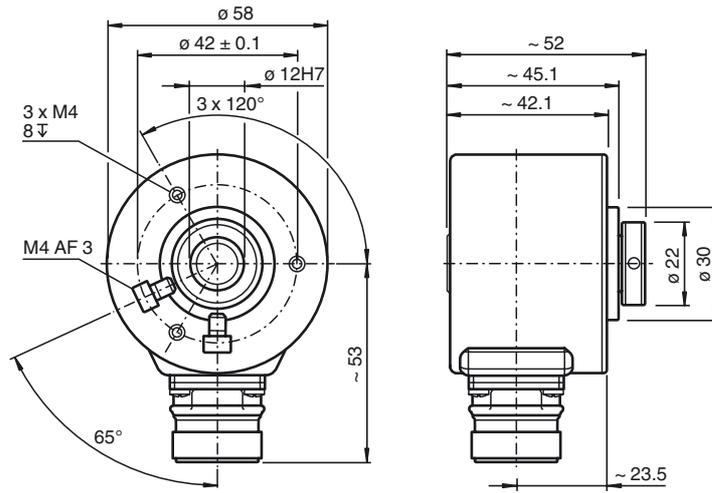| General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute rotary encoder with incremental output (sin/cos)
Functional safety related parameters	
Safety Integrity Level (SIL)	SIL 2
Performance level (PL)	PL d
$MTTF_d$	1000 a
Mission Time (T_M)	20 a
PFH_d	4.6 E-10
L_{10}	70 E+9 at 1.5 rpm
Diagnostic Coverage (DC)	99.7 %
Electrical specifications	
Operating voltage U_B	24 V DC ± 25 %
No-load supply current I_0	max. 100 mA
Time delay before availability t_v	< 250 ms
Output code	Gray code
Code course (counting direction)	cw ascending (clockwise rotation, code course ascending)
Interface	
Interface type	SSI + incremental track (sin/cos)
Monoflop time	≤ 15 µs
Resolution	
Single turn	13 Bit
Overall resolution	13 Bit
Transfer rate	max. 500 kBit/s
Standard conformity	RS 422
Input 1	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 24 V
Low	0 ... 2 V
Input current	< 6 mA
Switch-on delay	< 20 ms
Input 2	
Input type	zero-set (PRESET 1)
Signal voltage	
High	4.5 ... 24 V
Low	0 ... 2 V
Input current	< 6 mA
Signal duration	≥ 10 ms
Switch-on delay	< 20 ms
Output	
Output type	sine / cosine
Pulses	2048
Amplitude	1 V_{ss} ± 10 %
Load current	max. per channel 10 mA , conditionally short-circuit proof (not with U_b), reverse polarity protected
Output frequency	max. 200 kHz (3 dB limit)
Connection	
Connector	type 9416L (M23), 12-pin
Standard conformity	
Degree of protection	DIN EN 60529, IP65
Climatic testing	DIN EN 60068-2-3, no moisture condensation
Salt spray test	DIN EN 60068-2-52 , 672 h
Emitted interference	DIN EN 61000-6-4
Noise immunity	DIN EN 61000-6-2
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Functional safety	IEC/EN 61508:2010 EN 62061/A2:2015 EN 61326-3-1:2008 EN 61800-5-2:2016 Suitable up to SIL 2, PL d, see leaflet.
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Housing	3.2315 aluminum
Flange	3.2315 aluminum
Shaft	stainless steel 1.4404 / AISI 316L
Mass	approx. 220 g
Rotational speed	max. 10 min^{-1}
Moment of inertia	≤ 80 gcm^2
Starting torque	< 10 Ncm
Shaft load	
Radial offset	max. 0.04 mm
Approvals and certificates	
EAC conformity	TR CU 020/2011
TÜV approval	Cert. no. Z10 17 03 68273 002

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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Dimensions

ø 58

ø 42 ± 0.1

ø 12H7

3 x 120°

3 x M4
8↓

M4 AF 3

~ 53

65°

~ 52

~ 45.1

~ 42.1

ø 22

ø 30

~ 23.5

Electrical connection

Signal	Connector 9416L, 12-pin	Explanation
GND (encoder)	1	Power supply
U_b (encoder)	2	Power supply
Clock (+)	3	Positive cycle line
Clock (-)	4	Negative cycle line
Data (+)	5	Positive transmission data
Data (-)	6	Negative transmission data
Preset	7	Zero-setting input
V/R	8	Input for selection of counting direction
A / Cos	9	Cosinus signal
$\overline{A}$ / $\overline{Cos}$	10	Inverted cosinus signal
B / Sin	11	Sinus signal
$\overline{B}$ / $\overline{Sin}$	12	Inverted sinus signal
	8 7 11 6 5 4 9 1 12 2 10 3	

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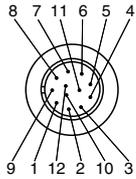
Description

The Synchronous Serial Interface was specially developed for transferring the output data of an absolute encoder to a control device. The control module sends a clock bundle and the absolute encoder responds with the position value.

Thus only 4 lines are required for the clock and data, no matter what the resolution of the rotary encoder is. The RS 422 interface is optically isolated from the power supply.

SSI signal course Standard

$D_1, ..., D_n$:	Position data
S:	Special bit
MSB:	Most significant bit
LSB:	Least significant bit

$T = 1/f$:	Duration of period of clock signal ≤ 1 MHz
T_m:	Monoflop time
T_p:	Clock pause $\geq$ monoflop time ($T_p \geq T_m$)
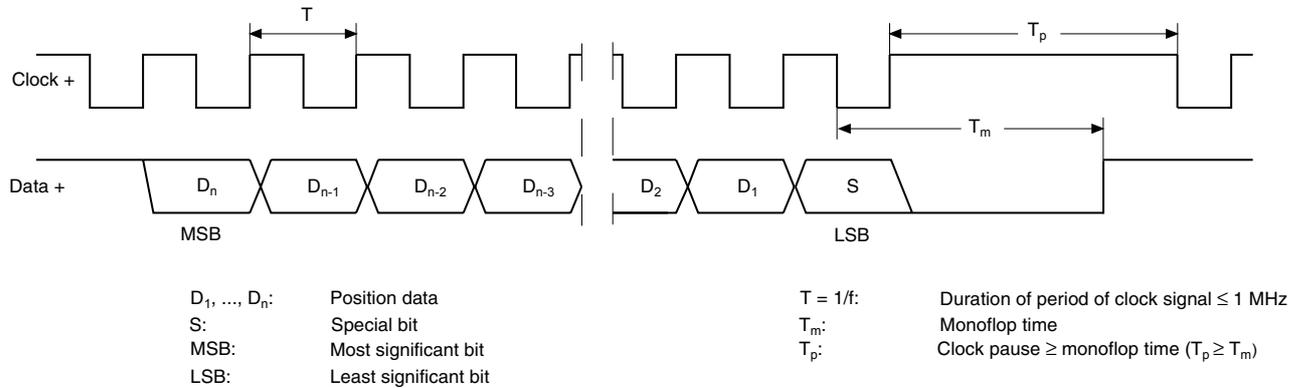
SSI output format Standard

- At idle status signal lines "Data +" and "Clock +" are at high level (5 V).
- The first time the clock signal switches from high to low, the data transfer in which the current information (position data (D_n) and special bit (S)) is stored in the encoder is introduced.
- The highest order bit (MSB) is applied to the serial data output of the encoder with the first rising pulse edge.
- The next successive lower order bit is transferred with each following rising pulse edge.
- After the lowest order bit (LSB) has been transferred the data line switches to low until the monoflop time T_m has expired.
- No subsequent data transfer can be started until the data line switches to high again or the time for the clock pause T_p has expired.
- After the clock sequence is complete, the monoflop time T_m is triggered with the last falling pulse edge.
- The monoflop time T_m determines the lowest transmission frequency.
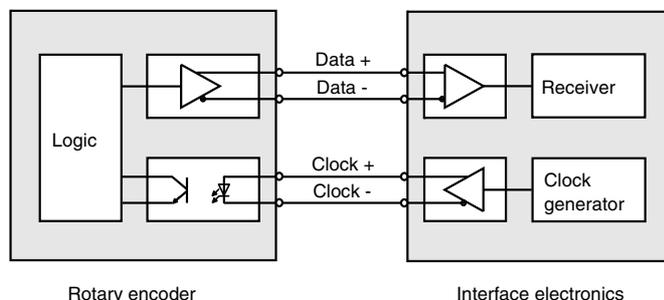
SSI output format ring slide operation (multiple transmission)

- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 13 bits are transferred per data word in standard format.
- If the clock change is not interrupted after the last falling pulse edge, ring slide operation automatically becomes active. This means that the information that was stored at the time of the first clock change is generated again.
- After the first transmission, the 26th pulse controls data repetition. If the 26th pulse follows after an amount of time greater than the monoflop time T_m, a new current data word will be transmitted with the following pulses.

If the pulse line is exchanged, the data word is generated offset.
Ring slide operation is possible up to max. 13 bits.
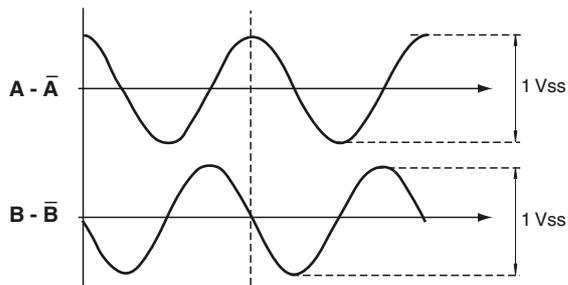
Block diagram

Rotary encoder   Interface electronics

Line length

Line length in m	Baudrate in kHz
< 50	< 400

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

Signal outputs

↻ cw - flange view

A - $\overline{A}$ 1 Vss

B - $\overline{B}$ 1 Vss

mesuré en mode différence

$0.5 \leq \sin^2 + \cos^2 \leq 1.5$
THD $< 10\ \%$ (0 ... 200 kHz)

Inputs

The selection of the counting direction input (cw/ccw) and the zero-set input (PRESET 1) are activated with 1-level.

IN

U_e

Filter   Logic

Pull down

⊥

Refer to "General Notes Relating to Pepperl+Fuchs Product Information".

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