



## Absolute rotary encoder

### ENA58IL-S\*\*\*-SSI

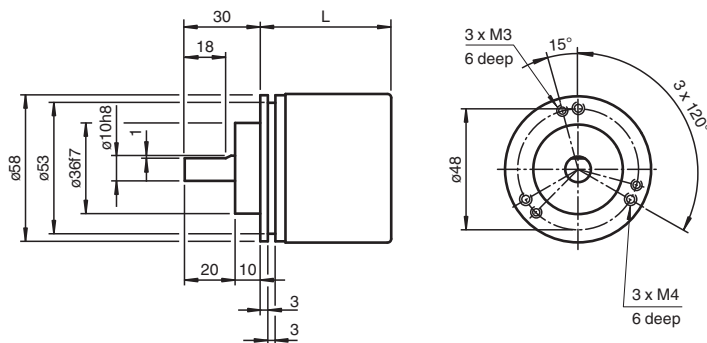
- Solid shaft
- SSI interface
- Up to 32 Bit multiturm
- Free of wear magnetic sampling
- High resolution and accuracy
- Additionally push buttons for preset function (only model characteristic SB2, SG2)
- Up to 4096 pulses on incremental track



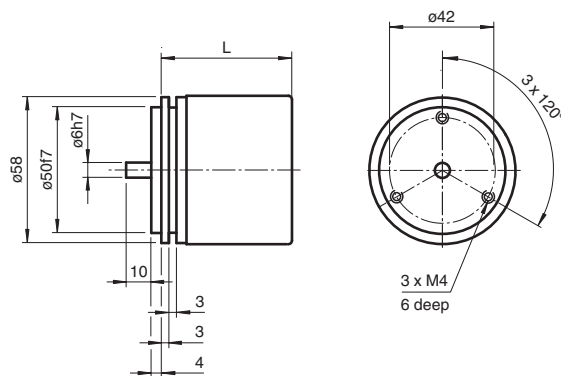
## Function

The ENA58IL series are high precision encoders with internal magnetic sampling. This multiturm absolute encoder transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The control module sends a start sequence to the absolute 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 counting direction with the function input.

## Dimensions



Clamping flange



Servo flange

**Dimensions**

Design	L [mm]	
	Axial output	Radial output
Singleturn	41.7	52.7
Multiturn	52.7	

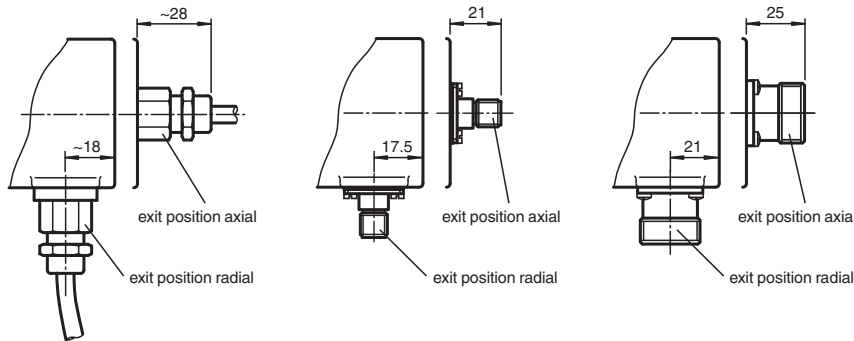
**Connections**

Dimensions in mm

Cable

Connector M12

Connector M23



**Technical Data**

**General specifications**

Detection type	magnetic sampling
Device type	Absolute rotary encoder
Linearity error	$\leq \pm 0.1^\circ$
UL File Number	E223176 "For use in NFPA 79 Applications only", if UL marking is marked on the product.

**Functional safety related parameters**

MTTF <sub>d</sub>	700 a at 40 °C
Mission Time (T <sub>M</sub> )	20 a
L <sub>10</sub>	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

**Electrical specifications**

Operating voltage	U <sub>B</sub>	4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)
No-load supply current	I <sub>0</sub>	typ. 50 mA
Power consumption	P <sub>0</sub>	approx. 1.5 W
Time delay before availability	t <sub>v</sub>	< 450 ms
Output code		Gray code, binary code
Code course (counting direction)		adjustable

**Interface**

Interface type	SSI ; SSI + incremental track
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 16 Bit
Overall resolution	up to 32 Bit
Transfer rate	0.1 ... 2 MBit/s
Cycle time	< 100 μs
Standard conformity	RS 422

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## Technical Data

<b>Input 1</b>	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.75 V ... $U_B$ or unconnected (cw descending)
Low	0 ... 2 V (cw ascending)
Input current	< 6 mA
Switch-on delay	< 250 ms
<b>Input 2</b>	
Input type	zero-set (PRESET 1) with falling edge
Signal voltage	
High	4.75 V ... $U_B$
Low	0 ... 2 V
Input current	< 6 mA
Signal duration	min. 1.1 s
<b>Output</b>	
Output type	RS422, Push/Pull
Signal output	A+B+/A+/B
Pulses	1024, 2048, 4096
<b>Connection</b>	
Connector	M12 connector, 8-pin or M23 connector, 12-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m (cable length, see order code)
<b>Standard conformity</b>	
Degree of protection	DIN EN 60529, IP65 or IP67 (not for M23 device plug)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 200 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 20 g, 10 ... 1000 Hz
<b>Approvals and certificates</b>	
UL approval	cULus Listed, General Purpose, Class 2 Power Source , if UL marking is marked on the product.
<b>Ambient conditions</b>	
Operating temperature	cable, flexing: -5 ... 70 °C (23 ... 158 °F), cable, fixed: -30 ... 70 °C (-22 ... 158 °F) connector models: -40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
<b>Mechanical specifications</b>	
Material	
Housing	nickel-plated steel , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g , with cable
Rotational speed	max. 12000 min <sup>-1</sup>
Moment of inertia	50 gcm <sup>2</sup>
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N















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## Accessories





	<b>V19-G-2M-PUR-ABG-V19-G</b>	Cordset M12 socket straight to M12 plug straight A-coded, 8-pin, PUR cable grey, shielded
	<b>V19-G-2M-PUR-ABG</b>	Female cordset single-ended M12 straight A-coded, 8-pin, PUR cable grey, shielded
	<b>V19-G-5M-PUR-ABG</b>	Female cordset single-ended M12 straight A-coded, 8-pin, PUR cable grey, shielded
	<b>V19-W-ABG-PG9</b>	Female connector M12 angled A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	<b>V19-G-ABG-PG9</b>	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	<b>9401 6*10</b>	Spring steel coupling
	<b>9401 6*6</b>	Spring steel coupling
	<b>9402 6*6</b>	Spring steel coupling
	<b>9404 6*6</b>	Spring disk coupling
	<b>9409 6*10</b>	Bellows coupling
	<b>9409 6*6</b>	Bellows coupling
	<b>9409 6*8</b>	Bellows coupling
	<b>9410 6*6</b>	Precision coupling
	<b>KW-6/10</b>	Helical coupling
	<b>KW-6/6</b>	Helical coupling
	<b>KW-6/8</b>	Helical coupling
	<b>9108, 6</b>	Measuring wheel
	<b>9109, 6</b>	Measuring wheel for shaft diameter 6 mm
	<b>9110, 6</b>	Measuring wheel for shaft diameter 6 mm
	<b>9113, 6</b>	Measuring wheel for shaft diameter 6 mm

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**Accessories**

	<b>MBT-36ALS</b>	Spring-loaded mounting bracket with a diameter of 36 mm
	<b>V19-G-10M-PVC-TP</b>	Female cordset, M12, 8-pin, shielded, PVC cable
	<b>V19-G-2M-PVC-TP</b>	Female cordset, M12, 8-pin, shielded, PVC cable
	<b>V19-G-5M-PVC-TP</b>	Female cordset, M12, 8-pin, shielded, PVC cable

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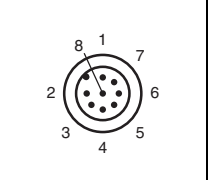
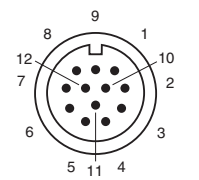
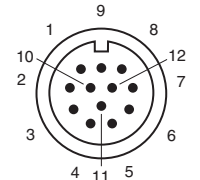
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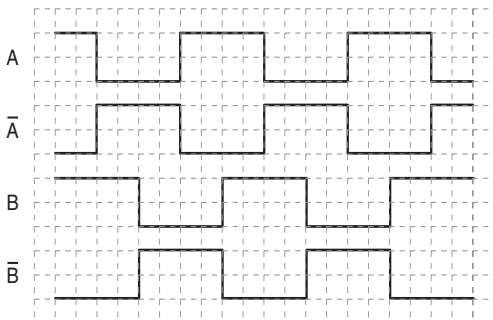
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**Connection**

Signal	Cable, 12-core	Connector M12, 8-pin	Connector M23, 12-pin, cw	Connector M23, 12-pin, ccw	Explanation
GND (encoder)	White	1	1	1	Power supply
U <sub>B</sub> (encoder)	Brown	2	2	8	Power supply
Clock (+)	Green	3	3	3	Positive cycle line
Clock (-)	Yellow	4	4	11	Negative cycle line
Data (+)	Grey	5	5	2	Positive transmission data
Data (-)	Pink	6	6	10	Negative transmission data
A	Black		7	12	Incremental track A
V/R	Red	8	8	5	Input for selection of counting direction
PRESET 1	Blue	7	9	9	Zero-setting input
B	Grey/Pink		10	4	Incremental track B
$\bar{A}$	Violet		11	6	Incremental track $\bar{A}$
$\bar{B}$	Red/Blue		12	7	Incremental track $\bar{B}$
					

**Operation**

**Signal output**

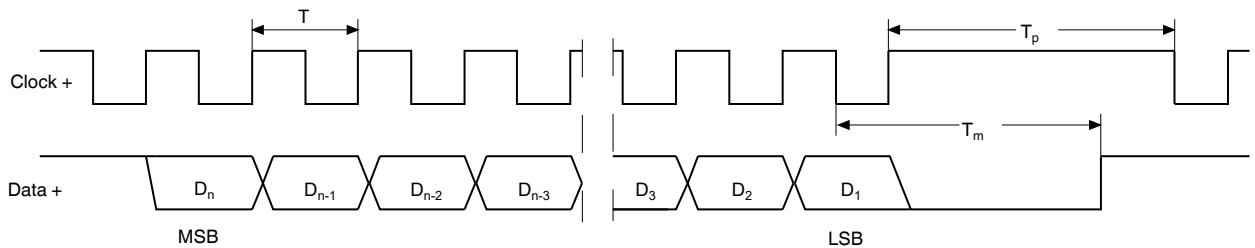


cw - with view onto the shaft

**Interface**

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<sub>1</sub>, ..., D<sub>n</sub>: Position data  
 MSB: Most significant bit  
 LSB: Least significant bit  
 T = 1/f: Duration of period of clock signal ≤ 2 MHz  
 T<sub>m</sub>: Monoflop time 20 μs ± 1 μs  
 T<sub>p</sub>: Clock pause ≥ monoflop time (T<sub>p</sub> ≥ T<sub>m</sub>)

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**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<sub>n</sub>)) 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<sub>m</sub> 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<sub>p</sub> has expired.
- After the clock sequence is complete, the monoflop time T<sub>m</sub> is triggered with the last falling pulse edge.
- The monoflop time T<sub>m</sub> determines the lowest transmission frequency.

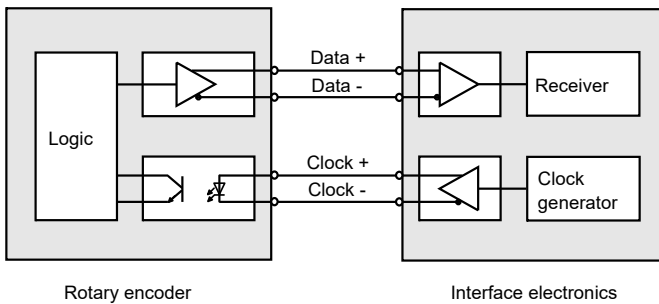
**SSI output format ring slide operation (multiple transmission)**

- 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, n bits are transferred per data word in standard format. The value n equals the total resolution of the encoder.  
As an example: a multiturn encoder with a resolution of 8192 steps/revolution (13 bit) and a max. number of 4096 revolutions (12 bit) has a total resolution of n = 25 bit.
- 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 position transmission, the n+1 pulse controls data repetition. If the n+1 pulse follows after an amount of time greater than the monoflop time T<sub>m</sub>, a new current data word will be transmitted with the following pulses.



If the pulse line is exchanged, the data word is generated offset.

**Block diagram**



**Line length**

Line length in m	Baudrate in kHz
< 50	< 400
< 100	< 300
< 200	< 200
< 400	< 100

**Parameterization**

**Push buttons on encoder with model characteristic SB2, SG2**

In addition to the electrical preset function (PRESET 1) these models are equipped with 2 push buttons for manually setting the zero point of the rotary encoder.

**Manually zero set**

1. Simultaneously press and hold the push buttons A and B for 2 s.

After releasing the push buttons the rotary encoder sets the current position as zero point.

**Type Code**

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**Connection type**

- C1** Cable, 1 m
- C2** Cable, 2 m
- C5** Cable, 5 m
- CA** Cable, 10 m
- AA** M23 device plug, cw
- AB** M23 device plug, ccw
- BE** M12 device plug, 8-pin (not available with SSI + incremental track)

**Connection alignment**

- A** axial
- R** radial

**Electrical interface**

**SG1 ... SIC** see next page

**Singleturn resolution**

- 12** 12 bit
- 13** 13 bit
- 16** 16 bit

**Multiturn resolution**

- 00** Singleturn rotary encoder
- 12** Multiturn rotary encoder, 12 bit
- 14** Multiturn rotary encoder, 14 bit
- 16** Multiturn rotary encoder, 16 bit

**Degree of protection**

- 5** IP65
- 7** IP67 (not for M23 device plug)

**Flange**

- CA** Clamping flange
- SA** Servo flange

**Shaft diameter**

- 06** 6 mm
- 10** 10 mm

**Shaft type**

- S** Solid shaft

**Version**

- IL** Industrial Line

**Size**

- 58** Housing diameter: 58 mm

**Device type**

- ENA** Absolute rotary encoder



**Electrical interface**

- SG1** SSI Gray
- SB1** SSI binary
- SG2** SSI Gray, with push buttons
- SB2** SSI binary, with push buttons
- SI1** SSI Gray + 1024 pulses, Push/Pull
- SI2** SSI Gray + 2048 pulses, Push/Pull
- SI3** SSI Gray + 4096 pulses, Push/Pull
- SI4** SSI Gray + 1024 pulses, RS422
- SI5** SSI Gray + 2048 pulses, RS422
- SI6** SSI Gray + 4096 pulses, RS422
- SI7** SSI Binär + 1024 pulses, Push/Pull

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- SI8** SSI Binär + 2048 pulses, Push/Pull
- SI9** SSI Binär + 4096 pulses, Push/Pull
- SIA** SSI Binär + 1024 pulses, RS422
- SIB** SSI Binär + 2048 pulses, RS422
- SIC** SSI Binär + 4096 pulses, RS422

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