



## Model Number

ENA42HD-S\*\*\*-SSI

## Features

- Solid shaft
- SSI interface
- Up to 32 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Highly shock / vibration and soiling resistant
- Sturdy construction
- Increased shaft load capacity
- Stainless steel housing
- IP69K

## Description

The ENA42HD series are high precision encoders with internal magnetic sampling.

This multiturn 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.

## Technical data

### General specifications

Detection type	magnetic sampling
Device type	Absolute encoders
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>	10 E+8 revolutions
Diagnostic Coverage (DC)	0 %

### Electrical specifications

Operating voltage U <sub>B</sub>	4.75 ... 30 V DC
Power consumption P <sub>0</sub>	$\leq 1$ 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
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

### Input 1

Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.75 V ... U <sub>B</sub> (cw descending)
Low	0 ... 2 V or unconnected (cw ascending)
Input current	< 6 mA
Switch-on delay	< 250 ms

### Input 2

Input type	zero-set (PRESET 1) with falling edge
Signal voltage	
High	4.75 V ... U <sub>B</sub>
Low	0 ... 2 V
Input current	< 6 mA
Signal duration	$\geq 1.1$ s

### Connection

Connector	M12 connector, 8-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m (cable length, see order code)

### Standard conformity

Degree of protection	DIN EN 60529 , IP66 / IP68 / IP69K
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, 300 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 30 g, 10 ... 1000 Hz

### Ambient conditions

Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation

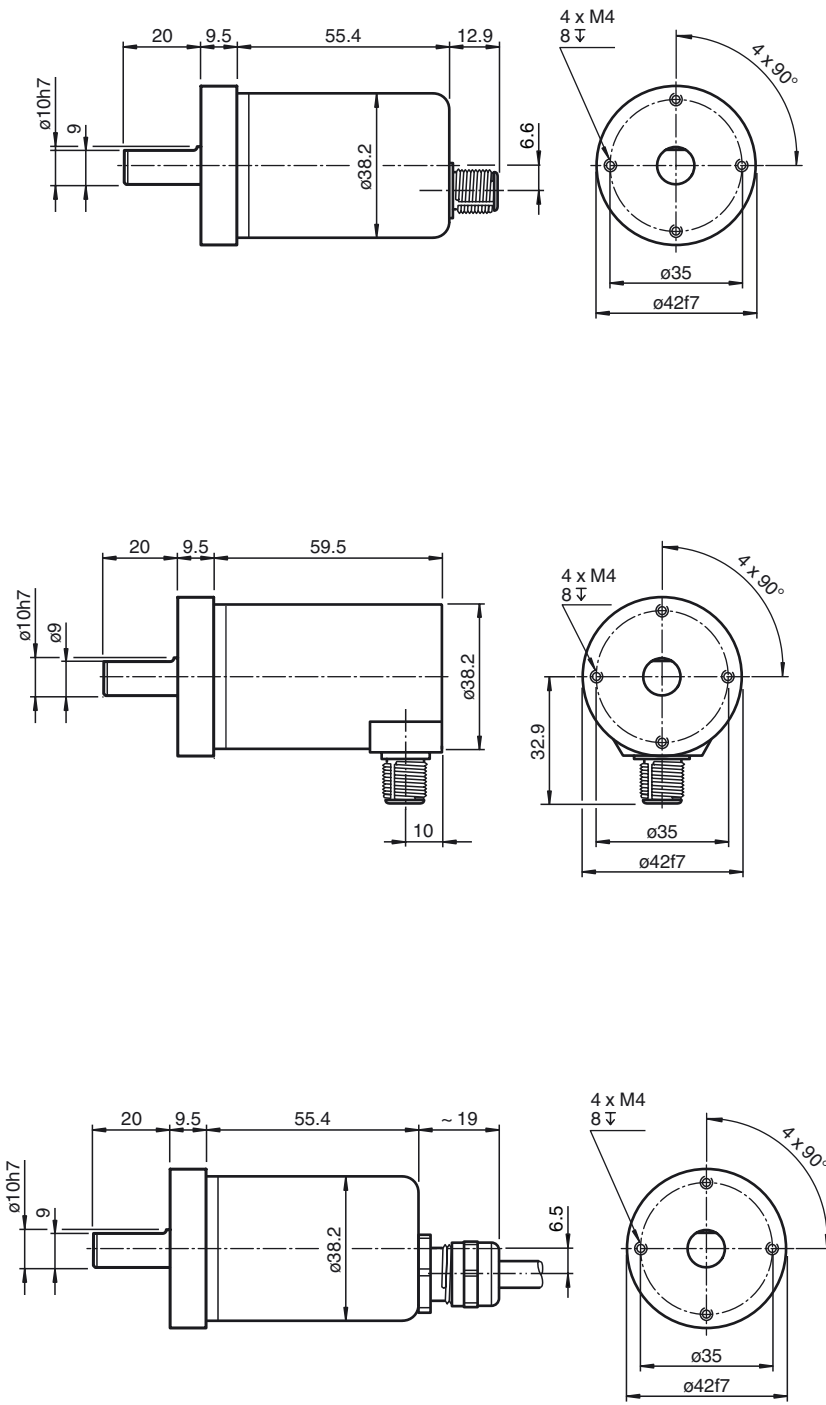
### Mechanical specifications

Material	
Housing	stainless steel 1.4404 / AISI 316L
Flange	stainless steel 1.4404 / AISI 316L
Shaft	Stainless steel 1.4412 / AISI 440B
Mass	approx. 350 g
Rotational speed	max. 6000 min <sup>-1</sup>
Moment of inertia	30 gcm <sup>2</sup>
Starting torque	< 5 Ncm
Shaft load	
Axial	270 N
Radial	270 N

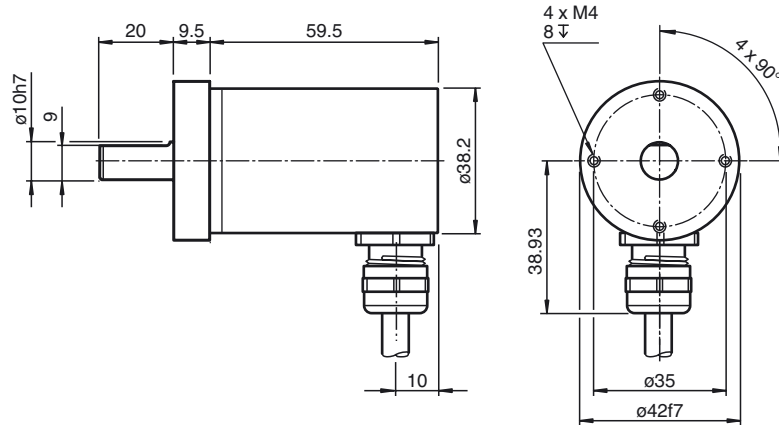
### Approvals and certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source , if UL marking is marked on the product.
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Dimensions



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**Electrical connection**

Signal	Cable, 12-core	Connector M12, 8-pin	Explanation
GND (encoder)	White	1	Power supply
$U_b$ (encoder)	Brown	2	Power supply
Clock (+)	Green	3	Positive cycle line
Clock (-)	Yellow	4	Negative cycle line
Data (+)	Grey	5	Positive transmission data
Data (-)	Pink	6	Negative transmission data
V/R	Red	8	Input for selection of counting direction
PRESET 1	Blue	7	Zero-setting input

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

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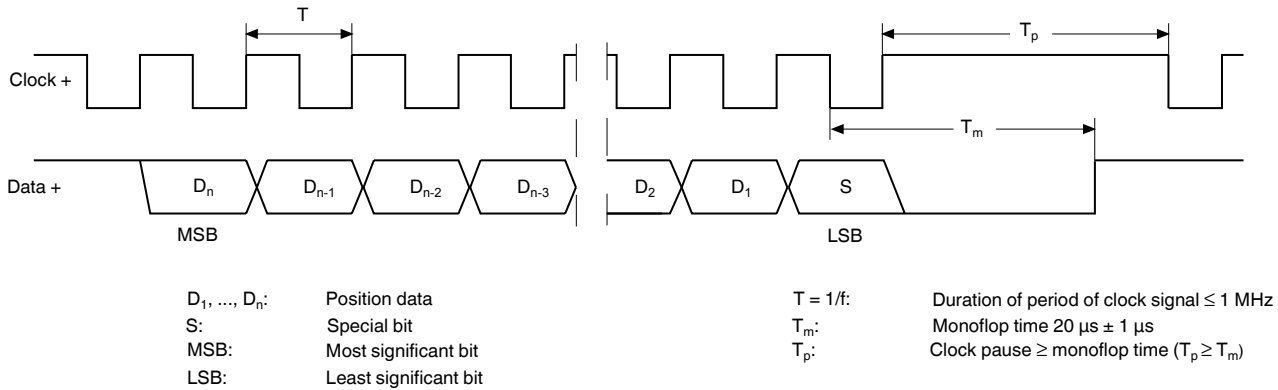
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### Description

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



### 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.

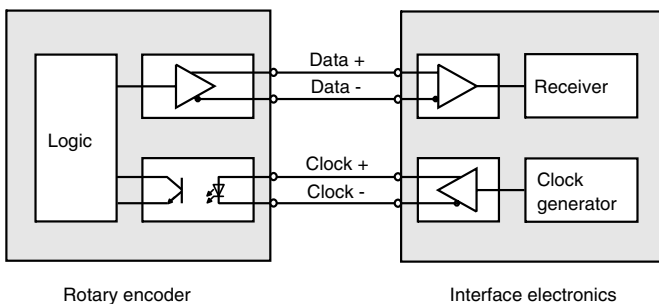
### SSI output format ring slide operation (multiple transmission)

- 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,  $n$  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  $T_m$ , a new current data word will be transmitted with the following pulses.



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

### Block diagram



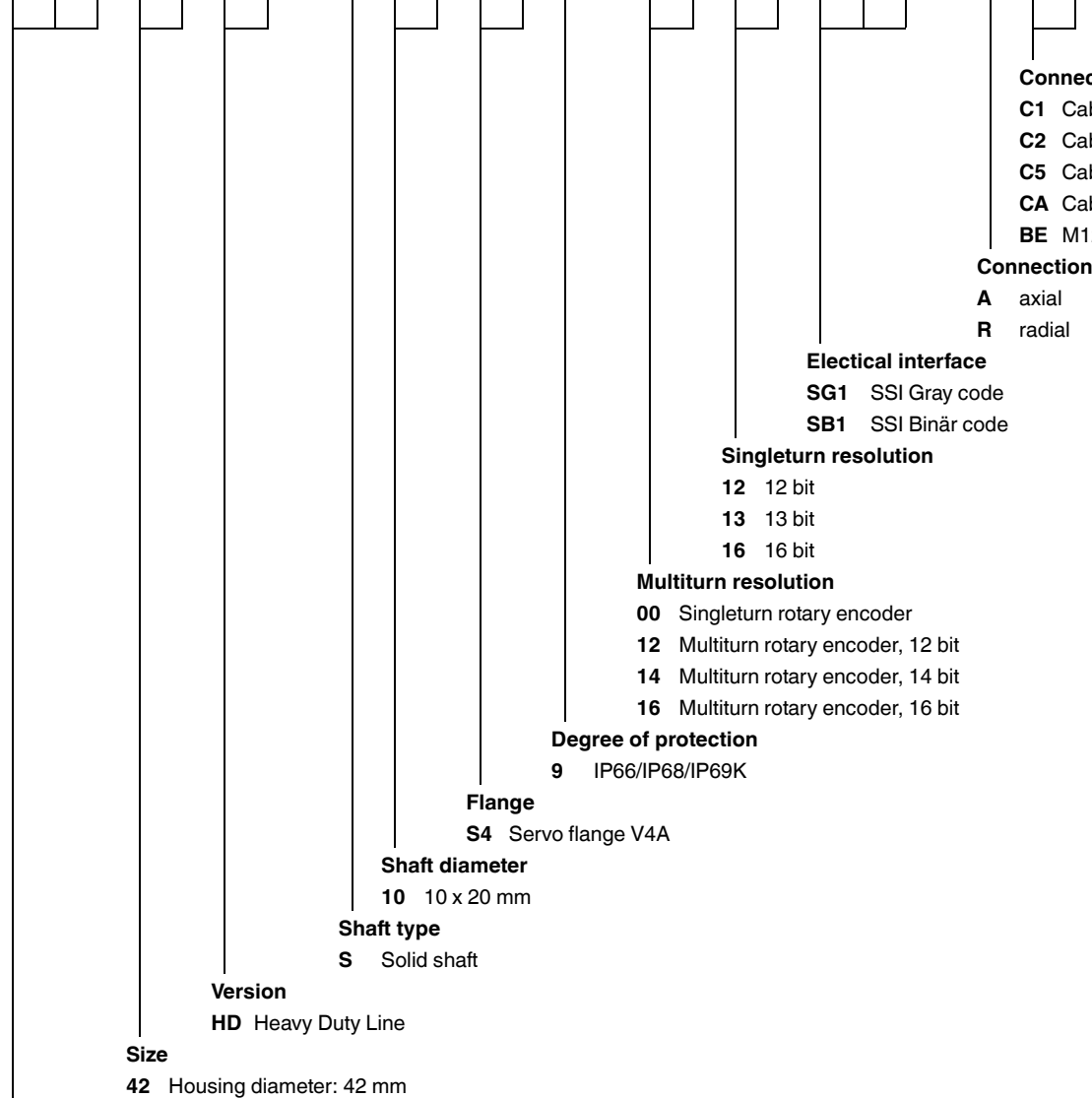
### Line length

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

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**E N A 4 2 H D - S 1 0 S 4 9 -**



- Connection type**  
**C1** Cable, 1 m  
**C2** Cable, 2 m  
**C5** Cable, 5 m  
**CA** Cable, 10 m  
**BE** M12 device plug, 8-pin

- Connection alignment**  
**A** axial  
**R** radial

- Electical interface**  
**SG1** SSI Gray code  
**SB1** SSI Binär code

- 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**  
**9** IP66/IP68/IP69K

- Flange**  
**S4** Servo flange V4A

- Shaft diameter**  
**10** 10 x 20 mm

- Shaft type**  
**S** Solid shaft

- Version**  
**HD** Heavy Duty Line

- Size**  
**42** Housing diameter: 42 mm

**Device type**

**ENA** Absolute rotary encoder

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