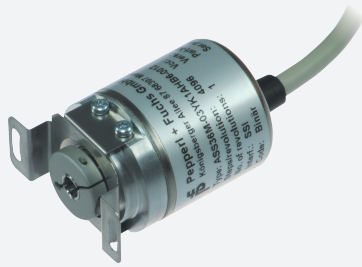


Absolute encoders

ENA36IL-R***-SSI



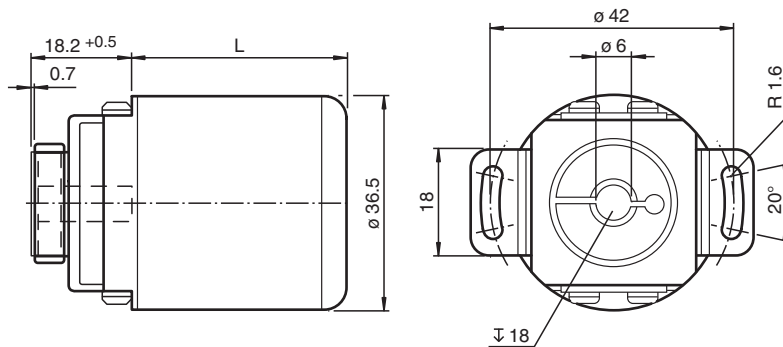
- Very small housing
- Up to 32 Bit multiturn
- SSI interface
- Free of wear magnetic sampling
- High resolution and accuracy



Function

The ENA36IL 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.

Dimensions



Degree of protection	L [mm]	
	Axial output	Radial output
IP54	36	
IP64/IP65	36	32

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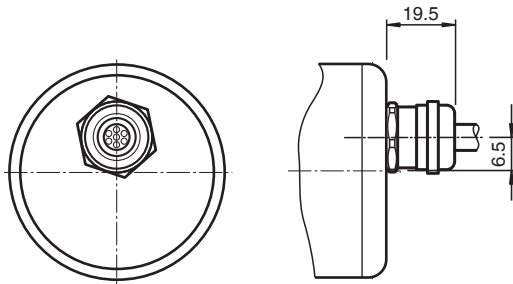
USA: +1 330 486 0001
fa-info@us.pepperl-fuchs.com

Germany: +49 621 776 1111
fa-info@de.pepperl-fuchs.com

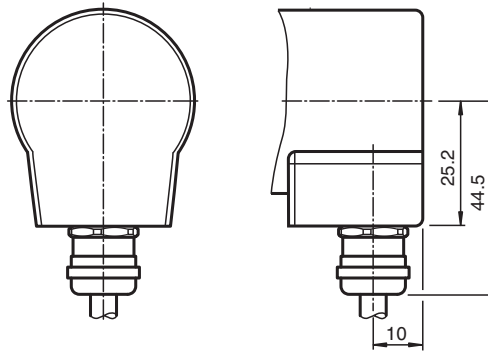
Singapore: +65 6779 9091
fa-info@sg.pepperl-fuchs.com

PF PEPPERL+FUCHS

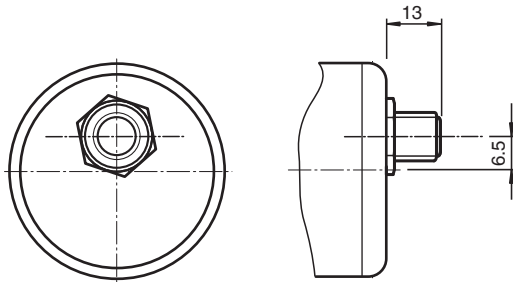
Dimensions



Output, axial, IP64/IP65



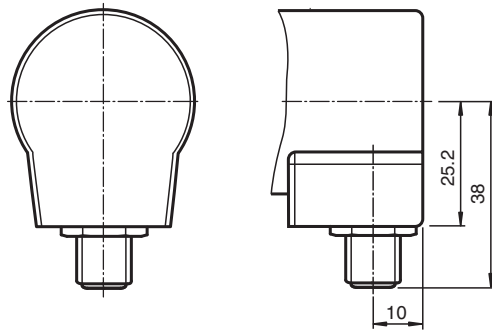
Output, radial, IP64/IP65



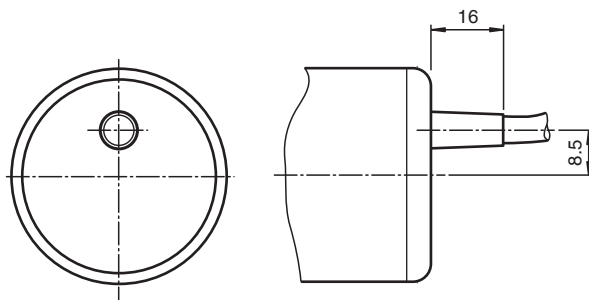
Output, axial, IP64/IP65

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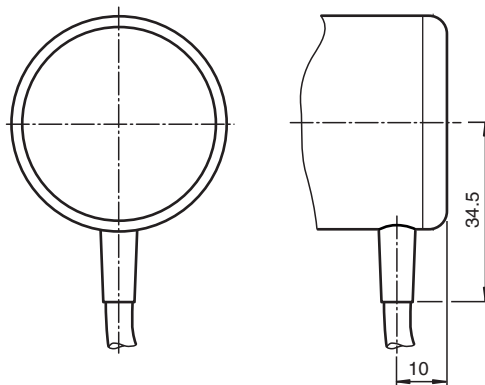
Dimensions



Output, radial, IP64/IP65



Output, axial, IP54



Output, radial, IP54

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 _d	700 a at 40 °C

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Technical Data

Mission Time (T _M)		20 a
L ₁₀		1035 E+8 revolutions at 19/44 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Electrical specifications		
Operating voltage	U _B	4.75 ... 30 V DC
Power consumption	P ₀	≤ 1 W
Time delay before availability	t _v	< 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 _B (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 _B
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 1.1 s
Connection		
Connector		M12 connector, 8-pin
Cable		Ø6 mm, 4 x 2 x 0.14 mm ²
Standard conformity		
Degree of protection		DIN EN 60529, IP65 or IP54
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
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source , if UL marking is marked on the product.
Ambient conditions		
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
Mechanical specifications		
Material		
Housing		nickel-plated steel

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fa-info@de.pepperl-fuchs.comSingapore: +65 6779 9091
fa-info@sg.pepperl-fuchs.com

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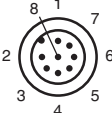
Technical Data

Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 150 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	19 N
Radial	44 N
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static

Accessories

	V19-W-ABG-PG9	Female connector M12 angled A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable

Connection Assignment

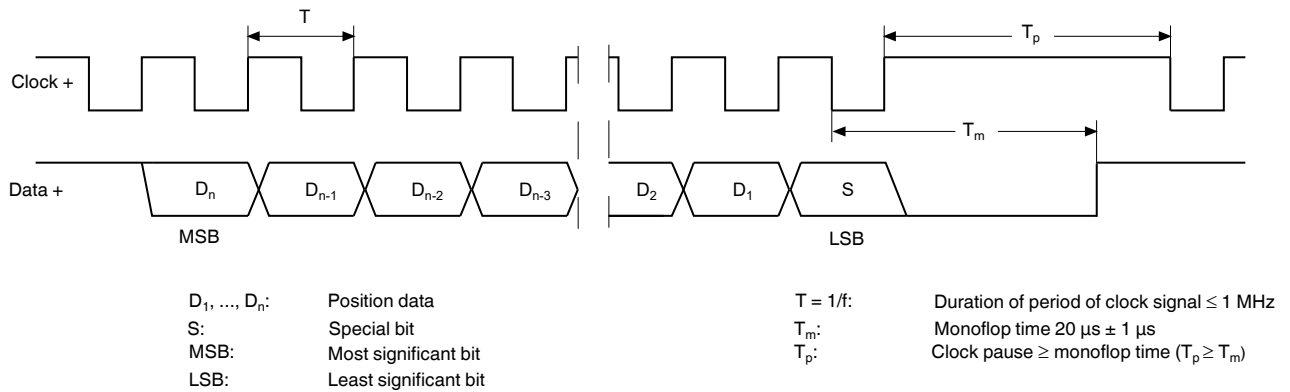
Signal	Wire end	Connector
GND (encoder)	White	1
U _b (encoder)	Brown4	2
Clock (+)	Green	3
Clock (-)	Yellow	4
Data (+)	Grey	5
Data (-)	Pink	6
Preset	Black or Blue	7
Counting direction	Red	8
Shielding	Shielding	Housing
Pinout	-	

Interface

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.

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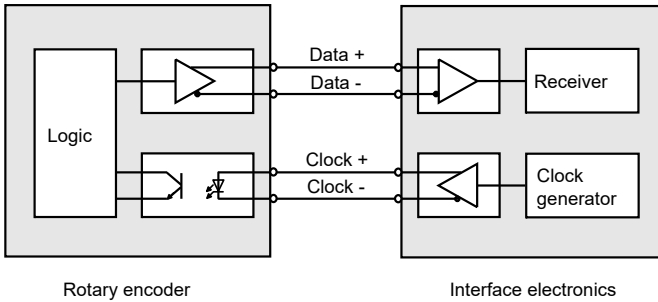
As an example: a multiturn encoder with a resolution of 8192 steps/revolution (13 bit) and a max. number of 4096 revolutions (12 bit) has a total resolution of $n = 25$ bit.

- 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

Type Code

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Model number



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

Interface, electric
SG1 SSI Gray, $U_B = 4.75\text{ V} \dots 30\text{ V}$
SB1 SSI digital, $U_B = 4.75\text{ V} \dots 30\text{ V}$

Single-turn resolution
12 12 bit
13 13 Bit
14 14 Bit
16 16 bit

Multiturn resolution
00 Single-turn rotary encoder
12 Multiturn rotary encoder, 12 bit
13 Multiturn rotary encoder, 13 bit
14 Multiturn rotary encoder, 14 bit
16 Multiturn rotary encoder, 16 bit

Protection class
4 IP54
5 IP65

Flange
DA Dual spring plate

Shaft diameter
06 6 mm (d = 6F7)

Shaft type
R Recessed hollow shaft

Version
IL Industrial Line

Size
36 Housing diameter: 36 mm

Device type
ENA Absolute rotary encoder

Installation

Anti-interference measures

The use of highly sophisticated microelectronics requires a consistently implemented anti-interference and wiring concept. This becomes all the more important the more compact the constructions are and the higher the demands are on the performance of modern machines.

The following installation instructions and proposals apply for "normal industrial environments". There is no ideal solution for all interfering environments.

When the following measures are applied, the encoder should be in perfect working order:

- Termination of the serial line with a 120 Ω resistor (between Receive/Transmit and Receive/Transmit) at the beginning and end of the serial line (e. g. the control and the last encoder).
- The wiring of the encoder should be laid at a large distance to energy lines which could cause interferences.
- Cable cross-section of the screen at least 4 mm².
- Cable cross-section at least 0,14 mm².
- The wiring of the screen and 0 V should be arranged radially, if and when possible.

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- Do not kink or jam the cables.
- Adhere to the minimum bending radius as given in the data sheet and avoid tensile as well as shearing load.

Operating instructions

Every encoder manufactured by Pepperl+Fuchs leaves the factory in a perfect condition. In order to ensure this quality as well as a faultless operation, the following specifications have to be taken into consideration:

- Avoid any impact on the housing and in particular on the encoder shaft as well as the axial and radial overload of the encoder shaft.
- The accuracy and service life of the encoder is guaranteed only, if a suitable coupling is used.
- The operating voltage for the encoder and the follow-up device (e. g. control) has to be switched on and off simultaneously.
- Any wiring work has to be carried out with the system in a dead condition.
- The maximum operating voltages must not be exceeded. The devices have to be operated at extra-low safety voltage.

Notes on connecting the electric screening

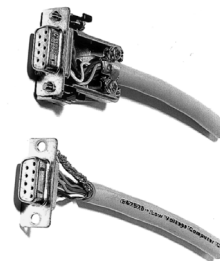
The immunity to interference of a plant depends on the correct screening. In this field installation faults occur frequently. Often the screen is applied to one side only, and is then soldered to the earthing terminal with a wire, which is a valid procedure in LF engineering. However, in case of EMC the rules of HF engineering apply.

One basic goal in HF engineering is to pass the HF energy to earth at an impedance as low as possible as otherwise energy would discharge into the cable. A low impedance is achieved by a large-surface connection to metal surfaces.

The following instructions have to be observed:

- Apply the screen on both sides to a "common earth" in a large surface, if there is no risk of equipotential currents.
- The screen has to be passed behind the insulation and has to be clamped on a large surface below the tension relief.
- In case of cable connections to screw-type terminals, the tension relief has to be connected to an earthed surface.
- If plugs are used, metallised plugs only should be fitted (such as sub D plugs with metallised housing). Please observe the direct connection of the tension relief to the housing.

Advantage:	metallised connector, shield
	clamped with the strain relief
	clamp
Disadvantage:	soldering shield on



Safety instructions

Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

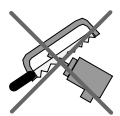
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

Tighten the clamping ring only, if a shaft has been fitted in the area of the clamping ring (hollow shaft encoders).

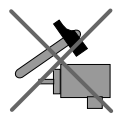
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

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