

Абсолютные энкодеры

Технические характеристики

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Absolute encoders

ENA58IL-S10C4E-1416B17-RH5

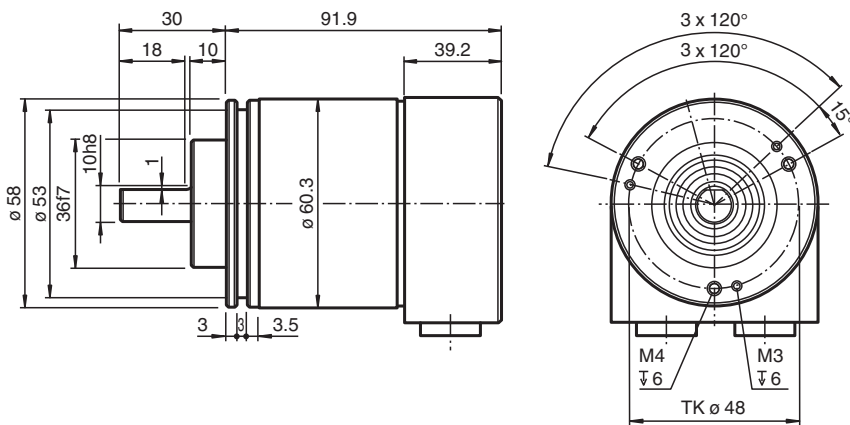
- Solid shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface



Function

The ENA58IL series are high precision encoders with internal magnetic sampling.

Dimensions



Technical Data

General specifications

Detection type	magnetic sampling
Device type	Absolute encoders
Linearity error	$\leq \pm 0.1^\circ$

Functional safety related parameters

MTTF _d	130 a at 40 °C
Mission Time (T _M)	12 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

Electrical specifications







Operating voltage	U _B	10 ... 30 V DC
Power consumption	P ₀	approx. 3 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)

Interface

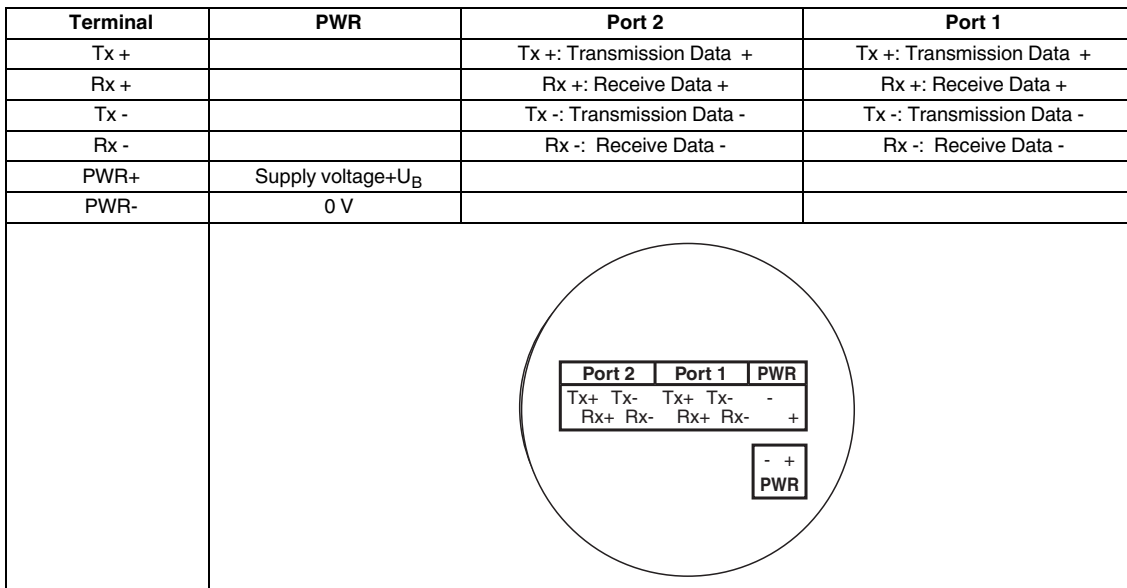
Technical Data

Interface type	PROFINET IO
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	100 MBit/s
Cycle time	≥ 1 ms
Connection	
Terminal compartment	Connection cover with radial cable outlet, with 2 threads M20 for cable glands
Standard conformity	
Degree of protection	DIN EN 60529, IP66, IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 1000 Hz
Ambient conditions	
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	stainless steel V4A
Flange	stainless steel V4A
Shaft	stainless steel V4A
Mass	approx. 1000 g
Rotational speed	max. 3000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

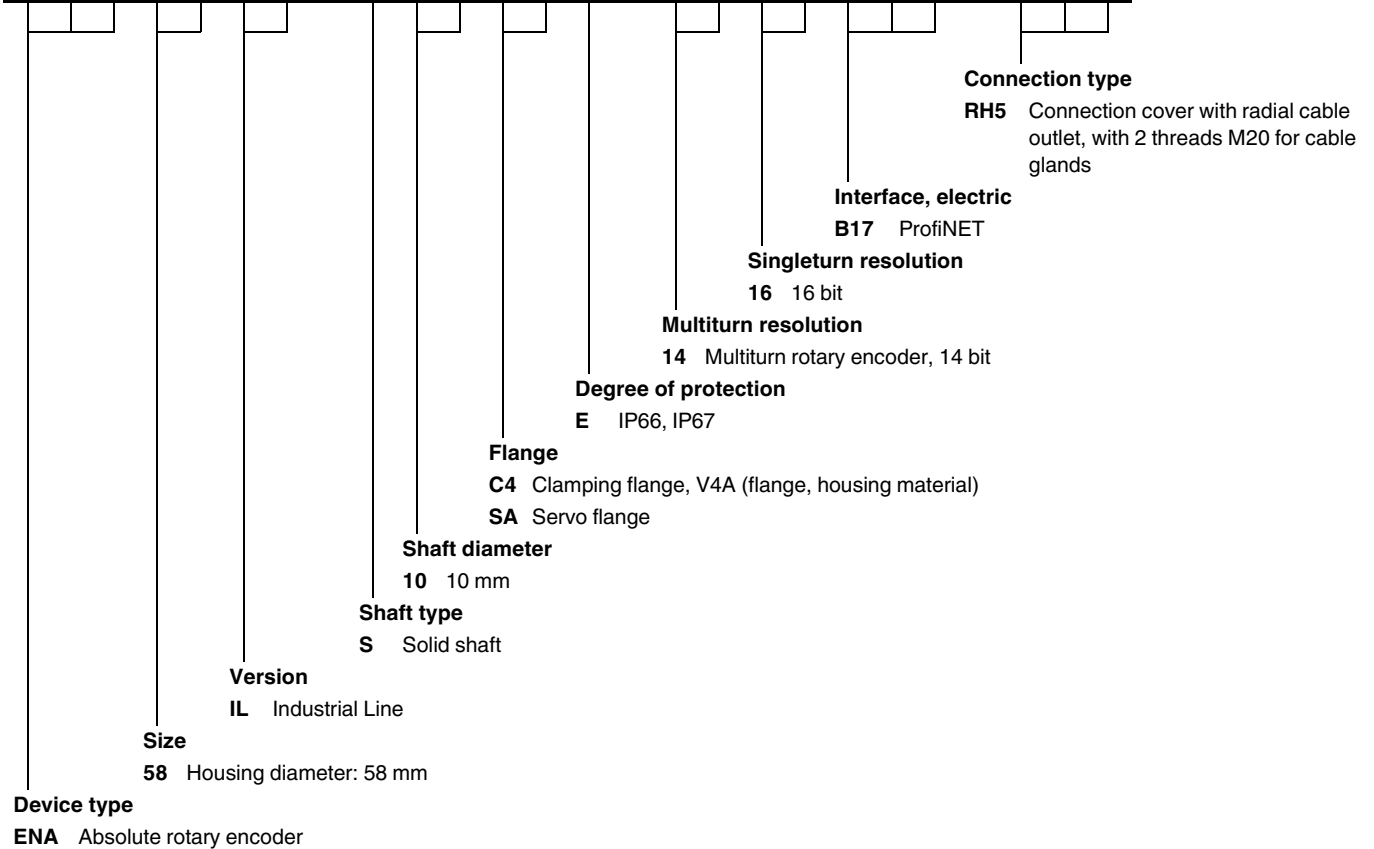
Connection



Type Code

Model number

E N A 5 8 I L - S 1 0 C 4 E - 1 4 1 6 B 1 7 - R H 5



Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: 310873_eng.pdf

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.
- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



Safety instructions

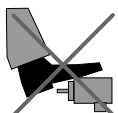
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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!

Absolute encoders

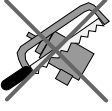
ENA58IL-S10C4E-1416B17-RH5



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute encoders

ENA36HD-S10SA9-0413I42-RBD

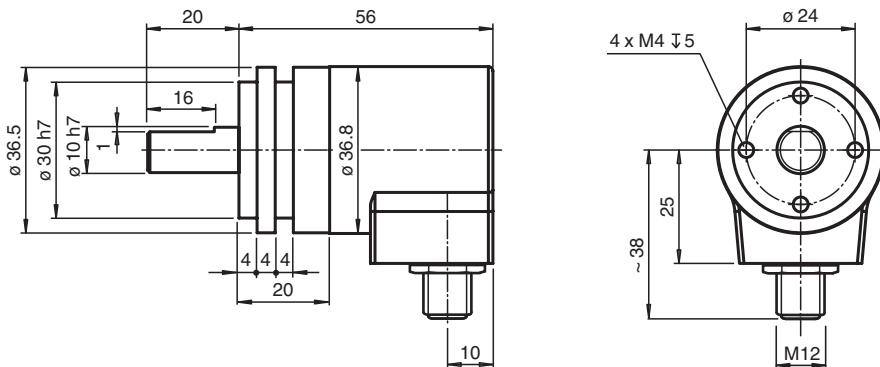
- Very small housing
- Analog interface
- 13 bit overall resolution
- Free of wear magnetic sampling
- High climatic resistance



Function

This absolute encoder with internal magnetic sampling is available with an analog voltage output or an analog current output. Depending on the model, the analog output provides a voltage value or a current value corresponding to the shaft setting.

Dimensions



Technical Data

General specifications

Detection type	magnetic sampling
Device type	Absolute encoders
Measurement range	min. 0 ... 22.5 ° max. 65536 x 360 ° factory setting: 16 x 360°
Resolution	13 Bit
UL File Number	E223176 "For use in NFPA 79 Applications only", if UL marking is marked on the product.

Functional safety related parameters

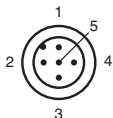
MTTF _d	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions
Diagnostic Coverage (DC)	0 %

Electrical specifications

Technical Data

Operating voltage	U_B	8 ... 32 V DC
Current consumption		typ. 20 mA (with current output)
Input 1		
Input type		lower limit of measurement range
Signal voltage		
High		8 ... 32 V DC
Signal duration		min. 1 s
Input 2		
Input type		upper limit of measurement range
Signal voltage		
High		8 ... 32 V DC
Signal duration		min. 1 s
Analog output		
Output type		analog current output
Default setting		rising ramp at ccw rotation
Linearity error		$\leq 0.15\%$
Load resistor		max. 500 Ω
Connection		
Connector		M12 connector, 5 pin
Standard conformity		
Degree of protection		DIN EN 60529 , 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, 200 g, 11 ms
Vibration resistance		DIN EN 60068-2-6, 30 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		Steel , corrosion-resistant
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 150 g
Rotational speed		max. 6000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		180 N
Radial		180 N

Connection

Signal	M12 connector
Analog output	1
+V _s (encoder)	2
GND (encoder)	3
Set 2	4
Set 1	5
Shielding	Housing
Pinout	

Operation

Description of rotary encoder functions

Default Settings

	Lower measuring range limit	Mid measuring range	Upper measuring range limit
Singleturn absolute rotary encoder	0	180°	360°
Multiturn absolute rotary encoder	0	8 x 360°	16 x 360°

Programming Encoders with No Operating Buttons

Scaling the measuring range

Use signal inputs "Set 1" and "Set 2" to scale the measuring range (minimum measuring range: 22.5°).

1. Connect signal inputs "Set 1" and "Set 2" simultaneously to +U_B for 15 seconds. The programming mode is activated now.
2. Turn the rotary encoder shaft to position 1 (lower measuring range limit).
3. Connect signal input "Set 1" to a high-potential source (+U_{B min} ≤ high potential ≤ +U_{B max}) for 1 second.
4. Connect signal input "Set 1" to ground
5. Turn the rotary encoder shaft to position 2 (upper measuring range limit).
6. Connect signal input "Set 2" to a high-potential source (+U_{B min} ≤ high potential ≤ +U_{B max}) for 1 second.
7. Connect signal input "Set 2" to ground

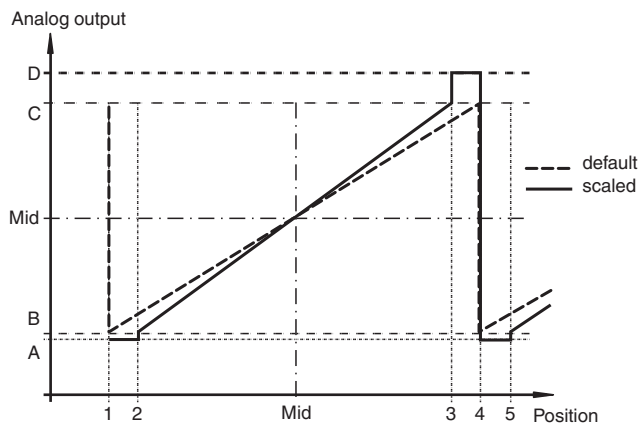
The analog output is now scaled to the programmed measuring range and the rotary encoder will operate in normal mode.

Resetting to the Default Setting

1. Connect the two signal inputs ("Set 1" and "Set 2") to a high-potential source (+U_{B min} ≤ high potential ≤ +U_{B max}) for 1 second. The measuring range is then reset to the default setting.

Analog Output Properties

The rotary encoder projects the current angular position of the rotary encoder shaft in an analog current value. The following graphic shows the values the output accepts at the various angular positions:



Legend:

Encoder type ¹⁾	Angular position					
	1	2	Mid	3	4	5

Singleturn	Factory default setting	0°	-	180°	-	360°	-
	Scaled	0°	Lower measuring range limit	-	Upper measuring range limit	360°	Lower measuring range limit
Multiturn	Factory default setting	0°	-	2 ⁴ x 180°	-	2 ⁴ x 360°	-
	Scaled ²⁾	0°	Lower measuring range limit	-	Upper measuring range limit	2 ⁿ x 360°	Lower measuring range limit

n = whole number from 1 to 16

1) See model number

2) Overflow at 360°, 720°, 1440°, 2880°, 5760°, etc. depending on the scale set.

Encoder output type	Analog output value				
	A	B	Mid	C	D
4 mA ... 20 mA	3.6 mA	4 mA	12 mA	20 mA	22 mA

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- The wiring of the screen and 0 V should be arranged radially, if and when possible.
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- Adhere to the minimum bending radius as given in the data sheet and avoid tensile as well as shearing load.

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Absolute encoders

ENA36HD-S10SA9-0413I42-RBD

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



Safety instructions

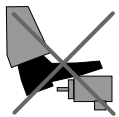
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Tighten the clamping ring only, if a shaft has been fitted in the area of the clamping ring (hollow shaft encoders).

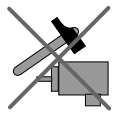
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Singleturn absolute encoder AVS58N-011YYRYGN-0014

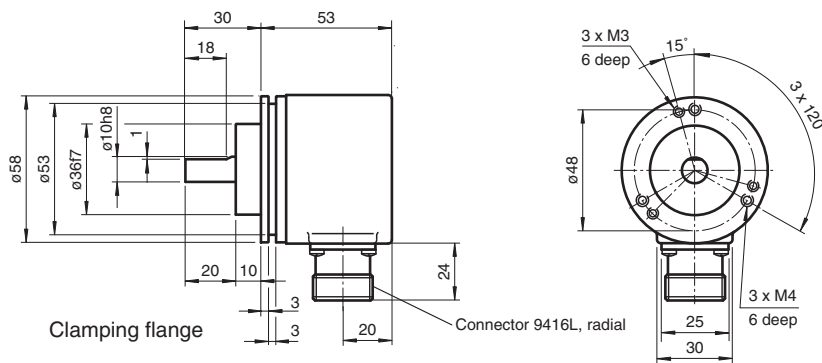
- YY: Connector 9416L with special assignment
- Y: Power supply 5 V DC
- 14 Bit singleturn
- Hardware encoder
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Clamping flange



Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AVS58 is maximum 16384 steps per revolution. In contrast to the AVS58 series the encoder does not have a microcontroller. Thus, it is a pure hardware encoder. The control module sends a clock bundle 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. This singleturn absolute encoder is available in clamp flange design with a shaft diameter of 10 mm x 20 mm. The electrical connection is made by a 12-pin round plug connector.

Dimensions



Technical Data

Functional safety related parameters

MTTF _d	170 a
Mission Time (T _M)	20 a
L ₁₀	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %


Electrical specifications

Operating voltage	U _B	5 V DC
No-load supply current	I ₀	max. 120 mA
Linearity		± 2 LSB at 14 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit
Output code		Gray code

Technical Data

Code course (counting direction)	cw descending (clockwise rotation, code course descending)
Interface	
Interface type	SSI
Monoflop time	20 ± 10 µs
Resolution	
Single turn	14 Bit
Overall resolution	14 Bit
Transfer rate	0.1 ... 2 MBit/s
Standard conformity	RS 422
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
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Mass	approx. 460 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
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Connection

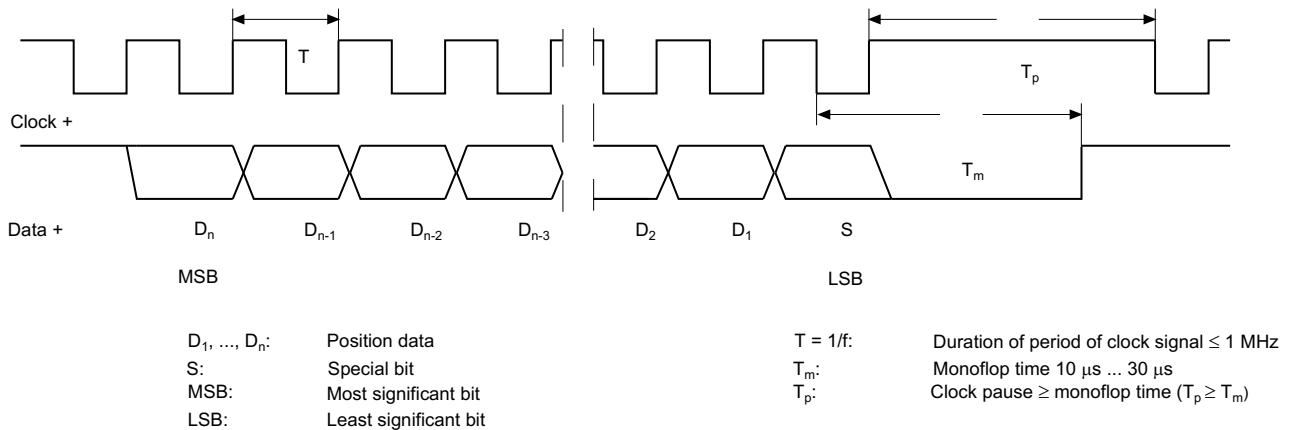
Signal	Connector 9416L, 12-pin	Explanation	Pinout
GND (encoder)	12	Power supply	
U _b (encoder)	10	Power supply	
Clock (+)	2	Positive cycle line	
Clock (-)	1	Negative cycle line	
Data (+)	3	Positive transmission data	
Data (-)	4	Negative transmission data	
Reserved	11	Not wired, reserved	
Reserved	5	Not wired, reserved	
Reserved	9	Not wired, reserved	
Reserved	8	Not wired, reserved	
Reserved	6	Not wired, reserved	
Reserved	7	Not wired, reserved	

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.

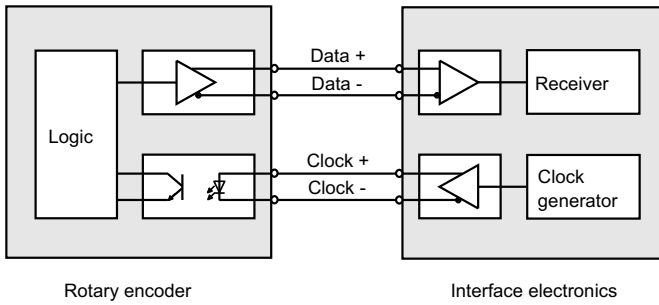
SSI output format ring slide operation (multiple transmission)

- 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, 25 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



Line length

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

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.
- 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.

Singleturn absolute encoder

AVS58N-011YYRYGN-0014

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



Safety instructions

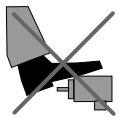
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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!

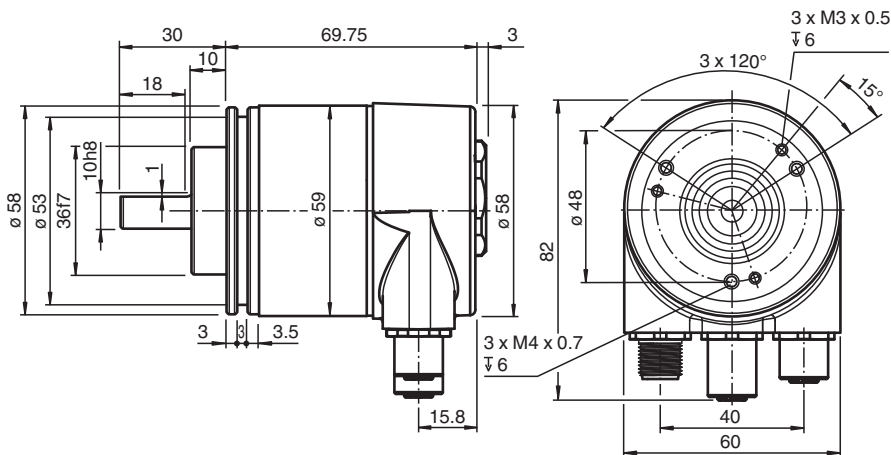


Singleturn absolute encoder EVS58N-011IZR0BY-0013:01

- Industrial standard housing $\varnothing 58$ mm
- EtherNet/IP
- 13 Bit singleturn
- Clamping flange
- Compatible with Rockwell/ Allen Bradley/ Schneider control
- Mechanical compatibility with all major encoders with fieldbus interface
- Rotary axis functionality
- Status LEDs



Dimensions



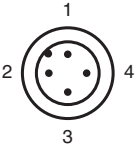
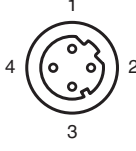
Technical Data

General specifications		
Detection type		photoelectric sampling
Device type		Singleturn absolute encoder
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
Power consumption	P_0	max. 4 W
Linearity		± 0.5 LSB (12 Bit)
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		EtherNet/IP
Resolution		
Single turn		13 Bit
Overall resolution		13 Bit
Physical		Ethernet
Transfer rate		100 MBit/s

Technical Data

Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, shaft side: IP64 housing side: IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Mass		approx. 370 g
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 3 Ncm (version without shaft seal)
Shaft load		
Axial		40 N
Radial		110 N

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -
		

Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available

Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> bus disconnected Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> Slave not configured yet or wrong configuration Wrong station address assigned (but not outside the permitted range) Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Absolute rotary encoder

ENA58IL-R15YY5-1212SG1-RBY:01

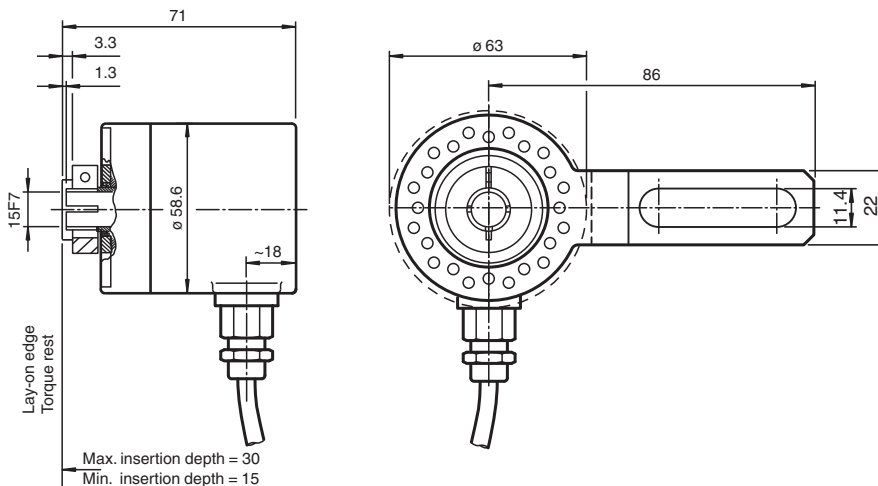
- SSI interface
- Recessed hollow shaft
- Resolution: 12 singleturn, 12 bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy



Function

The ENA58IL 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.

Dimensions



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.	

Electrical specifications

Operating voltage	U_B	4.5 ... 30 V
No-load supply current	I_0	typ. 50 mA
Power consumption	P_0	approx. 1.5 W
Time delay before availability	t_v	< 450 ms
Output code	Gray code	
Code course (counting direction)	cw ascending	

Interface

Interface type	SSI	
Resolution		

Technical Data

Single turn	12 Bit
Multiturn	12 Bit
Transfer rate	0.1 ... 2 MBit/s
Cycle time	< 100 µs
Standard conformity	RS 422
Connection	
Fixed cable with plug	cable Ø8 mm, 8 x 2 x 0.14 mm ² , length 300 mm, M12 connector, 8-pin
Standard conformity	
Degree of protection	DIN EN 60529, IP65
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)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	nickel-plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static
General information	
Scope of delivery	Spring plate is enclosed as accessory

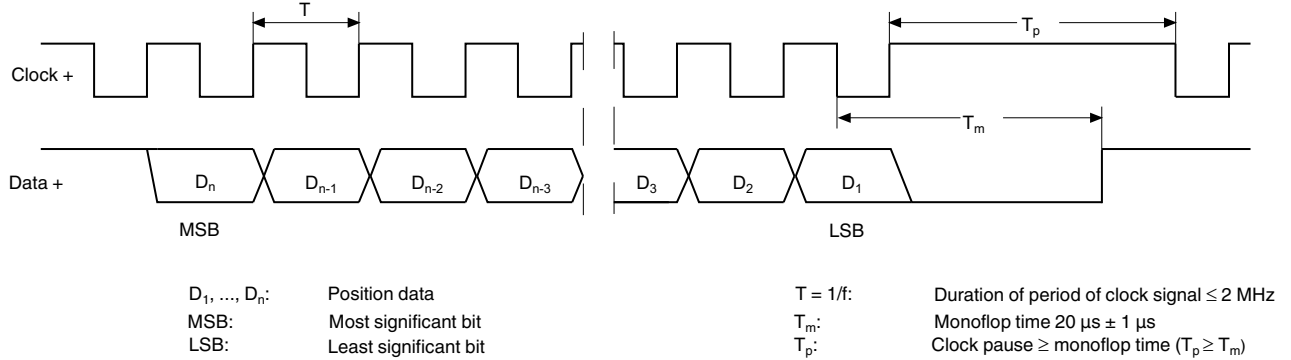
Connection

Signal	Connector M12, 8-pin
Not connected	1
+U _B (rotary encoder)	2
Data (+)	3
Data (-)	4
Clock (+)	5
Clock (-)	6
GND (rotary encoder)	7
Not connected	8

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



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)) 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.

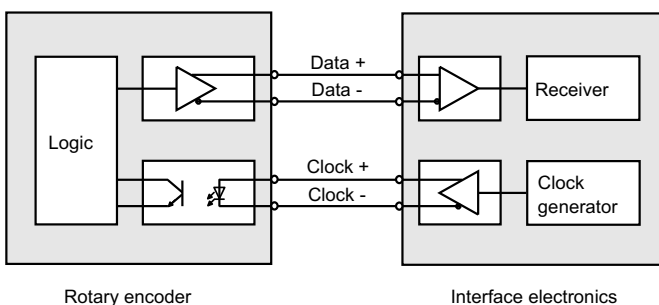
SSI output format ring slide operation (multiple transmission)

- 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

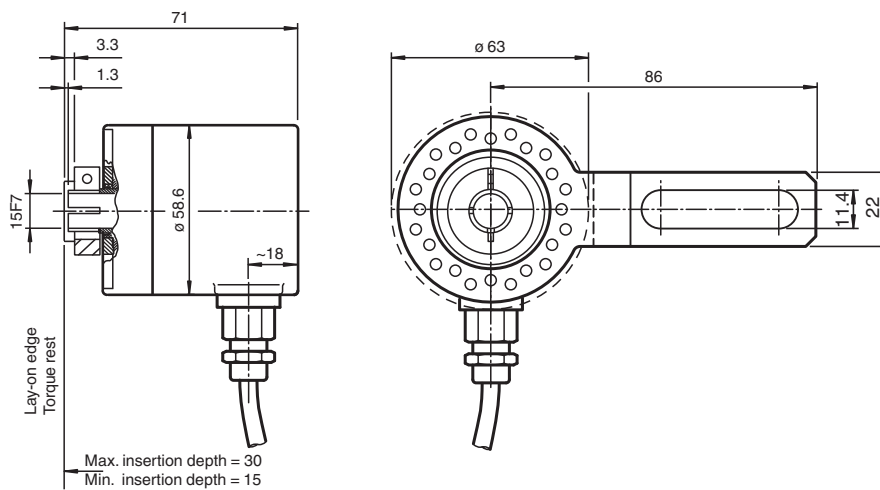
Absolute rotary encoder

ENA58IL-R15YY5-1212SI2-RAY:01

- SSI interface
- Recessed hollow shaft
- Resolution: 12 singleturn, 12 bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy



Dimensions



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.	

Electrical specifications

Operating voltage	U_B	10 ... 30 V
No-load supply current	I_0	typ. 50 mA
Power consumption	P_0	approx. 1.5 W
Time delay before availability	t_v	< 450 ms
Output code	Gray code	
Code course (counting direction)	cw ascending	

Interface

Interface type	SSI ; SSI + incremental track	
Resolution		
Single turn	12 Bit	
Multiturn	12 Bit	
Transfer rate	0.1 ... 2 MBit/s	
Cycle time	< 100 μ s	
Standard conformity	RS 422	

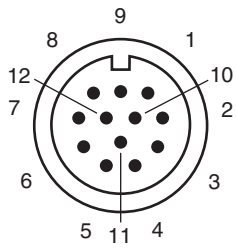
Technical Data

Output	
Output type	Push/pull
Signal output	A+B+Z+/A-/B-/Z
Pulses	2048
Connection	
Fixed cable with plug	cable Ø8 mm, 8 x 2 x 0.14 mm ² , length 300 mm, M23 connector, 12-pin, right-rotating
Standard conformity	
Degree of protection	DIN EN 60529, IP65
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)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 %, no moisture condensation
Mechanical specifications	
Material	
Housing	nickel-plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static
General information	
Scope of delivery	Spring plate is enclosed as accessory

Connection Assignment


Signal	M23 connector, 12-pin, clockwise
GND	1
+U _B	2
Clock (+)	3
Clock (-)	4
Data (+)	5
Data (-)	6
A	7
Z	8
/Z	9
B	10
/A	11
/B	12

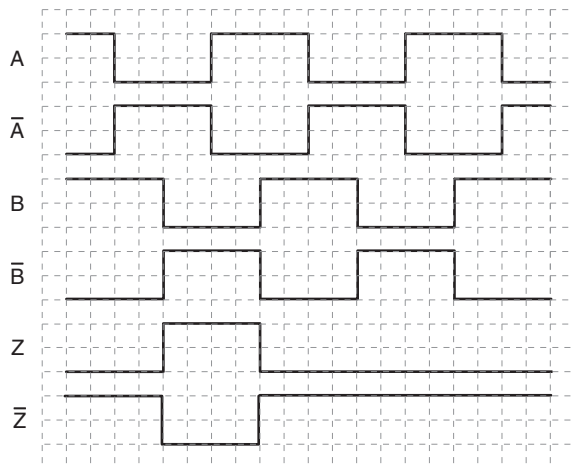
Connection Assignment



Operation

Signal outputs

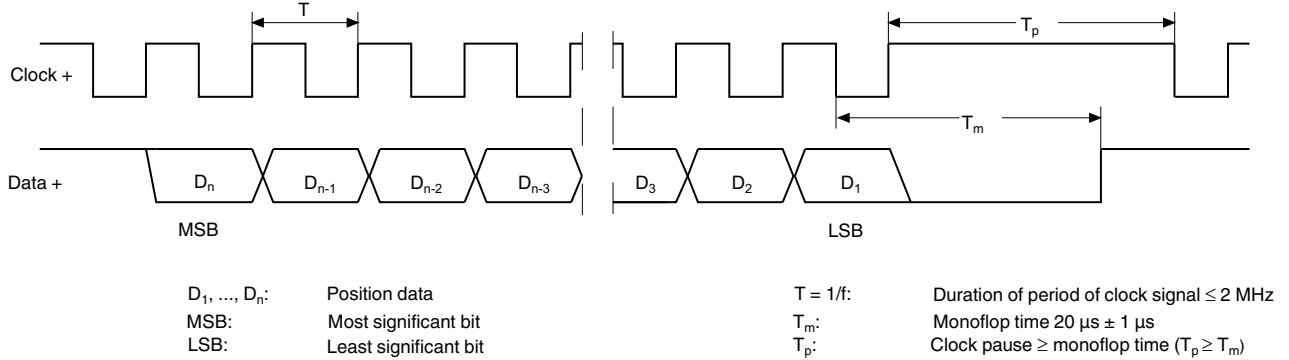
 cw - with view onto the shaft



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



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)) 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.

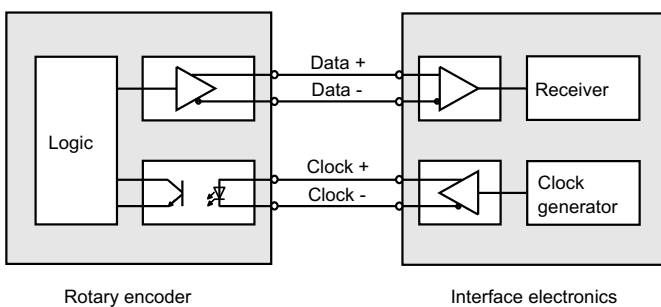
SSI output format ring slide operation (multiple transmission)

- 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.



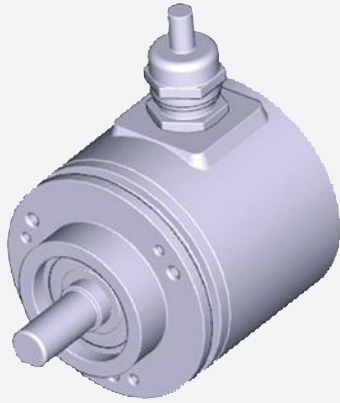
If the pulse line is exchanged, the data word is generated offset.

Block diagram



Line length

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



Absolute rotary encoder

ENA58IL-S10CA5-0012SY1-RC5:01

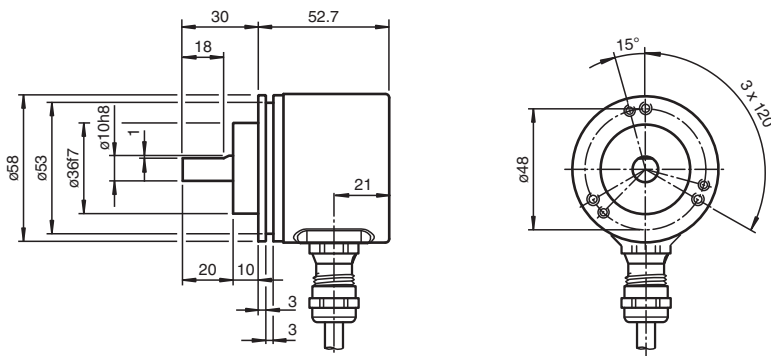
- Solid shaft
- SSI interface
- 12 Bit singleturn
- Free of wear magnetic sampling
- High resolution and accuracy



Function

The ENA58IL 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



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.	

Electrical specifications

Operating voltage	U_B	4.5 ... 30 V DC
No-load supply current	I_0	typ. 50 mA
Power consumption	P_0	approx. 1 W
Time delay before availability	t_v	< 450 ms
Output code	Gray code	
Code course (counting direction)	adjustable	

Technical Data

Interface	
Interface type	SSI
Resolution	
Single turn	12 Bit
Transfer rate	0.1 ... 2 MBit/s
Cycle time	< 100 µs
Input 1	
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
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	
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 5 m
Standard conformity	
Degree of protection	IP65
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, movable installation: -5 ... 70 °C (23 ... 158 °F), cable, fixed installation: -30 ... 70 °C (-22 ... 158 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 %, no moisture condensation
Mechanical specifications	
Material	
Housing	nickel-plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g, with cable
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

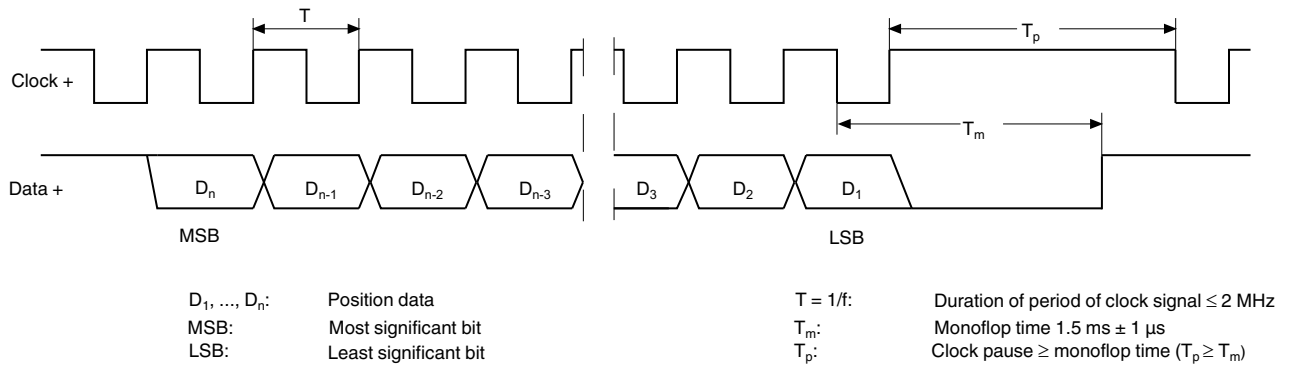
Connection

Signal	Cable	Explanation
GND (encoder)	White	Power supply
+U _B (encoder)	Brown	Power supply
Clock (+)	Green	Positive cycle line
Clock (+)	Yellow	Negative cycle line
Data (+)	Grey	Positive transmission data
Data (-)	Pink	Negative transmission data
V/R	Red	Input for selection of counting direction
PRESET 1	Blue	Zero-setting input

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



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)) 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.

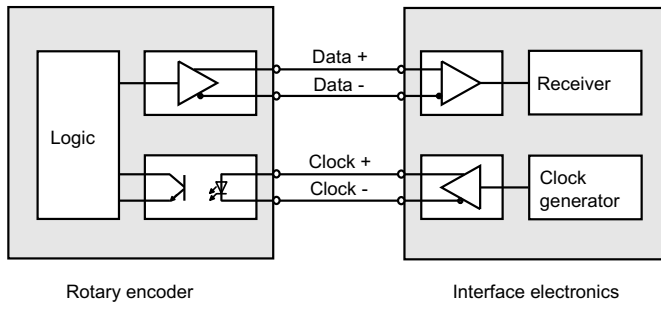
SSI output format ring slide operation (multiple transmission)

- 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

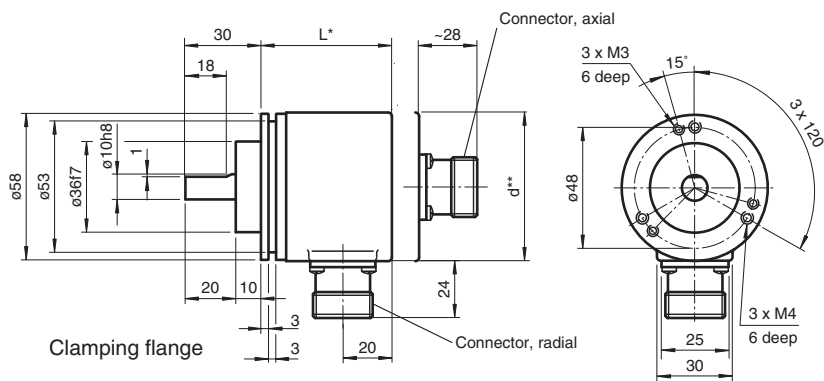


Singleturn absolute encoder FVS58

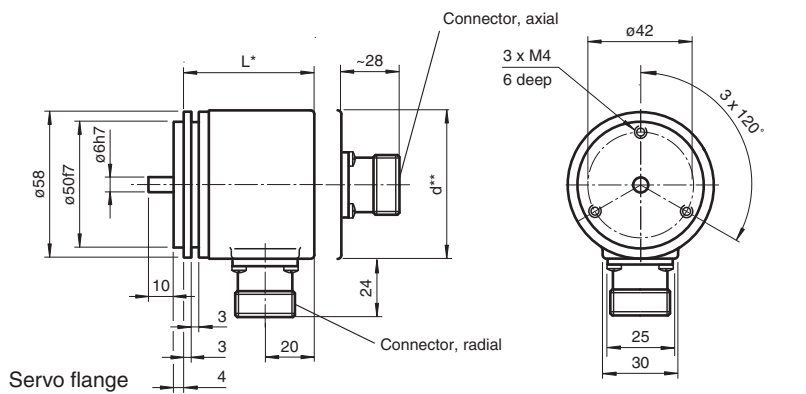
- Industrial standard housing $\varnothing 58$ mm
- 13 Bit singleturn
- Output code: gray and binary
- Short-circuit proof push-pull output
- Inputs for selecting counting direction, LATCH, and PRESET
- Code change frequency up to 400 kHz
- Servo or clamping flange



Dimensions



* with radial exit position L = 53
 ** Aluminium: d = 59, stainless steel: d = 61



* inum/stainless steel),
 with radial exit position L = 53
 ** Aluminium: d = 59, stainless steel: d = 61



















Technical Data

Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 10 ms
Switch-on delay		≥ 1 ms
Switch-off delay		≥ 1 ms
Input 2		
Input type		Temporary storage (LATCH)
Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 100 µs
Switch-on delay		< 0.1 ms
Switch-off delay		< 0.1 ms
Input 3		
Input type		zero-set (PRESET)
Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 10 ms
Switch-on delay		< 1 ms
Connection		
Connector		type 9424 (M23), 19-pin
Cable		Ø9 mm, 12 x 2 x 0.14 mm ² , 2 m
Standard conformity		
Degree of protection		DIN EN 60529, IP65
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F) cable models: -30 ... 70 °C (rigid wiring) -5 ... 70 °C (flexible wiring)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F) (cable models: -5 ... 70 °C)
Mechanical specifications		
Material		
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel flange: stainless steel shaft: stainless steel
Mass		approx. 200 g (combination 1) approx. 400 g (combination 2)
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 5 Ncm
Shaft load		





Technical Data

Axial	40 N
Radial	110 N

Accessories

	9203	Angled flange
	9424	Female cordset
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling

Accessories

	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling
	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Function

The emphasis for this series is on rapid data transfer. Position data are read directly out of the Gray code disc. The high code switching frequency of 400 kHz is achieved by consciously avoiding the use of a microcontroller.

In terms of the mechanics, designs with clamping flange or servo flange are available for the FVS58 singleturn absolute encoder.

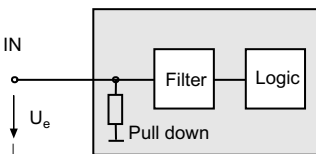
Connection

Signal	Cable Ø9 mm, 24-core	Connector 9424, 19-pin	Explanation
GND (rotary encoder)	White	6	Power supply
U _b (rotary encoder)	Brown	12	Power supply
Data bit 1	Green	1	Data output
Data bit 2	Yellow	2	Data output
Data bit 3	Grey	3	Data output
Data bit 4	Pink	4	Data output
Data bit 5	Blue	5	Data output
Data bit 6	Red	7	Data output
Data bit 7	Black	8	Data output
Data bit 8	Violet	9	Data output
Data bit 9	Grey/Pink	10	Data output
Data bit 10	Red/Blue	11	Data output
Data bit 11	White/Green	13	Data output
Data bit 12	Brown/Green	14	Data output
Data bit 13	White/Yellow	15	Data output
	White/Grey	-	Reserved
	Grey/Brown	19	Reserved
V/R	White/Pink	16	Input for selection of counting direction
LATCH	Pink/Brown	17	Temporary storage input
	White/Blue	-	Reserved
PRESET	Brown/Blue	18	Zero setting input
	White/Red	-	Reserved
	Brown/Red	-	Reserved

Interface

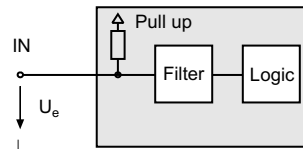
Inputs

Input for temporary storage (LATCH)
Input zero setting (PRESET)



Input level: "0" 0 V ... 2 V,
"1" 10 V ... 30 V,
I_e < 6 mA

Input for selection of counting direction (V/R)



Input for selection of counting direction (V/R)

The counting direction for the absolute value rotary encoder as seen looking on the shaft is defined as right rotating (cw) rising or descending. The counting direction can be reversed with the V/R input. If the input is not used, the counting direction is defined as rising (standard), the level is at "1". Pulse duration T > 10 ms.

Input level: "1" or unused = rising code value with direction of rotation cw.

Input level: "0" = descending code value for direction of rotation cw.

Input for temporary storage (LATCH)

With LATCH input "active", the position data on the parallel interface are "frozen". This makes it possible to accept position data without errors (especially for binary position data), since any change in the data during the read procedure is prevented. If this input is unused, its value is "0". Pulse duration $T > 100 \mu\text{s}$.

Input level: "1" = position data saved and stable at the output.

Input level: "0" or unused = position data free running at the output.

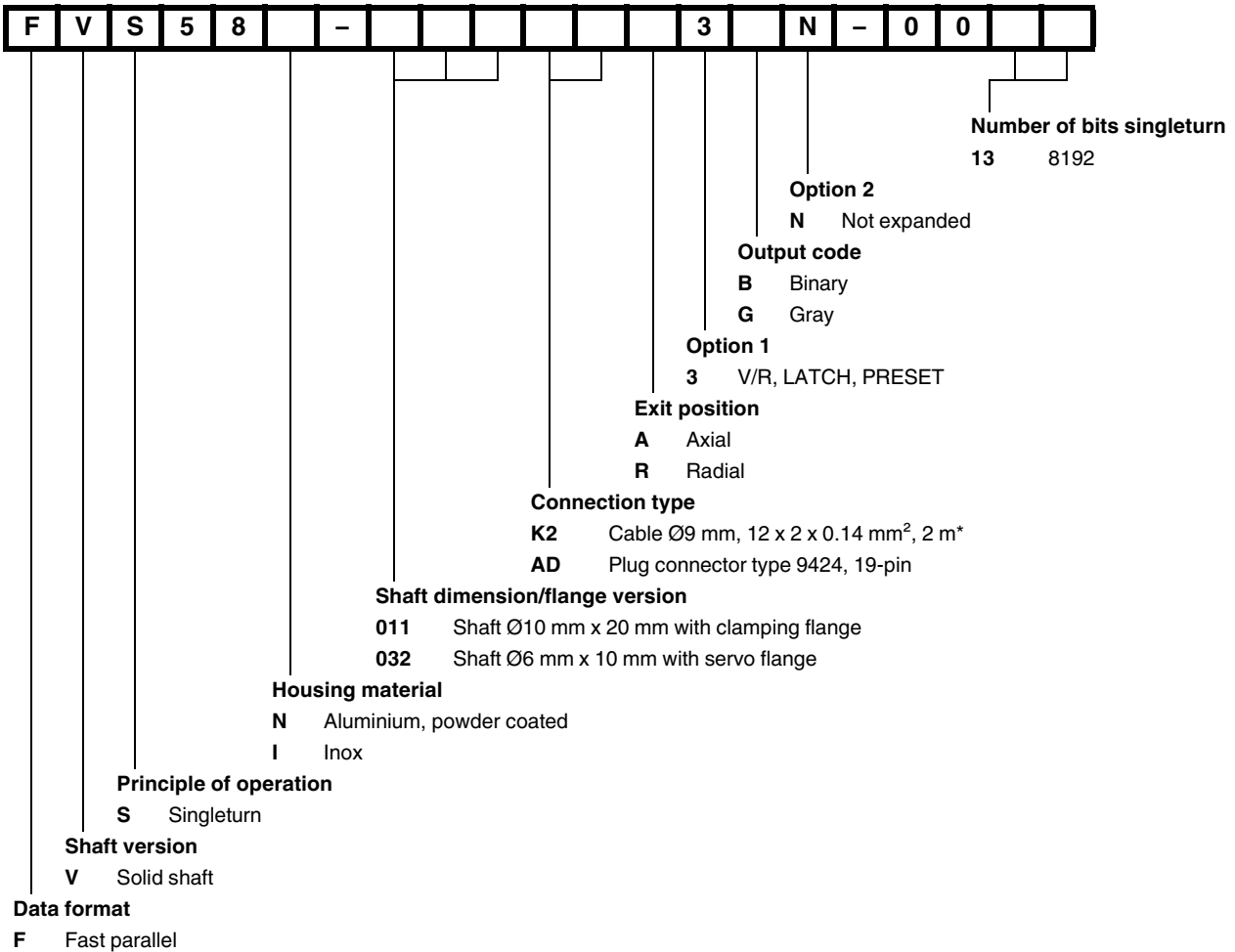
Input zero setting (PRESET)

By means of the PRESET input, the absolute value rotary encoder can be adjusted electronically to position value 0. Pulse duration $T > 10 \text{ ms}$.

Input level: "0" or unused = inactive.

Input level: "1" = Data output word is set to 0.

Type Code



Singleturn absolute encoder

FSS58



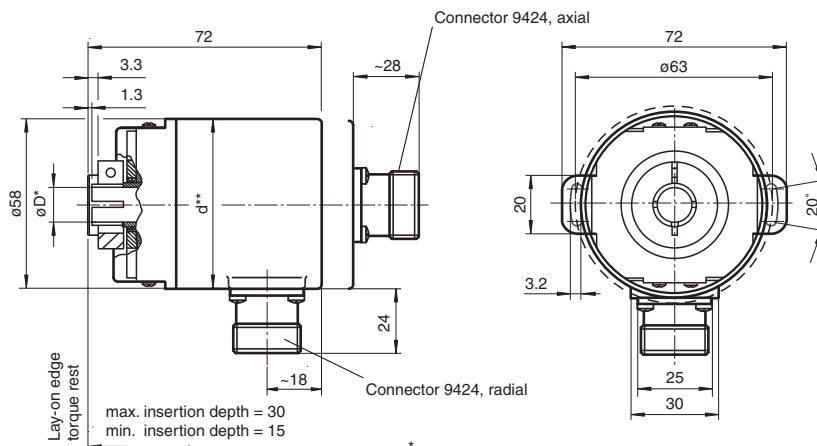
- Industrial standard housing $\varnothing 58$ mm
- 13 Bit singleturn
- Output code: gray and binary
- Short-circuit proof push-pull output
- Inputs for selecting counting direction, LATCH, and PRESET
- Code change frequency up to 400 kHz
- Recessed hollow shaft



Function

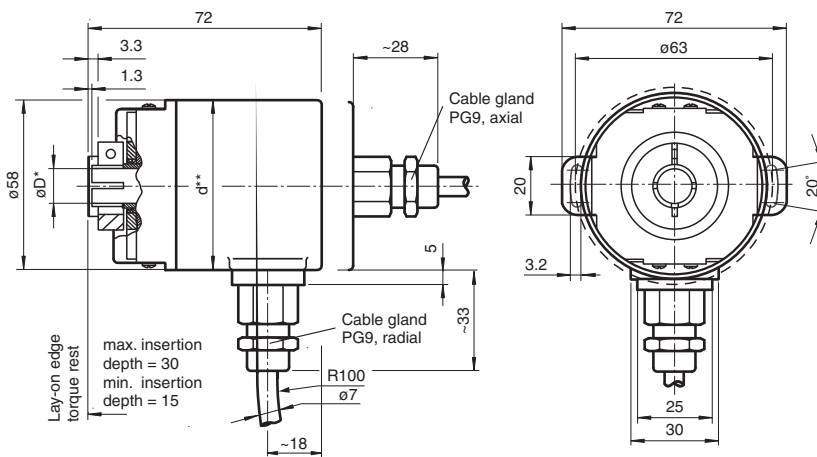
The emphasis for this series is on rapid data transfer. Position data are read directly out of the Gray code disc. The high code switching frequency of 400 kHz is achieved by consciously avoiding the use of a microcontroller. The FSS58 singleturn absolute encoder is equipped with a recessed hollow shaft. The encoder housing has a diameter of 58 mm. The recessed hollow shaft is available with diameters of 10 mm, 12 mm and 15 mm. This version in particular represents a simple and cost-effective mounting solution. The shaft hub connection is already integrated into the rotary encoder. The rotary encoder is held in place by a torque rest.

Dimensions



Recessed hollow shaft

** Aluminium: $d = 59$, stainless steel: $d = 61$



Recessed hollow shaft

** Aluminium: $d = 59$, stainless steel: $d = 61$






Technical Data

Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	max. 140 mA
Power consumption	P_0	≤ 2 W , without output drivers
Linearity		± 0.5 LSB
Output code		Gray code, binary code and Gray excess code
Code course (counting direction)		cw ascending (clockwise rotation, code course ascending)
Code preparation time		0.3 ms
Interface		
Interface type		Push-pull, parallel , short-circuit protected
Resolution		
Single turn		13 Bit
Load current		20 mA
Voltage drop		≤ 2.5 V
Signal voltage		
High		operating voltage minus voltage drop
Low		≤ 2.8 V
Rise time		300 ns
De-energized delay		300 ns
Code change frequency		400 kHz
Input 1		
Input type		Selection of counting direction (cw/ccw)
Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 10 ms
Switch-on delay		≥ 1 ms
Switch-off delay		≥ 1 ms
Input 2		
Input type		Temporary storage (LATCH)
Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 100 μ s
Switch-on delay		< 0.1 ms
Switch-off delay		< 0.1 ms
Input 3		
Input type		zero-set (PRESET)
Signal voltage		
High		10 ... 30 V
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 10 ms
Switch-on delay		< 1 ms
Connection		
Connector		type 9424 (M23), 19-pin
Cable		$\varnothing 9$ mm, 12 x 2 x 0.14 mm ² , 2 m
Standard conformity		
Degree of protection		DIN EN 60529, IP65
Climatic testing		DIN EN 60068-2-3, no moisture condensation
Emitted interference		EN 61000-6-4:2007

Technical Data

Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F) cable models: -30 ... 70 °C (rigid wiring) -5 ... 70 °C (flexible wiring)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F) (cable models: -5 ... 70 °C)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 200 g (combination 1) approx. 400 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 5 Ncm

Accessories

	9424	Female cordset
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Cable Ø9 mm, 24-core	Connector 9424, 19-pin	Explanation
GND (rotary encoder)	White	6	Power supply
U _b (rotary encoder)	Brown	12	Power supply
Data bit 1	Green	1	Data output
Data bit 2	Yellow	2	Data output
Data bit 3	Grey	3	Data output
Data bit 4	Pink	4	Data output
Data bit 5	Blue	5	Data output
Data bit 6	Red	7	Data output
Data bit 7	Black	8	Data output
Data bit 8	Violet	9	Data output
Data bit 9	Grey/Pink	10	Data output
Data bit 10	Red/Blue	11	Data output
Data bit 11	White/Green	13	Data output
Data bit 12	Brown/Green	14	Data output
Data bit 13	White/Yellow	15	Data output
	White/Grey	-	Reserved
	Grey/Brown	19	Reserved
V/R	White/Pink	16	Input for selection of counting direction
LATCH	Pink/Brown	17	Temporary storage input
	White/Blue	-	Reserved
PRESET	Brown/Blue	18	Zero setting input
	White/Red	-	Reserved
	Brown/Red	-	Reserved

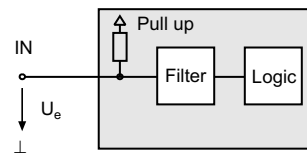
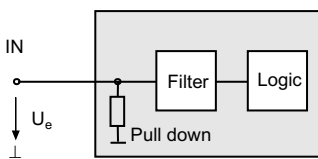
Interface

Inputs

Input for temporary storage (LATCH)
Input zero setting (PRESET)

Input level: "0" 0 V ... 2 V,
"1" 10 V ... 30 V,
I_e < 6 mA

Input for selection of counting direction (V/R)



Input for selection of counting direction (V/R)

The counting direction for the absolute value rotary encoder as seen looking on the shaft is defined as right rotating (cw) rising or descending. The counting direction can be reversed with the V/R input. If the input is not used, the counting direction is defined as rising (standard), the level is at "1". Pulse duration T > 10 ms.

Input level: "1" or unused = rising code value with direction of rotation cw.

Input level: "0" = descending code value for direction of rotation cw.

Input for temporary storage (LATCH)

With LATCH input "active", the position data on the parallel interface are "frozen". This makes it possible to accept position data without errors (especially for binary position data), since any change in the data during the read procedure is prevented. If this input is unused, its value is "0". Pulse duration T > 100 µs.

Input level: "1" = position data saved and stable at the output.

Input level: "0" or unused = position data free running at the output.

Input zero setting (PRESET)

By means of the PRESET input, the absolute value rotary encoder can be adjusted electronically to position value 0. Pulse duration T > 10 ms.

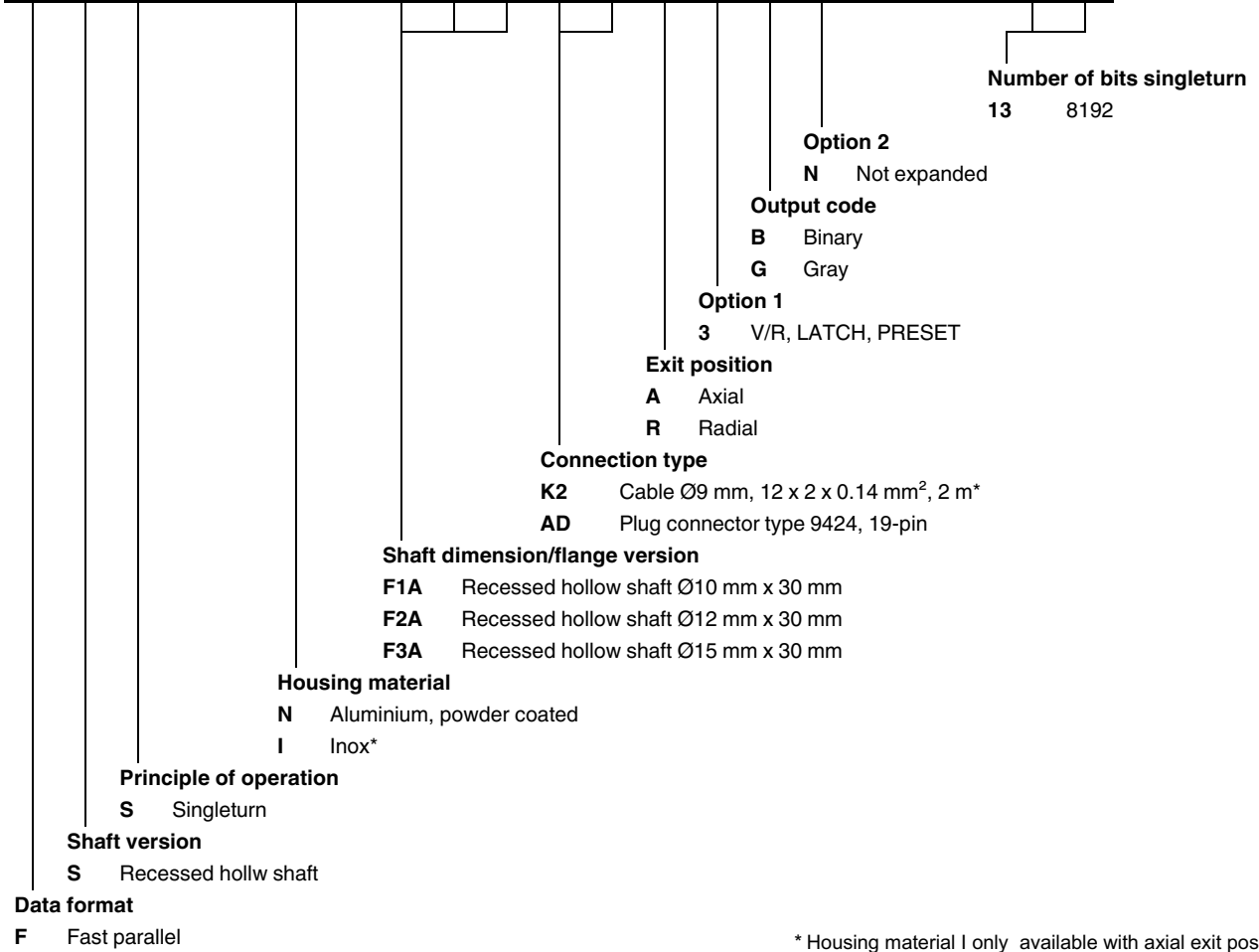
Input level: "0" or unused = inactive.

Input level: "1" = Data output word is set to 0.

Type Code

Order code

F	S	S	5	8	-						3		N	-	0	0		
---	---	---	---	---	---	--	--	--	--	--	---	--	---	---	---	---	--	--



Singleturn absolute encoder

EVS58-TZ



- Industrial standard housing $\varnothing 58$ mm
- Ethernet interface with TCP/IP
- 16 Bit singleturn
- Integrated webservice
- Servo or clamping flange



Function

Absolute rotary encoders deliver an absolute step value for each angle setting.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

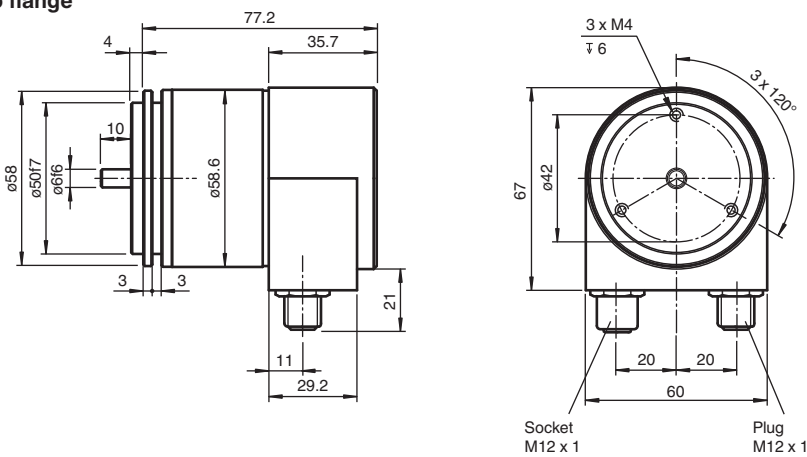
The Ethernet interface of this absolute encoder supports the TCP/IP protocol. The integrated webservice provides Java applets, which allow the whole parameterisation of the encoder via any web browser. The following operation modes can be selected:

- Polled mode
- Cyclic mode
- Change of state mode

The device is designed for shaft mounting and is available in servo flange or clamping flange design.

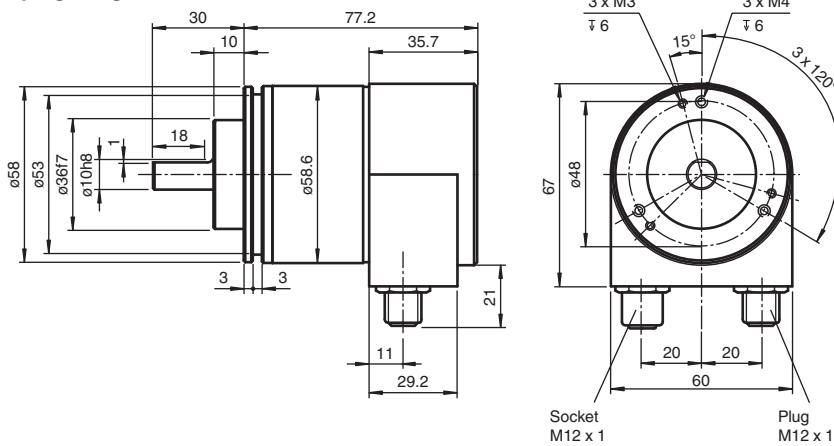
Dimensions

Servo flange



Dimensions

Clamping flange











Technical Data

General specifications			
Detection type	photoelectric sampling		
Device type	Singleturn absolute encoder		
Functional safety related parameters			
MTTF _d	130 a		
Mission Time (T _M)	20 a		
L ₁₀	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load		
Diagnostic Coverage (DC)	0 %		
Electrical specifications			
Operating voltage	U _B	10 ... 30 V DC	
Power consumption	P ₀	max. 4 W	
Linearity	± 0.5 LSB (up to 12 Bit) ± 2 LSB (up to 16 Bit)		
Output code	binary code		
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)		
Interface			
Interface type	TCP/IP		
Resolution			
Single turn	up to 16 Bit		
Overall resolution	up to 16 Bit		
Physical	Ethernet		
Transfer rate	10 MBit/s / 100 MBit/s		
Connection			
Connector	Ethernet: 1 socket M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 5-pin, A-coded		
Standard conformity			
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65		
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, 100 g, 6 ms		
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 1000 Hz		
Approvals and certificates			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		

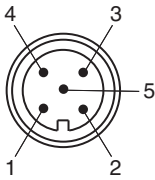
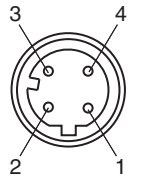
Technical Data

Ambient conditions	
Operating temperature	0 ... 60 °C (32 ... 140 °F) Standard , with Option T -40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Mass	approx. 500 g
Rotational speed	max. 12000 min ⁻¹ without shaft seal max. 3000 min ⁻¹ with shaft seal
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm without shaft seal ≤ 5 Ncm with shaft seal
Shaft load	
Axial	40 N
Radial	110 N

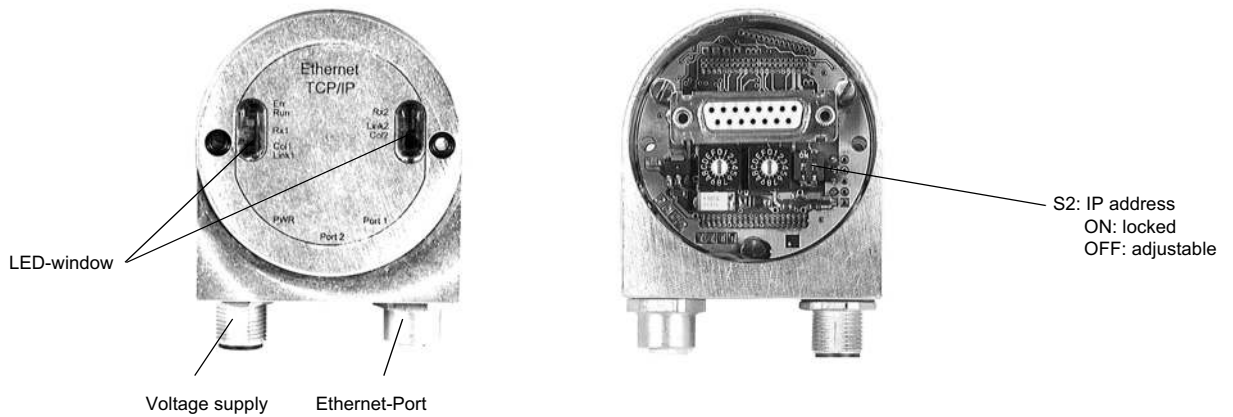
Accessories

	9203	Angled flange
	V1SD-G-ABG-PG9	Male connector M12 straight D-coded 4-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V1SD-G-2M-PUR-ABG-V45-G	Connection cable, M12 to RJ-45, PUR cable 4-pin, CAT5e
	V15-G-YE2M-PVC	Female cordset, M12, 5-pin, PVC cable
	9300	Mounting bracket for servo flange
	V15-G-YE5M-PVC	Female cordset, M12, 5-pin, PVC cable
	V15-G-PG9	Female connector M12 straight A-coded 5-pin, for cable diameter 6 - 8 mm, field-attachable
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 5-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	+ 24 V	Tx +
2	+ 24 V	Rx +
3	0 V	Tx -
4	0 V	Rx -
5	PE	
		

Indication



LED-indicators

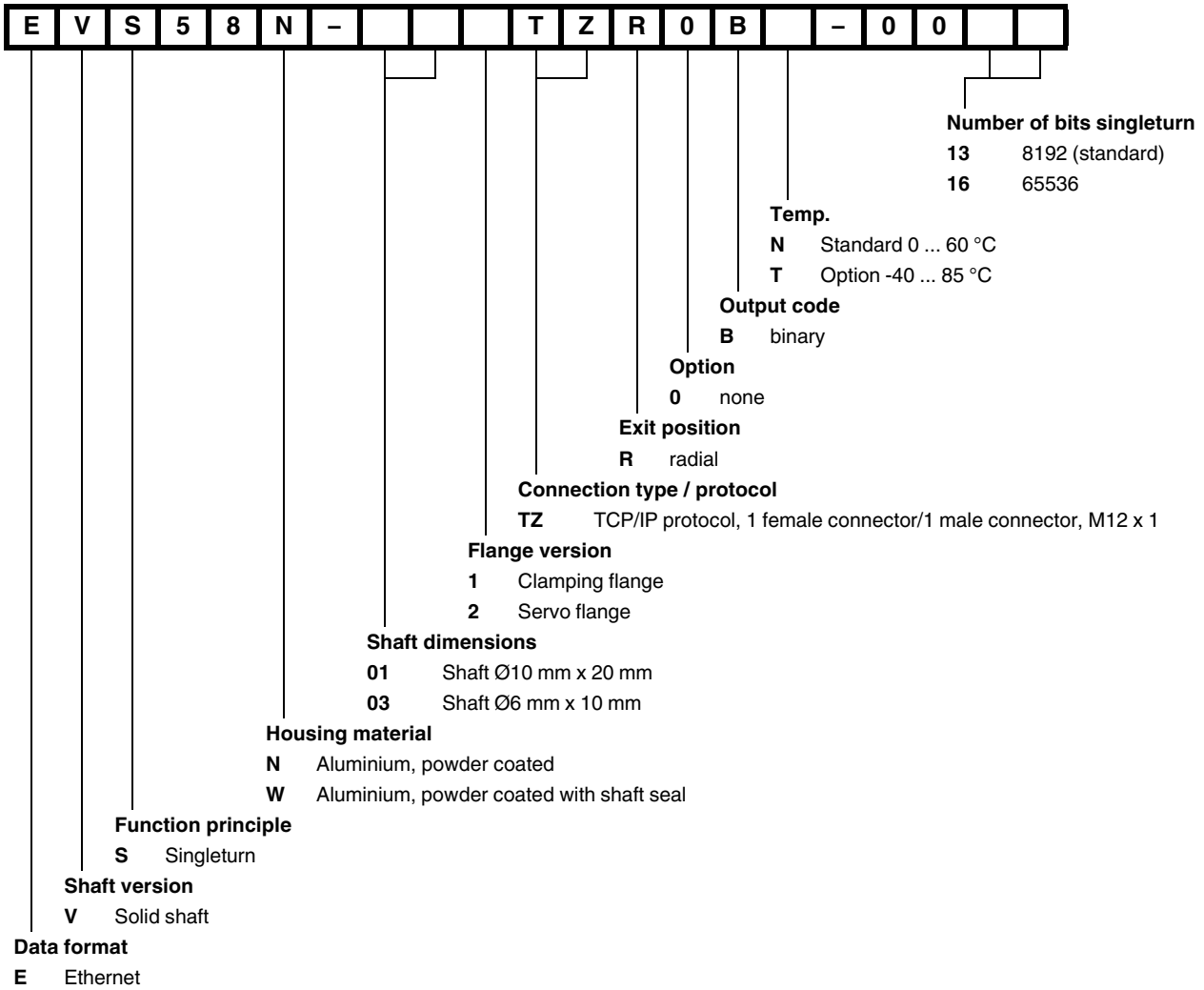
LED	Colour	Meaning
Rx1	yellow	Data traffic on Port 1
Link1	green	Connection to an Ethernet device on Port 1
Col1	red	Bus collision on Port 1
Err	red	Internal error
Run	green	Ethernet interface ready to work

Set switch S2 to position OFF. The IP address can be adjusted now. In switch position ON, the IP address is blocked to avoid unintended change. The rotary switches and switch S1 are without any function.

IP address adjustment

Type Code

Order code



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.
- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on

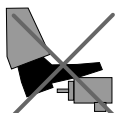


Safety instructions

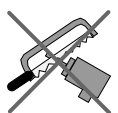
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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.

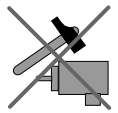
Tighten the clamping ring only, if a shaft has been fitted in the area of the clamping ring (hollow shaft encoders). Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Singleturn absolute encoder

ESS58-TZ



- Industrial standard housing Ø58 mm
- Ethernet interface with TCP/IP
- 16 Bit singleturn
- Integrated webserver
- Recessed hollow shaft



Function

In addition to the CANopen-, DeviceNet-, PROFIBUS- and AS-Interface encoders, we have broadened our product line of bus-capable absolute encoders with the ESS58 for Ethernet.

Absolute rotary encoders deliver an absolute step value for each angle setting.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

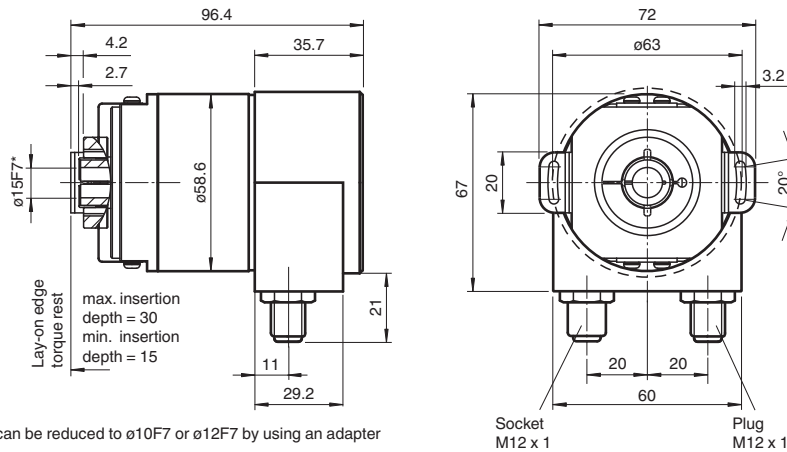
The Ethernet interface of this absolute encoder supports the TCP/IP protocol. The integrated webserver provides Java applets, which allow the whole parameterisation of the encoder via any web browser. In addition to various functions like resolution adjustment, e-mail-services, change of the IP address and many others, the following operation modes can be selected:

- Polled mode
- Cyclic mode
- Change of state mode

The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

Dimensions

Recessed hollow shaft



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder



Functional safety related parameters

MTTF _d	130 a
Mission Time (T _M)	20 a
L ₁₀	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load








Technical Data

Diagnostic Coverage (DC)	0 %	
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
Power consumption	P_0	max. 4 W
Linearity	± 0.5 LSB (12 Bit) ,	
Output code	binary code	
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	TCP/IP	
Resolution		
Single turn	up to 16 Bit	
Overall resolution	up to 16 Bit	
Physical	Ethernet	
Transfer rate	10 MBit/s / 100 MBit/s	
Connection		
Connector	Ethernet: 1 socket M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 5-pin, A-coded	
Standard conformity		
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	
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, 100 g, 6 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 1000 Hz	
Approvals and certificates		
UL approval	cULus Listed, General Purpose, Class 2 Power Source	
Ambient conditions		
Operating temperature	0 ... 60 °C (32 ... 140 °F) Standard , with Option T -40 ... 85 °C (-40 ... 185 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel	
Mass	approx. 500 g	
Rotational speed	max. 12000 min ⁻¹ without shaft seal max. 3000 min ⁻¹ with shaft seal	
Moment of inertia	30 gcm ²	
Starting torque	≤ 3 Ncm without shaft seal ≤ 5 Ncm with shaft seal	
Tightening torque, fastening screws	max. 1.8 Nm	
Shaft load		
Angle offset	$\pm 0.9^\circ$	
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm	
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm	

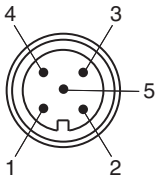
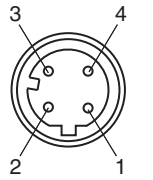
Accessories

	V15-G-YE2M-PVC	Female cordset, M12, 5-pin, PVC cable
	V15-G-YE5M-PVC	Female cordset, M12, 5-pin, PVC cable

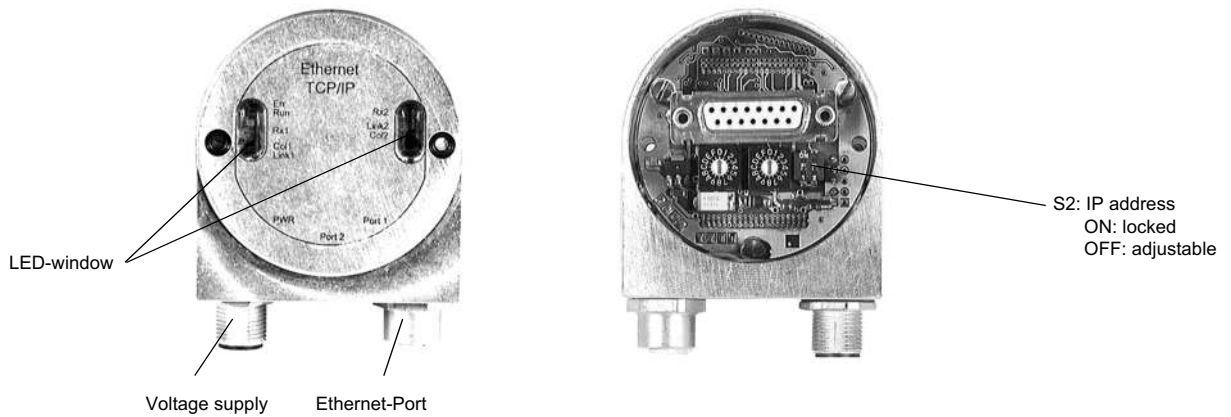
Accessories

	V1SD-G-ABG-PG9	Male connector M12 straight D-coded 4-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V1SD-G-2M-PUR-ABG-V45-G	Connection cable, M12 to RJ-45, PUR cable 4-pin, CAT5e
	V15-G-PG9	Female connector M12 straight A-coded 5-pin, for cable diameter 6 - 8 mm, field-attachable
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Pin	Male connector M12 x 1, 5-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	+ 24 V	Tx +
2	+ 24 V	Rx +
3	0 V	Tx -
4	0 V	Rx -
5	PE	
		

Indication



LED-indicators

LED	Colour	Meaning
Rx1	yellow	Data traffic on Port 1
Link1	green	Connection to an Ethernet device on Port 1
Col1	red	Bus collision on Port 1
Err	red	Internal error
Run	green	Ethernet interface ready to work

Set switch S2 to position OFF. The IP address can be adjusted now. In switch position ON, the IP address is blocked to avoid unintended change. The rotary switches and switch S1 are without any function.

IP address adjustment

Type Code

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

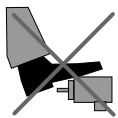
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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!

Singleturn absolute encoder

ESS58-PN



- Industrial standard housing $\varnothing 58$ mm
- PROFINET IRT
- 16 Bit singleturn
- Recessed hollow shaft
- Network loop through by means of integrated 2 port switch (IRT capable)
- IP address resettable
- No DIP switches for address setting
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



Function

In addition to the CANopen-, DeviceNet-, PROFIBUS- and AS-Interface encoders, we have broadened our product line of bus-capable absolute encoders with the ESS58 for Ethernet.

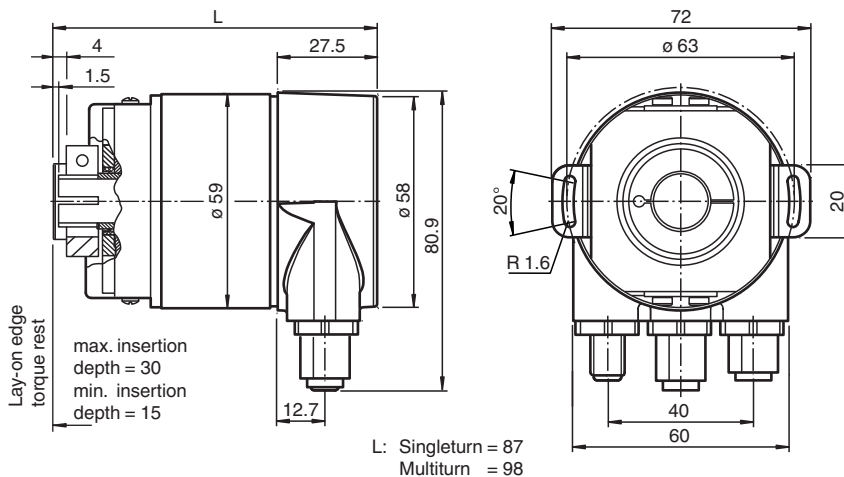
Absolute rotary encoders deliver an absolute step value for each angle setting. This device has a maximum basic resolution of 65536 steps per revolution (16 bits).

The Ethernet interface of this absolute encoder supports the Profinet protocol. The integrated webserver provides Java applets, which allow the whole parameterisation of the encoder via any web browser. In addition to various functions like resolution adjustment, e-mail-services, change of the IP address and many others, the following operation modes can be selected:

- Polled mode
- Cyclic mode
- Change of state mode

The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
UL File Number	E223176 "For use in NFPA 79 Applications only", if UL marking is marked on the product.

Functional safety related parameters

Technical Data

MTTF _d		130 a
Mission Time (T _M)		20 a
L ₁₀		1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
Power consumption	P ₀	max. 4 W
Linearity		± 0.5 LSB (12 Bit) ,
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		PROFINET IO
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Physical		
Transfer rate		100 MBit/s
Cycle time		≤ 1 ms (IRT) ; ≤ 10 ms (RT)
Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4301 / AISI 304 shaft: stainless steel 1.4305 / AISI 303
Mass		approx. 360 g (combination 1) approx. 910 g (combination 2)
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 3 Ncm (version without shaft seal)
Tightening torque, fastening screws		max. 1.8 Nm
Shaft load		
Angle offset		± 0.9 °
Axial offset		static: ± 0.3 mm, dynamic: ± 0.1 mm

Technical Data

Radial offset static: ± 0.5 mm, dynamic: ± 0.2 mm

Type Code

Structure of the type code

E	S	S	5	8	(1)	-	(2)	(2)	(2)	P	N	R	0	B	N	-	0	0	(3)	(3)
---	---	---	---	---	-----	---	-----	-----	-----	---	---	---	---	---	---	---	---	---	-----	-----

E	Data format
E	Ethernet

S	Shaft version
S	Recessed hollow shaft

S	Function principle
S	Singleturn

58	Housing diameter
58	58 mm

1	Housing material
N	Aluminum, powder coated
W	Aluminum, powder coated with shaft seal
I	Stainless steel

(2) (2) (2)	Shaft dimensions
F1A	Recessed hollow shaft $\varnothing 10$ mm x 30 mm
F2A	Recessed hollow shaft $\varnothing 12$ mm x 30 mm
F3A	Recessed hollow shaft $\varnothing 15$ mm x 30 mm

PN	Connection type / protocol
PN	Profinet protocol, 1 female connector/1 male connector, M12 x 1

R	Exit position
R	Radial





0	Option
0	None

B	Output code
B	Binary

N	Temperature
N	Normal

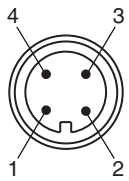
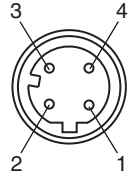
(3) (3)	Number of bits singleturn
13	13 Bits : 8192 pulses (standard)
16	16 Bits : 65536 pulses

Accessories

	ACC-PACK-ABS-_S_58 ø15	Accessories set for $\varnothing 58$ absolute rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for $\varnothing 58$ absolute rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for $\varnothing 58$ absolute rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for $\varnothing 58$ absolute rotary encoder with recessed hollow shaft 10 mm

Connection

Pin	Voltage supply	Ethernet
	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	+VS (15 ... 30 VDC)	Tx +
2	n. c.	Rx +
3	GND (0 V)	Tx -
4	n. c.	Rx -

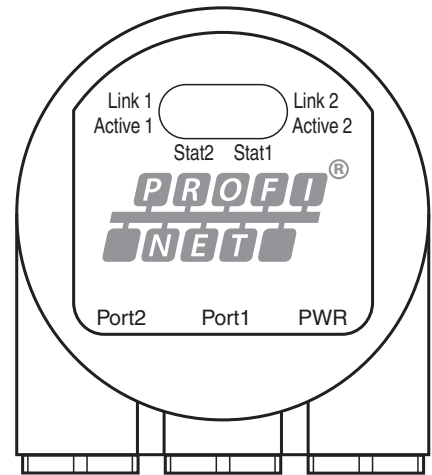



Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Singleturn absolute encoder

EVS58-PN



- Industrial standard housing $\varnothing 58$ mm
- PROFINET IRT
- 16 Bit singleturn
- Servo or clamping flange
- Network loop through by means of integrated 2 port switch (IRT capable)
- IP address resettable
- No DIP switches for address setting
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



Function

In addition to the CANopen-, DeviceNet-, PROFIBUS- and AS-Interface encoders, we have broadened our product line of bus-capable absolute encoders with the EVS58 for Ethernet.

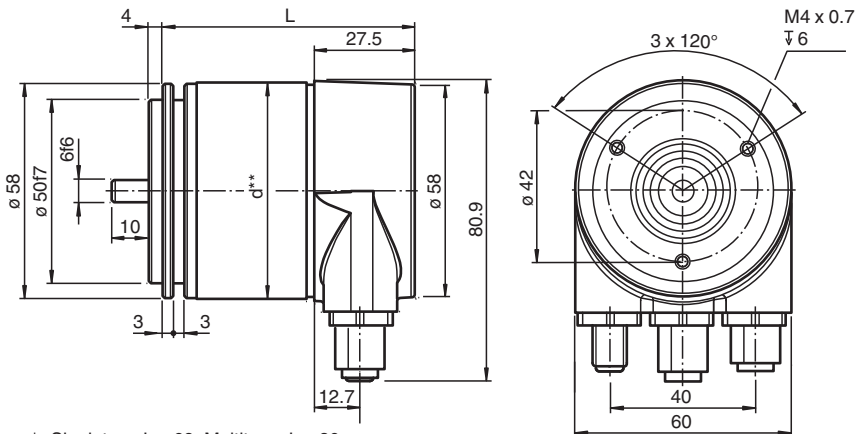
Absolute rotary encoders deliver an absolute step value for each angle setting. This device has a maximum basic resolution of 65536 steps per revolution (16 bits).

The Ethernet interface of this absolute encoder supports the Profinet protocol. The integrated webserver provides Java applets, which allow the whole parameterisation of the encoder via any web browser. In addition to various functions like resolution adjustment, e-mail-services, change of the IP address and many others, the following operation modes can be selected:

- Polled mode
- Cyclic mode
- Change of state mode

The device is designed for shaft mounting and is available in servo flange or clamping flange design.

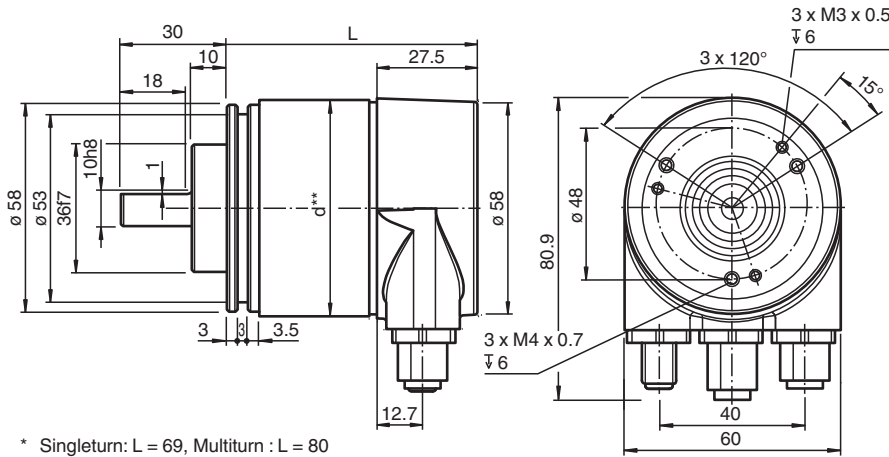
Dimensions



* Singleturn: $L = 69$, Multiturn : $L = 80$

** Aluminum: $d = 59$, stainless steel: $d = 61$

Dimensions



* Singleturn: L = 69, Multiturn : L = 80
 ** Aluminum: d = 59, stainless steel: d = 61

Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
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	130 a
Mission Time (T _M)	20 a
L ₁₀	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 10 ... 30 V DC
Power consumption	P ₀ max. 4 W
Linearity	± 0.5 LSB (12 Bit)
Output code	binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Interface type	PROFINET IO
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Physical	Ethernet
Transfer rate	100 MBit/s
Cycle time	≤ 1 ms (IRT) ; ≤ 10 ms (RT)
Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz

Technical Data

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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Ambient conditions

Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)

Mechanical specifications

Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4301 / AISI 304 shaft: stainless steel 1.4305 / AISI 303
Mass	approx. 370 g (combination 1) approx. 840 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N

Type Code

Structure of the type code

E	V	S	5	8	(1)	-	(2)	(2)	(3)	P	N	R	0	B	N	-	0	0	(4)	(4)
---	---	---	---	---	-----	---	-----	-----	-----	---	---	---	---	---	---	---	---	---	-----	-----

E	Data format
E	Ethernet

V	Shaft version
V	Solid shaft

S	Function principle
S	Singleturn

58	Housing diameter
58	58 mm

1	Housing material
N	Aluminum, powder coated
W	Aluminum, powder coated with shaft seal
I	Stainless steel

(2) (2)	Shaft dimensions
01	Shaft Ø10 mm x 20 mm
03	Shaft Ø6 mm x 10 mm

(3)	Flange
1	Clamping flange
2	Servo flange

PN	Connection type / protocol
PN	Profinet protocol, 1 female connector/1 male connector, M12 x 1

R	Exit position
R	Radial

0	Option
0	None




Type Code

B	Output code
B	Binary

N	Temperature
N	Normal

(3) (3)	Number of bits singleturn
13	13 Bits : 8192 pulses (standard)
16	16 Bits : 65536 pulses

Accessories

	9203	Angled flange
	9300	Mounting bracket for servo flange
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

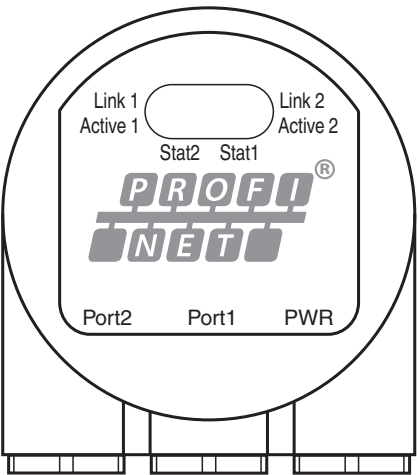
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds



Singleturn absolute encoder

BSS58

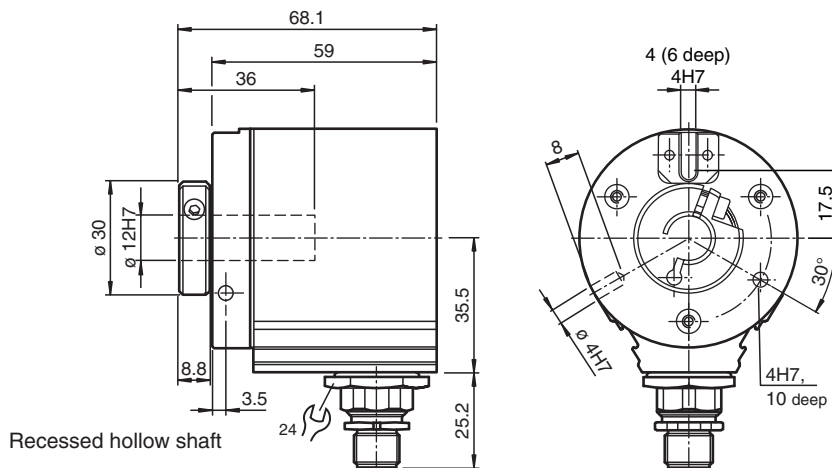
- Industrial standard housing Ø58 mm
- 13 Bit singleturn
- Output code: gray and binary
- Transfer of position data with 4 AS-Interface slaves
- Parameterization and addressing via AS-Interface
- Recessed hollow shaft



Function

In modern machines and systems, binary sensors and actuators are connected together via AS-Interface. Until now it was necessary to go back to the use of costly conventional wiring when wanting to use absolute encoders. The reason for this was that the handshake mode with the control module of the analogue profile proved to be too slow for positioning tasks. In order to meet the real-time demands of many applications, a multi-slave solution using the BSS58 AS-Interface rotary encoders was created. The position value of 13 Bits in length is transferred within a single cycle via the 4 integrated AS-Interface chips to the master and made available to the PLC. The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest. This may simply be a slide-in pin that locks in the plastic receptacle integrated into the flange.

Dimensions



Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Electrical specifications	
Operating voltage	U_B 29.5 ... 31.6 V DC
No-load supply current	I_0 max. starting current 155 mA , operating current max. 85 mA
Linearity	± 1 LSB
Output code	programmable, Gray code, binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)

Technical Data

Interface

Interface type	AS-Interface
Resolution	
Single turn	13 Bit
Overall resolution	13 Bit
Transfer rate	max. 0.167 MBit/s
Standard conformity	AS-Interface

Connection

Connector	type V1, M12, 4-pin
-----------	---------------------

Standard conformity

Degree of protection	DIN EN 60529, IP65
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, 100 g, 11 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz

Ambient conditions

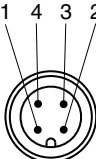
Operating temperature	-20 ... 70 °C (-4 ... 158 °F)
Storage temperature	-25 ... 85 °C (-13 ... 185 °F)

Mechanical specifications

Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Mass	approx. 330 g
Rotational speed	max. 10000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 2 Ncm
Tightening torque, fastening screws	max. 1.8 Nm
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm

Connection

Signal	V1 connector, 4-pin	Explanation
AS-Interface +	1	
Reserved	2	Not wired
AS-Interface -	3	
Reserved	4	Not wired



Interface

Addresses

	Slave A	Slave B	Slave C	Slave D
Preset address	1	2	3	4
IO code	7	0	0	0
ID code	F	F	F	F



When readdressing by means of a bus master or a programming device, it is absolutely essential to assign different addresses to the four integrated AS-Interface chips.

Parameterization

Parameter bits

The four parameter bits of slave A are used to set the parameters of the rotary encoder. The parameter bits of slave B, C and D are not used.

Status of parameter bit	Slave A			
	P0	P1	P2	P3
0	Gray code	Transfer with flag bits	Descending counting direction for clockwise rotation	Not used
1	Binary code	Transfer without flag bits	Ascending counting direction for clockwise rotation	Not used

Data bits

From the AS-Interface master to the rotary encoder

Data from the AS-Interface master are transferred to the rotary encoder via slave A, which works bidirectionally. Slaves B, C and D work unidirectionally, i.e. they are incapable of receiving data.

Status of D0/D1 or D2/D3	Slave A			
	D0/D1		D2/D3	
00	Normal mode		Position data are not saved!	
01	Rotary encoder is set to ¼ of the singleturn resolution.		Position data are saved!	
10	Rotary encoder is set to 0.		Position data are saved!	
11	Normal mode		Position data are not saved!	

When a change is made in data bits D2 and D3 from 01 to 10 or vice-versa, position data are resaved in the rotary encoder.

From the rotary encoder to the AS-Interface master

Depending on the value of parameter bit P1 of slave A, data transfer to the AS-Interface master takes place with or without flag bits.

P1 = 1: Transfer without flag bits

Slave A				Slave B				Slave C				Slave D			
D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12			

P1 = 0: Transfer with flag bits MA, MB, MC, MD

Slave A				Slave B				Slave C				Slave D			
D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3
Bit 0	Bit 1	Bit 2	MA	Bit 3	Bit 4	Bit 5	MB	Bit 6	Bit 7	Bit 8	MC	Bit 9	Bit 10	Bit 11	MD

Interface

Operating modes

Address assignments for the four slaves

The AS-Interface master accesses all slaves one after the other within an AS-Interface cycle in order to transfer output data to slave A or to read in input data from the slaves. The singleturn absolute encoder uses only four AS-Interface chips to transfer the position data that are 13 bits wide, i. e. four slave addresses are assigned.

Since these four slaves are queried one after the other, the data may originate from any one of four different sampling times. To minimise the influence of this effect, sequential addresses (n, n+1, n+2 and n+3) should be assigned to slaves A, B, C and D.

Furthermore, it should be noted that slave A is responsible for controlling the functions of the absolute encoder. If the order of the slaves is changed (D = n, C = n+1, B = n+2, A = n+3), the output word, which is supposed to be transmitted by the function control module of the absolute encoder, will not be transmitted until slaves D, C and B have been read in.

A memory command would thus only take effect for slave A. The command would not take effect for slaves that were already read until the next read cycle. Data consistency would be lost because of the change of order.

Temporary storage and transfer with flag bits

If individual telegrams of the four slaves to the AS-Interface master suffer interference, it may happen in spite of temporary storage in the rotary encoder that the data that are transferred to the control module do not all originate from the same position data set.

Transferring one flag bit for each slave makes it possible for the control module to check which position data set an individual data set belongs to by comparing the four flag bits. Data bit D2 is used for this purpose.

Example:

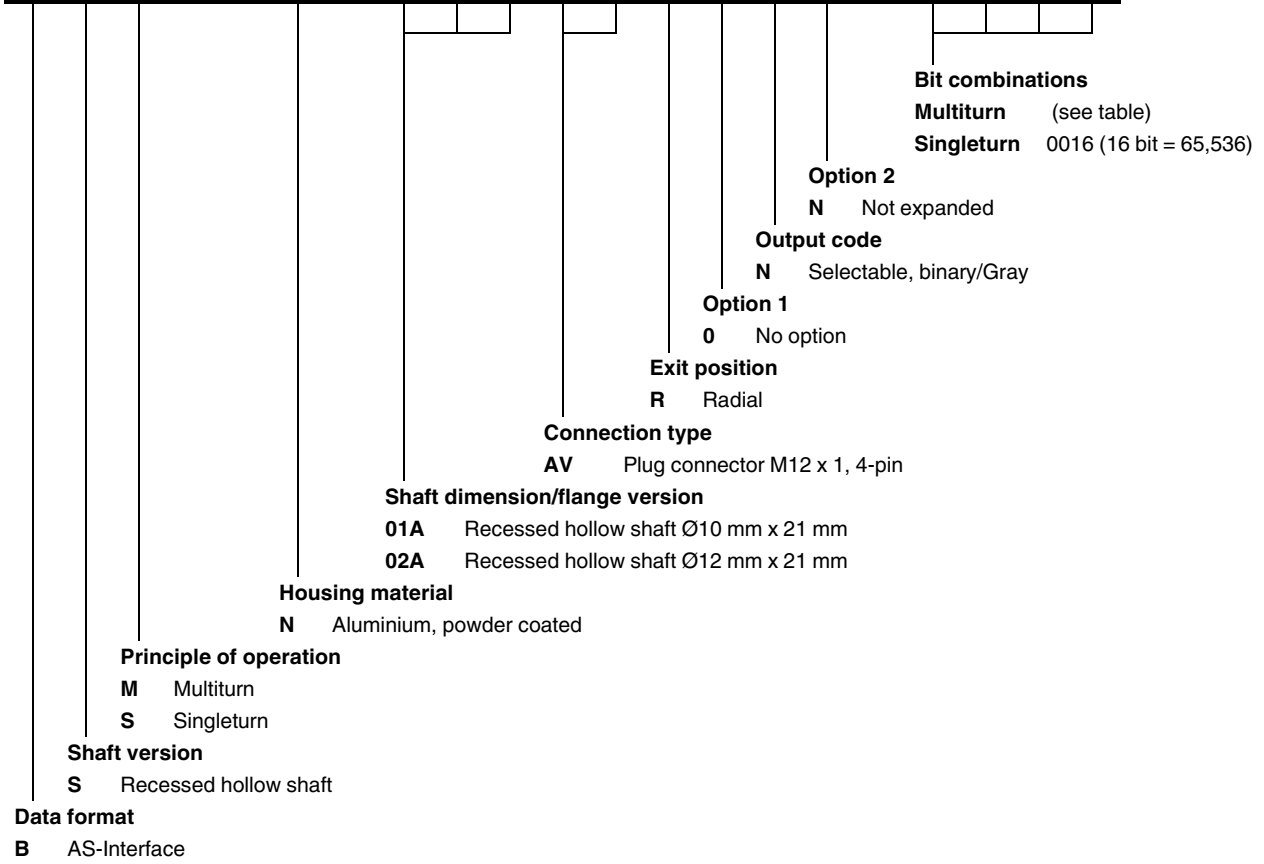
Cycle	Slave A Data bit D2	Position data			
		Slave A	Slave B	Slave C	Slave D
1	0	XXX0	XXX0	XXX0	XXX0
2	1	XXX1	XXX1	XXX1	XXX1
3	0	XXX0	XXX0	XXX0	XXX0
4	1	XXX1	XXX1	XXX1	XXX1
etc.					

Bit D2 is influenced by the control module. Bit 4 of the input data corresponds to the value of this bit for each slave.

D2 is set to 0 in cycle 1. If the value of bit 4 of a slave were "1", that value would be derived from another cycle. This is a simple way to recognise data consistency.

Transferring the flag bits, however, reduces the usable position data from 13 bits to 12. Masking out the fourth bit of each slave increases slightly the effort of putting together the position data set in the control module.

Order code





Singleturn absolute encoder BVS58

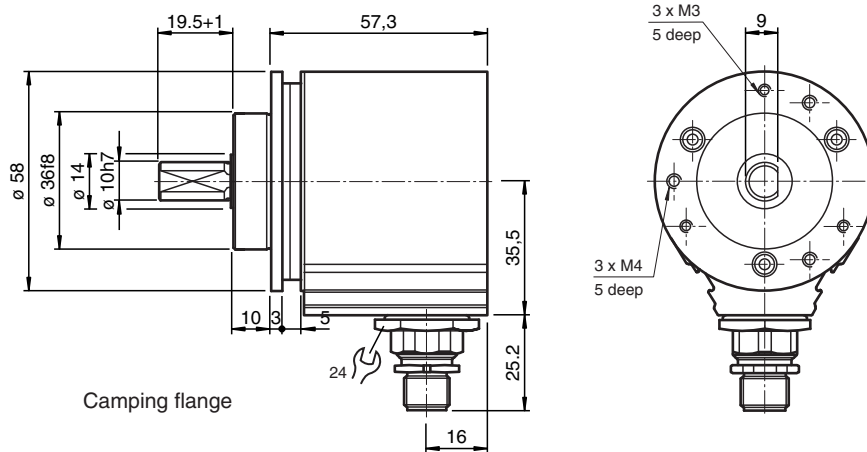
- Industrial standard housing $\varnothing 58$ mm
- 13 Bit singleturn
- Output code: gray and binary
- Transfer of position data with 4 AS-Interface slaves
- Parameterization and addressing via AS-Interface
- Servo or clamping flange



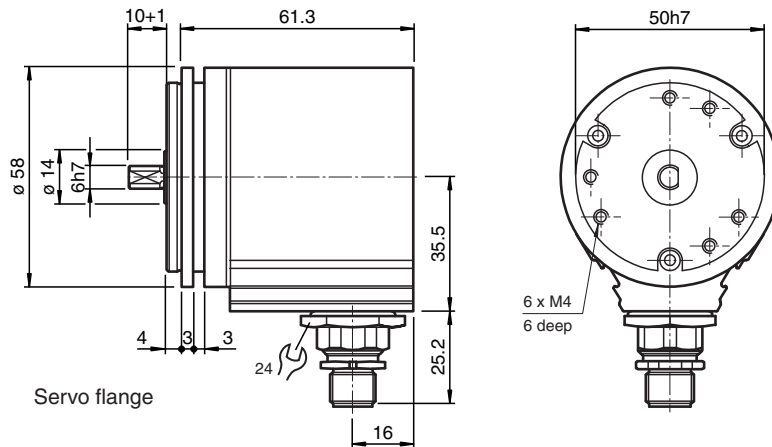
Function

In modern machines and systems, binary sensors and actuators are connected together via AS-Interface. Until now it was necessary to go back to the use of costly conventional wiring when wanting to use absolute encoders. The reason for this was that the handshake mode with the control module of the analogue profile proved to be too slow for positioning tasks. In order to meet the real-time demands of many applications, a multi-slave solution using the BVS58 AS-Interface rotary encoders was created. The position value of 13 Bits in length is transferred within a single cycle via the 4 integrated AS-Interface chips to the master and made available to the PLC. This singleturn absolute encoder is available either in clamping flange design with a shaft 10 mm in diameter x 20 mm or in servo flange design with a shaft 6 mm in diameter x 10 mm.

Dimensions



Dimensions






Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Electrical specifications	
Operating voltage	U_B 29.5 ... 31.6 V DC
No-load supply current	I_0 max. starting current 155 mA , operating current max. 85 mA
Linearity	± 1 LSB
Output code	programmable, Gray code, binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Interface type	AS-Interface
Resolution	
Single turn	13 Bit
Overall resolution	13 Bit
Transfer rate	max. 0.167 MBit/s
Standard conformity	AS-Interface
Connection	
Connector	type V1, M12, 4-pin
Standard conformity	
Degree of protection	DIN EN 60529, IP65
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, 100 g, 11 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Ambient conditions	
Operating temperature	-20 ... 70 °C (-4 ... 158 °F)
Storage temperature	-25 ... 85 °C (-13 ... 185 °F)
Mechanical specifications	
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Mass	approx. 330 g
Rotational speed	max. 10000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 2 Ncm

Technical Data

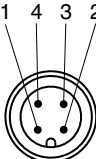
Shaft load		
Axial		40 N at max. 6000 min ⁻¹ 10 N at max. 12000 min ⁻¹
Radial		60 N at max. 6000 min ⁻¹ 20 N at max. 12000 min ⁻¹

Accessories

	9203	Angled flange
	9300	Mounting bracket for servo flange
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Signal	V1 connector, 4-pin	Explanation
AS-Interface +	1	
Reserved	2	Not wired
AS-Interface -	3	
Reserved	4	Not wired



Interface

Addresses

	Slave A	Slave B	Slave C	Slave D
Preset address	1	2	3	4
IO code	7	0	0	0
ID code	F	F	F	F



When readdressing by means of a bus master or a programming device, it is absolutely essential to assign different addresses to the four integrated AS-Interface chips.

Parameterization

Parameter bits

The four parameter bits of slave A are used to set the parameters of the rotary encoder. The parameter bits of slave B, C and D are not used.

Status of parameter bit	Slave A			
	P0	P1	P2	P3
0	Gray code	Transfer with flag bits	Descending counting direction for clockwise rotation	Not used
1	Binary code	Transfer without flag bits	Ascending counting direction for clockwise rotation	Not used

Data bits

From the AS-Interface master to the rotary encoder

Data from the AS-Interface master are transferred to the rotary encoder via slave A, which works bidirectionally. Slaves B, C and D work unidirectionally, i.e. they are incapable of receiving data.

Status of D0/D1 or D2/D3	Slave A			
	D0/D1		D2/D3	
00	Normal mode		Position data are not saved!	
01	Rotary encoder is set to ¼ of the singleturn resolution.		Position data are saved!	
10	Rotary encoder is set to 0.		Position data are saved!	
11	Normal mode		Position data are not saved!	

When a change is made in data bits D2 and D3 from 01 to 10 or vice-versa, position data are resaved in the rotary encoder.

From the rotary encoder to the AS-Interface master

Depending on the value of parameter bit P1 of slave A, data transfer to the AS-Interface master takes place with or without flag bits.

P1 = 1: Transfer without flag bits

Slave A				Slave B				Slave C				Slave D			
D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11	Bit 12	Not used!		

P1 = 0: Transfer with flag bits MA, MB, MC, MD

Slave A				Slave B				Slave C				Slave D			
D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3	D0	D1	D2	D3
Bit 0	Bit 1	Bit 2	MA	Bit 3	Bit 4	Bit 5	MB	Bit 6	Bit 7	Bit 8	MC	Bit 9	Bit 10	Bit 11	MD

Interface

Operating modes

Address assignments for the four slaves

The AS-Interface master accesses all slaves one after the other within an AS-Interface cycle in order to transfer output data to slave A or to read in input data from the slaves. The singleturn absolute encoder uses only four AS-Interface chips to transfer the position data that are 13 bits wide, i. e. four slave addresses are assigned.

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Furthermore, it should be noted that slave A is responsible for controlling the functions of the absolute encoder. If the order of the slaves is changed (D = n, C = n+1, B = n+2, A = n+3), the output word, which is supposed to be transmitted by the function control module of the absolute encoder, will not be transmitted until slaves D, C and B have been read in.

A memory command would thus only take effect for slave A. The command would not take effect for slaves that were already read until the next read cycle. Data consistency would be lost because of the change of order.

Temporary storage and transfer with flag bits

If individual telegrams of the four slaves to the AS-Interface master suffer interference, it may happen in spite of temporary storage in the rotary encoder that the data that are transferred to the control module do not all originate from the same position data set.

Transferring one flag bit for each slave makes it possible for the control module to check which position data set an individual data set belongs to by comparing the four flag bits. Data bit D2 is used for this purpose.

Example:

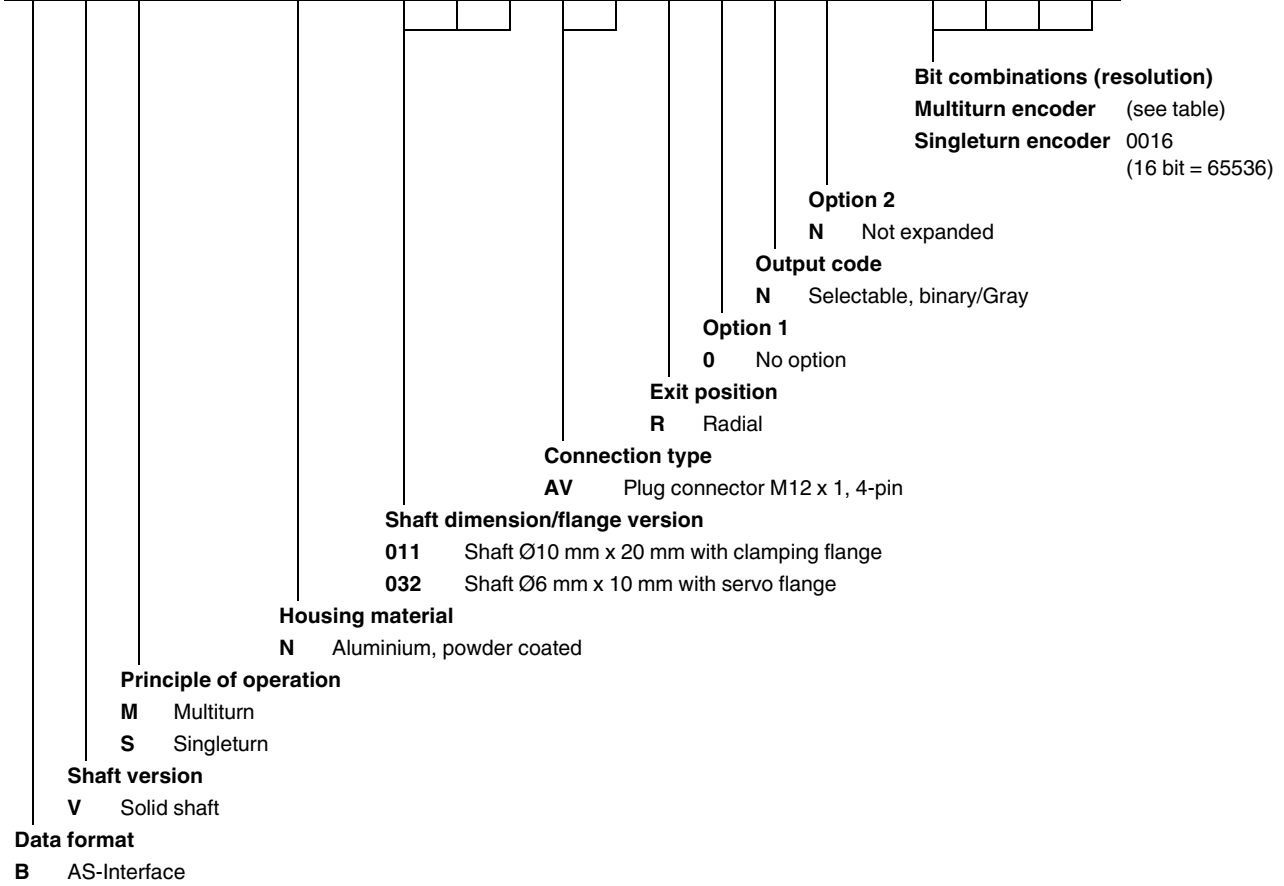
Cycle	Slave A Data bit D2	Position data			
		Slave A	Slave B	Slave C	Slave D
1	0	XXX0	XXX0	XXX0	XXX0
2	1	XXX1	XXX1	XXX1	XXX1
3	0	XXX0	XXX0	XXX0	XXX0
4	1	XXX1	XXX1	XXX1	XXX1
etc.					

Bit D2 is influenced by the control module. Bit 4 of the input data corresponds to the value of this bit for each slave.

D2 is set to 0 in cycle 1. If the value of bit 4 of a slave were "1", that value would be derived from another cycle. This is a simple way to recognise data consistency.

Transferring the flag bits, however, reduces the usable position data from 13 bits to 12. Masking out the fourth bit of each slave increases slightly the effort of putting together the position data set in the control module.

Order code





Singleturn absolute encoder

EVS58-IZ

- Industrial standard housing Ø58 mm
- EtherNet/IP
- Up to 16 Bit singleturn
- Servo or clamping flange
- Network loop through by means of integrated 2 port switch
- IP address resettable
- No DIP switches for address setting
- Compatible with Rockwell/ Allen Bradley/ Schneider control
- Mechanical compatibility with all major encoders with fieldbus interface
- Rotary axis functionality
- Status LEDs
- Ethernet IP declaration of conformity
- CIP encoder profile

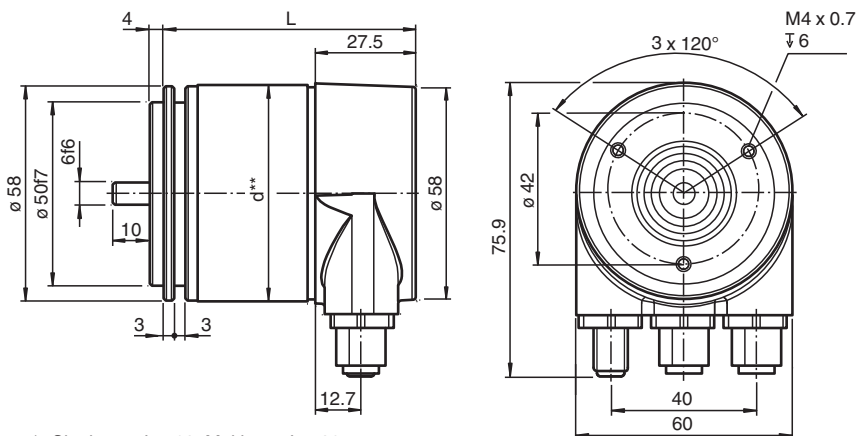


Function

In addition to the CANopen-, DeviceNet-, PROFIBUS- and AS-Interface encoders, we have broadened our product line of bus-capable absolute encoders with the EVS58 for Ethernet.

Absolute rotary encoders deliver an absolute step value for each angle setting. This device has a maximum basic resolution of 65536 steps per revolution (16 bits). The device is designed for shaft assembly and is available in servo flange or clamping flange design.

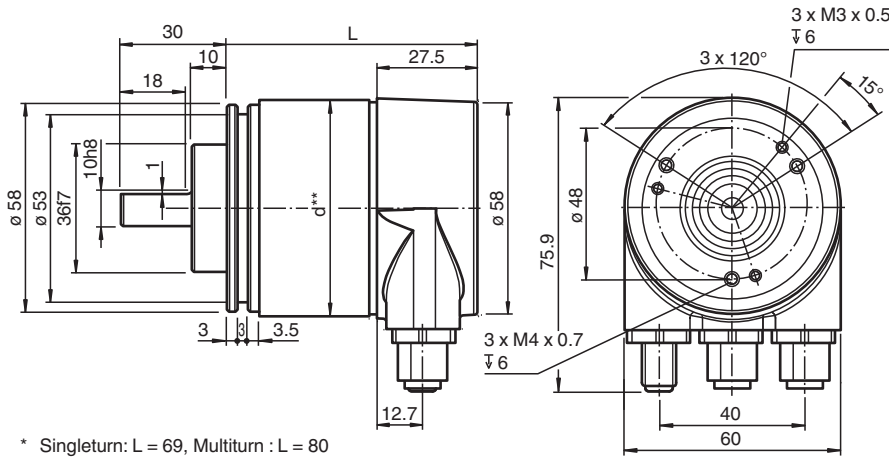
Dimensions



* Singleturn: L = 69, Multiturn : L = 80

** Aluminum: d = 59, stainless steel: d = 61

Dimensions



* Singleturn: L = 69, Multiturn : L = 80
 ** Aluminum: d = 59, stainless steel: d = 61




Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Functional safety related parameters	
MTTF _d	130 a
Mission Time (T _M)	20 a
L _{10h}	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 10 ... 30 V DC
Power consumption	P ₀ max. 4 W
Linearity	± 0.5 LSB (12 Bit) ,
Output code	binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Interface type	EtherNet/IP
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Physical	Ethernet
Transfer rate	100 MBit/s
Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source

Technical Data

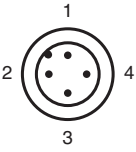
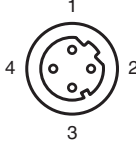
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4301 / AISI 304 shaft: stainless steel 1.4305 / AISI 303
Mass	approx. 370 g (combination 1) approx. 840 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	9203	Angled flange
	9300	Mounting bracket for servo flange
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

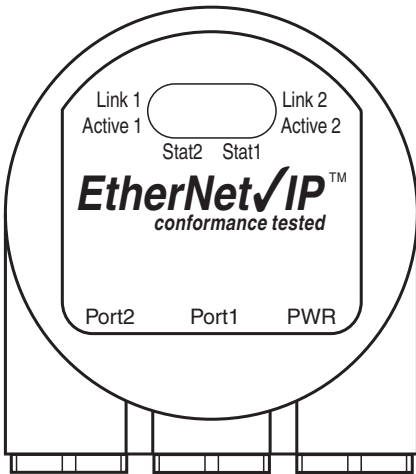
	
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



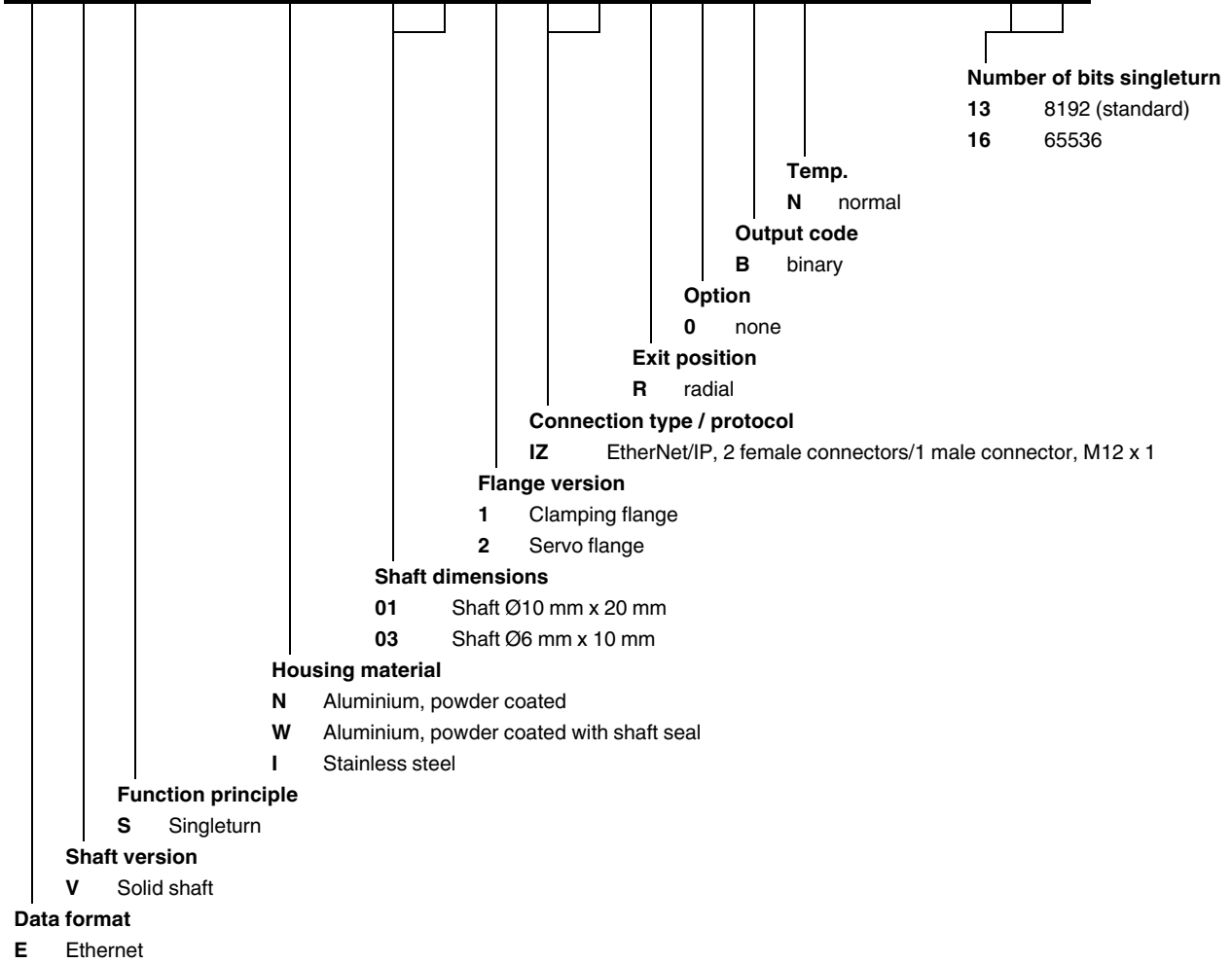
Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Type Code

Order code

E V S 5 8 N - I Z R 0 B N - 0 0





Singleturn absolute encoder

ESS58-IZ

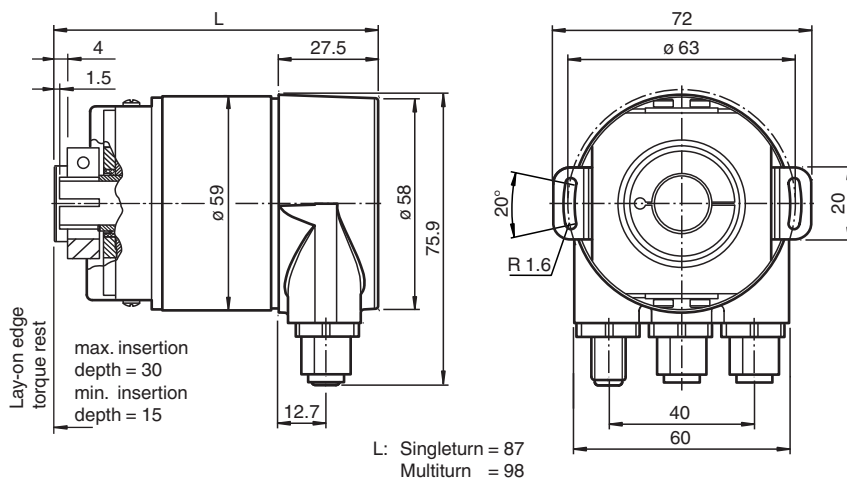
- Industrial standard housing $\varnothing 58$ mm
- EtherNet/IP
- Up to 30 Bit multiturn
- Servo or clamping flange
- Network loop through by means of integrated 2 port switch
- IP address resettable
- No DIP switches for address setting
- Compatible with Rockwell/ Allen Bradley/ Schneider control
- Mechanical compatibility with all major encoders with fieldbus interface
- Rotary axis functionality
- Status LEDs
- Ethernet IP declaration of conformity
- CIP encoder profile



Function

In addition to the CANopen-, DeviceNet-, PROFIBUS- and AS-Interface encoders, we have broadened our product line of bus-capable absolute encoders with the ESS58 for Ethernet. Absolute rotary encoders deliver an absolute step value for each angle setting. This device has a maximum basic resolution of 65536 steps per revolution (16 bits).

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder

Functional safety related parameters


MTTF _d	130 a
Mission Time (T _M)	20 a
L _{10h}	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

Electrical specifications




Technical Data

Operating voltage	U_B	10 ... 30 V DC
Power consumption	P_0	max. 4 W
Linearity		± 0.5 LSB (12 Bit) ,
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		EtherNet/IP
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Physical		Ethernet
Transfer rate		100 MBit/s
Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		0 ... 60 °C (32 ... 140 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4301 / AISI 304 shaft: stainless steel 1.4305 / AISI 303
Mass		approx. 370 g (combination 1) approx. 840 g (combination 2)
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 3 Ncm (version without shaft seal)
Tightening torque, fastening screws		max. 1.8 Nm
Shaft load		
Angle offset		$\pm 0.9^\circ$
Axial offset		static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset		static: ± 0.5 mm, dynamic: ± 0.2 mm

Accessories

	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
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Accessories

	<p>ACC-PACK-ABS-_S_58 ø14</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm</p>
	<p>ACC-PACK-ABS-_S_58 ø12</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm</p>
	<p>ACC-PACK-ABS-_S_58 ø10</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm</p>

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

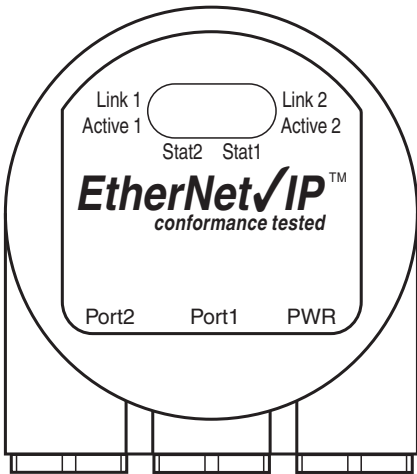
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

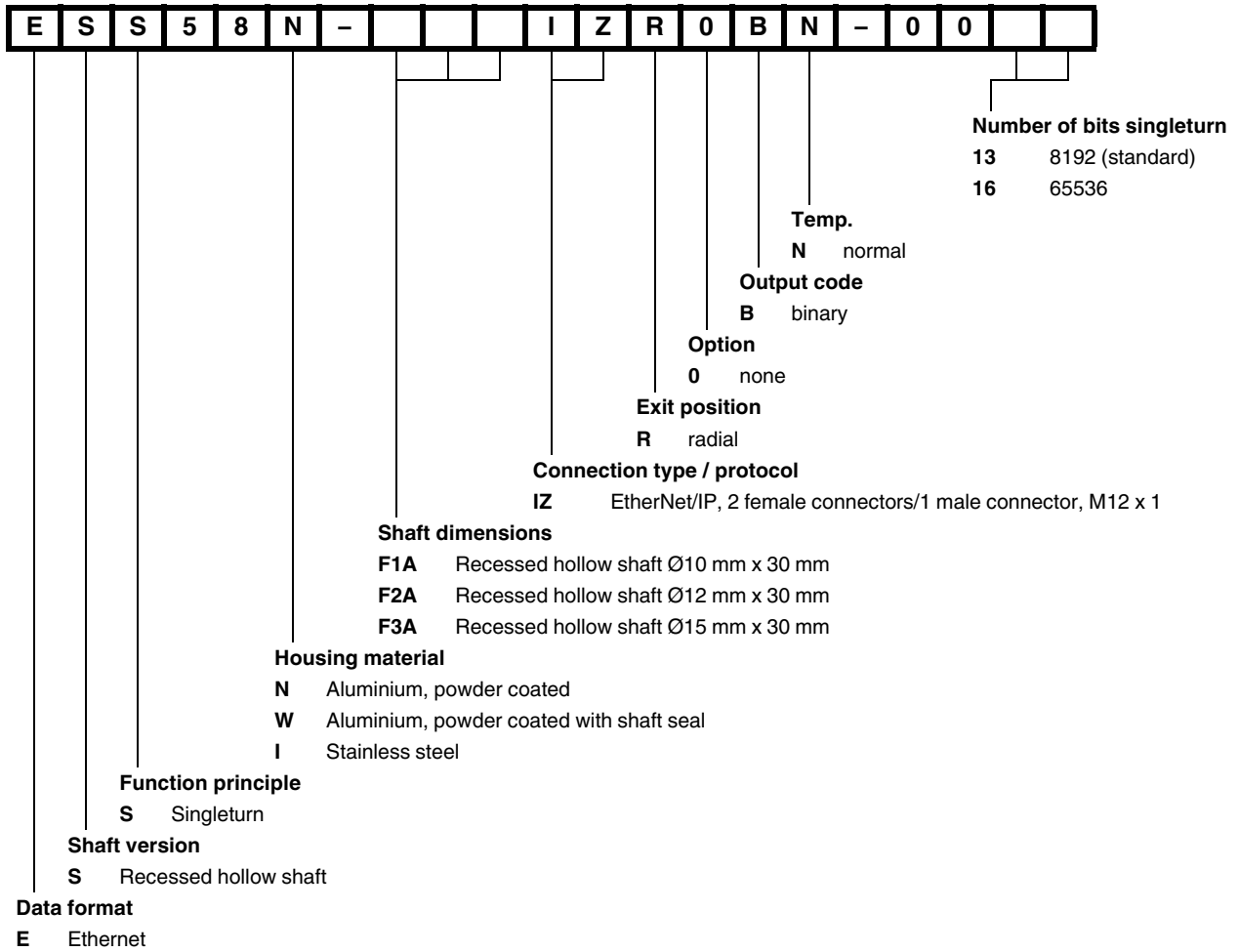
* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Type Code





Singleturn absolute rotary encoder PVS58

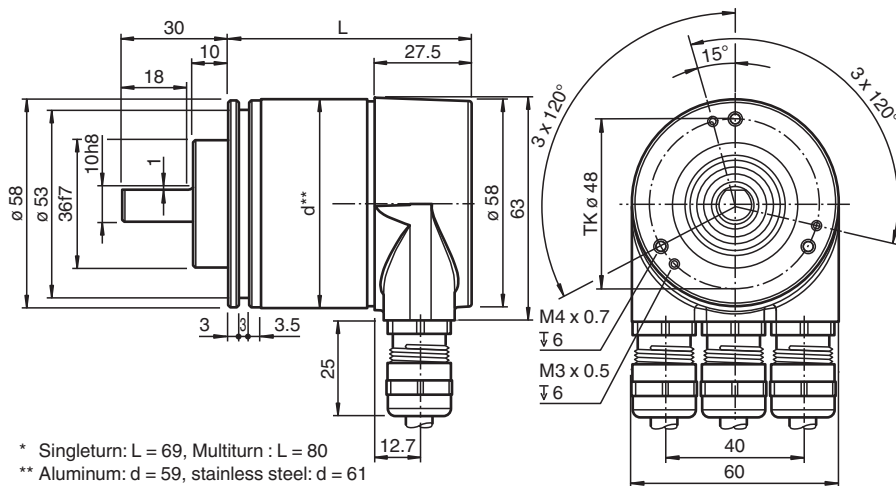
- Industrial standard housing Ø58 mm
- PROFIBUS interface
- 16 Bit singleturn
- Speed transfer
- Extended scaling functions
- Programmable limit switches
- Commissioning mode
- Servo or clamping flange



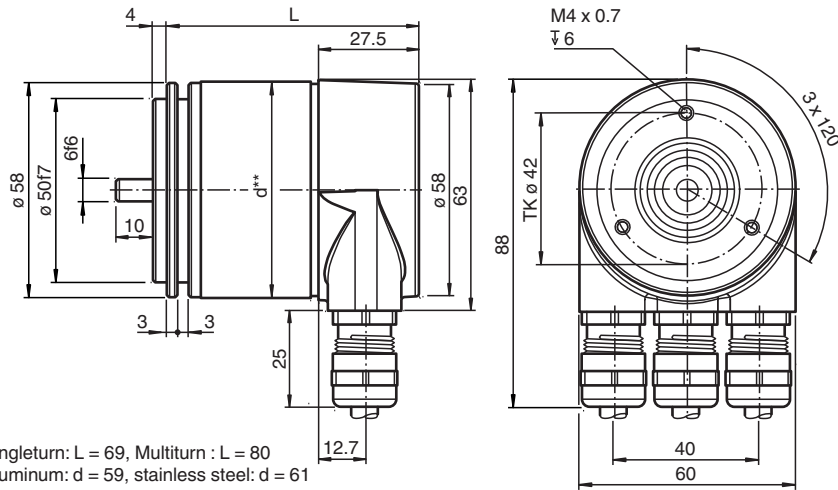
Function

This series of PROFIBUS rotary encoders is based on the modern fast technology of singleturn sampling. The absolute value rotary encoder corresponds to the PROFIBUS Profile for Encoders, Order No. 3.062. Operation is supported based on Class 1 and Class 2. For operation based on Class 1, position data and diagnostic data bytes 1 ... 16 are available. In addition, the direction of the code can be selected as either cw ascending (clockwise rotation, code course ascending) or cw descending (clockwise rotation, code course descending). If the rotary encoder is operated according to Class 2, additional functions to those from Class 1 are available. These include scaling of the resolution per revolution and the overall resolution, as well as the preset function. In addition, expanded diagnostic reporting is supported. Besides, the rotary encoder offers extended functionalities such as speed transfer, extended scaling functions, programmable limit switches and a commissioning mode. The removable connecting hood contains a slide switch for setting the terminating resistor and the rotary switches for setting the address. Assign a fixed address and bus termination to the encoder with this switches.

Dimensions



Dimensions



* Singleturn: L = 69, Multiturn : L = 80
 ** Aluminum: d = 59, stainless steel: d = 61

Technical Data

General specifications		
Detection type		photoelectric sampling
Device type		Singleturn absolute rotary encoder
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	max. 230 mA at 10 V DC max. 100 mA at 24 V DC
Power consumption	P_0	max. 2.5 W
Time delay before availability	t_v	< 1000 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Transfer rate		0.0096 ... 12 MBit/s
Standard conformity		PNO profile 3.062, RS-485
Connection		
Terminal compartment		in removable housing cover
Standard conformity		
Degree of protection		DIN EN 60529, IP65 IP66 (with shaft seal)
Climatic testing		DIN EN 60068-2-30 , no moisture condensation
Emitted interference		EN 61000-6-4:2007
Noise immunity		EN 61000-6-2:2005
Shock resistance		DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		

Technical Data

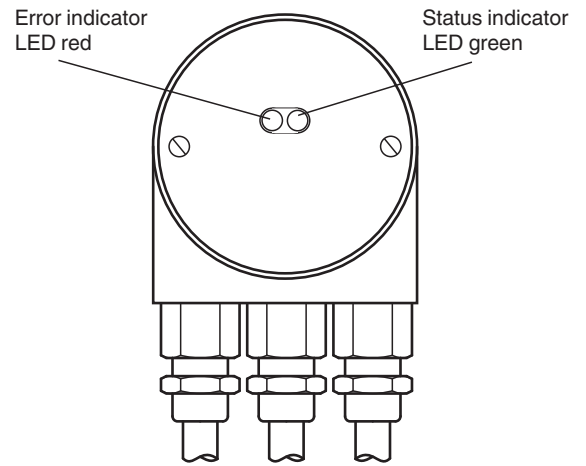
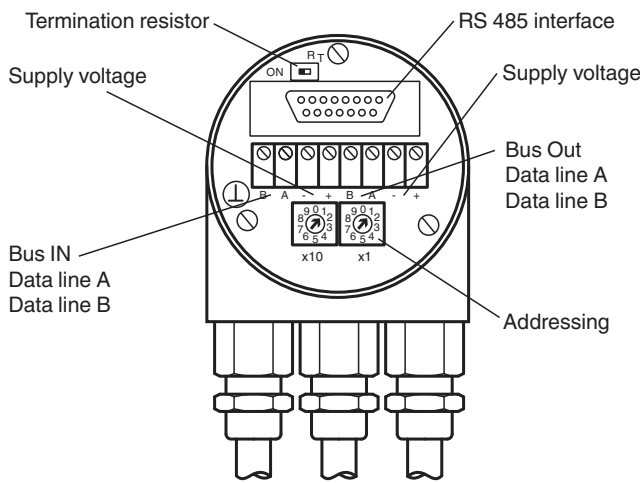
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 550 g (combination 1) approx. 1100 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N
Dimensions	
Diameter	58 mm

Connection

Terminal	Explanation
⊥	Ground connection for power supply
B (left)	Data line B (pair 1), Bus In
A (left)	Data line A (pair 1), Bus In
(-)	0 V
(+)	10 V ... 30 V
B (right)	Data line B (pair 2), Bus Out
A (right)	Data line A (pair 2), Bus Out
(-)	0 V
(+)	10 V ... 30 V
	The supply lines only have to be connected once (regardless to which terminal). The outgoing bus is being uncoupled while the terminal resistor is on.

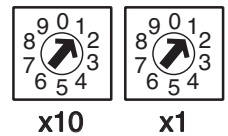
The arrangement of the terminals is shown in the section commissioning.

Configuration



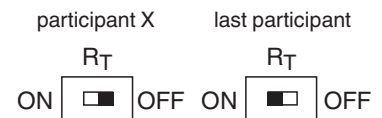
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (220 Ω) can be connected to the circuit by means of the switch:

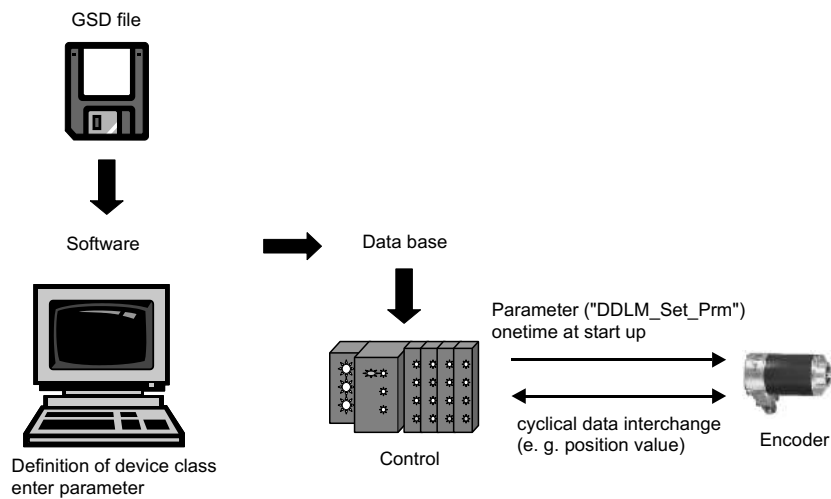


ALED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: - adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Function Principle

Principle of data transmission



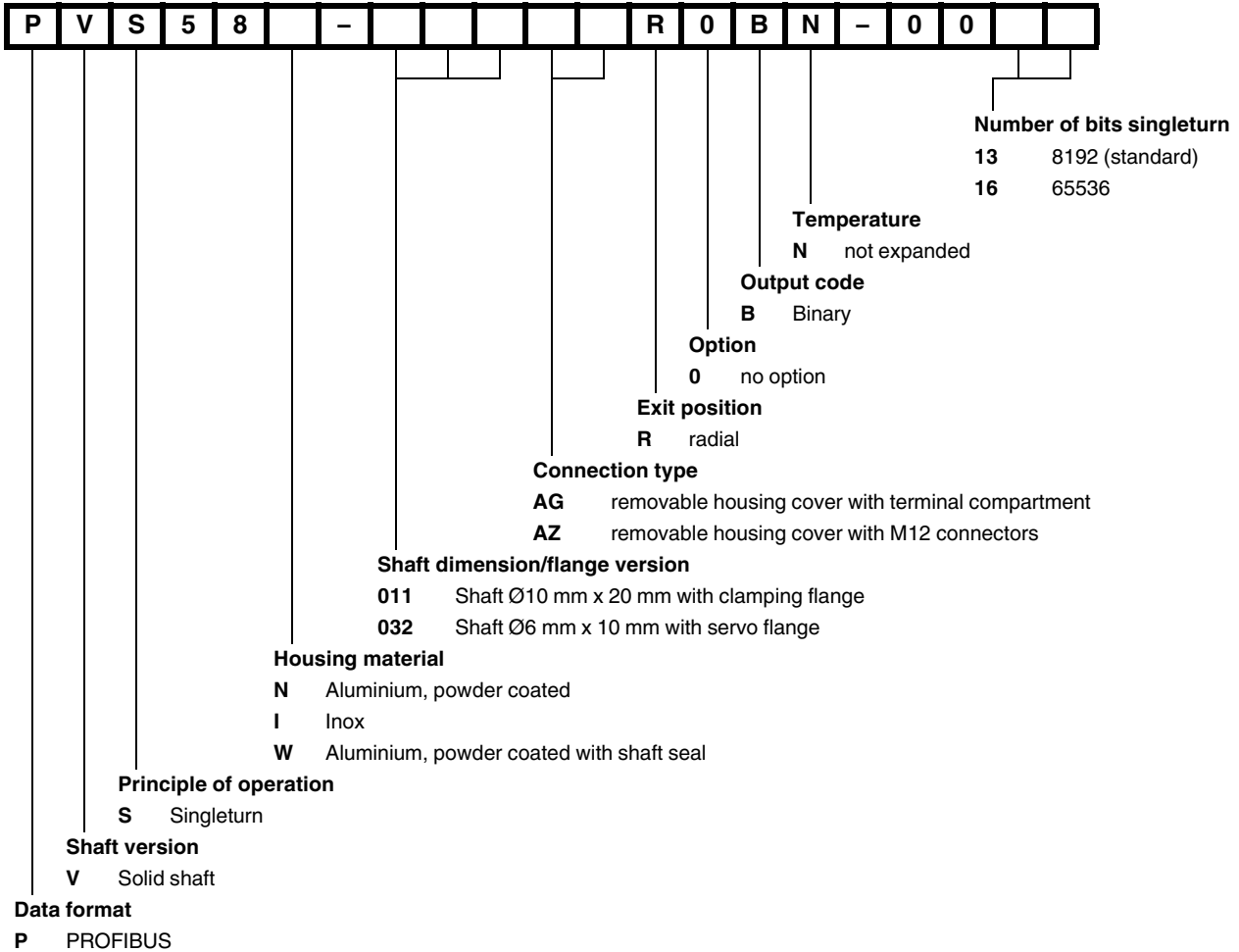
Parameterization

Parameter table encoder classes P+F 2.1 and P+F 2.2

Octet number (Byte)	Parameter	Bit number
1...8	PROFIBUS standard parameters	
9	Direction of rotation	0
	Class 2 functionality	1
	Commissioning Diagnostics	2
	Scaling function	3
	Reserved	4
	Reserved	5
	Activate manufacturer specific parameters (Octet 26)	6
	Reserved	7
10 ... 13	Desired measuring steps (reference: Octet 26, Bit 0 and 1)	
14 ... 17	Overall resolution	
18 ... 25	Reserved	
26	Reference for desired measuring steps	0
		1
	Activate commissioning mode	2
	Reduced diagnosis	3
	Reserved	4
	Activate lower software limit switch	5
	Activate upper software limit switch	6

	Activation of the parameters from Octet 27	7
27 ... 30	Lower limit switch	
31 ... 34	Upper limit switch	
35 ... 38	Physical measuring steps	
39	Reserved	0
	Rotary encoder type (singleturn or multiturn)	1
	Reserved	2
	Reserved	3
	Selection of the unit for speed transfer	4
		5
	Reserved	6
Reserved	7	

Type Code





Singleturn absolute rotary encoder

PSS58

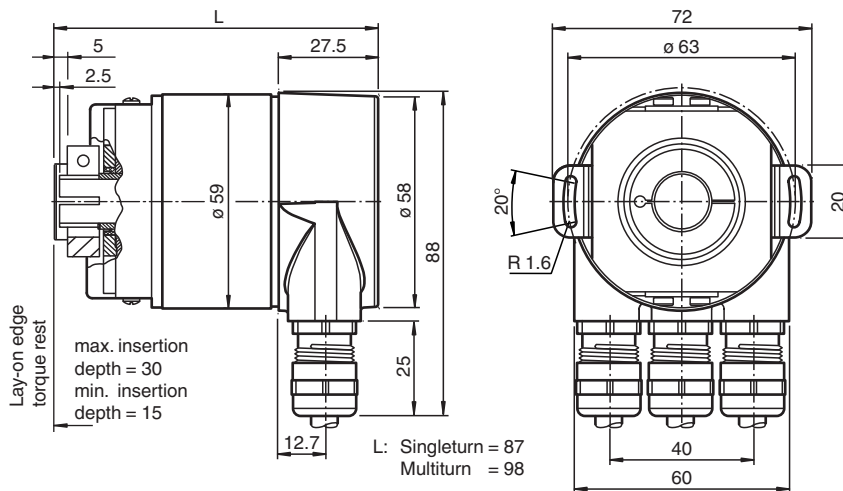
- Industrial standard housing $\varnothing 58$ mm
- PROFIBUS interface
- 16 Bit singleturn
- Speed transfer
- Extended scaling functions
- Programmable limit switches
- Commissioning mode
- Recessed hollow shaft



Function

This series of PROFIBUS rotary encoders is based on the modern fast technology of singleturn sampling. The absolute value rotary encoder corresponds to the PROFIBUS Profile for Encoders, Order No. 3.062. Operation is supported based on Class 1 and Class 2. For operation based on Class 1, position data and diagnostic data bytes 1 ... 16 are available. In addition, the direction of the code can be selected as either cw ascending (clockwise rotation, code course ascending) or cw descending (clockwise rotation, code course descending). If the rotary encoder is operated according to Class 2, additional functions to those from Class 1 are available. These include scaling of the resolution per revolution and the overall resolution, as well as the preset function. In addition, expanded diagnostic reporting is supported. Besides, the rotary encoder offers extended functionalities such as speed transfer, extended scaling functions, programmable limit switches and a commissioning mode. The removable connecting hood contains a slide switch for setting the terminating resistor and the rotary switches for setting the address. Assign a fixed address and bus termination to the encoder with this switches. The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

Dimensions



Technical Data

General specifications			
Detection type		photoelectric sampling	
Device type		Singleturn absolute rotary encoder	
Electrical specifications			
Operating voltage	U_B	10 ... 30 V DC	
No-load supply current	I_0	max. 230 mA at 10 V DC max. 100 mA at 24 V DC	
Power consumption	P_0	max. 2.5 W	

Technical Data

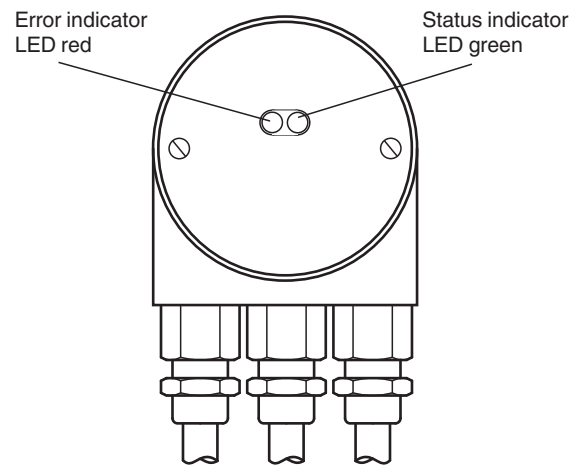
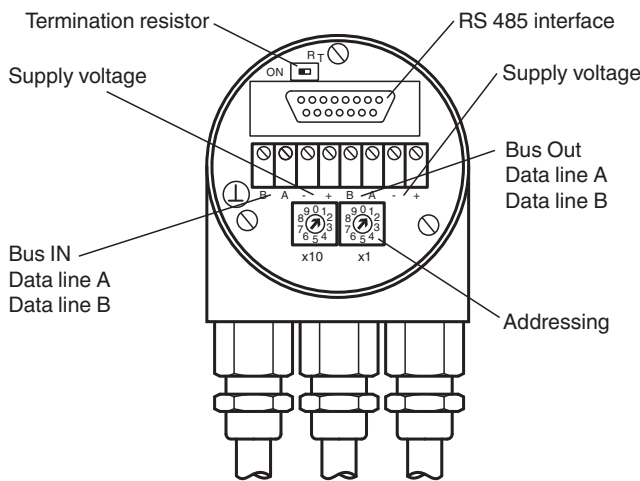
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code	binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.0096 ... 12 MBit/s
Standard conformity	PNO profile 3.062, RS-485
Connection	
Terminal compartment	in removable housing cover
Standard conformity	
Degree of protection	DIN EN 60529, IP65 IP66 (with shaft seal)
Climatic testing	DIN EN 60068-2-30, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 550 g (combination 1) approx. 1100 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Tightening torque, fastening screws	max. 1.8 Nm
Shaft load	
Angle offset	$\pm 0.9^\circ$
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm
Dimensions	
Length	87 mm
Diameter	59 mm

Connection

Terminal	Explanation
⊥	Ground connection for power supply
B (left)	Data line B (pair 1), Bus In
A (left)	Data line A (pair 1), Bus In
(-)	0 V
(+)	10 V ... 30 V
B (right)	Data line B (pair 2), Bus Out
A (right)	Data line A (pair 2), Bus Out
(-)	0 V
(+)	10 V ... 30 V
	The supply lines only have to be connected once (regardless to which terminal). The outgoing bus is being uncoupled while the terminal resistor is on.

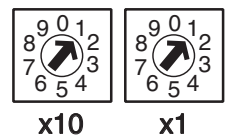
The arrangement of the terminals is shown in the section commissioning.

Configuration



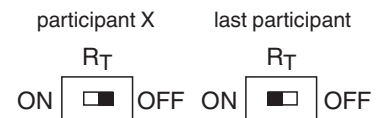
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (220 Ω) can be connected to the circuit by means of the switch:

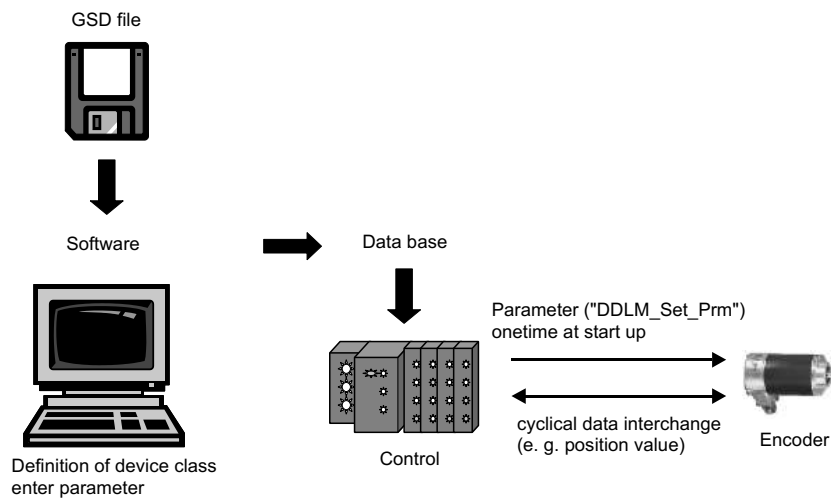


ALED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: - adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Function Principle

Principle of data transmission



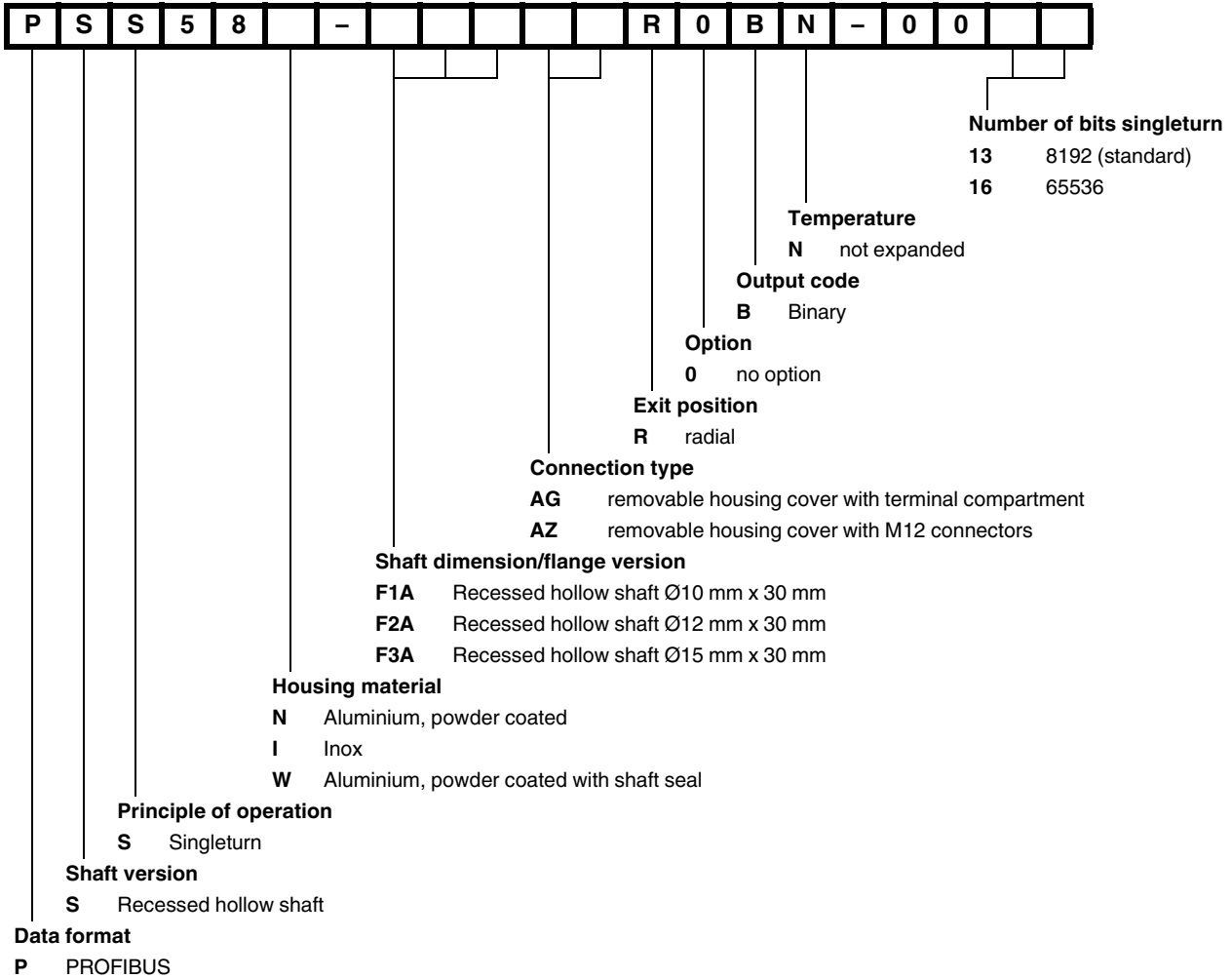
Parameterization

Parameter table encoder classes P+F 2.1 and P+F 2.2

Octet number (Byte)	Parameter	Bit number
1...8	PROFIBUS standard parameters	
9	Direction of rotation	0
	Class 2 functionality	1
	Commissioning Diagnostics	2
	Scaling function	3
	Reserved	4
	Reserved	5
	Activate manufacturer specific parameters (Octet 26)	6
	Reserved	7
10 ... 13	Desired measuring steps (reference: Octet 26, Bit 0 and 1)	
14 ... 17	Overall resolution	
18 ... 25	Reserved	
26	Reference for desired measuring steps	0
		1
	Activate commissioning mode	2
	Reduced diagnosis	3
	Reserved	4
	Activate lower software limit switch	5
	Activate upper software limit switch	6

	Activation of the parameters from Octet 27	7
27 ... 30	Lower limit switch	
31 ... 34	Upper limit switch	
35 ... 38	Physical measuring steps	
39	Reserved	0
	Rotary encoder type (singleturn or multiturn)	1
	Reserved	2
	Reserved	3
	Selection of the unit for speed transfer	4
		5
	Reserved	6
Reserved	7	

Type Code





Singleturn absolute encoder DVS58

- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Galvanically isolated DeviceNet interface
- Servo or clamping flange



Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples of one or more code disks. The code disks are screened by an infrared LED and the bit obtained sample is detected by means of an optical array. Its signals are electronically amplified and are forwarded on to the interface for processing.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

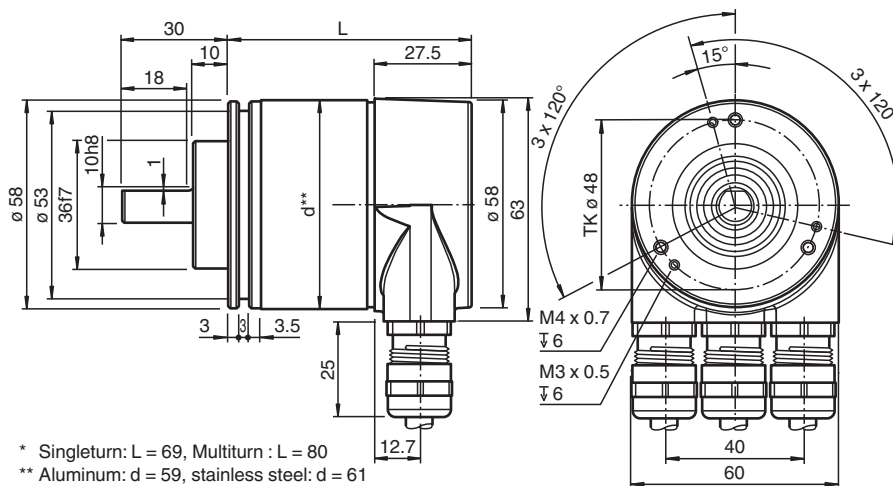
The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Change of state mode

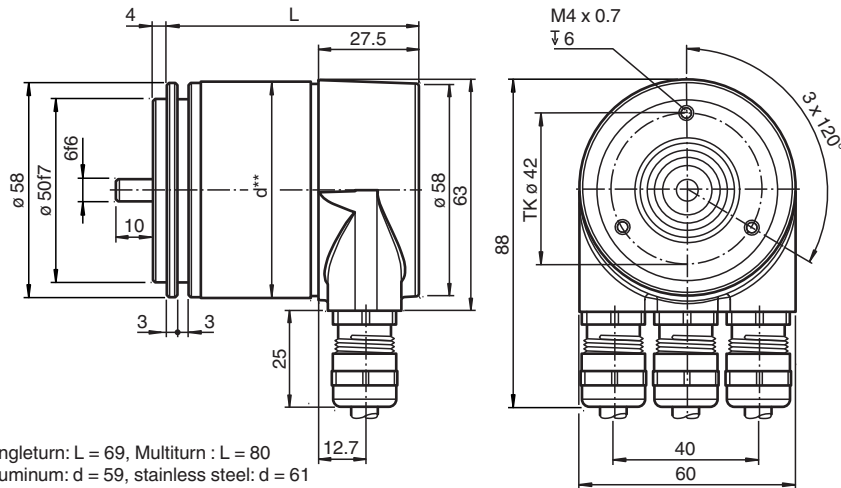
The device is designed for shaft mounting and is available in servo flange or clamping flange design.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions



Dimensions


















Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Electrical specifications	
Operating voltage	U_B 10 ... 30 V DC
No-load supply current	I_0 max. 230 mA at 10 V DC max. 100 mA at 24 V DC
Time delay before availability	t_v < 250 ms
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code	binary code
Code course (counting direction)	cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Interface type	DeviceNet
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	max. 0.5 MBit/s
Connection	
Terminal compartment	in removable housing cover
Standard conformity	
Degree of protection	DIN EN 60529, IP65 IP66 (with shaft seal)
Climatic testing	DIN EN 60068-2-30 , no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel




Technical Data

Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 550 g (combination 1) approx. 1000 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N

Accessories

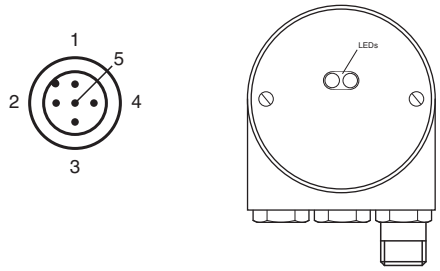
	9203	Angled flange
	AH 58-B1CA-2BW	Connection cover
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling

Accessories

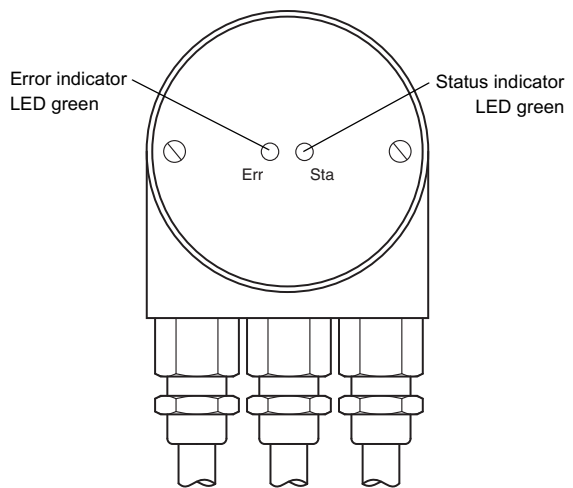
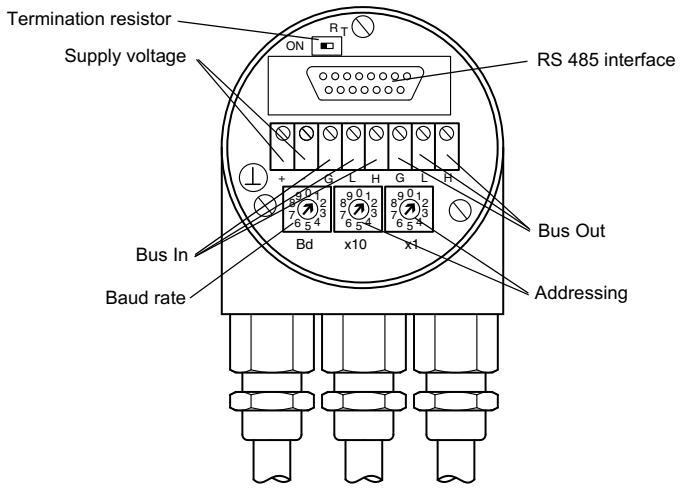
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling
	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling
	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Terminal	Cable	M12 x 1 Connector	Explanation
⊥	-	-	Ground connection for power supply
(+)	Red	2	Power supply
(-)	Black	3	Power supply
CG	-	1	CAN ground
CL	Blue	5	CAN low
CH	White	4	CAN high
CG	-	-	CAN ground
CL	Blue	-	CAN low
CH	White	-	CAN high

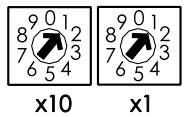


Configuration



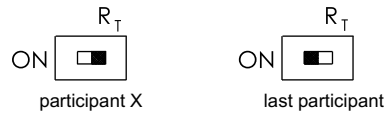
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 63, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position
125	0
250	1
500	2
125	3
reserved	4 ... 9

LED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
off	on	Encoder ready, boot-up message not transmitted, yet. Possible reasons: - no further participant present - wrong baud rate - encoder in prepared status
flashing	on	Boot-up message transmitted, Device configuration possible.
on	on	Normal operation mode, encoder in operational status.

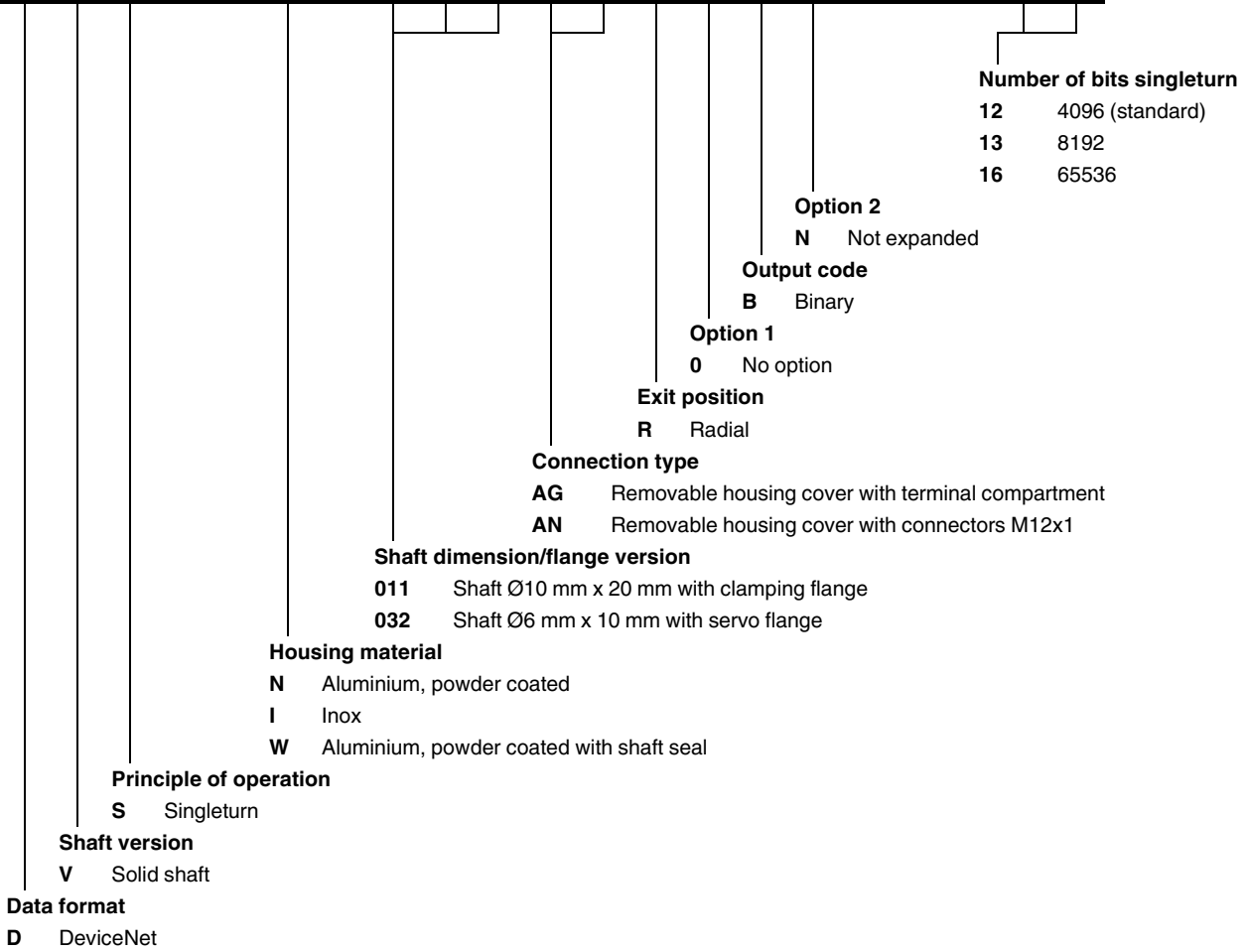
Parameterization**Programmable CAN operating modes**

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a telegram. The absolute encoder reads in the current position, calculates all parameters that may have been set and then sends back the actual process value.
Cyclic mode	The absolute encoder sends the current process value depending on a programmable timer. This can cause the bus load to be reduced since the member on the network only sends a message after a specific amount of time without a prompt from the master.
Change of state mode	The absolute encoder monitors the current process value and transfers the current value by itself if there is any change in the value. This can cause the bus load to be reduced, since the member on the network only sends a message if there has been a change.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will be rising or descending.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to a revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.

Order code





Singleturn absolute encoder

DSS58

- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Galvanically isolated DeviceNet interface
- Recessed hollow shaft



Function

In addition to the CANopen, PROFIBUS and AS-Interface rotary encoders, we have broadened our product line of bus-capable absolute encoders with the DSS58 for DeviceNet.

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples of one or more code disks. The code disks are screened by an infrared LED and the bit obtained sample is detected by means of an optical array. Its signals are electronically amplified and are forwarded on to the interface for processing.

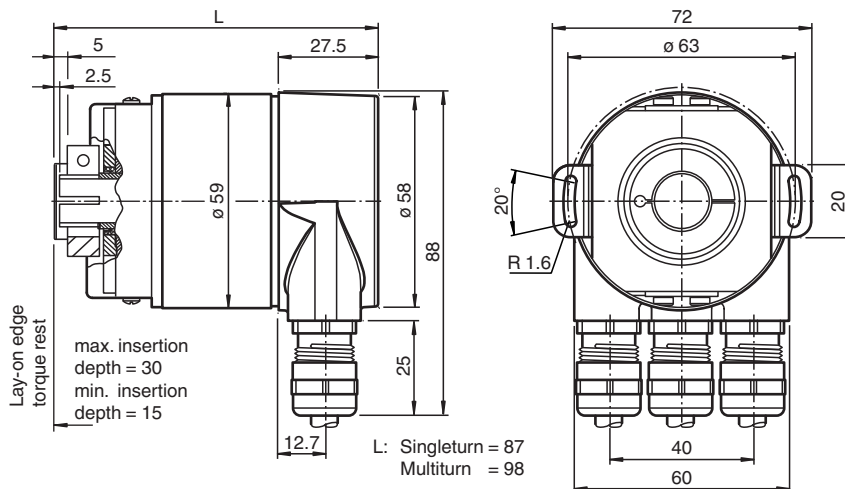
The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Change of state mode

The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder




Electrical specifications

Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	max. 230 mA at 10 V DC max. 100 mA at 24 V DC



Technical Data

Time delay before availability	t_v	< 250 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code		binary code
Code course (counting direction)		cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		DeviceNet
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Transfer rate		max. 0.5 MBit/s
Connection		
Terminal compartment		in removable housing cover
Standard conformity		
Degree of protection		DIN EN 60529, IP65 IP66 (with shaft seal)
Climatic testing		DIN EN 60068-2-30 , no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel flange: stainless steel shaft: stainless steel
Mass		approx. 550 g (combination 1) approx. 1100 g (combination 2)
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 3 Ncm (version without shaft seal)
Tightening torque, fastening screws		max. 1.8 Nm
Shaft load		
Angle offset		$\pm 0.9^\circ$
Axial offset		static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset		static: ± 0.5 mm, dynamic: ± 0.2 mm

Accessories

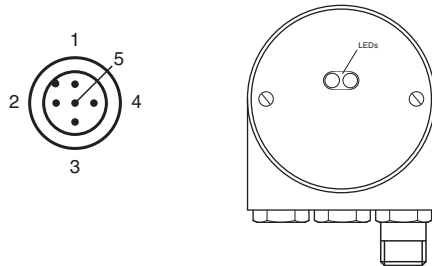
	AH 58-B1CA-2BW	Connection cover
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm

Accessories

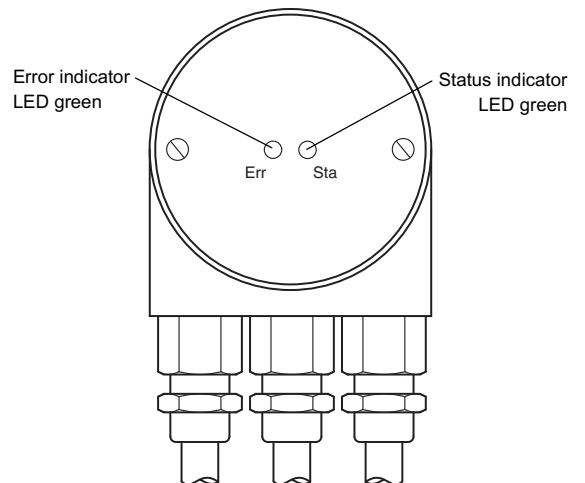
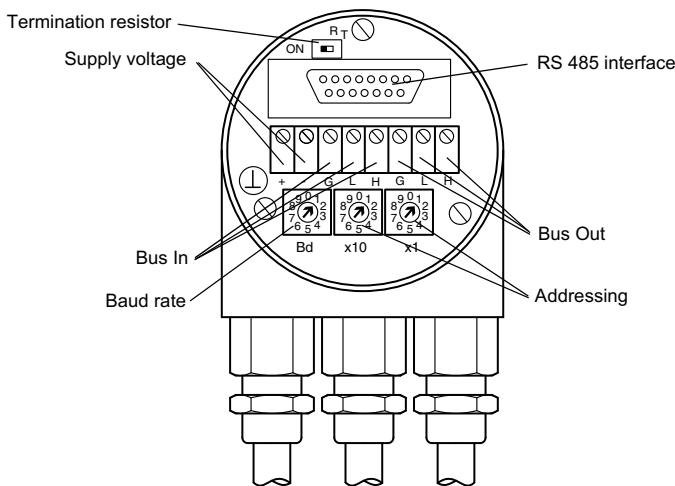
	<p>ACC-PACK-ABS-_S_58 ø12</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm</p>
	<p>ACC-PACK-ABS-_S_58 ø10</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm</p>

Connection

Terminal	Cable	M12 x 1 Connector	Explanation
⊥	-	-	Ground connection for power supply
(+)	Red	2	Power supply
(-)	Black	3	Power supply
CG	-	1	CAN ground
CL	Blue	5	CAN low
CH	White	4	CAN high
CG	-	-	CAN ground
CL	Blue	-	CAN low
CH	White	-	CAN high

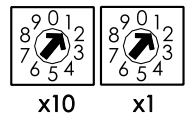


Configuration



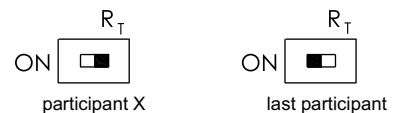
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 63, and may only be assigned once.



Adjusting the termination resistor

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Baud rate adjustment

Baud rate [kBit/s]	Switch position
125	0
250	1
500	2
125	3
reserved	4 ... 9

LED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
off	on	Encoder ready, boot-up message not transmitted, yet. Possible reasons: - no further participant present - wrong baud rate - encoder in prepared status
flashing	on	Boot-up message transmitted, Device configuration possible.
on	on	Normal operation mode, encoder in operational status.

Parameterization**Programmable CAN operating modes**

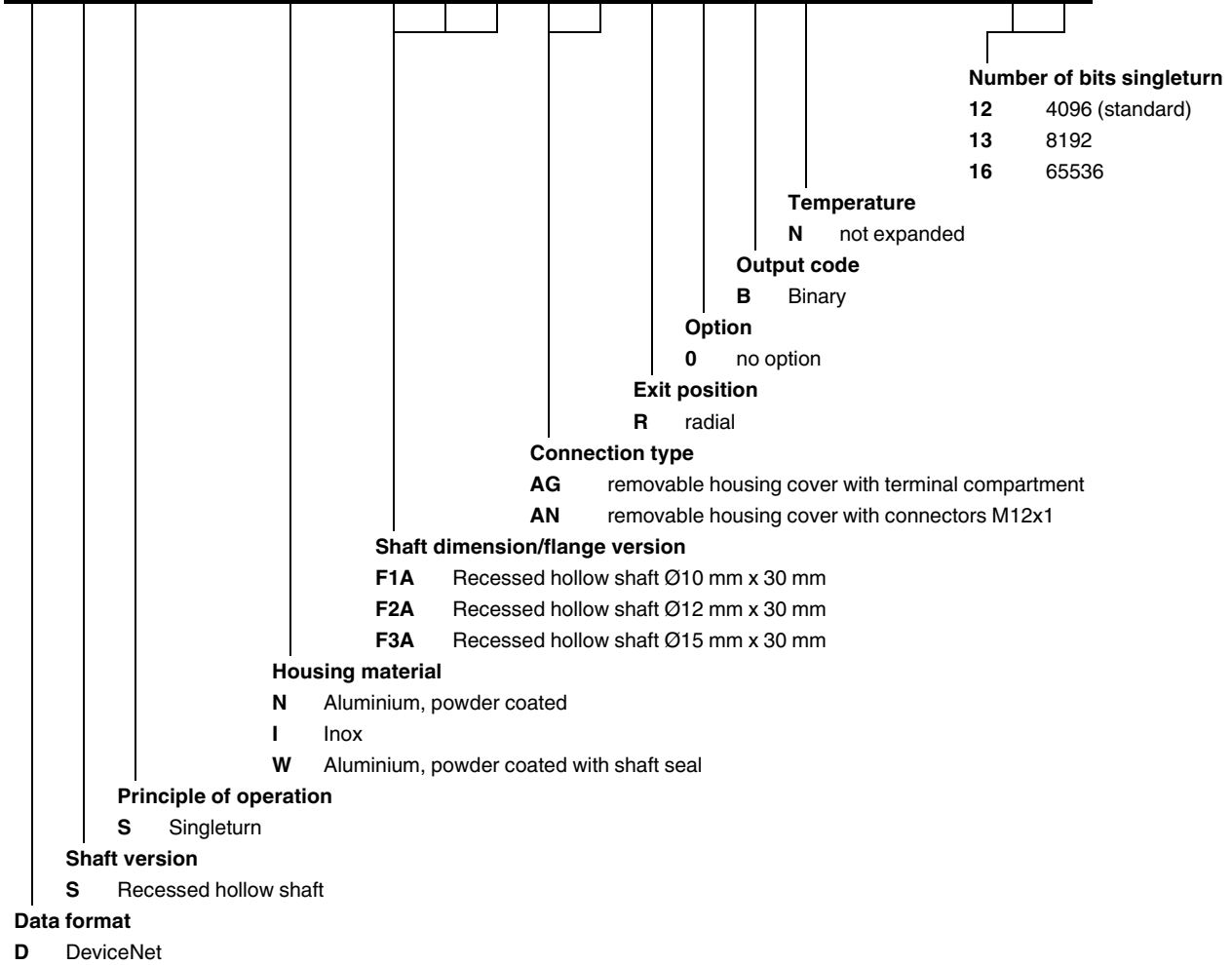
Mode	Explanation
Polled mode	The connected host requests the current actual position value via a telegram. The absolute encoder reads in the current position, calculates all parameters that may have been set and then sends back the actual process value.
Cyclic mode	The absolute encoder sends the current process value depending on a programmable timer. This can cause the bus load to be reduced since the member on the network only sends a message after a specific amount of time without a prompt from the master.
Change of state mode	The absolute encoder monitors the current process value and transfers the current value by itself if there is any change in the value. This can cause the bus load to be reduced, since the member on the network only sends a message if there has been a change.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will be rising or descending.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to a revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.

Type Code

Order code





Singleturn absolute encoder CVS58

- Industrial standard housing Ø58 mm
- Servo or clamping flange
- 16 Bit singleturn
- Galvanically isolated CAN interface
- 2 limit switches
- 8 programmable cams
- Velocity and acceleration output
- Event triggered process data transfer



Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples on one or more code disks which are sampled by a photoelectric array.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

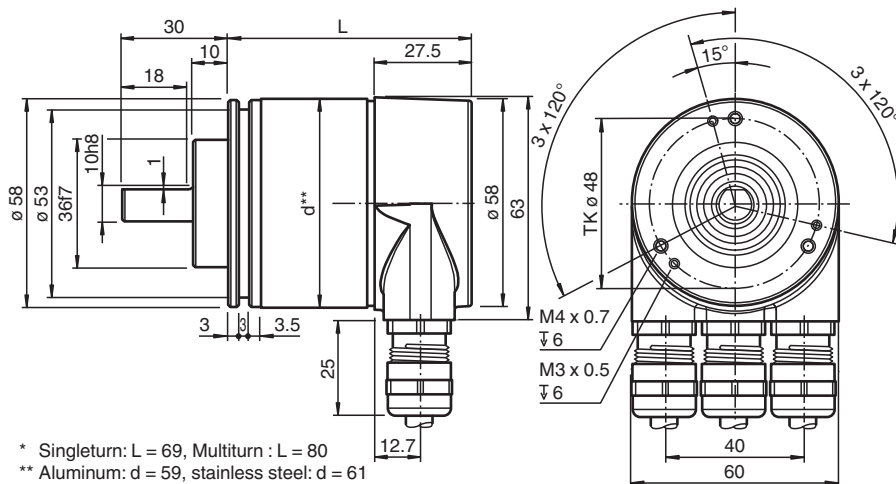
The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Sync mode

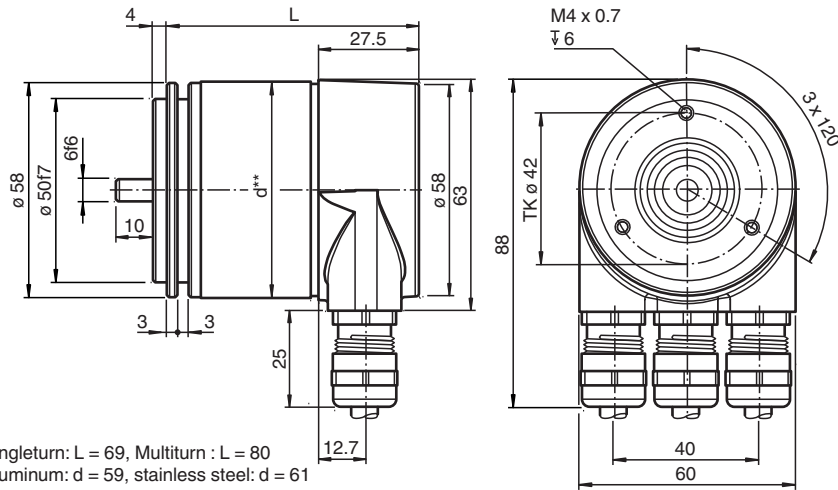
The device is designed for shaft mounting and is available in servo flange or clamping flange design.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions



Dimensions



* Singleturn: L = 69, Multiturn : L = 80
 ** Aluminum: d = 59, stainless steel: d = 61
















Technical Data

General specifications			
Detection type		photoelectric sampling	
Device type		Singleturn absolute encoder	
Electrical specifications			
Operating voltage	U_B	10 ... 30 V DC	
No-load supply current	I_0	max. 350 mA	
Time delay before availability	t_v	< 250 ms	
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	
Output code		binary code	
Code course (counting direction)		cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface			
Interface type		CANopen	
Resolution			
Single turn		up to 16 Bit	
Overall resolution		up to 16 Bit	
Transfer rate		max. 1 MBit/s	
Standard conformity		communication profile: DS 301 Device profiles: DS 406 and DS 417 , programmable according to class 2	
Connection			
Terminal compartment		in removable housing cover	
Standard conformity			
Degree of protection		DIN EN 60529, IP65 IP66 (with shaft seal)	
Climatic testing		DIN EN 60068-2-30 , no moisture condensation	
Emitted interference		EN 61000-6-4:2007	
Noise immunity		EN 61000-6-2:2005	
Shock resistance		DIN EN 60068-2-27, 100 g, 6 ms	
Vibration resistance		DIN EN 60068-2-6, 20 g, 10 ... 2000 Hz	
Approvals and certificates			
UL approval		cULus Listed, General Purpose, Class 2 Power Source	
Ambient conditions			
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)	
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications			
Material			








Technical Data

Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 550 g (combination 1) approx. 1100 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	9203	Angled flange
	AH 58-B1CA-2BW	Connection cover
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling

Accessories

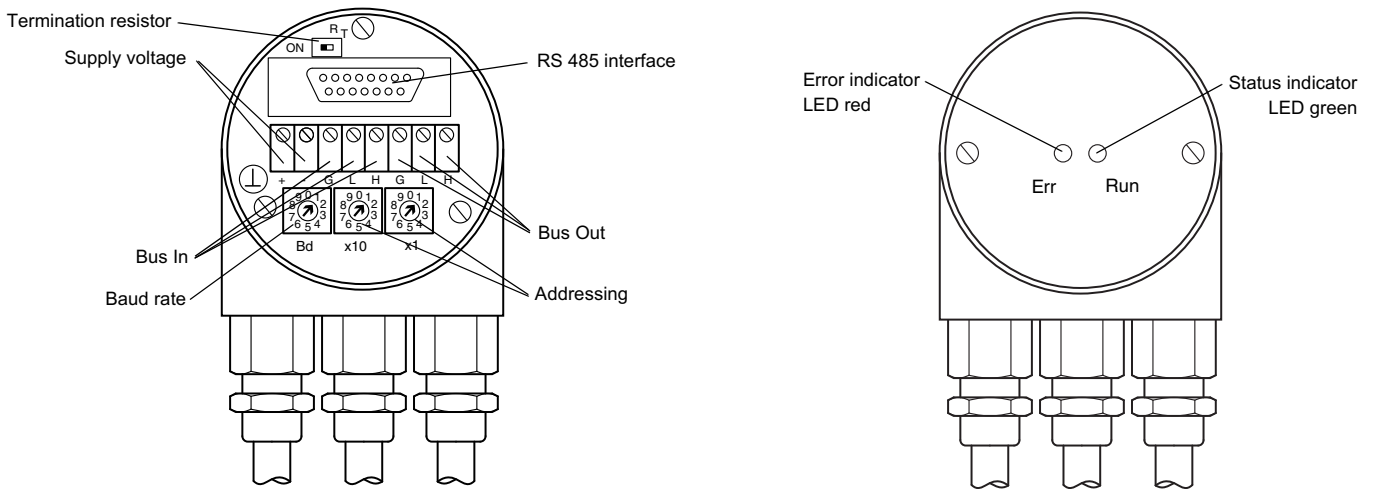
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling
	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling
	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Terminal	Cable	Explanation
⊥	-	Ground connection for power supply
(+)	Red	Power supply
(-)	Black	Power supply
G	-	CAN ground
L	Blue	CAN low
H	White	CAN high
G	-	CAN ground
L	Blue	CAN low
H	White	CAN high

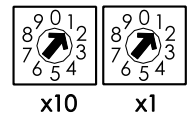
Configuration

Indicating and operating elements



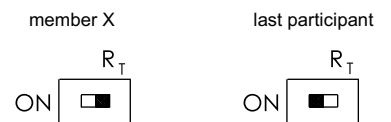
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 96, and may only be assigned once. The addresses 97 ... 99 are reserved.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position	Baud rate [kBit/s]	Switch position
20	0	500	5
50	1	800	6
100	2	1000	7
125	3	reserved	8
250	4	set baud rate by SDO message and LSS	9

LED-indicators

CAN Run (green)	State	Description
flickering	AutoBitrate / LSS	Auto-bitrate detection is in progress or LSS services are in progress
blinking	PREOPERATIONAL	Encoder is in state PREOPERATIONAL
single flash	STOPPED	Encoder is in state STOPPED
double flash		reserved
triple flash	Program / Firmware download	a software download is running on the encoder
on	OPERATIONAL	the encoder is in state OPERATIONAL
Err (red)	State	Description
off	no error	the encoder is in working condition
flickering	AutoBitrate / LSS	Auto-bitrate detection is in progress or LSS services are in progress
blinking	invalid configuration	general configuration error
single flash	Warning limit reached	at least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
double flash	Error control event	a guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
triple flash	Sync. error	the sync. message has not been received within the configured communication cycle period time out (see objekt 1006h)
quadruple flash	Error, event-timer	an expected PDO has not been received before the even-timer elapsed
on	Bus off	the CAN controller is bus off

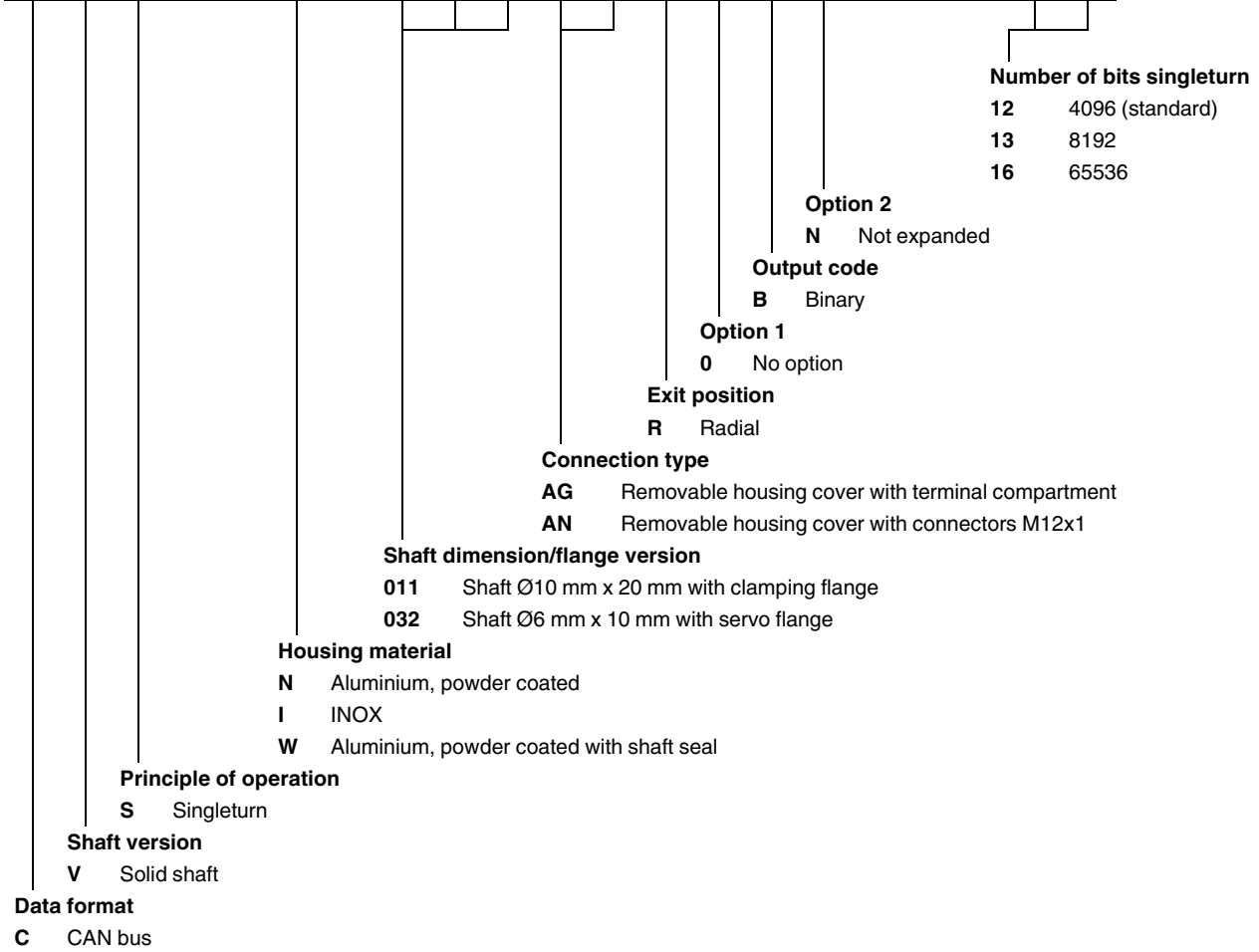
Parameterization**Programmable CAN operating modes**

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
2 limit switches	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
8 cam switches	Up to 8 position values can be programmed as cams. By reaching these values bits in object 6300h Cam state register are set.

Order code





Singleturn absolute encoder CSS58

- Industrial standard housing Ø58 mm
- Recessed hollow shaft
- 16 Bit singleturn
- Galvanically isolated CAN interface
- 2 limit switches
- 8 programmable cams
- Velocity and acceleration output
- Event triggered process data transfer



Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples on one or more code disks which are sampled by a photoelectric array.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

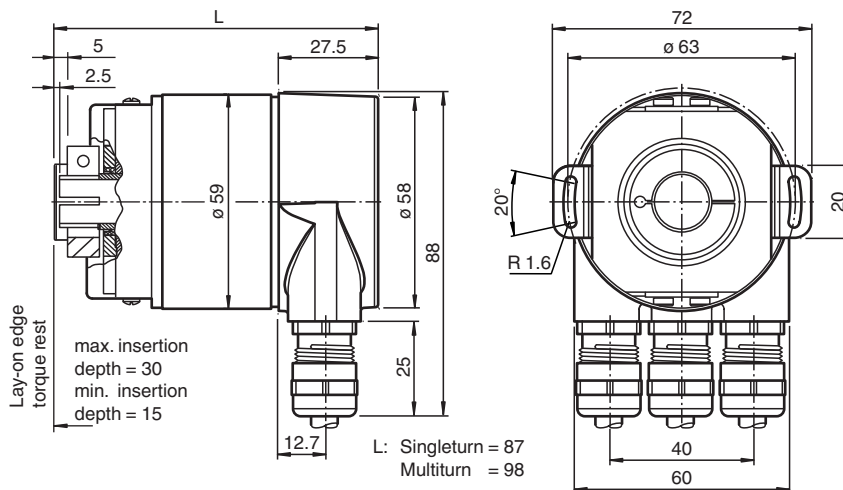
The encoders integrated CAN bus interface supports all CANopen functions. The following operating modes can be programmed, and can be selectively turned on or off:

- Polled mode
- Cyclic mode
- Sync mode

The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder



Electrical specifications

Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	max. 230 mA at 10 V DC max. 100 mA at 24 V DC




Technical Data

Time delay before availability	t_v	< 250 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code		binary code
Code course (counting direction)		cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Transfer rate		max. 1 MBit/s
Standard conformity		communication profile: DS 301 Device profiles: DS 406 and DS 417 , programmable according to class 2
Connection		
Terminal compartment		in removable housing cover
Standard conformity		
Degree of protection		DIN EN 60529, IP65 IP66 (with shaft seal)
Climatic testing		DIN EN 60068-2-30 , no moisture condensation
Emitted interference		EN 61000-6-4:2007
Noise immunity		EN 61000-6-2:2005
Shock resistance		DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel flange: stainless steel shaft: stainless steel
Mass		approx. 550 g (combination 1) approx. 1100 g (combination 2)
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		≤ 3 Ncm (version without shaft seal)
Tightening torque, fastening screws		max. 1.8 Nm
Shaft load		
Angle offset		$\pm 0,9^\circ$
Axial offset		static: $\pm 0,3$ mm, dynamic: $\pm 0,1$ mm
Radial offset		static: $\pm 0,5$ mm, dynamic: $\pm 0,2$ mm

Accessories

	AH 58-B1CA-2BW	Connection cover
	ACC-PACK-ABS-S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm

Accessories

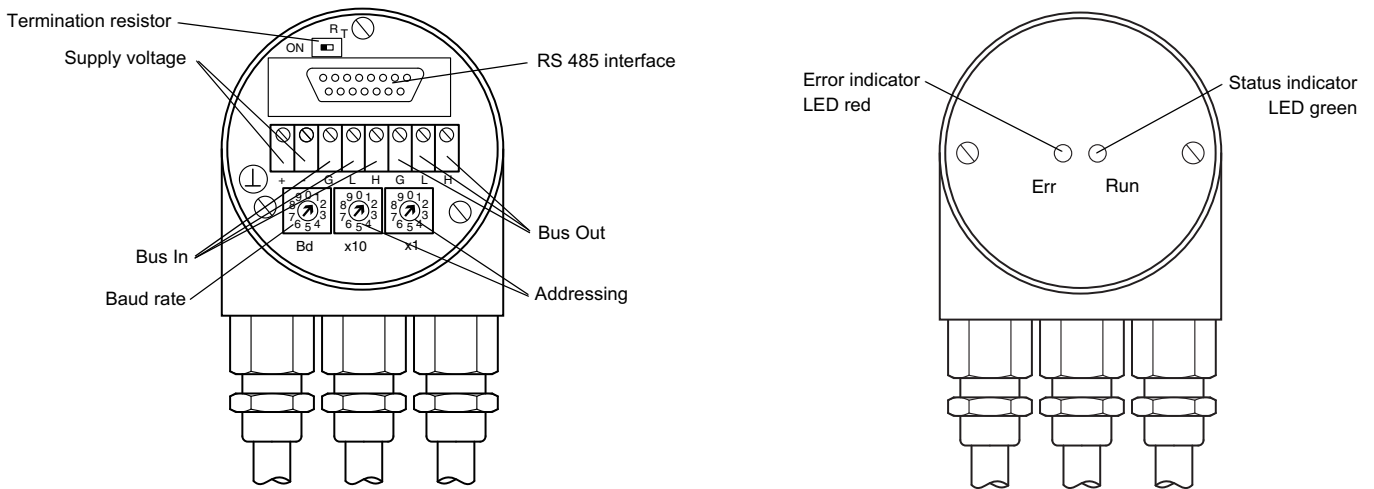
	<p>ACC-PACK-ABS-_S_58 ø14</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm</p>
	<p>ACC-PACK-ABS-_S_58 ø12</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm</p>
	<p>ACC-PACK-ABS-_S_58 ø10</p>	<p>Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm</p>

Connection

Terminal	Cable	Explanation
⊥	-	Ground connection for power supply
(+)	Red	Power supply
(-)	Black	Power supply
G	-	CAN ground
L	Blue	CAN low
H	White	CAN high
G	-	CAN ground
L	Blue	CAN low
H	White	CAN high

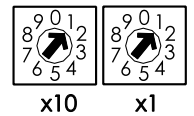
Configuration

Indicating and operating elements



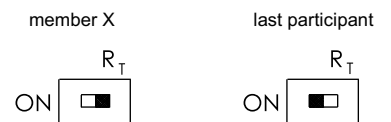
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 96, and may only be assigned once. The addresses 97 ... 99 are reserved.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position	Baud rate [kBit/s]	Switch position
20	0	500	5
50	1	800	6
100	2	1000	7
125	3	reserved	8
250	4	set baud rate by SDO message and LSS	9

LED-indicators

CAN Run (green)	State	Description
flickering	AutoBitrate / LSS	Auto-bitrate detection is in progress or LSS services are in progress
blinking	PREOPERATIONAL	Encoder is in state PREOPERATIONAL
single flash	STOPPED	Encoder is in state STOPPED
double flash		reserved
triple flash	Program / Firmware download	a software download is running on the encoder
on	OPERATIONAL	the encoder is in state OPERATIONAL
Err (red)	State	Description
off	no error	the encoder is in working condition
flickering	AutoBitrate / LSS	Auto-bitrate detection is in progress or LSS services are in progress
blinking	invalid configuration	general configuration error
single flash	Warning limit reached	at least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
double flash	Error control event	a guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
triple flash	Sync. error	the sync. message has not been received within the configured communication cycle period time out (see objekt 1006h)
quadruple flash	Error, event-timer	an expected PDO has not been received before the even-timer elapsed
on	Bus off	the CAN controller is bus off

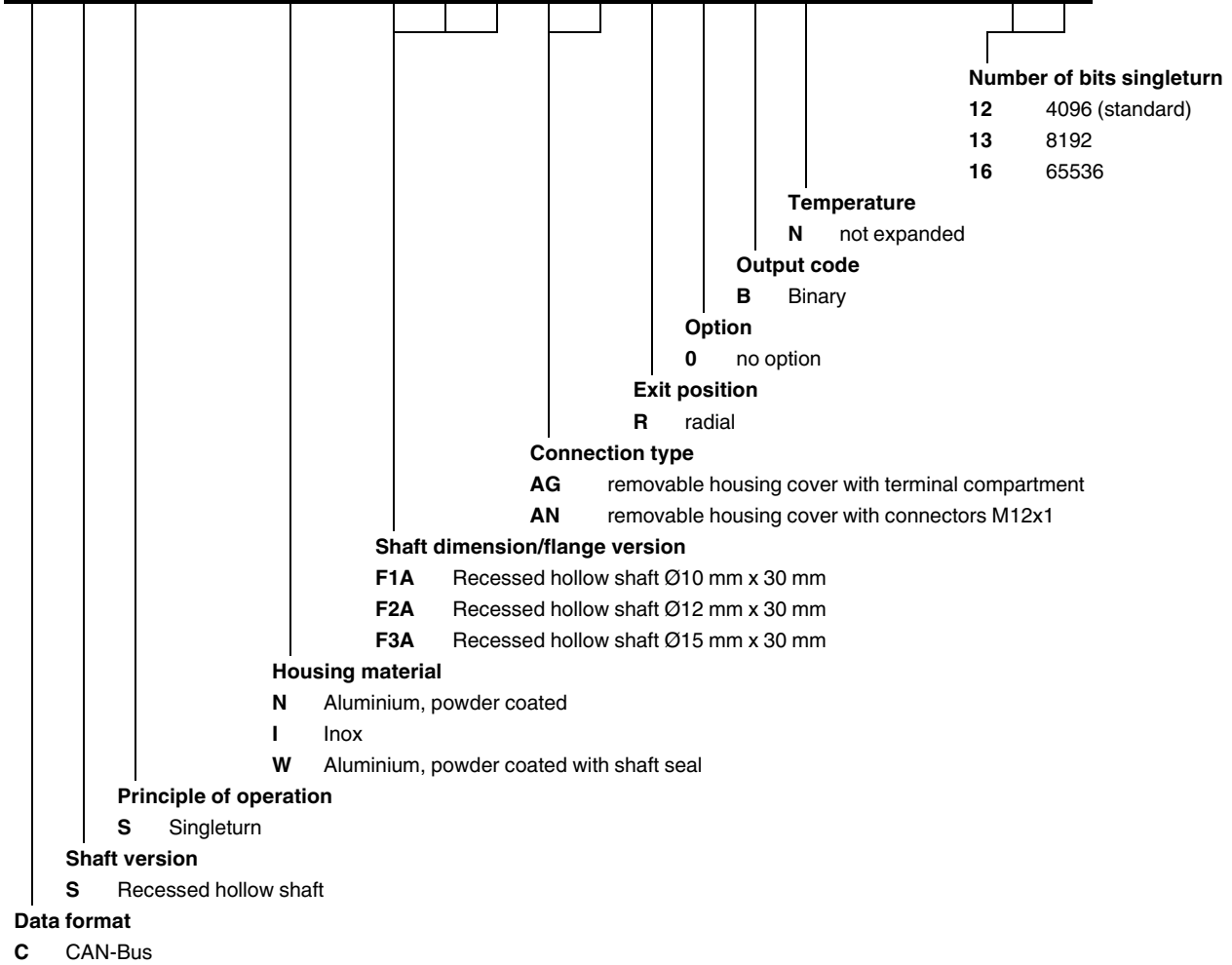
Parameterization**Programmable CAN operating modes**

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
2 limit switches	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
8 cam switches	Up to 8 position values can be programmed as cams. By reaching these values bits in object 6300h Cam state register are set.

Order code





Singleturn absolute encoder

AVS58-0

- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Servo or clamping flange
- Zero-set function



Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AVS58 is maximum 65536 steps per revolution.

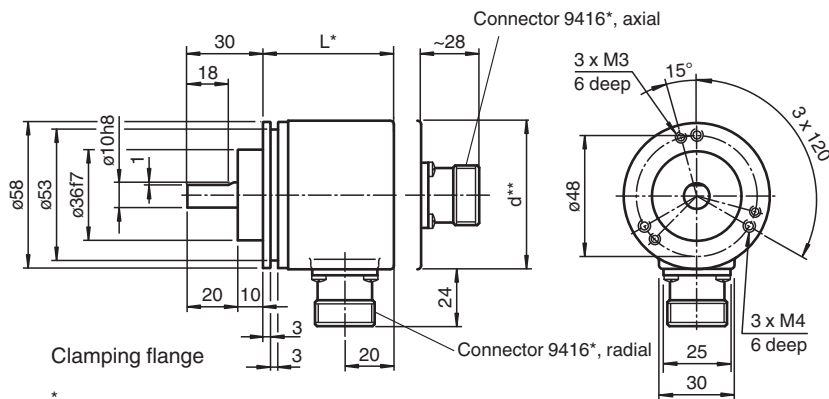
The devices of the AVS58 series are equipped with a microcontroller.

The control module sends a clock bundle to the absolute encoder to obtain 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).

This singleturn absolute encoder is available either in clamp flange design with a shaft diameter of 10 mm x 20 mm or in a servo flange design with a shaft diameter of 6 mm x 10 mm.

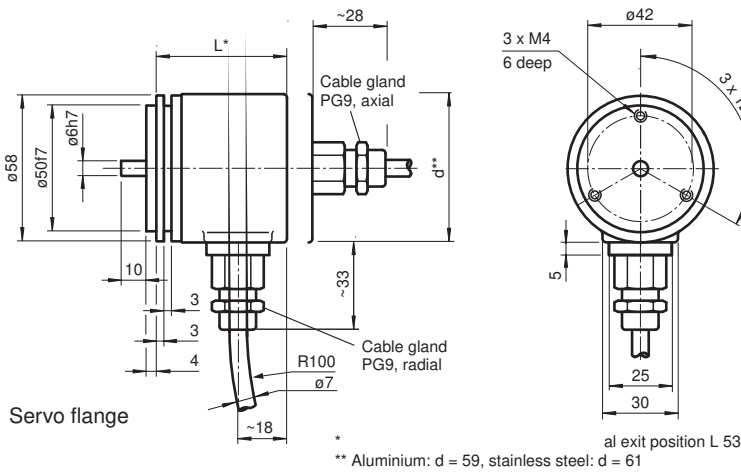
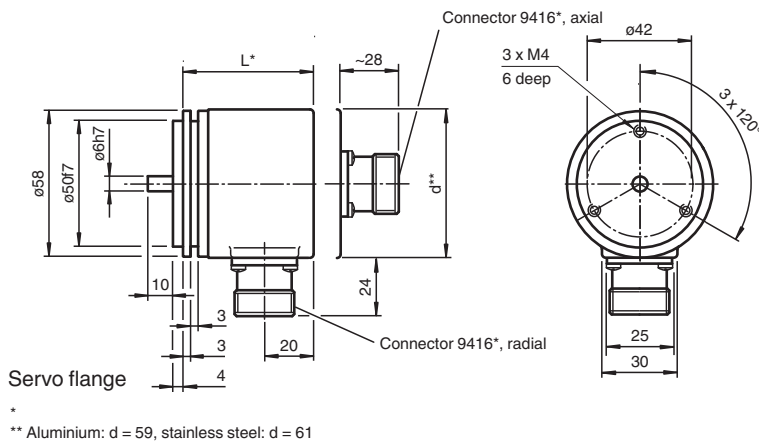
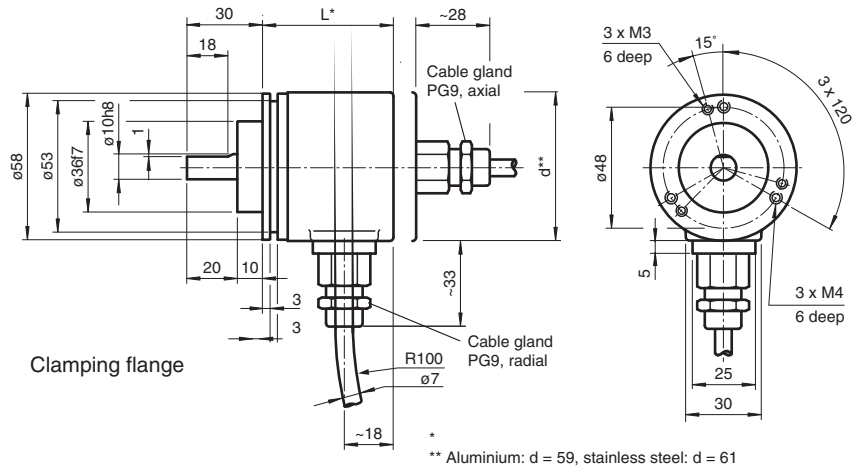
The electrical connection is made by a 12-pin round plug connector. A version with a 1 m cable connector is also available.

Dimensions



* Aluminium: d = 59, stainless steel: d = 61

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder

Electrical specifications

Operating voltage	U_B	4.5 ... 30 V DC
No-load supply current	I_0	max. 180 mA
Time delay before availability	t_v	< 250 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit



















Technical Data

Output code	Gray code, binary code
Code course (counting direction)	cw descending (clockwise rotation, code course descending)
Interface	
Interface type	SSI
Monoflop time	20 ± 10 µs
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.1 ... 2 MBit/s
Voltage drop	U _B - 2.5 V
Standard conformity	RS 422
Input 1	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 2 V
Input current	< 6 mA
Switch-on delay	< 10 ms
Input 2	
Input type	zero-set (PRESET 1)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 2 V
Input current	< 6 mA
Signal duration	min. 100 ms
Switch-on delay	< 10 ms
Connection	
Connector	type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	






Technical Data

Axial	40 N
Radial	110 N

Accessories

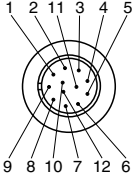
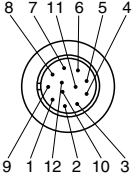
	9203	Angled flange
	9416	Female cordset
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling

Accessories

	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling
	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
PRESET 1	Black	9	9	zero-setting input
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

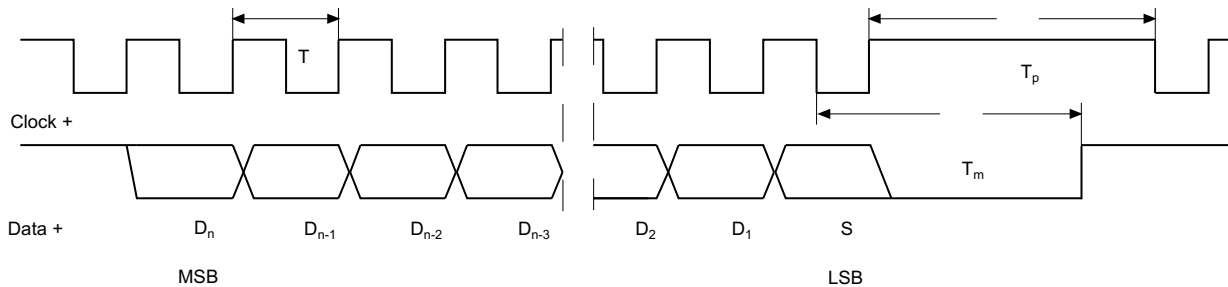



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

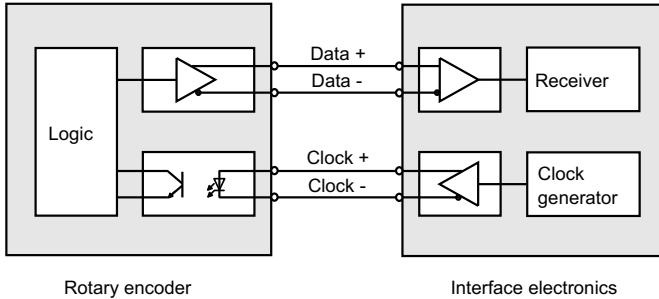
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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



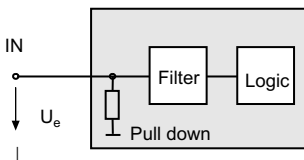
Line length

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

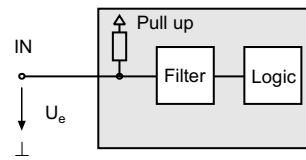
Inputs

The selection of the counting direction input (cw/ccw) is activated with 0-level. The zero-set input (PRESET 1) is activated with 1-level.

zero-set input (PRESET 1)

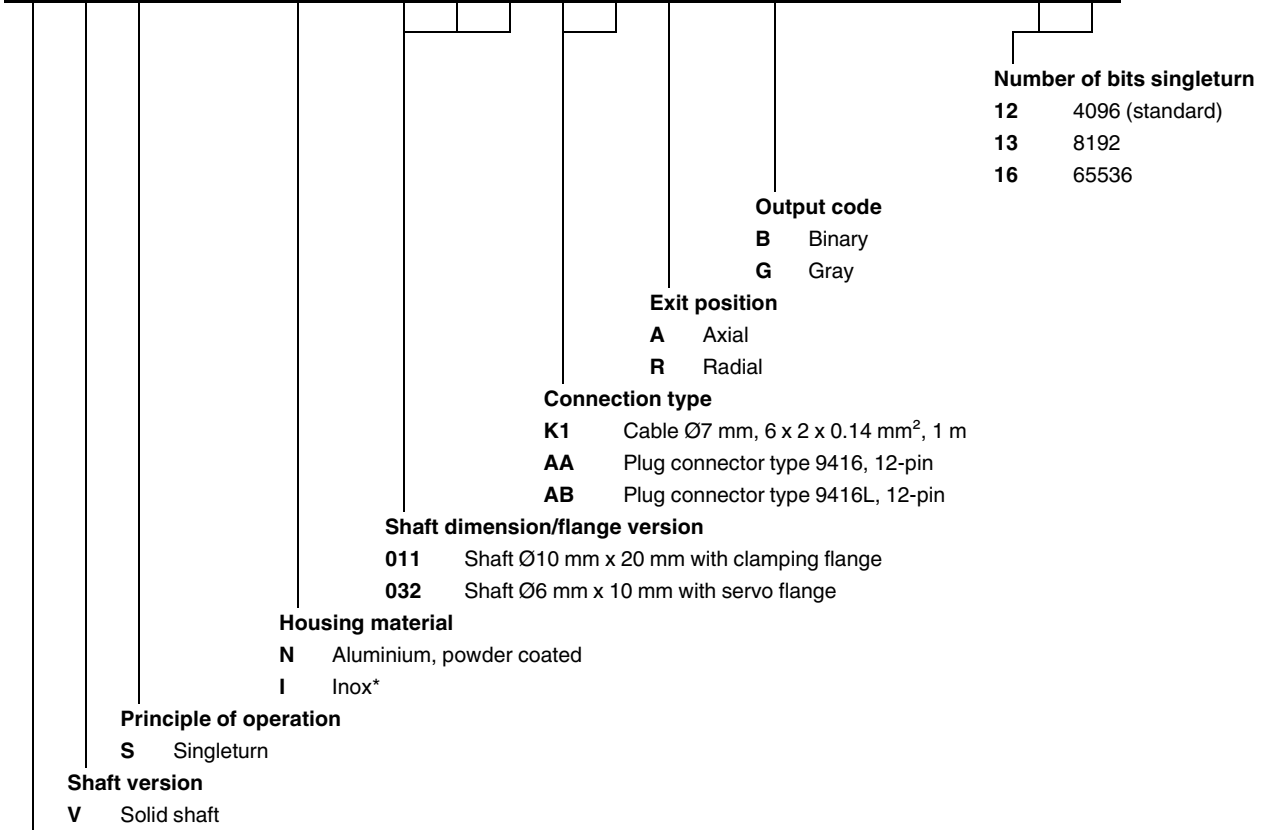


Input for selection of counting direction (cw/ccw)



Type Code

Order code



Data format

A SSI (Synchronous Serial Interface)

*Housing material I only available with axial exit position.



Singleturn absolute encoder

ASS58-0

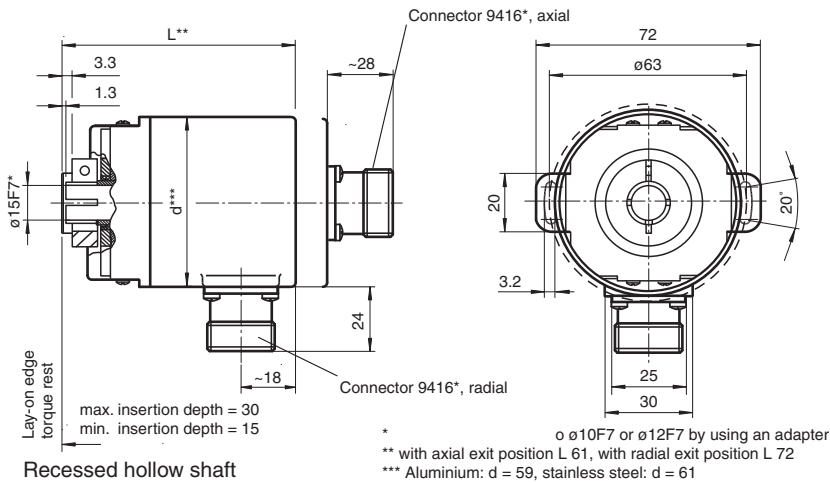
- Industrial standard housing $\varnothing 58$ mm
- 16 Bit singleturn
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Recessed hollow shaft
- Zero-set function



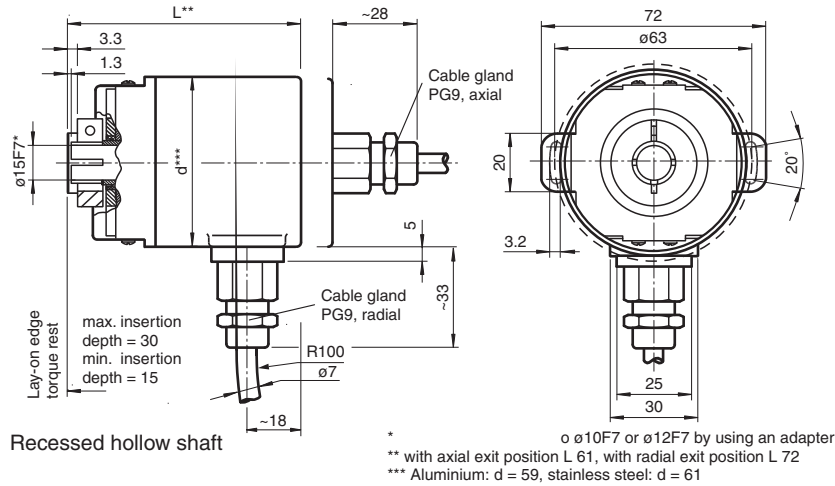
Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the ASS58 is maximum 65536 steps per revolution. The devices of the ASS58 series are equipped with a microcontroller. The control module sends a clock bundle to the absolute encoder to obtain 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). The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest. The electrical connection is made by a 12-pin round plug connector. It is also possible to obtain a version with a 1 m cable connector.

Dimensions



Dimensions









Technical Data

General specifications			
Detection type		photoelectric sampling	
Device type		Singleturn absolute encoder	
Electrical specifications			
Operating voltage	U_B	4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)	
No-load supply current	I_0	max. 180 mA	
Time delay before availability	t_v	< 250 ms	
Linearity		\pm 2 LSB at 16 Bit, \pm 1 LSB at 13 Bit, \pm 0,5 LSB at 12 Bit	
Output code		Gray code, binary code	
Code course (counting direction)		cw descending (clockwise rotation, code course descending)	
Interface			
Interface type		SSI ; SSI + incremental track	
Monoflop time		20 \pm 10 μ s	
Resolution			
Single turn		up to 16 Bit	
Overall resolution		up to 16 Bit	
Transfer rate		0.1 ... 2 MBit/s	
Voltage drop		U_B - 2.5 V	
Standard conformity		RS 422	
Input 1			
Input type		Selection of counting direction (cw/ccw)	
Signal voltage			
High		4.5 ... 30 V	
Low		0 ... 2 V	
Input current		< 6 mA	
Switch-on delay		< 10 ms	
Input 2			
Input type		zero-set (PRESET 1)	
Signal voltage			
High		4.5 ... 30 V	
Low		0 ... 2 V	
Input current		< 6 mA	
Signal duration		min. 100 ms	
Switch-on delay		< 10 ms	
Connection			
Connector		type 9416 (M23), 12-pin, type 9416L (M23), 12-pin	

Technical Data

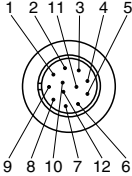
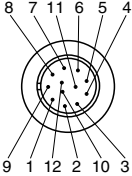
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
Emitted interference	DIN EN 61000-6-4
Noise immunity	DIN EN 61000-6-2
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Angle offset	± 0.9 °
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm

Accessories

	9416	Female cordset
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core
	ACC-PACK-ABS-_S_58 Ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 Ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 Ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 Ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
PRESET 1	Black	9	9	zero-setting input
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

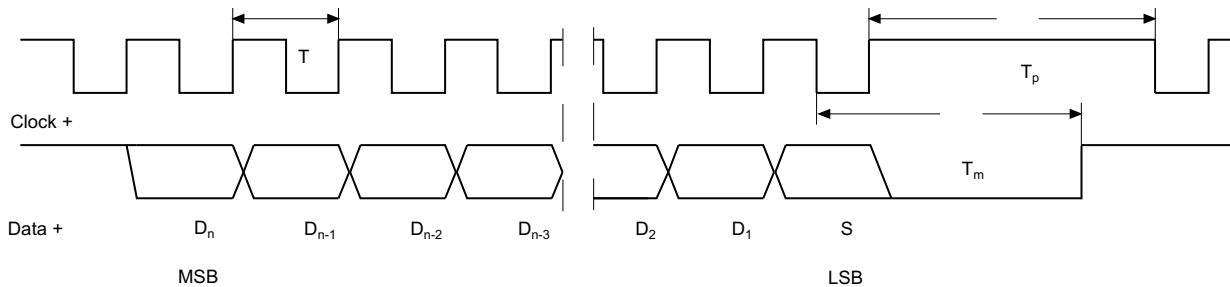



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

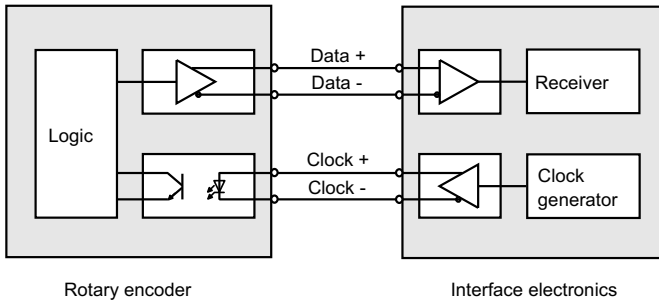
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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



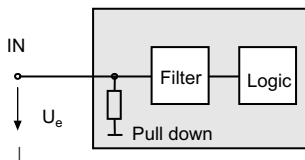
Line length

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

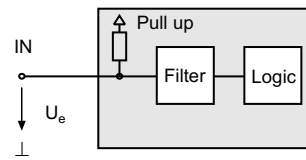
Inputs

The selection of the counting direction input (cw/ccw) is activated with 0-level. The zero-set input (PRESET 1) is activated with 1-level.

zero-set input (PRESET 1)



Input for selection of counting direction (cw/ccw)



Type Code

Order code

A	S	S	5	8	-						0			-	0	0		
---	---	---	---	---	---	--	--	--	--	--	---	--	--	---	---	---	--	--

Number of bits singleturn

12	4096 (standard)
13	8192
16	65536

Options

- N Standard
- 1 Incremental track 1024 pulses, Push/Pull
- 2 Incremental track 2048 pulses, Push/Pull
- 3 Incremental track 4096 pulses, Push/Pull
- 4 Incremental track 1024 pulses, RS422
- 5 Incremental track 2048 pulses, RS422
- 6 Incremental track 4096 pulses, RS422

Output code

- B Binary
- G Gray

Exit position

- A Axial
- R Radial

Connection type

- K1 Cable Ø7 mm, 6 x 2 x 0.14 mm², 1 m
- AA Plug connector type 9416, 12-pin
- AB Plug connector type 9416L, 12-pin

Shaft dimension/flange version

- F1A Recessed hollow shaft Ø10 mm x 30 mm
- F2A Recessed hollow shaft Ø12 mm x 30 mm
- F3A Recessed hollow shaft Ø15 mm x 30 mm

Housing material

- N Aluminium, powder coated
- I Inox*
- W Aluminium, powder coated with shaft seal

Principle of operation

- S Singleturn

Shaft version

- S Recessed hollow shaft

Data format

- A SSI (Synchronous Serial Interface)

*Housing material I only available with axial exit position.



Singleturn absolute encoder AVS58-K

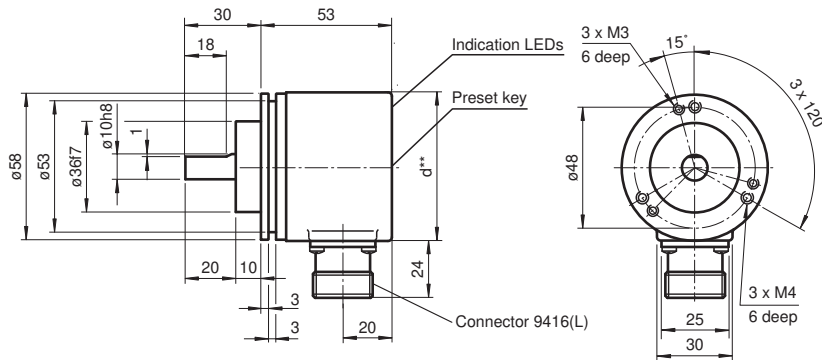
- Industrial standard housing $\varnothing 58$ mm
- 16 Bit singleturn
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Servo or clamping flange
- Zero-set function electrically and by preset key



Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AVS58-K is maximum 65536 steps per revolution. The devices of the AVS58-K series are equipped with a microcontroller. The control module sends a clock bundle to the absolute encoder to obtain 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). Another feature of this absolute encoder is the built in preset key at the rear housing side. By means of this, the position value can be locally set to zero. For status and diagnosis indication furthermore it is equipped with 2 LEDs. This singleturn absolute encoder is available either in clamp flange design with a shaft diameter of 10 mm x 20 mm or in a servo flange design with a shaft diameter of 6 mm x 10 mm. The electrical connection is made by a 12-pin round plug connector. A version with a 1 m cable connector is also available.

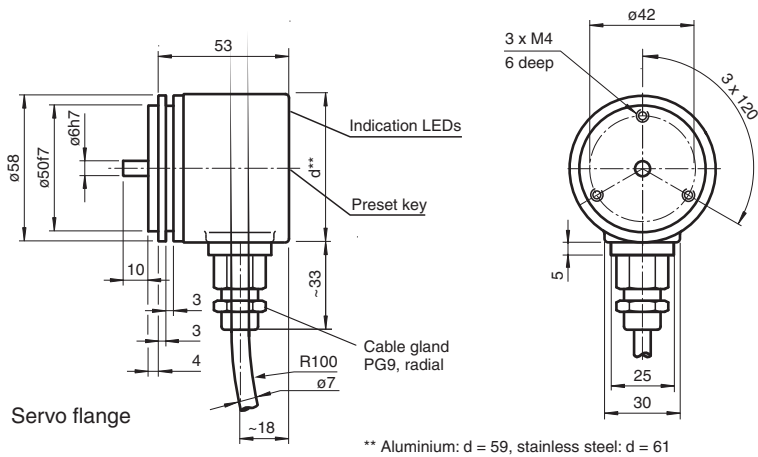
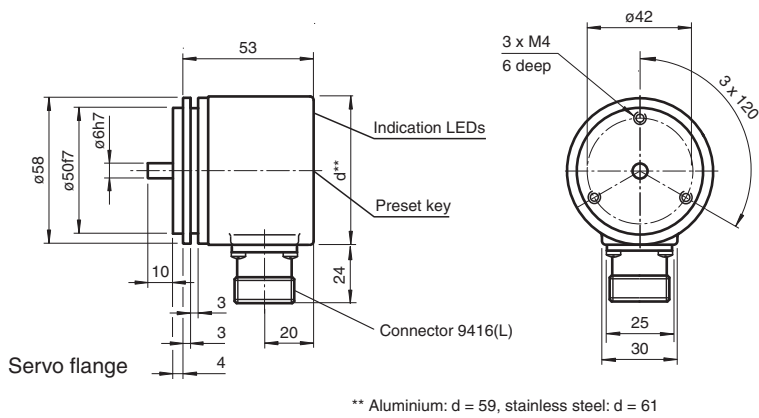
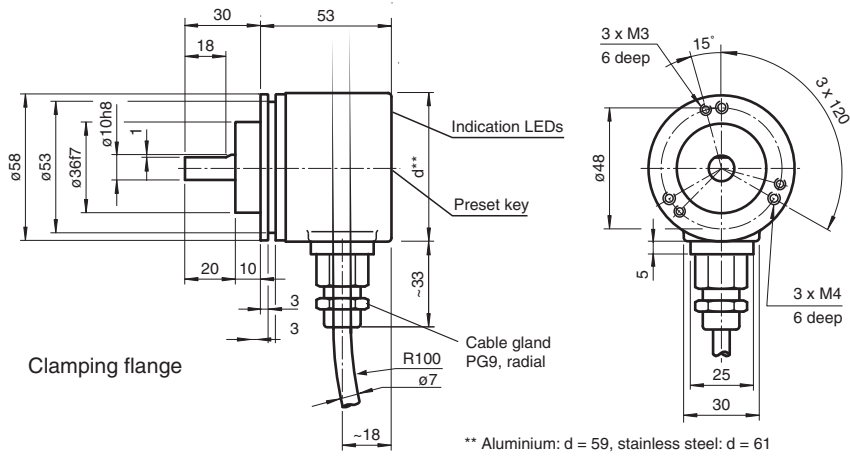
Dimensions



** Aluminium: d = 59, stainless steel: d = 61

Clamping flange

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder

Indicators/operating means

LED green	supply voltage/preset key pressed
LED red	internal diagnostic test failed

Electrical specifications

Operating voltage	U_B	4.5 ... 30 V DC
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Technical Data

Power consumption	P_0	$\leq 1 \text{ W}$
Time delay before availability	t_v	$< 250 \text{ ms}$
Linearity		$\pm 2 \text{ LSB at 16 Bit, } \pm 1 \text{ LSB at 13 Bit, } \pm 0,5 \text{ LSB at 12 Bit}$
Output code		Gray code, binary code
Code course (counting direction)		cw descending (clockwise rotation, code course descending)
Interface		
Interface type		SSI
Monoflop time		$20 \pm 10 \mu\text{s}$
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Transfer rate		0.1 ... 2 MBit/s
Voltage drop		$U_B - 2.5 \text{ V}$
Standard conformity		RS 422
Input 1		
Input type		Selection of counting direction (cw/ccw)
Signal voltage		
High		4.5 ... 30 V or open input (cw ascending)
Low		0 ... 1 V (cw descending)
Input current		$< 6 \text{ mA}$
Switch-on delay		$< 10 \text{ ms}$
Input 2		
Input type		zero-set (PRESET 1)
Signal voltage		
High		4.5 ... 30 V
Low		0 ... 1 V or open input
Input current		$< 6 \text{ mA}$
Signal duration		min. 100 ms
Switch-on delay		$< 10 \text{ ms}$ after falling input flank
Connection		
Connector		type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable		$\varnothing 7 \text{ mm, } 6 \times 2 \times 0.14 \text{ mm}^2, 1 \text{ m}$
Standard conformity		
Degree of protection		DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing		DIN EN 60068-2-3, no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions		
Operating temperature		$-40 \dots 85 \text{ }^\circ\text{C}$ ($-40 \dots 185 \text{ }^\circ\text{F}$)
Storage temperature		$-40 \dots 85 \text{ }^\circ\text{C}$ ($-40 \dots 185 \text{ }^\circ\text{F}$)
Mechanical specifications		
Material		
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel flange: stainless steel shaft: stainless steel
Mass		approx. 460 g (combination 1) approx. 800 g (combination 2)
Rotational speed		max. 12000 min^{-1}







Technical Data

Moment of inertia	$\leq 30 \text{ gcm}^2$
Starting torque	$< 3 \text{ Ncm}$ (version without shaft seal)
Shaft load	
Axial	40 N
Radial	110 N

Accessories

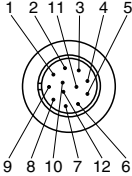
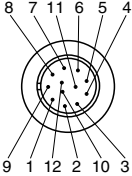
	9203	Angled flange
	9416	Female cordset
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling

Accessories

	9409 6*6	Bellows coupling
	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling
	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
PRESET 1	Black	9	9	zero-setting input
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

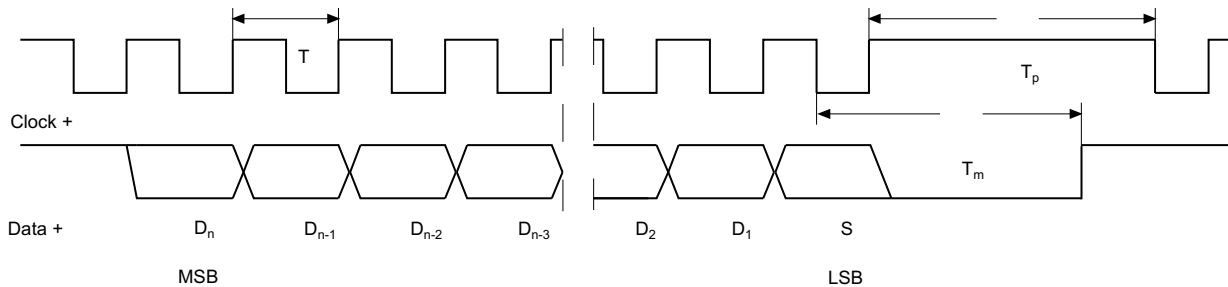



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

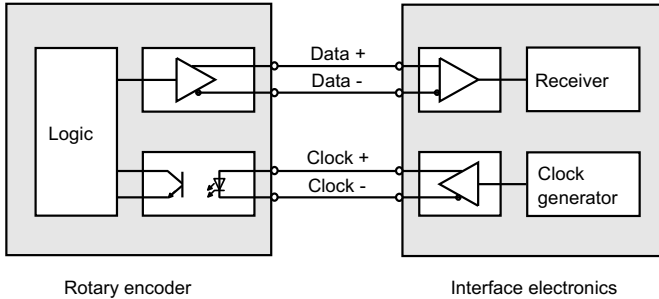
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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



Line length

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

Operation

Inputs

Input for selection of counting direction (V/R)

Level	counting direction by cw revolution (with view onto the shaft)	Input counting direction (V/R)
High (input open or connected to +UB)	ascending	
Low (Input connected to GND)	descending	

Zero-set input (Preset)

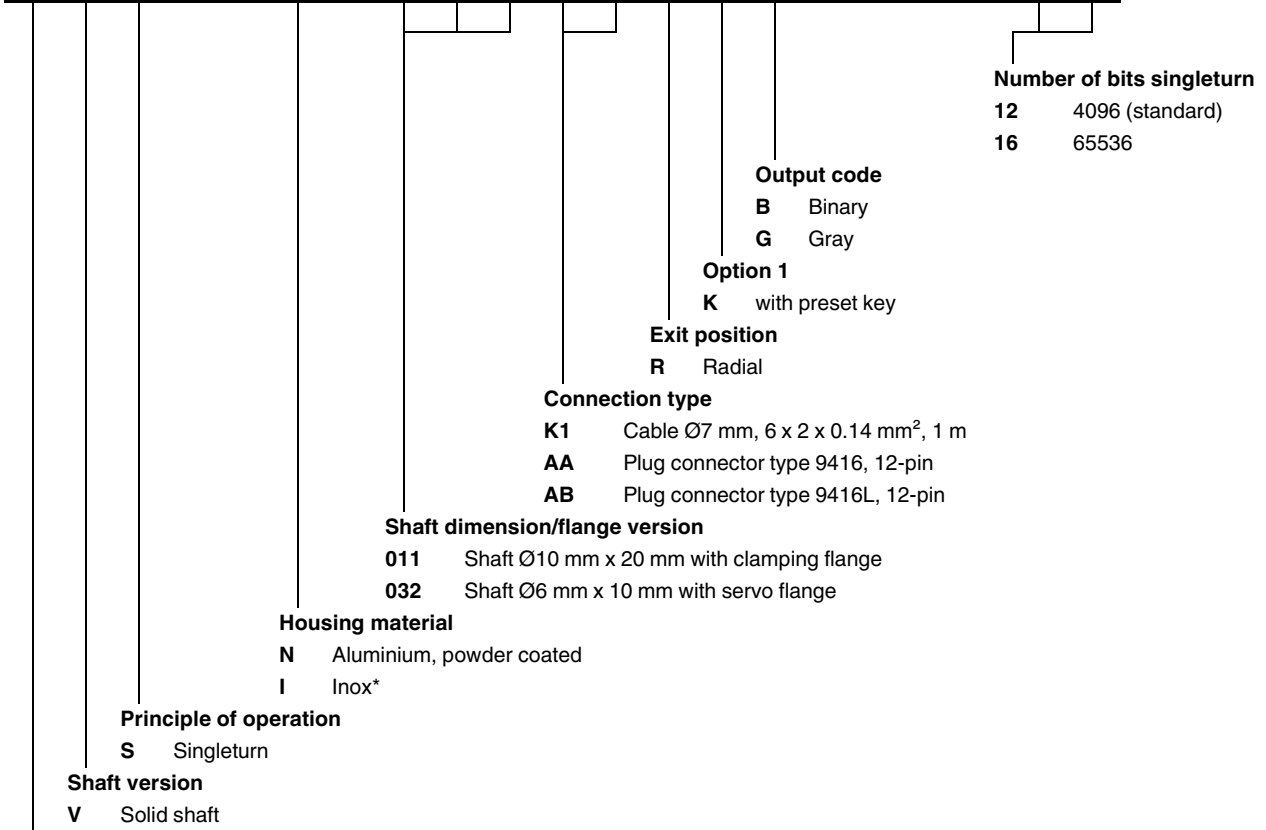
Level	Funktion	Zero-set input (Preset)
Low (input open or connected to GND)	Output position value	
High (Input connected to +UB or $U_e > 4,5 V$)	Activation with falling edge (min. 100 ms)	

Indicators/operation means

Preset key	Manually zero setting of the position value.	
LED green	<ul style="list-style-type: none"> • Lights up with supplied encoder • Goes off while preset key is pressed 	
LED red	Alarm/error indication <ul style="list-style-type: none"> • pre-fault indication (data output ist continued) • internal memory error (all data bits are set to high level permanently) 	

Order code

A	V	S	5	8	-						R	K			N	-	0	0		
---	---	---	---	---	---	--	--	--	--	--	---	---	--	--	---	---	---	---	--	--



Data format

A SSI (Synchronous Serial Interface)

*Housing material I only available with plug connector types.

Number of bits singleturn
 12 4096 (standard)
 16 65536

Output code

B Binary
G Gray

Option 1

K with preset key

Exit position

R Radial

Connection type

K1 Cable Ø7 mm, 6 x 2 x 0.14 mm², 1 m

AA Plug connector type 9416, 12-pin

AB Plug connector type 9416L, 12-pin

Shaft dimension/flange version

011 Shaft Ø10 mm x 20 mm with clamping flange

032 Shaft Ø6 mm x 10 mm with servo flange

Housing material

N Aluminium, powder coated

I Inox*

Principle of operation

S Singleturn

Shaft version

V Solid shaft



Singleturn absolute encoder

ASS58-K

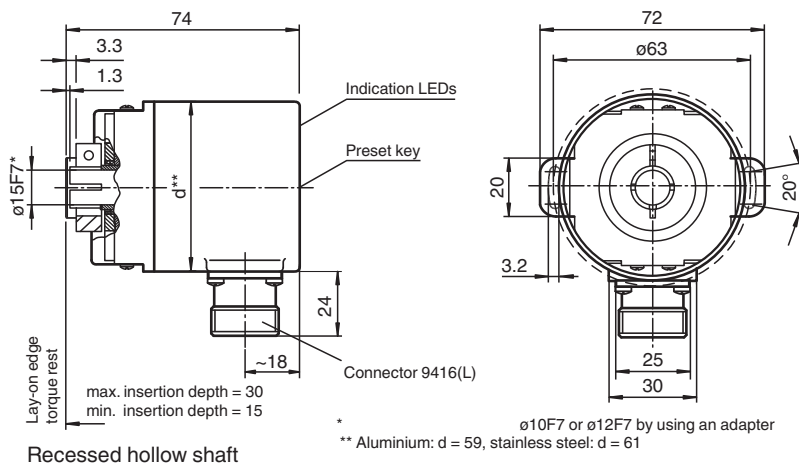
- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Recessed hollow shaft
- Zero-set function electrically and by preset key



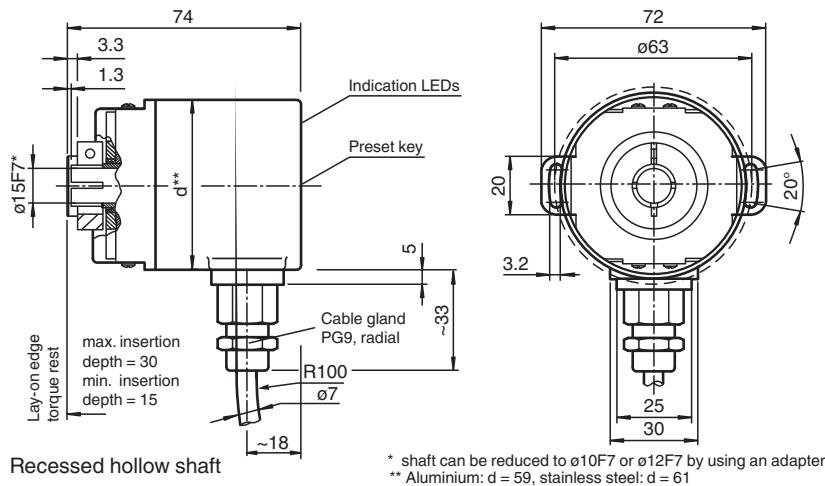
Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the ASS58-K is maximum 65536 steps per revolution. The devices of the ASS58-K series are equipped with a microcontroller. The control module sends a clock bundle to the absolute encoder to obtain 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). Another feature of this absolute encoder is the built in preset key at the rear housing side. By means of this, the position value can be locally set to zero. For status and diagnosis indication furthermore it is equipped with 2 LEDs. The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest. The electrical connection is made by a 12-pin round plug connector. It is also possible to obtain a version with a 1 m cable connector.

Dimensions



Dimensions



Technical Data







General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Indicators/operating means	
LED green	supply voltage/preset key pressed
LED red	internal diagnostic test failed
Electrical specifications	
Operating voltage	U_B 4.5 ... 30 V DC
Power consumption	P_0 ≤ 1 W
Time delay before availability	t_v < 250 ms
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code	Gray code, binary code
Code course (counting direction)	cw descending (clockwise rotation, code course descending)
Interface	
Interface type	SSI
Monoflop time	20 ± 10 μ s
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.1 ... 2 MBit/s
Voltage drop	$U_B - 2.5$ V
Standard conformity	RS 422
Input 1	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 30 V or open input (cw ascending)
Low	0 ... 1 V (cw descending)
Input current	< 6 mA
Switch-on delay	< 10 ms
Input 2	
Input type	zero-set (PRESET 1)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 1 V or open input
Input current	< 6 mA
Signal duration	min. 100 ms

Release date: 2023-02-14 Date of issue: 2023-02-14 Filename: t49174_eng.pdf

Technical Data

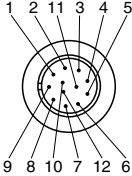
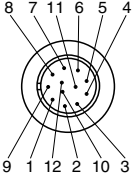
Switch-on delay	< 10 ms after falling input flank
Connection	
Connector	type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	≤ 30 gcm ²
Starting torque	< 3 Ncm (version without shaft seal)
Shaft load	
Angle offset	± 0.9 °
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm

Accessories

	9416	Female cordset
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
PRESET 1	Black	9	9	zero-setting input
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

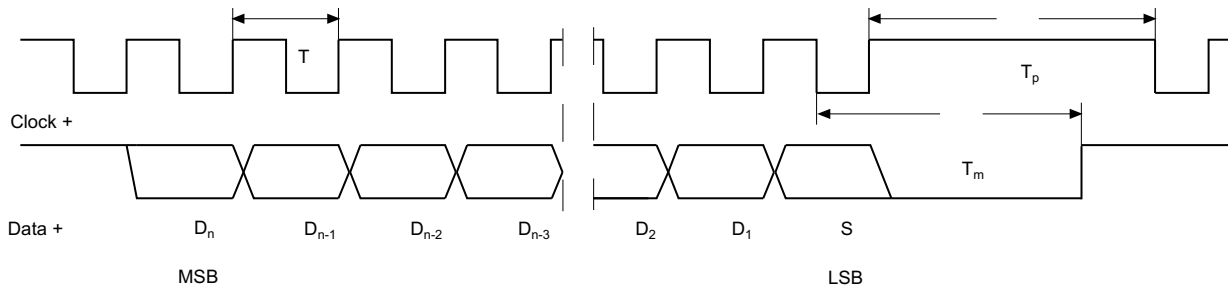



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

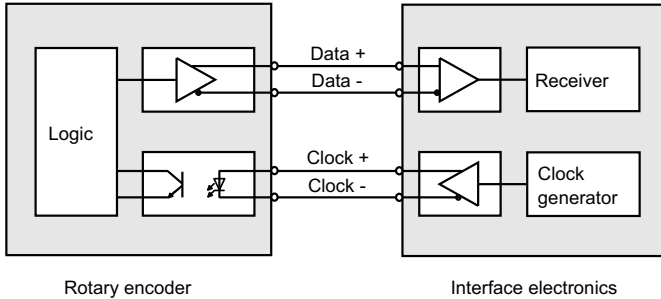
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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



Line length

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

Operation

Inputs

Input for selection of counting direction (V/R)

Level	counting direction by cw revolution (with view onto the shaft)	Input counting direction (V/R)
High (input open or connected to +UB)	ascending	
Low (Input connected to GND)	descending	

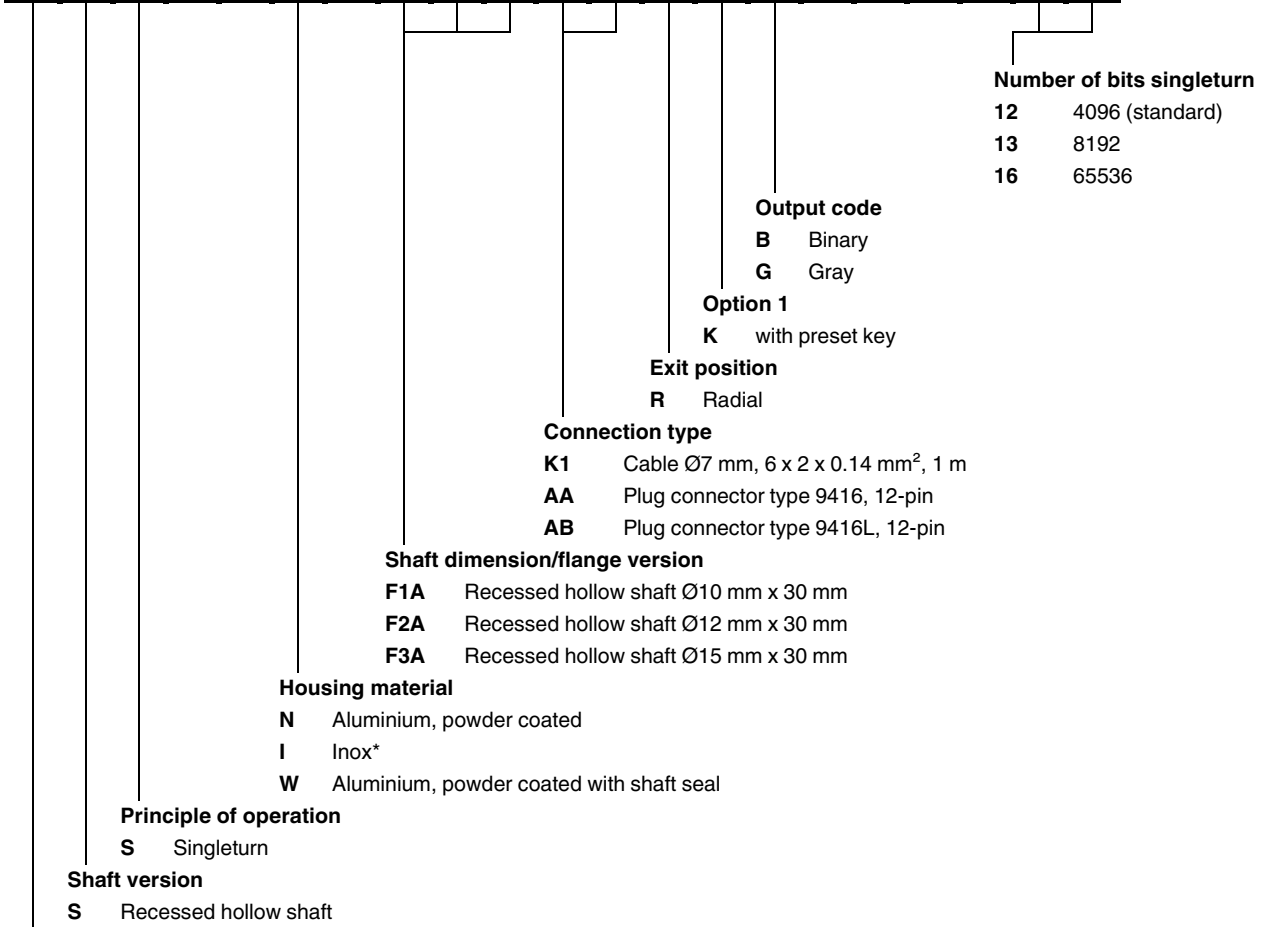
Zero-set input (Preset)

Level	Funktion	Zero-set input (Preset)
Low (input open or connected to GND)	Output position value	
High (Input connected to +UB or $U_e > 4,5 V$)	Activation with falling edge (min. 100 ms)	

Indicators/operation means

Preset key	Manually zero setting of the position value.	
LED green	<ul style="list-style-type: none"> • Lights up with supplied encoder • Goes off while preset key is pressed 	
LED red	Alarm/error indication <ul style="list-style-type: none"> • pre-fault indication (data output ist continued) • internal memory error (all data bits are set to high level permanently) 	

Order code



Number of bits singleturn

12	4096 (standard)
13	8192
16	65536

Output code
B Binary
G Gray

Option 1
K with preset key

Exit position
R Radial

Connection type
K1 Cable Ø7 mm, 6 x 2 x 0.14 mm², 1 m
AA Plug connector type 9416, 12-pin
AB Plug connector type 9416L, 12-pin

Shaft dimension/flange version
F1A Recessed hollow shaft Ø10 mm x 30 mm
F2A Recessed hollow shaft Ø12 mm x 30 mm
F3A Recessed hollow shaft Ø15 mm x 30 mm

Housing material
N Aluminium, powder coated
I Inox*
W Aluminium, powder coated with shaft seal

Principle of operation
S Singleturn

Shaft version
S Recessed hollow shaft

Data format
A SSI (Synchronous Serial Interface)

*Housing material I only available with plug connector types.



Singleturn absolute encoder AVS58-H

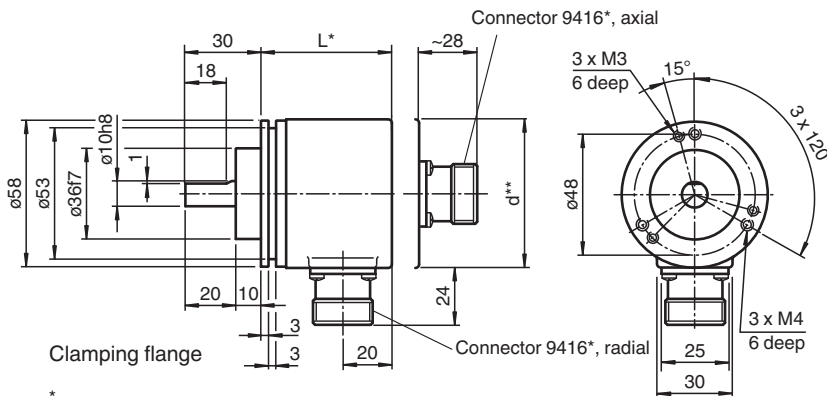
- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Hardware encoder
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Servo or clamping flange
- Up to 4096 pulses on incremental track



Function

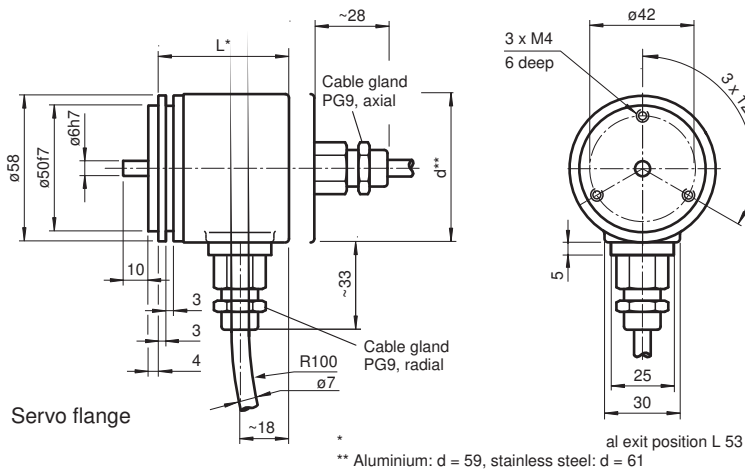
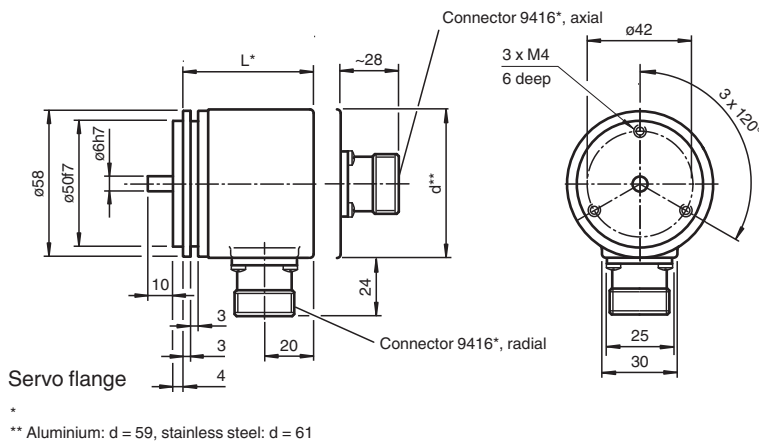
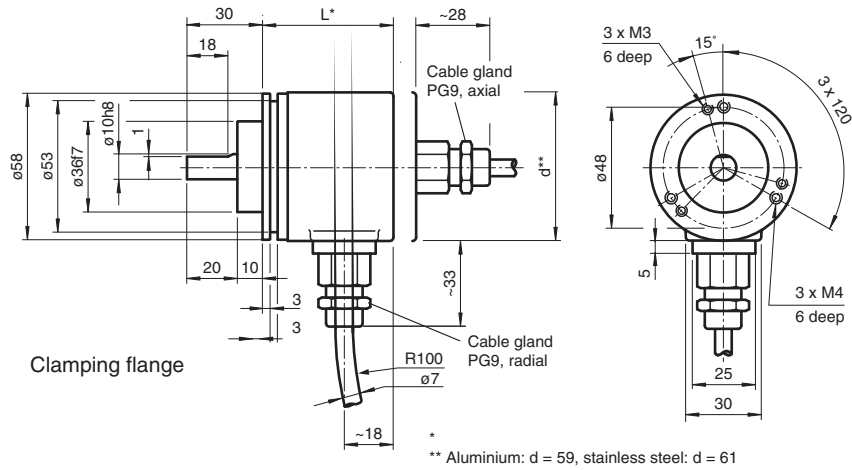
This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AVS58-H is maximum 65536 steps per revolution. In contrast to the AVS58 series the encoder does not have a microcontroller. Thus, it is a pure hardware encoder. The control module sends a clock bundle 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. This singleturn absolute encoder is available either in clamp flange design with a shaft diameter of Ø10 mm x 20 mm or in a servo flange design with a shaft diameter of Ø6 mm x 10 mm. The electrical connection is made by a 12-pin round plug connector. It is also possible to obtain a version with a 1 m cable connector.

Dimensions



* Aluminium: d = 59, stainless steel: d = 61
 ** Aluminium: d = 59, stainless steel: d = 61

Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute encoder





















Electrical specifications

Operating voltage	U_B	4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)
No-load supply current	I_0	max. 180 mA
Time delay before availability	t_v	< 250 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit




Technical Data

Output code	Gray code, binary code
Code course (counting direction)	cw descending (clockwise rotation, code course descending)
Interface	
Interface type	SSI ; SSI + incremental track
Monoflop time	20 ± 10 µs
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.1 ... 2 MBit/s
Voltage drop	U _B - 2.5 V
Standard conformity	RS 422
Input 1	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 2 V
Input current	< 6 mA
Switch-on delay	< 10 ms
Output	
Output type	RS422, Push/Pull
Signal output	A+B+/A+/B
Pulses	1024, 2048, 4096
Connection	
Connector	type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
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, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

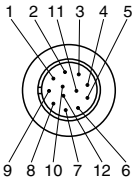
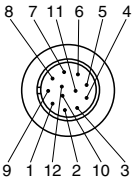
Accessories

	9203	Angled flange
	9416	Female cordset
	9310-3	Synchro clamping element
	9300	Mounting bracket for servo flange
	KW-10/10	Helical coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9401 10*10	Spring steel coupling
	9401 10*12	Spring steel coupling
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 10*10	Spring disk coupling
	9404 6*6	Spring disk coupling
	9409 10*10	Bellows coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling
	9409 6*8	Bellows coupling
	9410 10*10	Precision coupling

Accessories

	9410 6*6	Precision coupling
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
A	Blue	7	12	Incremental track A
V/R	Red	8	5	Input for selection of counting direction
Reserved	Black	9	9	Not wired, reserved
B	Violet	10	4	Incremental track B
A	Grey/Pink	11	6	Incremental track \bar{A}
B	Red/Blue	12	7	Incremental track \bar{B}

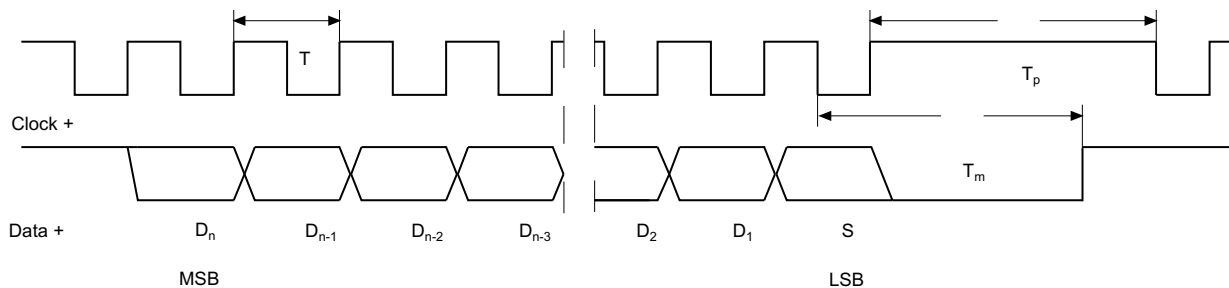



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

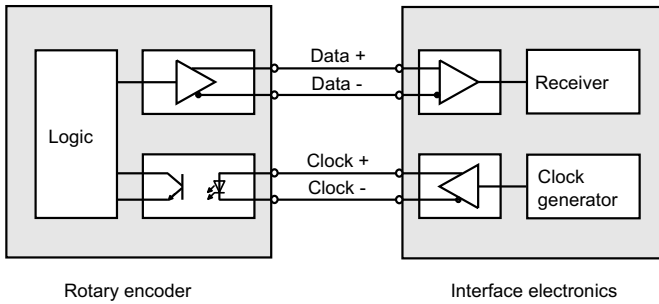
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.
- If the clock change is not interrupted after 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

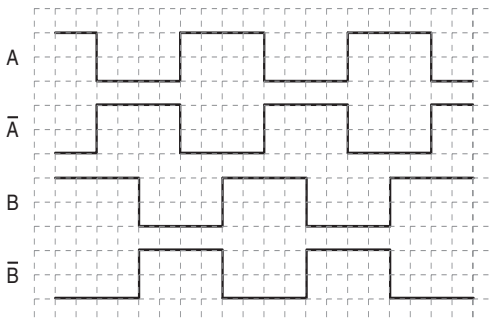


Line length

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

Operation

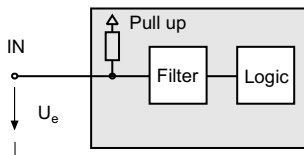
Signal output



↻ cw - with view onto the shaft

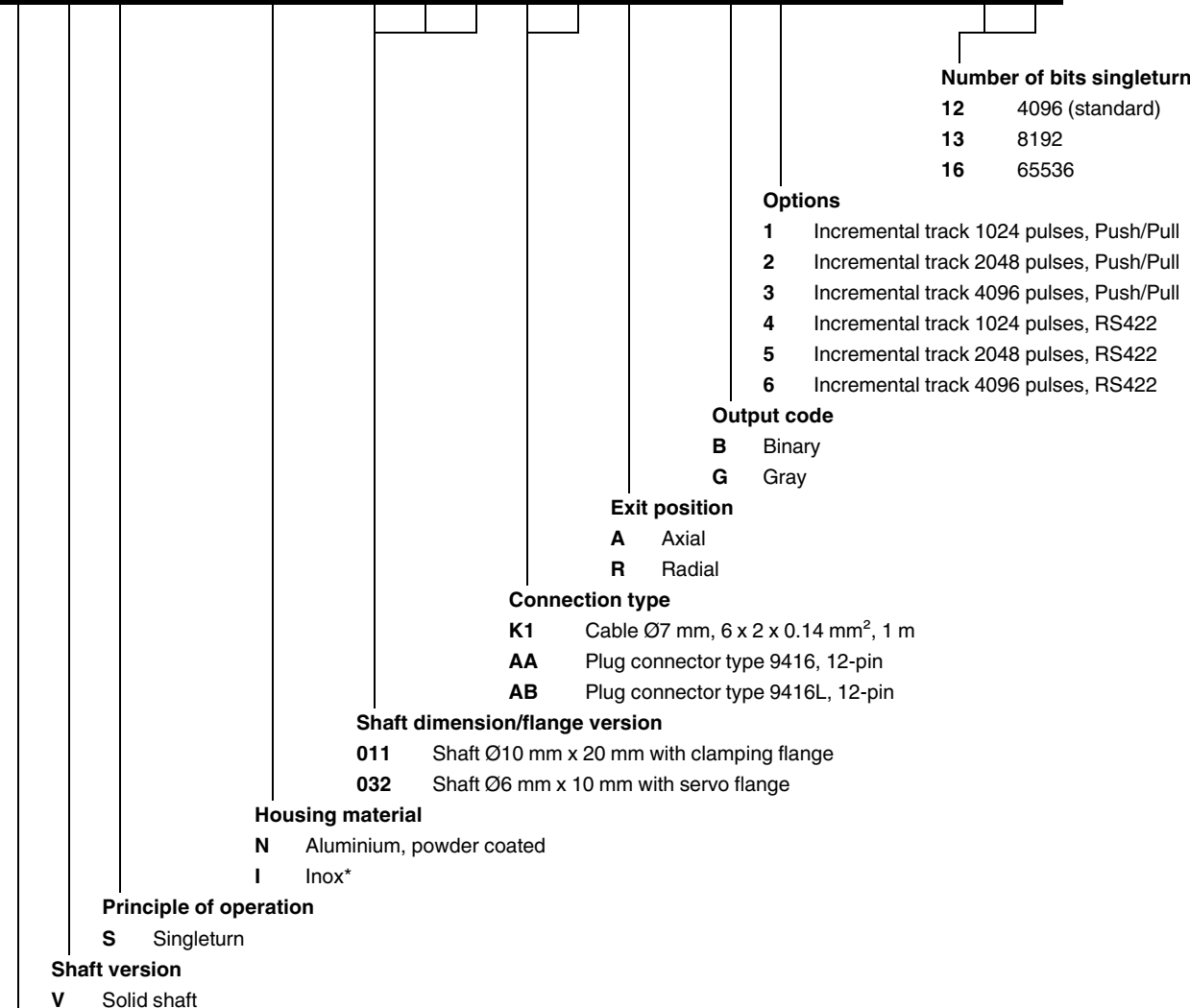
Input

The selection of the counting direction input (V/R) is activated with 0-level.



Order code

A	V	S	5	8	-						H		-	0	0		
---	---	---	---	---	---	--	--	--	--	--	---	--	---	---	---	--	--



Number of bits singleturn

12	4096 (standard)
13	8192
16	65536

- Options**
- 1 Incremental track 1024 pulses, Push/Pull
 - 2 Incremental track 2048 pulses, Push/Pull
 - 3 Incremental track 4096 pulses, Push/Pull
 - 4 Incremental track 1024 pulses, RS422
 - 5 Incremental track 2048 pulses, RS422
 - 6 Incremental track 4096 pulses, RS422

- Output code**
- B Binary
 - G Gray

- Exit position**
- A Axial
 - R Radial

- Connection type**
- K1 Cable Ø7 mm, 6 x 2 x 0.14 mm², 1 m
 - AA Plug connector type 9416, 12-pin
 - AB Plug connector type 9416L, 12-pin

- Shaft dimension/flange version**
- 011 Shaft Ø10 mm x 20 mm with clamping flange
 - 032 Shaft Ø6 mm x 10 mm with servo flange

- Housing material**
- N Aluminium, powder coated
 - I Inox*

- Principle of operation**
- S Singleturn

- Shaft version**
- V Solid shaft

- Data format**
- A SSI (Synchronous Serial Interface)

*Housing material I only available with axial exit position.



Singleturn absolute encoder ASS58-H

- Industrial standard housing $\varnothing 58$ mm
- 16 Bit singleturn
- Hardware encoder
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Recessed hollow shaft

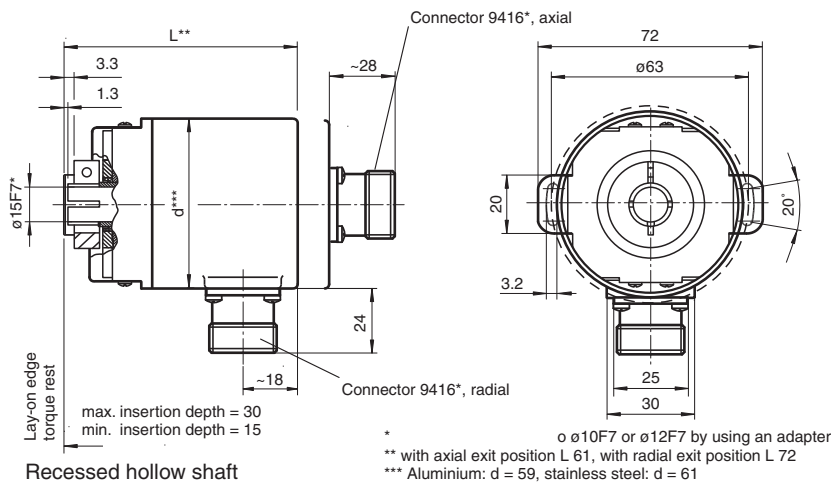


Function

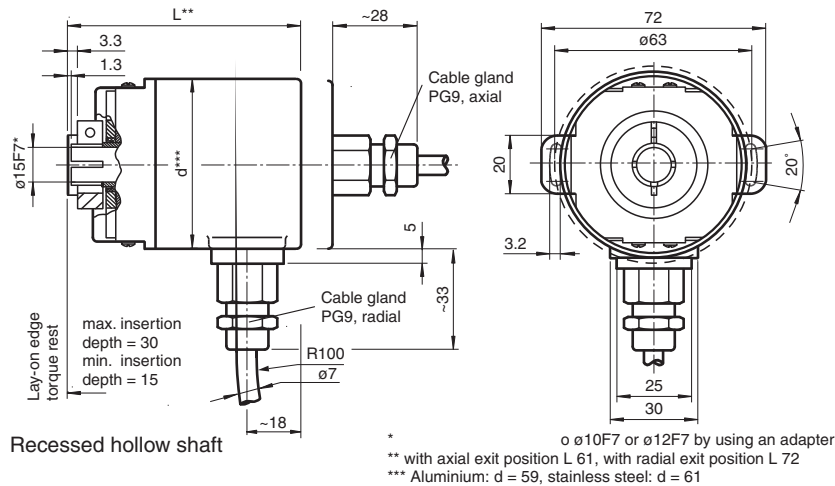
This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the ASS58-H is maximum 65536 steps per revolution. In contrast to the ASS58 series the encoder does not have a microcontroller. Thus, it is a pure hardware encoder. The control module sends a clock bundle 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. The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

The electrical connection is made by a 12-pin round plug connector. It is also possible to obtain a version with a 1 m cable connector.

Dimensions



Dimensions









Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Electrical specifications	
Operating voltage	U_B 4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)
No-load supply current	I_0 max. 180 mA
Time delay before availability	t_v < 250 ms
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code	Gray code, binary code
Code course (counting direction)	cw descending (clockwise rotation, code course descending)
Interface	
Interface type	SSI ; SSI + incremental track
Monoflop time	$20 \pm 10 \mu s$
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.1 ... 2 MBit/s
Voltage drop	$U_B - 2.5 V$
Standard conformity	RS 422
Input 1	
Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 2 V
Input current	< 6 mA
Switch-on delay	< 10 ms
Connection	
Connector	type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable	$\varnothing 7$ mm, $6 \times 2 \times 0.14$ mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65 (without shaft seal) ; DIN EN 60529, IP66/IP67 (with shaft seal)
Climatic testing	DIN EN 60068-2-3, no moisture condensation
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, 20 g, 10 ... 2000 Hz

Technical Data

Approvals and certificates		
UL approval	cULus Listed, General Purpose, Class 2 Power Source	
Ambient conditions		
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material		
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel	
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel	
Mass	approx. 460 g (combination 1) approx. 800 g (combination 2)	
Rotational speed	max. 12000 min ⁻¹	
Moment of inertia	50 gcm ²	
Starting torque	< 5 Ncm	
Shaft load		
Angle offset	± 0.9 °	
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm	
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm	

Accessories

	9416	Female cordset
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
Reserved	Black	9	9	Not wired, reserved
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

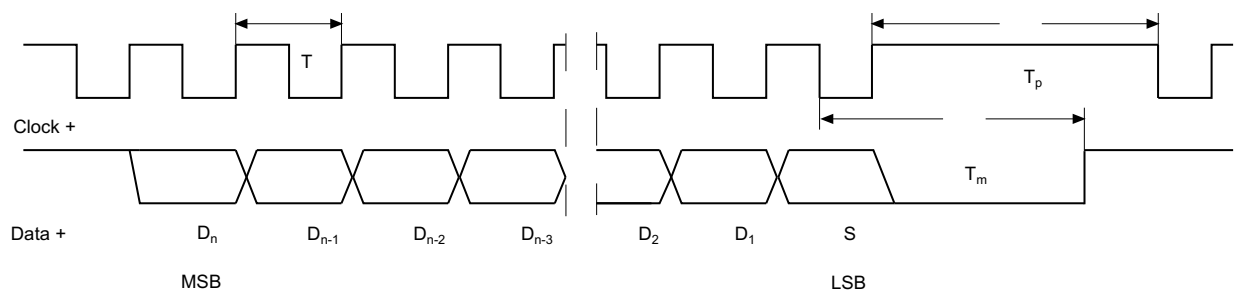
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Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

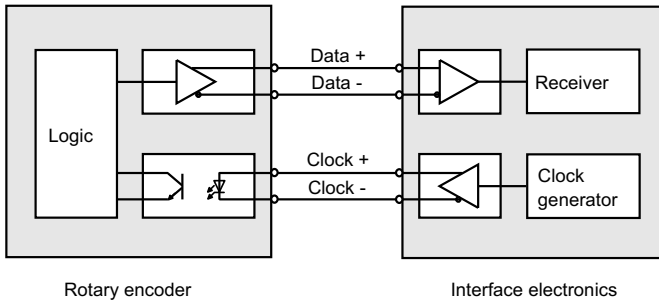
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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

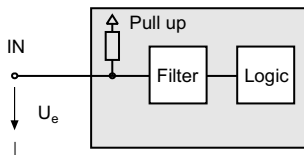


Line length

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

Input

The selection of the counting direction input (V/R) is activated with 0-level.



Type Code

Order code

A	S	S	5	8	-						H			-	0	0		
---	---	---	---	---	---	--	--	--	--	--	---	--	--	---	---	---	--	--

Number of bits singleturn

12	4096 (standard)
13	8192
16	65536

Options

- N Standard
- 1 Incremental track 1024 pulses, Push/Pull
- 2 Incremental track 2048 pulses, Push/Pull
- 3 Incremental track 4096 pulses, Push/Pull
- 4 Incremental track 1024 pulses, RS422
- 5 Incremental track 2048 pulses, RS422
- 6 Incremental track 4096 pulses, RS422

Output code

- B Binary
- G Gray

Exit position

- A Axial
- R Radial

Connection type

- K1 Cable Ø7 mm, 6 x 2 x 0.14 mm², 1 m
- AA Plug connector type 9416, 12-pin
- AB Plug connector type 9416L, 12-pin

Shaft dimension/flange version

- F1A Recessed hollow shaft Ø10 mm x 30 mm
- F2A Recessed hollow shaft Ø12 mm x 30 mm
- F3A Recessed hollow shaft Ø15 mm x 30 mm

Housing material

- N Aluminium, powder coated
- I Inox*
- W Aluminium, powder coated with shaft seal

Principle of operation

- S Singleturn

Shaft version

- S Recessed hollow shaft

Data format

- A SSI (Synchronous Serial Interface)

*Housing material I only available with axial exit position.



Singleturn absolute rotary encoder

AHS58-0

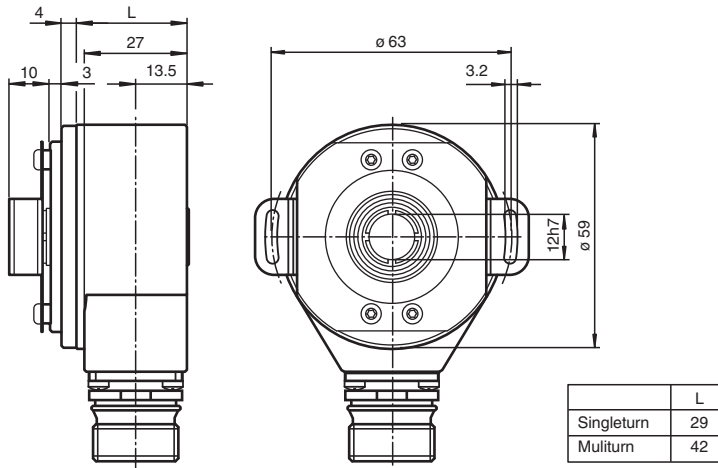
- Industrial standard housing $\varnothing 58$ mm
- 16 Bit singleturn
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Zero-set function
- Hollow shaft



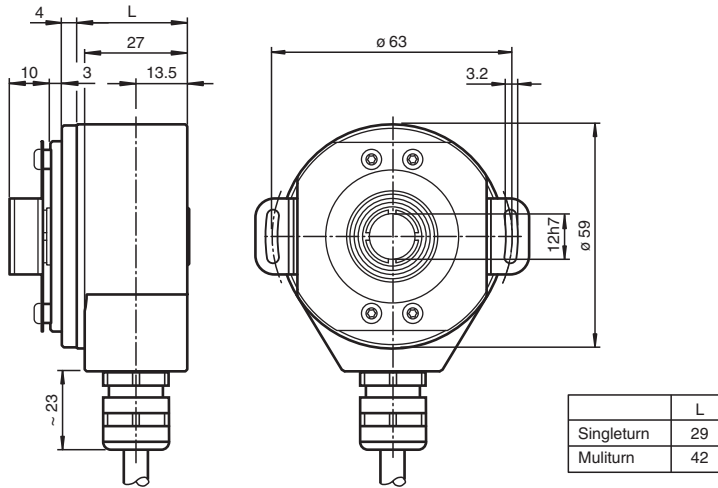
Function

This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AHS58 is maximum 65536 steps per revolution. The devices of the AHS58 series are equipped with a microcontroller. The control module sends a clock bundle to the absolute encoder to obtain 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). The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest. The electrical connection is made by a 12-pin round plug connector. A version with a 1 m cable connector is also available.

Dimensions



Dimensions



Technical Data

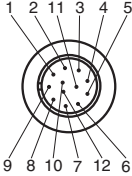
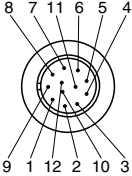
General specifications			
Detection type		photoelectric sampling	
Device type		Singleturn absolute rotary encoder	
Electrical specifications			
Operating voltage	U_B	4.5 ... 30 V DC	
No-load supply current	I_0	max. 180 mA	
Time delay before availability	t_v	< 250 ms	
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit	
Output code		Gray code, binary code	
Code course (counting direction)		cw descending (clockwise rotation, code course descending)	
Interface			
Interface type		SSI	
Monoflop time		20 \pm 10 μ s	
Resolution			
Single turn		up to 16 Bit	
Overall resolution		up to 16 Bit	
Transfer rate		0.1 ... 2 MBit/s	
Voltage drop		$U_B - 2.5$ V	
Standard conformity		RS 422	
Input 1			
Input type		Selection of counting direction (cw/ccw)	
Signal voltage			
High		4.5 ... 30 V	
Low		0 ... 2 V	
Input current		< 6 mA	
Switch-on delay		< 10 ms	
Input 2			
Input type		zero-set (PRESET 1)	
Signal voltage			
High		4.5 ... 30 V	
Low		0 ... 2 V	
Input current		< 6 mA	
Signal duration		min. 100 ms	
Switch-on delay		< 10 ms	
Connection			
Connector		type 9416 (M23), 12-pin, type 9416L (M23), 12-pin	

Technical Data

Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m
Standard conformity	
Degree of protection	DIN EN 60529, IP65
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
Ambient conditions	
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications	
Material	
Combination 1	housing: aluminum Flange: aluminum Shaft: stainless steel
Mass	approx. 300 g (combination 1)
Rotational speed	max. 3000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Angle offset	± 0.9 °
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm
Dimensions	
Length	36 mm
Diameter	59 mm

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
PRESET 1	Black	9	9	zero-setting input
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

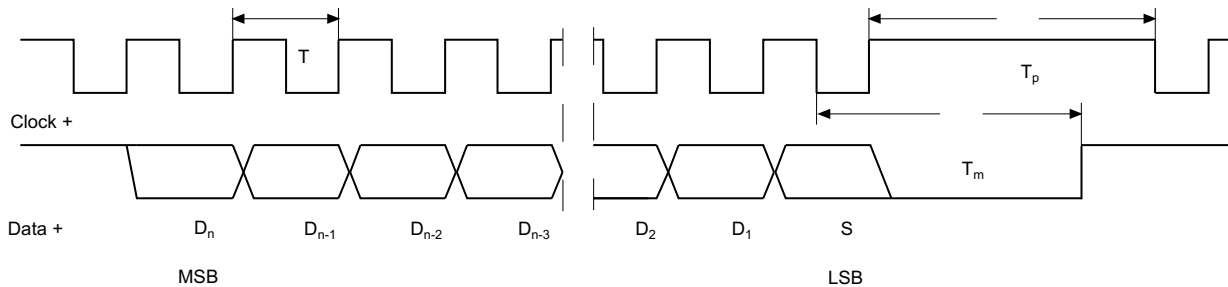



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

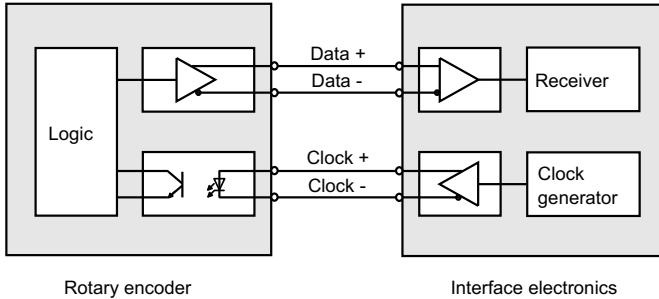
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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



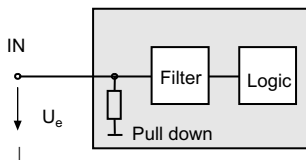
Line length

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

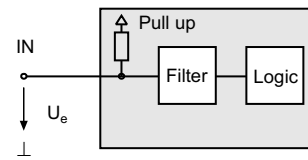
Inputs

The selection of the counting direction input (cw/ccw) is activated with 0-level. The zero-set input (PRESET 1) is activated with 1-level.

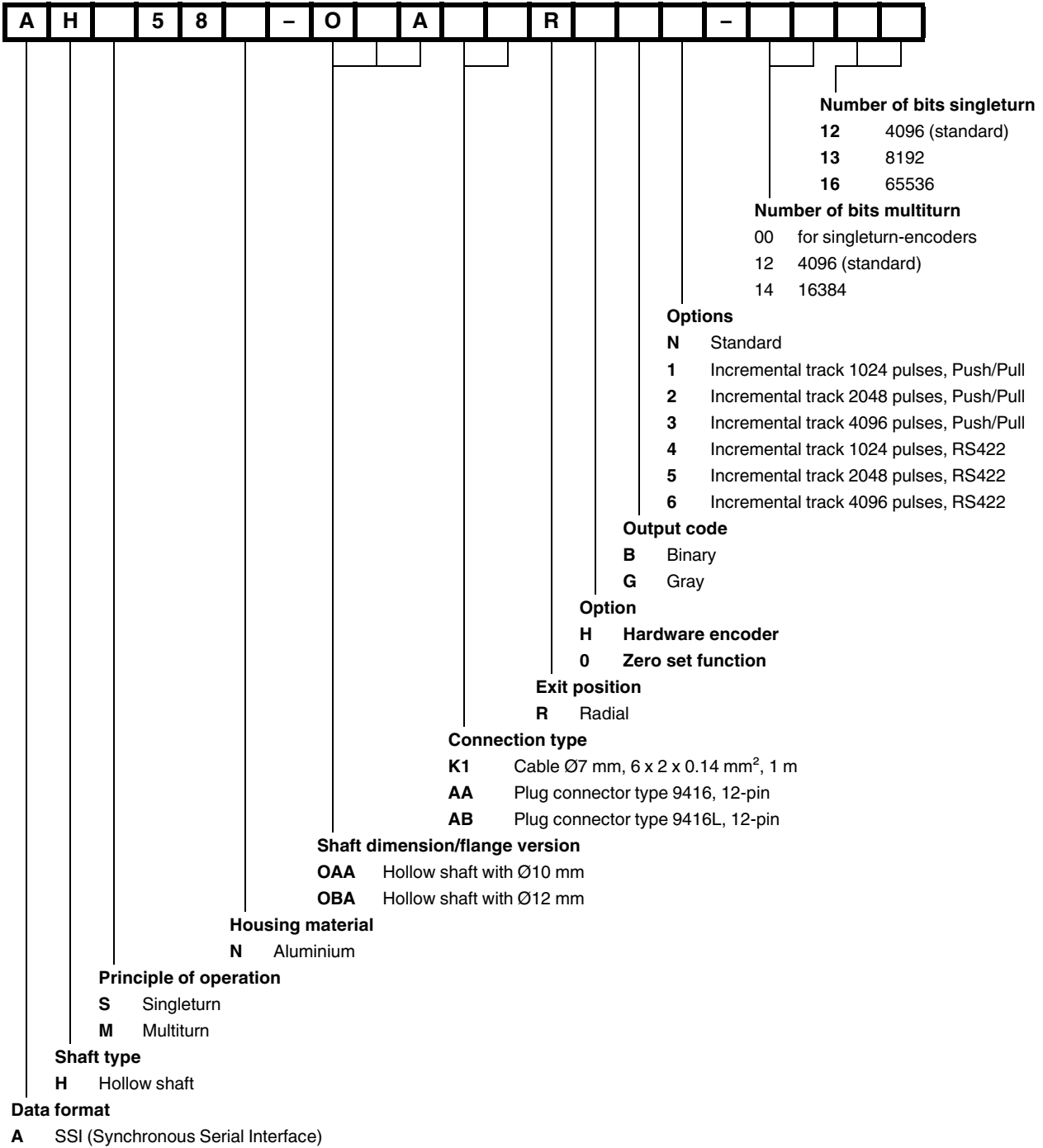
zero-set input (PRESET 1)



Input for selection of counting direction (cw/ccw)



Type Code



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.

- 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

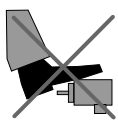
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

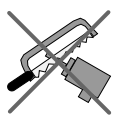
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

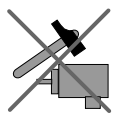
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Singleturn absolute rotary encoder

AHS58-H

- Industrial standard housing Ø58 mm
- 16 Bit singleturn
- Hardware encoder
- Data transfer up to 2 MBaud
- Optically isolated RS 422 interface
- Hollow shaft

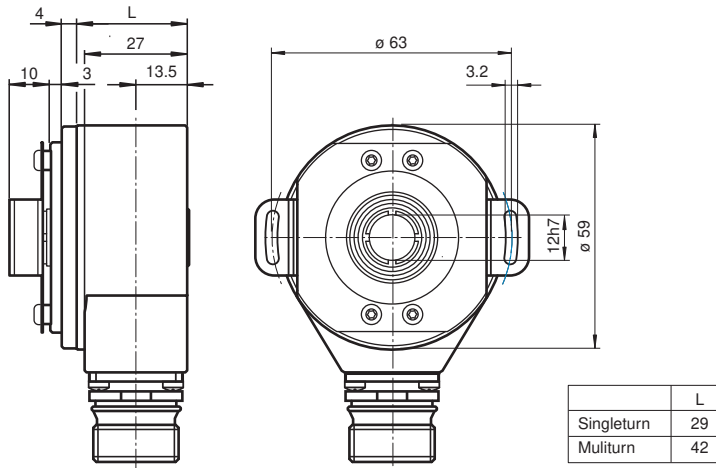


Function

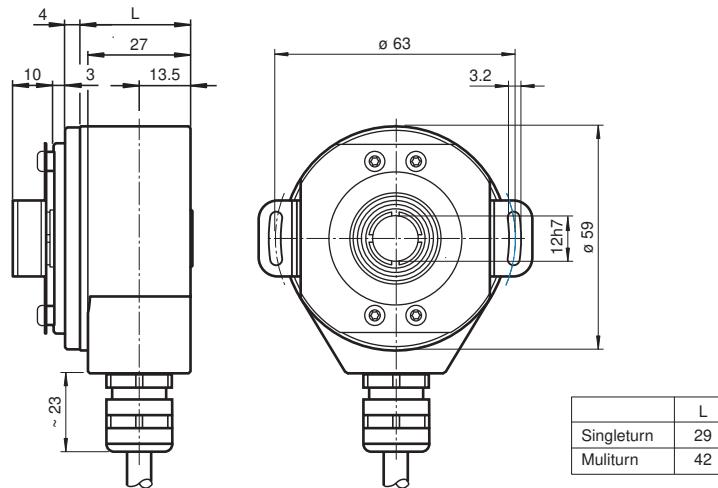
This singleturn absolute encoder with modern fast technology transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The resolution of the AHS58-H is maximum 65536 steps per revolution. In contrast to the AHS58 series the encoder does not have a microcontroller. Thus, it is a pure hardware encoder. The control module sends a clock bundle to the absolute encoder to obtain 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. The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

The electrical connection is made by a 12-pin round plug connector. A version with a 1 m cable connector is also available.

Dimensions



Dimensions



Technical Data

General specifications

Detection type	photoelectric sampling
Device type	Singleturn absolute rotary encoder

Electrical specifications

Operating voltage	U_B	4.5 ... 30 V DC
No-load supply current	I_0	max. 180 mA
Time delay before availability	t_v	< 250 ms
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, $\pm 0,5$ LSB at 12 Bit
Output code		Gray code, binary code
Code course (counting direction)		cw descending (clockwise rotation, code course descending)

Interface

Interface type	SSI
Monoflop time	$20 \pm 10 \mu\text{s}$
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Transfer rate	0.1 ... 2 MBit/s
Voltage drop	$U_B - 2.5 \text{ V}$
Standard conformity	RS 422

Input 1

Input type	Selection of counting direction (cw/ccw)
Signal voltage	
High	4.5 ... 30 V
Low	0 ... 2 V
Input current	< 6 mA
Switch-on delay	< 10 ms

Connection

Connector	type 9416 (M23), 12-pin, type 9416L (M23), 12-pin
Cable	$\varnothing 7 \text{ mm}$, $6 \times 2 \times 0.14 \text{ mm}^2$, 1 m

Standard conformity

Degree of protection	DIN EN 60529, IP65
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 20 g, 10 ... 2000 Hz

Technical Data

Approvals and certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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Ambient conditions

Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)

Mechanical specifications

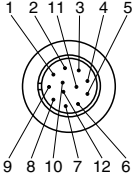
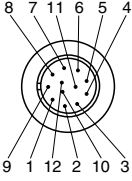
Material	
Combination 1	housing: aluminum Flange: aluminum Shaft: stainless steel
Mass	approx. 300 g (combination 1)
Rotational speed	max. 3000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Angle offset	± 0.9 °
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm

Accessories

	9416	Female cordset
	9416-*M-12P-AVM	Female cordset, M23, 12-pin, PVC cable, 8-core

Connection

Signal	Cable Ø7 mm, 12-core	Connector 9416, 12-pin	Connector 9416L, 12-pin	Explanation
GND (encoder)	White	1	1	Power supply
U _b (encoder)	Brown	2	8	Power supply
Clock (+)	Green	3	3	Positive cycle line
Clock (-)	Yellow	4	11	Negative cycle line
Data (+)	Grey	5	2	Positive transmission data
Data (-)	Pink	6	10	Negative transmission data
Reserved	Blue	7	12	Not wired, reserved
V/R	Red	8	5	Input for selection of counting direction
Reserved	Black	9	9	Not wired, reserved
Reserved	Violet	10	4	Not wired, reserved
Reserved	Grey/Pink	11	6	Not wired, reserved
Reserved	Red/Blue	12	7	Not wired, reserved

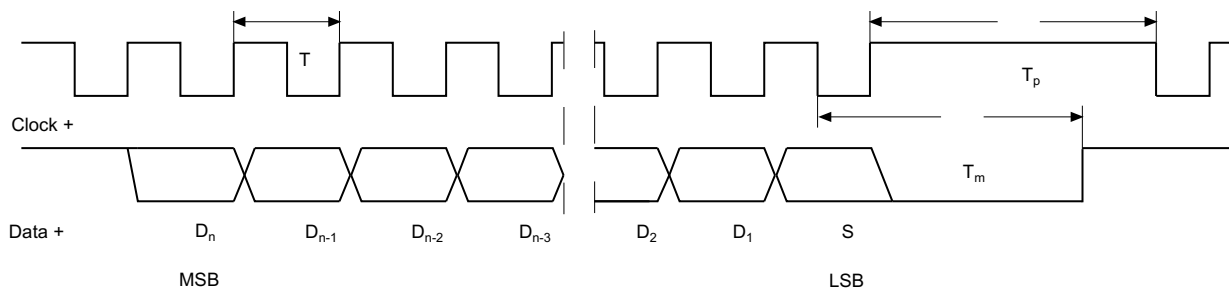



Interface

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 10 μs ... 30 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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)

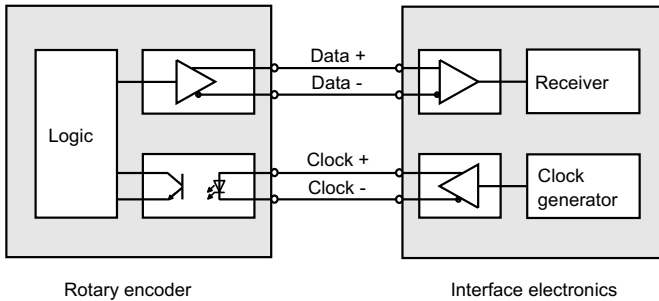
- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.

- 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

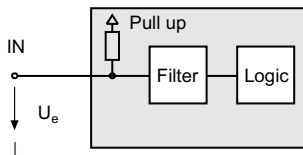


Line length

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

Input

The selection of the counting direction input (V/R) is activated with 0-level.



Type Code

- 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

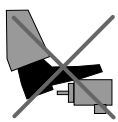
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

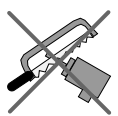
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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!

Singleturn absolute rotary encoder

AVS78E



- Up to 16 Bit singleturn
- ATEX approval
- IECEx approval
- Flameproof enclosure
- Removable connection cap
- Galvanically isolated RS 422 interface



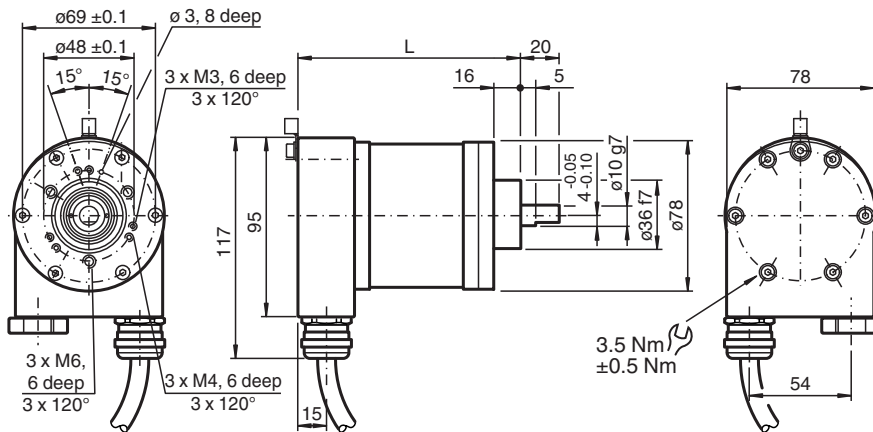
Function

This absolute rotary encoder returns a position value corresponding to the shaft position via the SSI interface. In order to obtain the position data, the controller sends a start sequence to the absolute rotary encoder. The encoder then responds synchronously to the pulses from the controller with the position data. The modular design enables you to order the absolute rotary encoder so that it fulfills your requirements. A listing of the part options can be found in the ordering information. You can select the counting direction via 2 functional inputs and set the zero position.

Dimensions

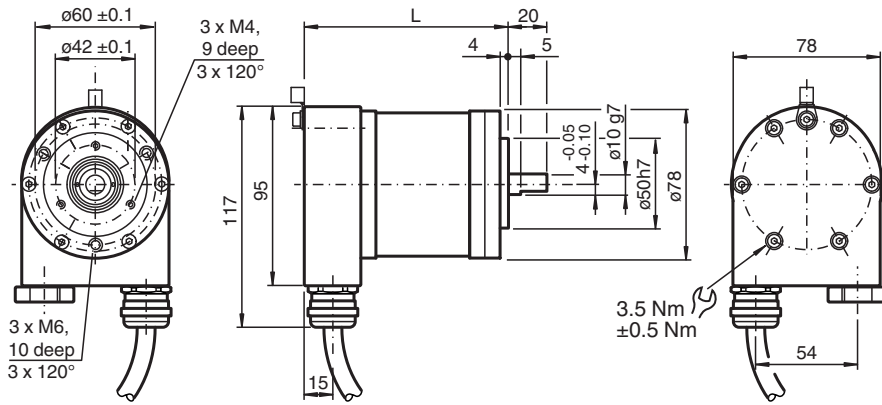
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	118 mm
	Servo flange	118 mm
Axial cable exit	Clamping flange	134 mm
	Servo flange	134 mm

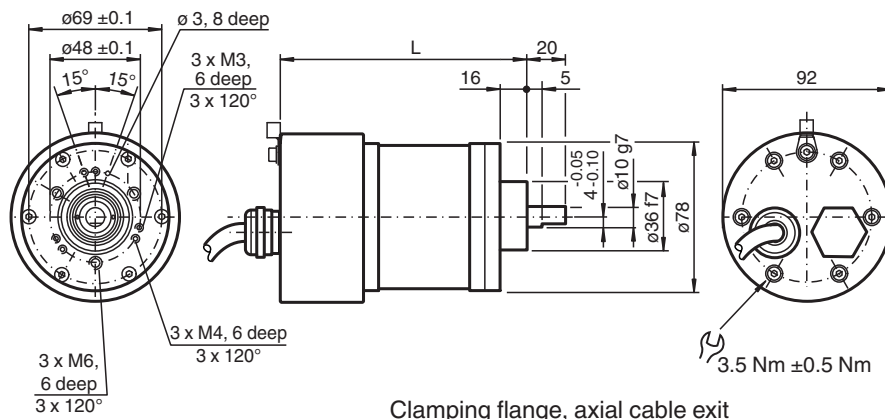


Clamping flange, cable exit radial

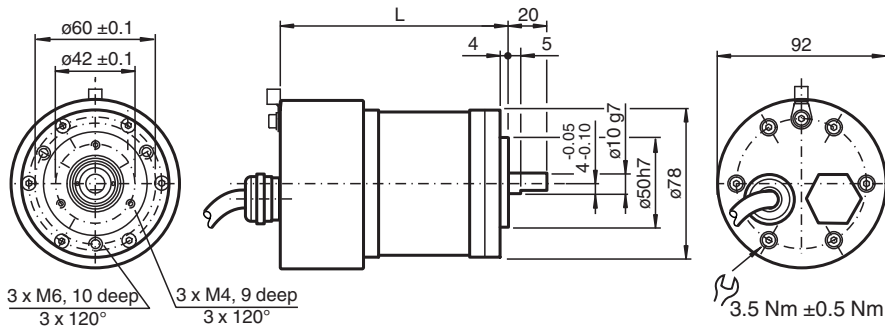
Dimensions



Servo flange, radial cable exit

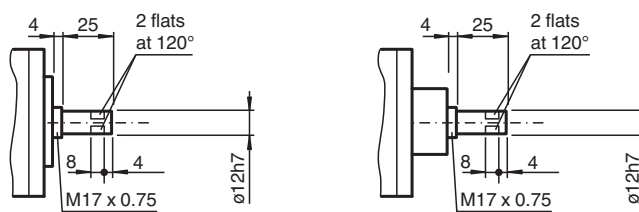


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Technical Data

General specifications

Technical Data

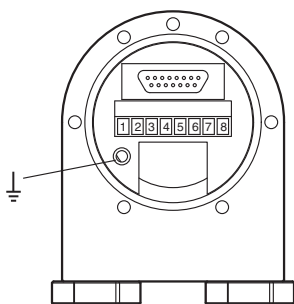
Detection type	photoelectric sampling	
Device type	Singleturn absolute rotary encoder	
Functional safety related parameters		
MTTF _d	210 a	
L ₁₀	7.7 E+9 at 3000 rpm	
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 90 mA
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	
Output code	Gray code, binary code	
Code course (counting direction)	see input 1	
Interface		
Interface type	SSI	
Monoflop time	20 ± 10 µs	
Resolution		
Single turn	up to 16 Bit	
Transfer rate	0.1 ... 2 MBit/s	
Standard conformity	RS 422	
Input 1		
Input type	Selection of counting direction (cw/ccw)	
Signal voltage		
High	10 ... 30 V or open input cw descending (clockwise rotation, code course descending)	
Low	0 ... 2 V cw ascending (clockwise rotation, code course ascending)	
Input current	< 6 mA	
Switch-on delay	< 10 ms	
Input 2		
Input type	zero-set (PRESET)	
Signal voltage		
High	10 ... 30 V	
Low	0 ... 2 V	
Input current	< 6 mA	
Signal duration	min. 100 ms	
Switch-on delay	< 10 ms	
Connection		
Cable	Ø 10.2 mm, Radox 9 x 0.5 mm ²	
Terminal compartment	see ordering information	
Standard conformity		
Degree of protection	DIN EN 60529, IP66	
Climatic testing	DIN EN 60068-2-78 , no moisture condensation	
Emitted interference	EN 61000-6-4:2007/A1:2011	
Noise immunity	EN 61000-6-2:2005	
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
IECEX approval		
Equipment protection level Gb	IECEX ITS 15.0061X	
ATEX approval		
Equipment protection level Gb	ITS 15 ATEX 18372X	
Ambient conditions		
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		

Technical Data

Material		
Combination 1		housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4404 / AISI 316L
Combination 2 (Inox)		housing: Stainless steel 1.4404 / AISI 316L flange: Stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4404 / AISI 316L
Mass		approx. 2600 g (combination 1) approx. 3900 g (combination 2)
Rotational speed		max. 3000 min ⁻¹
Moment of inertia		180 gcm ²
Starting torque		≤ 4 Ncm
Shaft load		
Axial		60 N
Radial		80 N
General information		
Use in the hazardous area		see instruction manuals

Connection

Signal	Cable	Terminal compartment
Ground wire	green-yellow	Grounding terminal
GND (rotary encoder)	1	1
+U _b (rotary encoder)	2	2
Pulse (+)	3	5
Pulse (-)	4	6
Data (+)	5	8
Data (-)	6	7
Preset	7	4
Counting direction	8	3

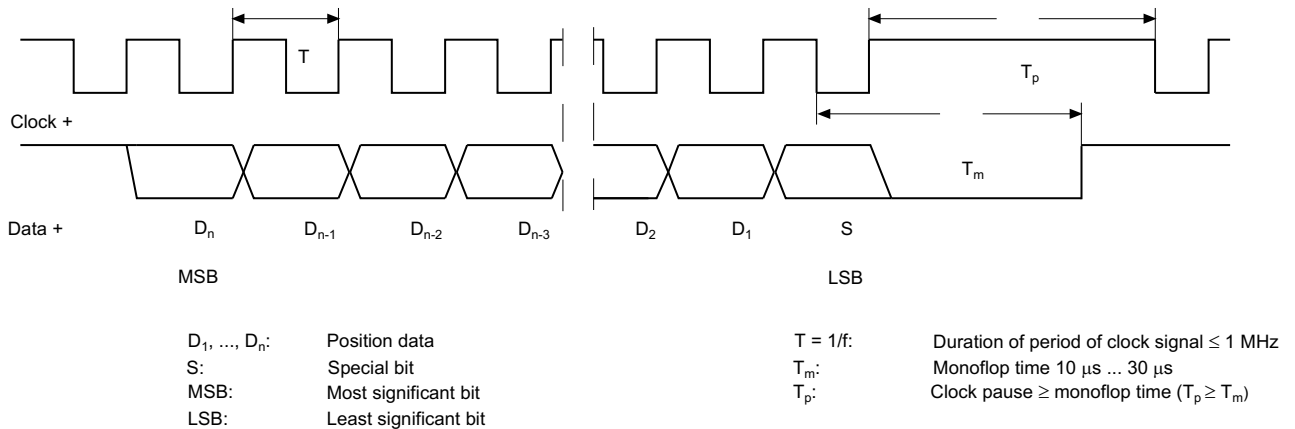


Interface

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, 25 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

Line length

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
relief	clamped with the strain 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.

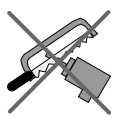
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

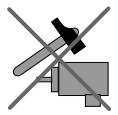
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Singleturn absolute rotary encoder

PVS78E



- Up to 16 Bit singleturn
- ATEX approval
- IECEx approval
- Flameproof enclosure
- Removable connection cap



Function

This series of PROFIBUS rotary encoders is based on the modern fast technology of singleturn sampling and the mechanical gear box of the multiturn unit. The absolute encoder corresponds to the PROFIBUS profile for encoders, order no. 3.062. Operation is supported based on Class 1 and Class 2.

For operation based on Class 1, position data and diagnostic data bytes 1 ... 16 are available. In addition, the direction of the code can be selected as either cw ascending (clockwise rotation, code course ascending) or cw descending (clockwise rotation, code course descending).

If the rotary encoder is operated according to Class 2, additional functions to those from Class 1 are available. These include scaling of the resolution per revolution and the overall resolution, as well as the preset function. In addition, expanded diagnostic reporting is supported.

Besides, the rotary encoder offers extended functionalities such as speed transfer, extended scaling functions, programmable limit switches and a commissioning mode.

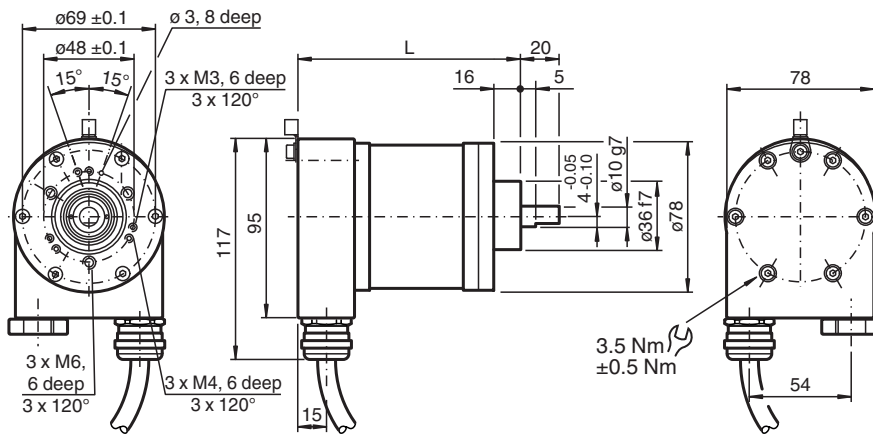
The removable connecting hood contains a slide switch for setting the terminating resistor and the rotary switches for setting the address. Assign a fixed address and bus termination to the encoder with this switches.

The device is designed for shaft mounting and is available in servo flange or clamping flange design.

Dimensions

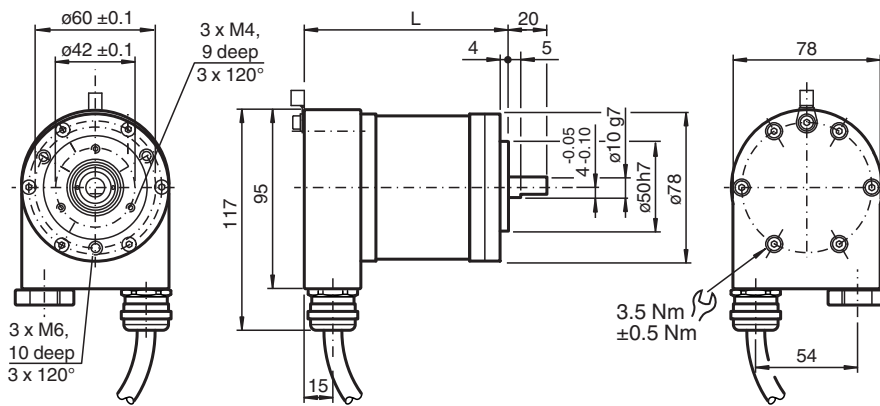
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	109 mm
	Servo flange	109 mm
Axial cable exit	Clamping flange	125 mm
	Servo flange	125 mm

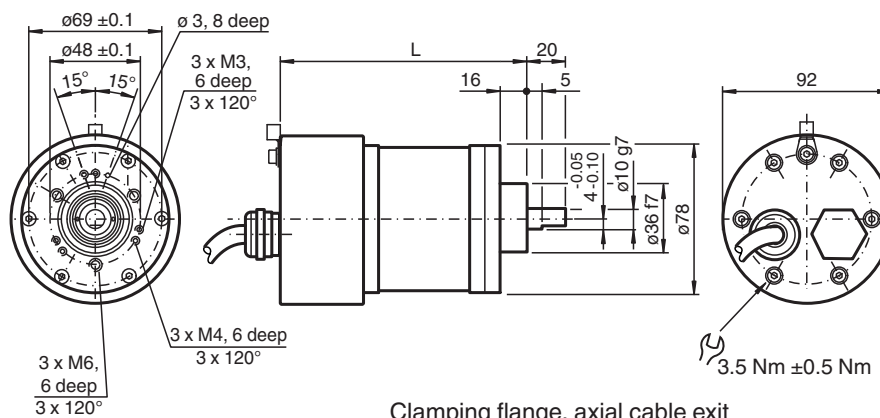


Clamping flange, cable exit radial

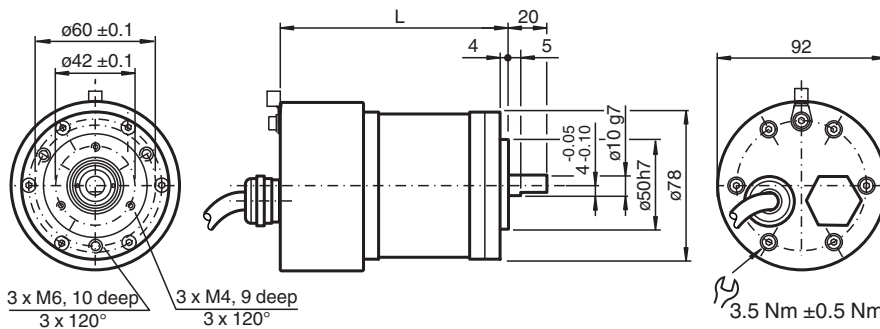
Dimensions



Servo flange, radial cable exit

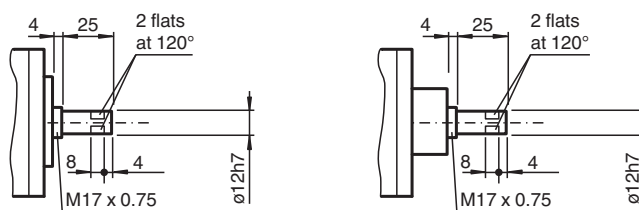


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Technical Data

General specifications

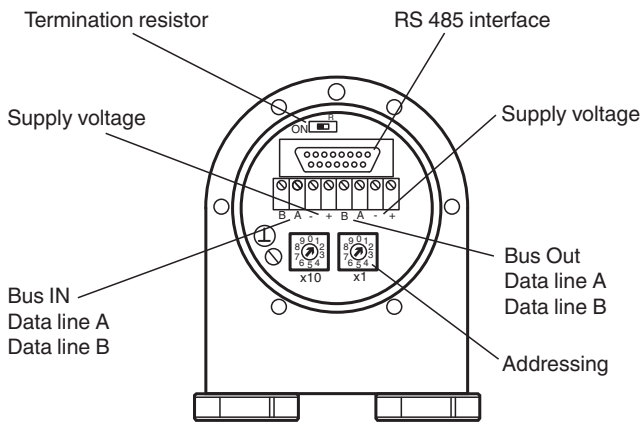
Technical Data

Detection type	photoelectric sampling	
Device type	Singleturn absolute rotary encoder	
Functional safety related parameters		
MTTF _d	210 a	
L ₁₀	7.7 E+9 at 3000 rpm	
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 230 mA at 10 V DC max. 100 mA at 24 V DC
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	
Output code	binary code	
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	PROFIBUS DP	
Resolution		
Single turn	up to 16 Bit	
Transfer rate	0.0096 ... 12 MBit/s	
Standard conformity	PNO profile 3.062, RS-485	
Connection		
Cable	Ø9.6 mm, 7-core	
Terminal compartment	see ordering information	
Standard conformity		
Degree of protection	DIN EN 60529, IP66	
Climatic testing	DIN EN 60068-2-78 , no moisture condensation	
Emitted interference	EN 61000-6-4:2007/A1:2011	
Noise immunity	EN 61000-6-2:2005	
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
IECEX approval		
Equipment protection level Gb	IECEX ITS 15.0061X	
ATEX approval		
Equipment protection level Gb	ITS 15 ATEX 18372X	
Ambient conditions		
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material		
Combination 1	housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4404 / AISI 316L	
Combination 2 (Inox)	housing: Stainless steel 1.4404 / AISI 316L flange: Stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4404 / AISI 316L	
Mass	approx. 2600 g (combination 1) approx. 3900 g (combination 2)	
Rotational speed	max. 3000 min ⁻¹	
Moment of inertia	180 gcm ²	
Starting torque	≤ 4 Ncm	
Shaft load		
Axial	60 N	
Radial	80 N	
General information		
Use in the hazardous area	see instruction manuals	

Connection

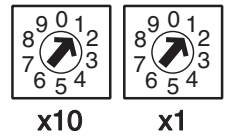
Signal	Terminal	Cable Ø9.6 mm, 7-core	Description
GND encoder	-	1	- Supply voltage
U _S encoder	+	2	+ Supply voltage
RxD/TxD-P	B	3	Data wire B (pair 1), bus in
RxD/TxD-N	A	4	Data wire A (pair 1), bus in
RxD/TxD-P	B	5	Data wire B (pair 2), bus out
RxD/TxD-N	A	6	Data wire A (pair 2), bus out
potential earth	⊥	GN/YE	

Configuration



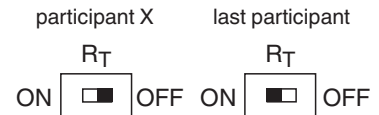
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.



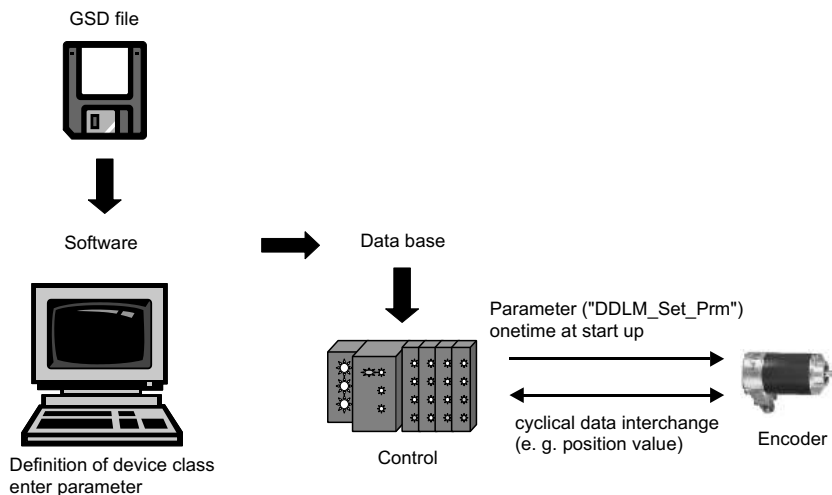
Adjusting the termination resistor

The terminating resistor R_T (220 Ω) can be connected to the circuit by means of the switch:



Function Principle

Principle of data transmission



Parameterization

Parameter table encoder classes P+F 2.1 and P+F 2.2

Octet number (Byte)	Parameter	Bit number
1...8	PROFIBUS standard parameters	
9	Direction of rotation	0
	Class 2 functionality	1
	Commissioning Diagnostics	2
	Scaling function	3
	Reserved	4
	Reserved	5
	Activate manufacturer specific parameters (Octet 26)	6
	Reserved	7
10 ... 13	Desired measuring steps (reference: Octet 26, Bit 0 and 1)	
14 ... 17	Overall resolution	
18 ... 25	Reserved	
26	Reference for desired measuring steps	0
		1
	Activate commissioning mode	2
	Reduced diagnosis	3
	Reserved	4
	Activate lower software limit switch	5
	Activate upper software limit switch	6
	Activation of the parameters from Octet 27	7
27 ... 30	Lower limit switch	
31 ... 34	Upper limit switch	
35 ... 38	Physical measuring steps	
39	Reserved	0
	Rotary encoder type (singleturn or multiturn)	1
	Reserved	2
	Reserved	3
	Selection of the unit for speed transfer	4
		5
	Reserved	6
	Reserved	7

Type Code

Ordering information



Number of singleturn bits
 12 4096
 13 8192
 16 65536

Number of multiturn bits
 00 Singleturn absolute rotary encoder

Housing material
 N Aluminum
 I INOX 1.4404 (AISI 316L)

Output code
 B Binary

Option
 0 None

Exit position
 A Axial
 R Radial

Connection type
 K2 Cable, 7-wire, 2 m
 K5 Cable, 7-wire, 5 m
 DR Terminal compartment, 2 cable glands
 KR Terminal compartment, 1 cable gland, 1 stopping plug

Flange version
 1 Clamping flange
 2 Servo flange

Shaft dimension
 01 Shaft Ø10 mm x 20 mm
 02 Shaft Ø12 mm x 25 mm

Option 1
 E Explosion-proof, standard IP66

Functional principle
 S Singleturn

Shaft version
 V Solid shaft

Data format
 P PROFIBUS

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.
- 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

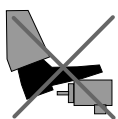
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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).

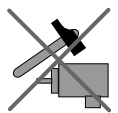
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Singleturn absolute rotary encoder CVS78E



- Up to 16 Bit singleturn
- ATEX approval
- IECEx approval
- Flameproof enclosure
- Removable connection cap



Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples on one or more code disks which are sampled by a photoelectric array.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Sync mode

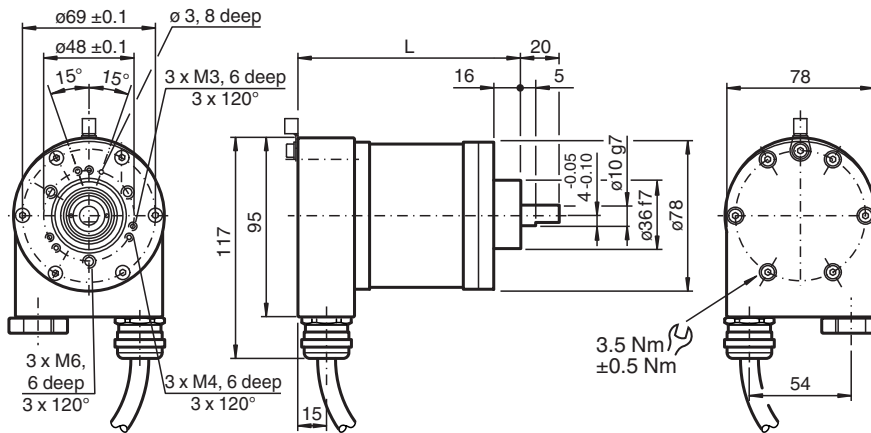
The device is designed for shaft mounting and is available in servo flange or clamping flange design.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions

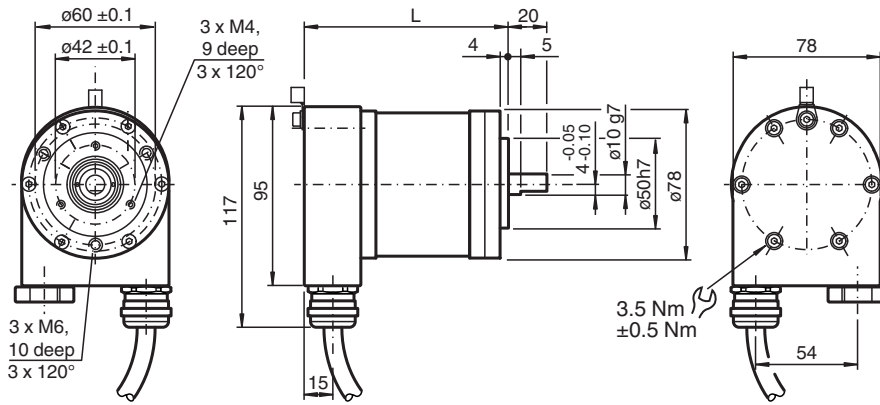
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	109 mm
	Servo flange	109 mm
Axial cable exit	Clamping flange	125 mm
	Servo flange	125 mm

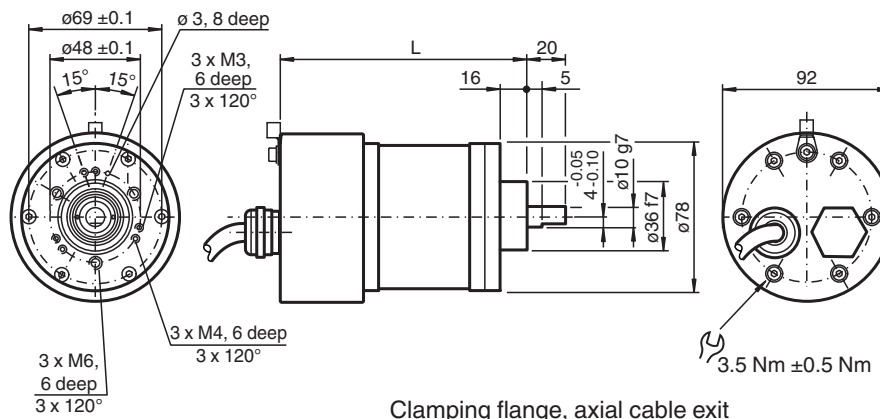


Clamping flange, cable exit radial

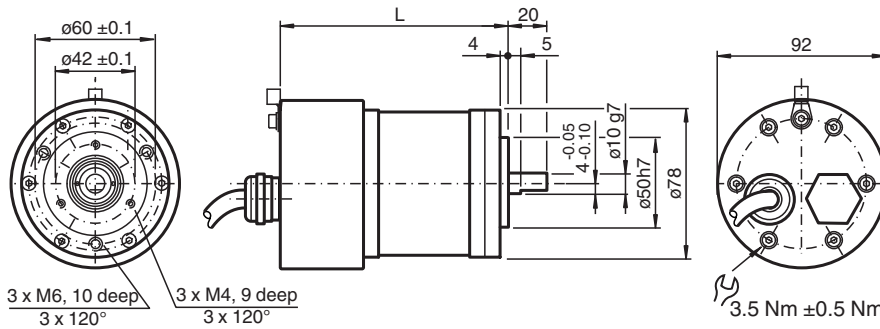
Dimensions



Servo flange, radial cable exit

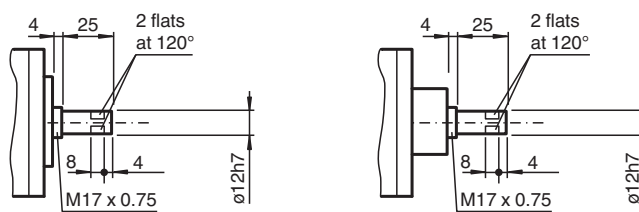


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Technical Data

General specifications

Technical Data

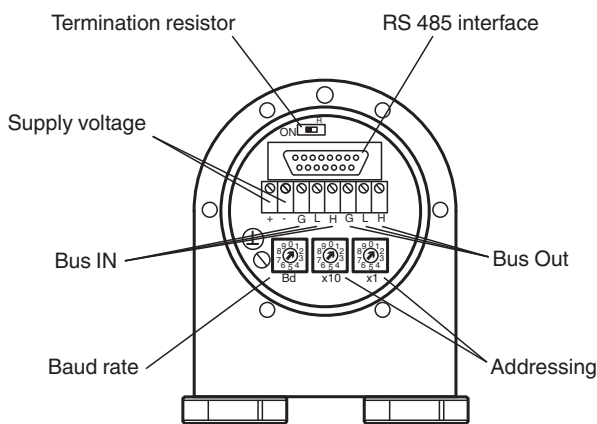
Detection type	photoelectric sampling	
Device type	Singleturn absolute rotary encoder	
Functional safety related parameters		
MTTF _d	25 a	
L ₁₀	7.7 E+9 at 3000 rpm	
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 350 mA
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	
Output code	binary code	
Code course (counting direction)	cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	CANopen	
Resolution		
Single turn	up to 16 Bit	
Overall resolution	up to 16 Bit	
Transfer rate	max. 1 MBit/s	
Standard conformity	communication profile: DS 301 Device profiles: DS 406 and DS 417 , programmable according to class 2	
Connection		
Cable	Ø 10.2 mm, Radox 9 x 0.5 mm ²	
Terminal compartment	see ordering information	
Standard conformity		
Degree of protection	DIN EN 60529, IP66	
Climatic testing	DIN EN 60068-2-78 , no moisture condensation	
Emitted interference	EN 61000-6-4:2007/A1:2011	
Noise immunity	EN 61000-6-2:2005	
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
IECEX approval		
Equipment protection level Gb	IECEX ITS 15.0061X	
ATEX approval		
Equipment protection level Gb	ITS 15 ATEX 18372X	
Ambient conditions		
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material		
Combination 1	housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4404 / AISI 316L	
Combination 2 (Inox)	housing: Stainless steel 1.4404 / AISI 316L flange: Stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4404 / AISI 316L	
Mass	approx. 2600 g (combination 1) approx. 3900 g (combination 2)	
Rotational speed	max. 3000 min ⁻¹	
Moment of inertia	180 gcm ²	
Starting torque	≤ 4 Ncm	
Shaft load		
Axial	60 N	
Radial	80 N	
General information		
Use in the hazardous area	see instruction manuals	

Connection

Terminal	Cable	Explanation
(-)	1	- Power supply
(+)	2	+ Power supply
L	3	CAN low
H	4	CAN high
G	5	CAN ground
L	6	CAN low
H	7	CAN high
G	8	CAN ground
⊥	green / yellow	Ground connection of encoder housing

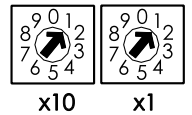
Configuration

Indicating and operating elements



Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 96, and may only be assigned once. The addresses 97 ... 99 are reserved.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position	Baud rate [kBit/s]	Switch position
20	0	500	5
50	1	800	6
100	2	1000	7
125	3	reserved	8
250	4	set baud rate by SDO message and LSS	9

Parameterization

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.

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.
- 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.

Singleturn absolute rotary encoder

DVS78E



- Up to 16 Bit singleturn
- ATEX approval
- IECEx approval
- Flameproof enclosure
- Removable connection cap



DeviceNet™

Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples of one or more code disks. The code disks are screened by an infrared LED and the bit obtained sample is detected by means of an optical array. Its signals are electronically amplified and are forwarded on to the interface for processing.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Change of state mode

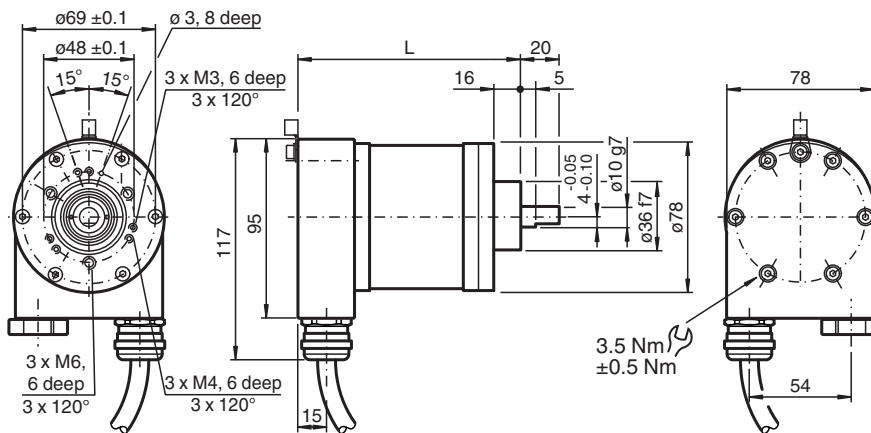
The device is designed for shaft mounting and is available in servo flange or clamping flange design.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions

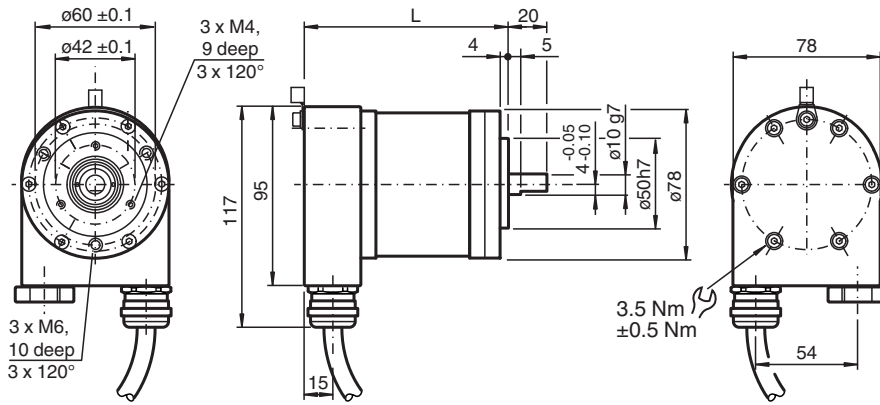
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	118 mm
	Servo flange	118 mm
Axial cable exit	Clamping flange	134 mm
	Servo flange	134 mm

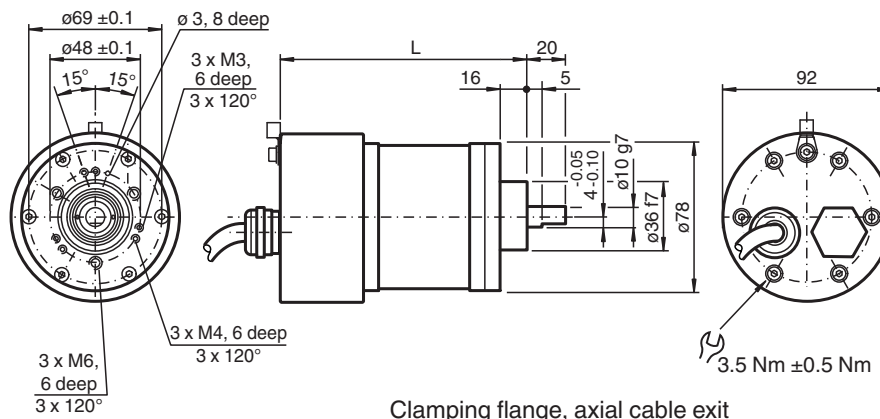


Clamping flange, cable exit radial

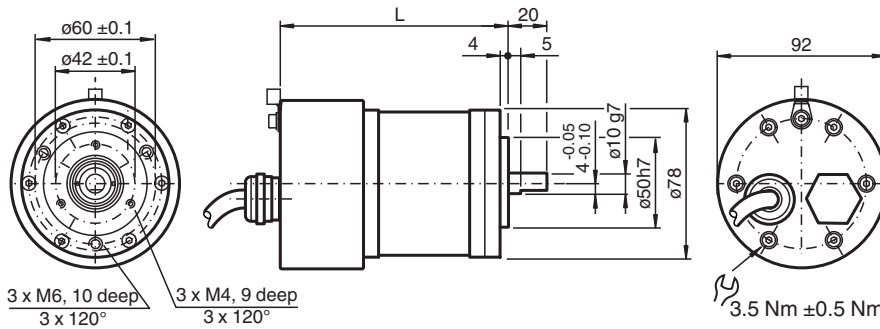
Dimensions



Servo flange, radial cable exit

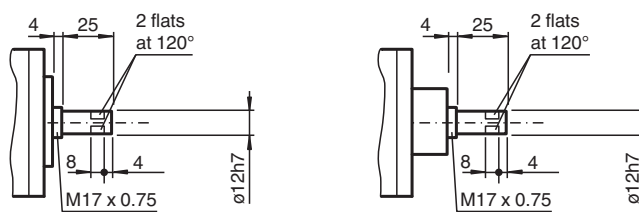


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Release date: 2024-03-11 Date of issue: 2024-03-11 Filename: t160346_eng.pdf

Technical Data

General specifications

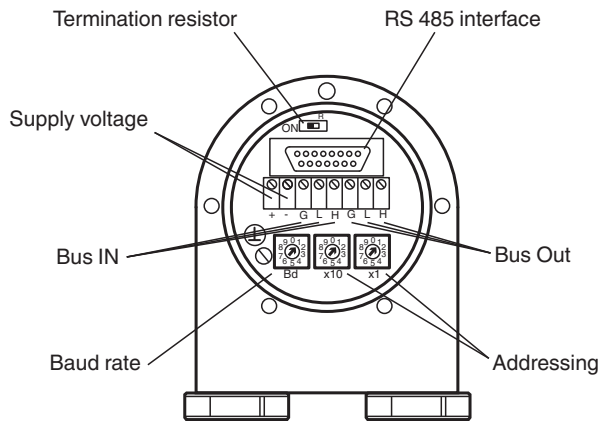
Technical Data

Detection type	photoelectric sampling	
Device type	Singleturn absolute rotary encoder	
Functional safety related parameters		
MTTF _d	25 a	
L ₁₀	7.7 E+9 at 3000 rpm	
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 230 mA at 10 V DC max. 100 mA at 24 V DC
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit	
Output code	binary code	
Code course (counting direction)	cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	DeviceNet	
Resolution		
Single turn	up to 16 Bit	
Overall resolution	up to 16 Bit	
Transfer rate	max. 0.5 MBit/s	
Connection		
Cable	Ø 10.2 mm, Radox 9 x 0.5 mm ²	
Terminal compartment	see ordering information	
Standard conformity		
Degree of protection	DIN EN 60529, IP66	
Climatic testing	DIN EN 60068-2-78 , no moisture condensation	
Emitted interference	EN 61000-6-4:2007/A1:2011	
Noise immunity	EN 61000-6-2:2005	
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
IECEX approval		
Equipment protection level Gb	IECEX ITS 15.0061X	
ATEX approval		
Equipment protection level Gb	ITS 15 ATEX 18372X	
Ambient conditions		
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material		
Combination 1	housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4404 / AISI 316L	
Combination 2 (Inox)	housing: Stainless steel 1.4404 / AISI 316L flange: Stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4404 / AISI 316L	
Mass	approx. 2600 g (combination 1) approx. 3900 g (combination 2)	
Rotational speed	max. 3000 min ⁻¹	
Moment of inertia	180 gcm ²	
Starting torque	≤ 4 Ncm	
Shaft load		
Axial	60 N	
Radial	80 N	
General information		
Use in the hazardous area	see instruction manuals	

Connection

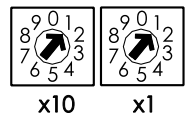
Terminal	Cable	Explanation
(-)	1	- Power supply
(+)	2	+ Power supply
L	3	CAN low
H	4	CAN high
G	5	CAN ground
L	6	CAN low
H	7	CAN high
G	8	CAN ground
⊥	green / yellow	Ground connection of encoder housing

Configuration



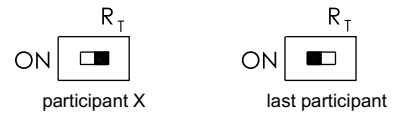
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 63, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position
125	0
250	1
500	2
125	3
reserved	4 ... 9

Parameterization

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a telegram. The absolute encoder reads in the current position, calculates all parameters that may have been set and then sends back the actual process value.
Cyclic mode	The absolute encoder sends the current process value depending on a programmable timer. This can cause the bus load to be reduced since the member on the network only sends a message after a specific amount of time without a prompt from the master.
Change of state mode	The absolute encoder monitors the current process value and transfers the current value by itself if there is any change in the value. This can cause the bus load to be reduced, since the member on the network only sends a message if there has been a change.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will be rising or descending.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to a revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.

Type Code

Ordering information

D	V	S	7	8	E	-	0					0	B	-	0	0		
---	---	---	---	---	---	---	---	--	--	--	--	---	---	---	---	---	--	--

Number of singleturn bits

12	4096
13	8192
16	65536

Number of multiturn bits

00	Singleturn absolute rotary encoder
----	------------------------------------

Housing material

N	Aluminum
I	INOX 1.4404 (AISI 316L)

Output code

B	Binary
---	--------

Option 2

0	None
---	------

Exit position

A	Axial
R	Radial

Connection type

K2	Cable, 9-wire, 2 m
K5	Cable, 9-wire, 5 m
DR	Terminal compartment, 2 cable glands
KR	Terminal compartment, 1 cable gland, 1 stopping plug

Flange version

1	Clamping flange
2	Servo flange

Shaft dimension

01	Shaft Ø10 mm x 20 mm
02	Shaft Ø12 mm x 25 mm

Option 1

E	Explosion-proof, standard IP66
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Functional principle

S	Singleturn
---	------------

Shaft version

V	Solid shaft
---	-------------

Data format

D	DeviceNet
---	-----------

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.
- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



Safety instructions

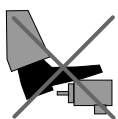
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

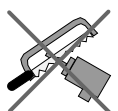
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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!



Singleturn absolute rotary encoder

CVS78E Mining

- Up to 16 Bit singleturn
- ATEX-approval for mining
- IECEx approval
- Flameproof enclosure
- Removable connection cap



Function

Absolute encoders deliver an absolute step value for each angle setting. All these values are represented by code samples on one or more code disks which are sampled by a photoelectric array.

The absolute encoder has a maximum basic resolution of 65536 steps per revolution (16 Bits).

The integrated CAN bus interface of the absolute encoder supports all DeviceNet functions. The following operating modes can be programmed, and can selectively be turned on or off:

- Polled mode
- Cyclic mode
- Sync mode

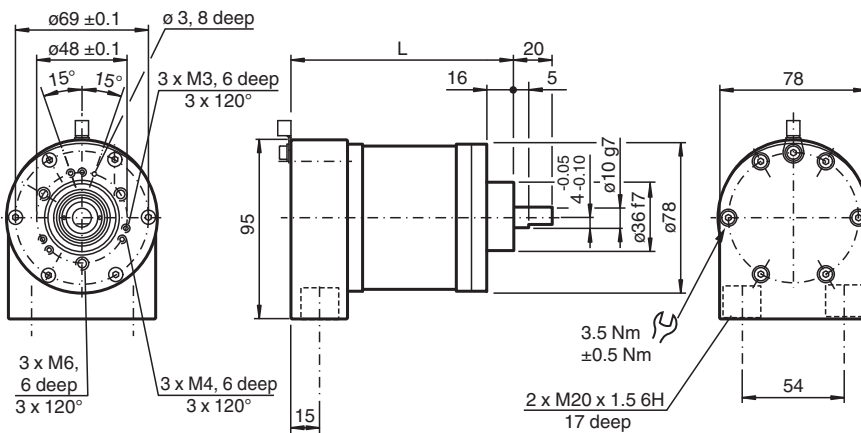
The device is designed for shaft mounting and is available in servo flange or clamping flange design.

The bus electronics module is integrated into the removable housing cover. This makes it possible to mount or replace the new rotary encoders and the matching bus electronics separately during installation or service.

Dimensions

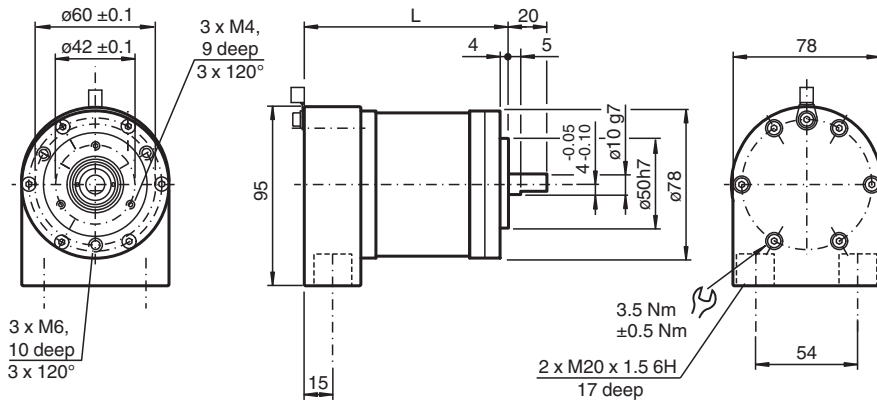
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	109 mm
	Servo flange	109 mm
Axial cable exit	Clamping flange	125 mm
	Servo flange	125 mm

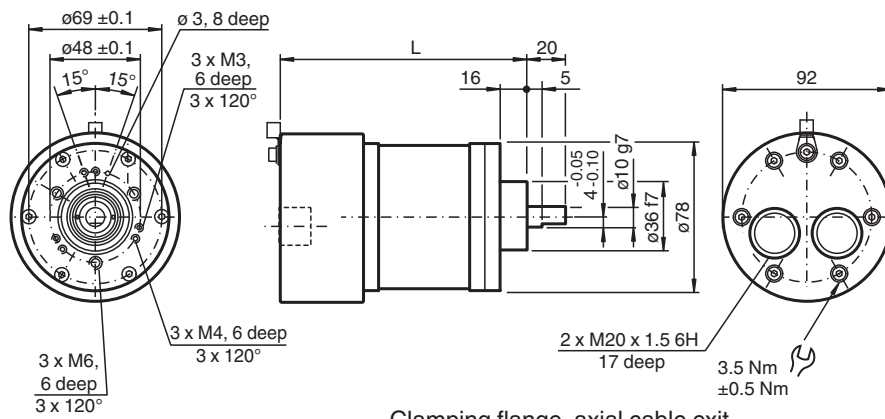


Clamping flange, cable exit radial

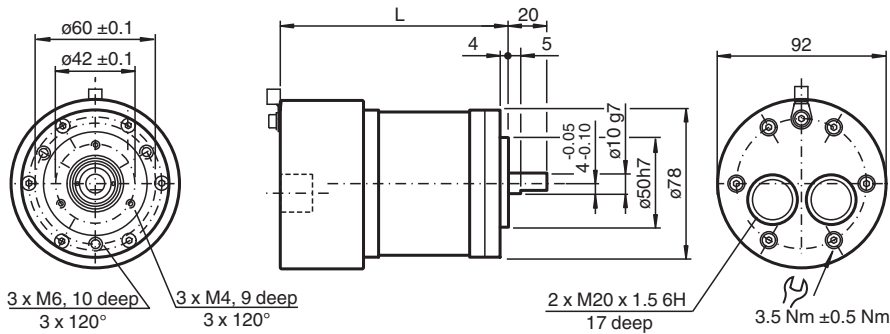
Dimensions



Servo flange, radial cable exit

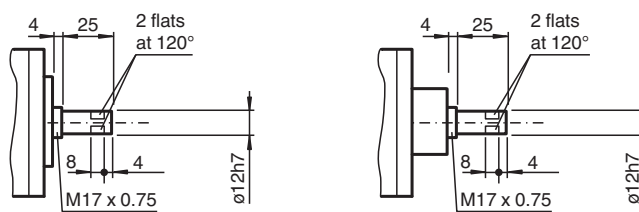


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Technical Data

General specifications

Technical Data

Detection type		photoelectric sampling
Device type		Singleturn absolute rotary encoder
Functional safety related parameters		
MTTF _d		25 a
L ₁₀		7.7 E+9 at 3000 rpm
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 350 mA
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit
Output code		binary code
Code course (counting direction)		cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Overall resolution		up to 16 Bit
Transfer rate		max. 1 MBit/s
Standard conformity		communication profile: DS 301 Device profiles: DS 406 and DS 417 , programmable according to class 2
Connection		
Terminal compartment		with 2 threads for cable glands: each M20 x 1.5 6H, 17 mm thread depth
Standard conformity		
Degree of protection		DIN EN 60529, IP66
Climatic testing		DIN EN 60068-2-78 , no moisture condensation
Emitted interference		EN 61000-6-4:2007/A1:2011
Noise immunity		EN 61000-6-2:2005
Shock resistance		DIN EN 60068-2-27, 100 g, 3 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates		
IECEX approval		
Equipment protection level Mb		IECEX ITS 15.0060X
ATEX approval		
Equipment protection level Mb		ITS 15 ATEX 18371X
Ambient conditions		
Operating temperature		-40 ... 70 °C (-40 ... 158 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Material		
Combination 2 (Inox)		
Housing		Stainless steel 1.4404 / AISI 316L
Flange		Stainless steel 1.4404 / AISI 316L
Shaft		Stainless steel 1.4404 / AISI 316L
Mass		approx. 3900 g
Rotational speed		max. 3000 min ⁻¹
Moment of inertia		180 gcm ²
Starting torque		≤ 4 Ncm
Shaft load		
Axial		60 N
Radial		80 N
General information		
Use in the hazardous area		see instruction manuals

Type Code

Structure of the type code

C	V	S	7	8	E	-	(1)	(1)	(2)	0	0	(3)	0	B	4	0	0	(4)	(4)
---	---	---	---	---	---	---	-----	-----	-----	---	---	-----	---	---	---	---	---	-----	-----

C	Data format
C	CANopen

V	Shaft version
V	Solid shaft

S	Funktional principle
S	Singleturn

78	Size
78	Housing diameter 78 mm

E	Option 1
E	Explosion proof, standard IP66

(1) (1)	Shaft diameter
01	Shaft Ø 10 mm x 20 mm
02	Shaft Ø 12 mm x 20 mm

(2)	Flange
1	Clamping flange
2	Servo flange

00	Connection type
00	Terminal compartment with two M20 x 1.5 6H threads each, 17 mm thread depth, for cable glands

(3)	Exit position
A	Axial
R	Radial

0	Option
0	None

B	Output Code
B	Binary

4	Housing material
4	Stainless steel 1.4404 / AISI 316L (V4A)

00	Multiturn: Number of bits and puls count
00	Singleturn Encoder

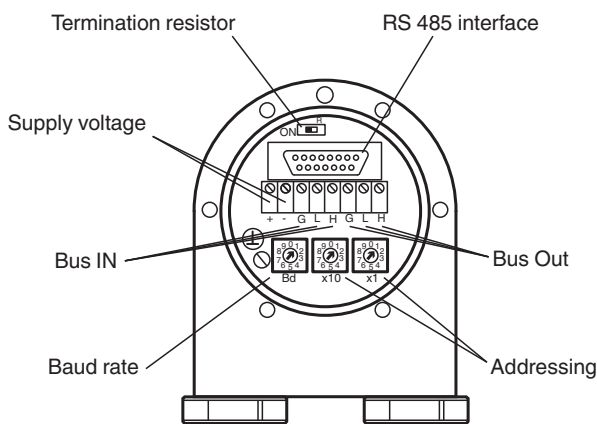
(4) (4)	Singleturn: Number of bits and puls count
12	12 bits, 4096 pulses
13	13 bits, 8192 pulses
16	16 bits, 65536 pulses

Connection

Terminal	Cable	Explanation
(-)	1	- Power supply
(+)	2	+ Power supply
L	3	CAN low
H	4	CAN high
G	5	CAN ground
L	6	CAN low
H	7	CAN high
G	8	CAN ground
⊥	green / yellow	Ground connection of encoder housing

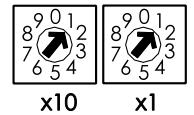
Configuration

Indicating and operating elements



Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 96, and may only be assigned once. The addresses 97 ... 99 are reserved.



Adjusting the termination resistor

The terminating resistor R_T (121 Ω) can be connected to the circuit by means of the switch:



Baud rate adjustment

Baud rate [kBit/s]	Switch position	Baud rate [kBit/s]	Switch position
20	0	500	5
50	1	800	6
100	2	1000	7
125	3	reserved	8
250	4	set baud rate by SDO message and LSS	9

Parameterization

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.



Singleturn absolute encoder EVS58-PZ

- Industrial standard housing Ø58 mm
- Ethernet interface with Powerlink
- 16 Bit singleturn
- Two Ethernet connectors with built in hub
- Servo or clamping flange



Function

Absolute rotary encoders deliver an absolute step value for each angle setting. On account of the high number of measuring steps, this type of absolute rotary encoder can be used to divide very long linear distances into small measuring steps.

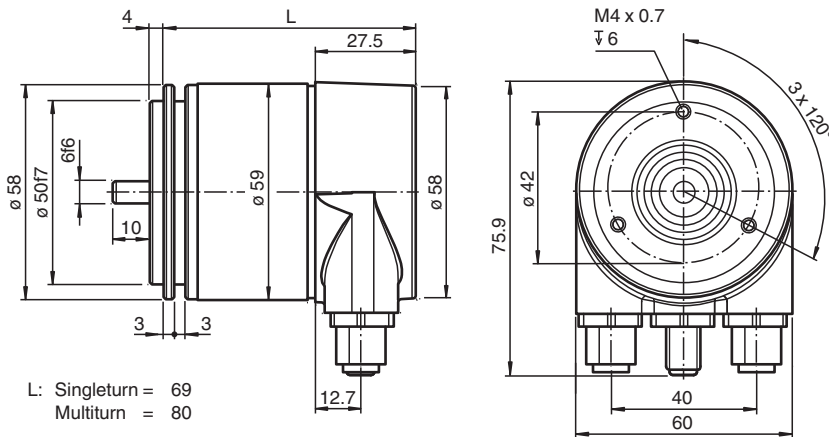
The Ethernet interface of this absolute encoder supports the Powerlink V2 protocol. An integrated hub allows wiring in a line structure (daisy chain).

In addition to various functions like resolution adjustment, rotation direction, node number setting or limit switch adjustment, the following operation modes can be selected:

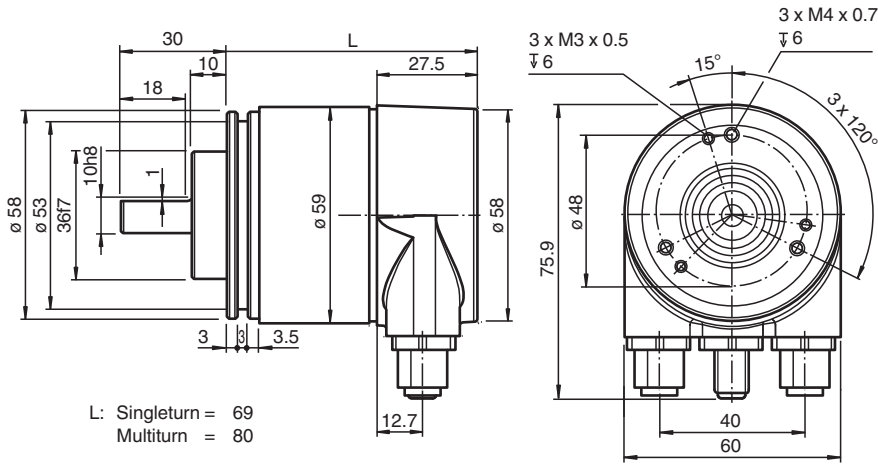
- Polled mode
- Multiplexed mode
- Poll Response chaining

The device is designed for shaft assembly and is available in servo flange or clamping flange design.

Dimensions



Dimensions



Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Functional safety related parameters	
MTTF _d	130 a
Mission Time (T _M)	20 a
L _{10h}	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 10 ... 30 V DC , safe galvanic isolation per EN 50178
Power consumption	P ₀ max. 3 W
Linearity	± 0.5 LSB (12 Bit) , ± 2 LSB (16 Bit)
Output code	binary code
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface	
Interface type	Ethernet Powerlink
Resolution	
Single turn	up to 16 Bit
Overall resolution	up to 16 Bit
Physical	Ethernet
Transfer rate	100 MBit/s
Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 5-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz
Approvals and certificates	
UL approval	cULus Listed, General Purpose, Class 2 Power Source
CCC approval	CCC approval / marking not required for products rated ≤36 V

Technical Data









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: powder coated aluminum flange: aluminum shaft: stainless steel
Mass	approx. 550 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	≤ 3 Ncm (version without shaft seal)
Shaft load	
Axial	40 N
Radial	80 N

Accessories

	9203	Angled flange
	V1SD-G-ABG-PG9	Male connector M12 straight D-coded 4-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V1SD-G-2M-PUR-ABG-V45-G	Connection cable, M12 to RJ-45, PUR cable 4-pin, CAT5e
	V15-G-YE2M-PVC	Female cordset, M12, 5-pin, PVC cable
	9300	Mounting bracket for servo flange
	V15-G-YE5M-PVC	Female cordset, M12, 5-pin, PVC cable
	V15-G-PG9	Female connector M12 straight A-coded 5-pin, for cable diameter 6 - 8 mm, field-attachable
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

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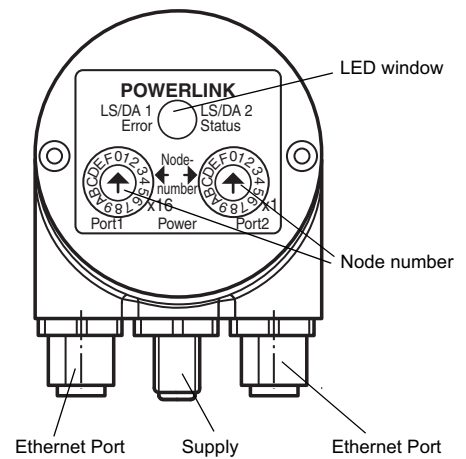
Indication

LEDs for HUB Port

LED	Color	Status	Meaning
LS/DA 1	green	on	LINK active for HUB Port 1
		blinking	Activity on HUB Port 1
LS/DA 2	green	on	LINK active for HUB Port 2
		blinking	Activity on HUB Port 2

LEDs for Powerlink

LED	Color	Status	Meaning
Error	red	on	- not allowed node number - internal communication error - buffer underrun/overflow - collision - CRC error - loss of SoC
		off	no error
Status	green	off	not active
		flickering	Basic Ethernet mode
		flashes 1x	Pre-Operational 1
		flashes 2x	Pre-Operational 2
		flashes 3x	ready to operate
		on	Operational
		blinking	Stopped



Node number adjustment

The setting of the controlled node number is achieved by 2 hexadecimal switches x16 and x1. Allowed node numbers range is 1 ... 239. The adjusted node number is calculated as follows:

$$\text{Node number} = \text{Decimal value}_{[\text{switch } x16]} \times 16 + \text{Decimal value}_{[\text{switch } x1]} \times 1$$

Example:

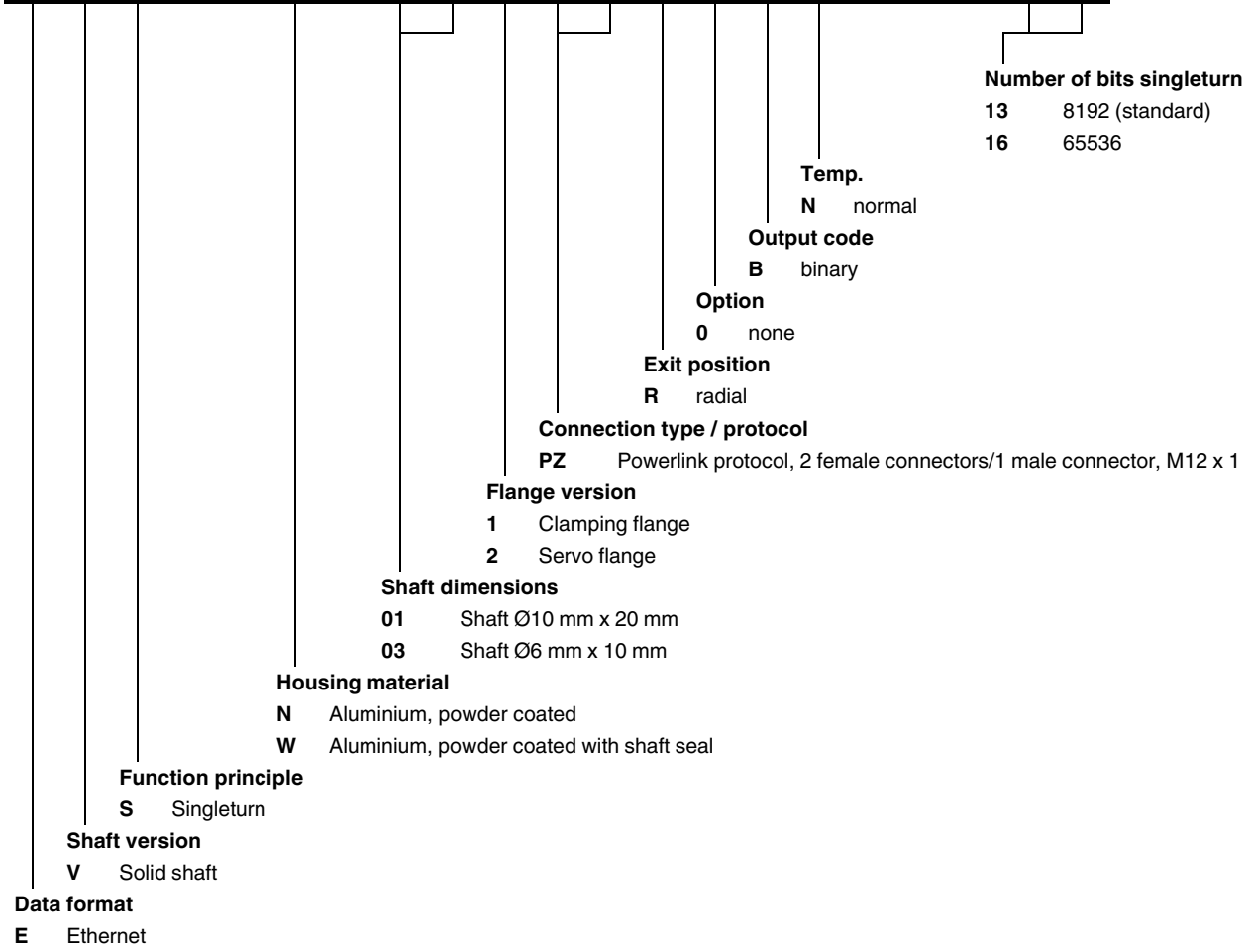
$$[\text{switch } x16] = A, [\text{switch } x1] = 5$$

$$A_{\text{hex}} = 10_{\text{dec}} \times 16 = 160 + 5 = 165$$

Type Code

Order code

E V S 5 8 N - P Z R 0 B N - 0 0





Singleturn absolute encoder

ESS58-PZ

- Industrial standard housing Ø58 mm
- Ethernet interface with Powerlink
- 16 Bit singleturn
- Two Ethernet connectors with built in hub
- Recessed hollow shaft



ETHERNET 
POWERLINK

Function

Absolute rotary encoders deliver an absolute step value for each angle setting. On account of the high number of measuring steps, this type of absolute rotary encoder can be used to divide very long linear distances into small measuring steps.

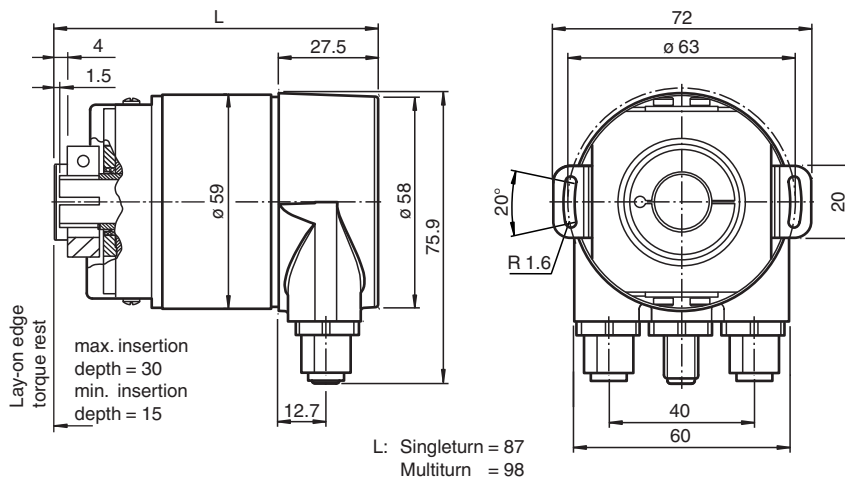
The Ethernet interface of this absolute encoder supports the Powerlink V2 protocol. An integrated hub allows wiring in a line structure (daisy chain).

In addition to various functions like resolution adjustment, rotation direction, node number setting or limit switch adjustment, the following operation modes can be selected:

- Polled mode
- Multiplexed mode
- Poll Response chaining

The absolute encoder is mounted directly onto the application shaft, without any coupling. Rotation of the absolute encoder is prevented by a torque rest.

Dimensions




Technical Data

General specifications	
Detection type	photoelectric sampling
Device type	Singleturn absolute encoder
Functional safety related parameters	
MTTF _d	130 a
Mission Time (T _M)	20 a
L _{10h}	1.9 E+11 at 6000 rpm and 20/40 N axial/radial shaft load









Technical Data

Diagnostic Coverage (DC)	0 %	
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC , safe galvanic isolation per EN 50178
Power consumption	P_0	max. 3 W
Linearity	± 0.5 LSB (12 Bit) , ± 2 LSB (16 Bit)	
Output code	binary code	
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	Ethernet Powerlink	
Resolution		
Single turn	up to 16 Bit	
Overall resolution	up to 16 Bit	
Physical	Ethernet	
Transfer rate	100 MBit/s	
Connection		
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 5-pin, A-coded	
Standard conformity		
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65	
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, 100 g, 6 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
UL approval	cULus Listed, General Purpose, Class 2 Power Source	
CCC approval	CCC approval / marking not required for products rated ≤ 36 V	
Ambient conditions		
Operating temperature	-40 ... 79 °C (-40 ... 174.2 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Relative humidity	98 % , no moisture condensation	
Mechanical specifications		
Material	housing: powder coated aluminum flange: aluminum shaft: stainless steel	
Mass	approx. 550 g	
Rotational speed	max. 12000 min ⁻¹	
Moment of inertia	30 gcm ²	
Starting torque	≤ 3 Ncm (version without shaft seal)	
Tightening torque, fastening screws	max. 1.8 Nm	
Shaft load		
Angle offset	$\pm 0.9^\circ$	
Axial offset	static: ± 0.3 mm, dynamic: ± 0.1 mm	
Radial offset	static: ± 0.5 mm, dynamic: ± 0.2 mm	

Accessories

	V15-G-YE2M-PVC	Female cordset, M12, 5-pin, PVC cable
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Accessories

	V15-G-YE5M-PVC	Female cordset, M12, 5-pin, PVC cable
	V1SD-G-ABG-PG9	Male connector M12 straight D-coded 4-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V1SD-G-2M-PUR-ABG-V45-G	Connection cable, M12 to RJ-45, PUR cable 4-pin, CAT5e
	V15-G-PG9	Female connector M12 straight A-coded 5-pin, for cable diameter 6 - 8 mm, field-attachable
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

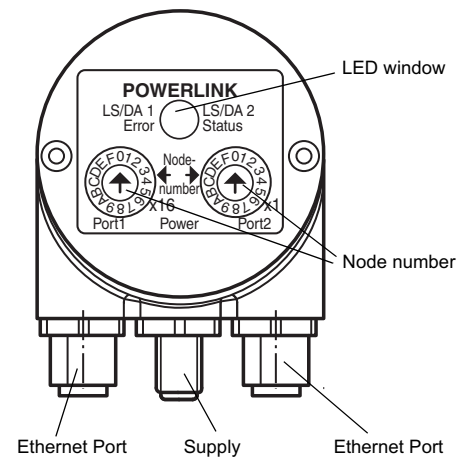
Indication

LEDs for HUB Port

LED	Color	Status	Meaning
LS/DA 1	green	on	LINK active for HUB Port 1
		blinking	Activity on HUB Port 1
LS/DA 2	green	on	LINK active for HUB Port 2
		blinking	Activity on HUB Port 2

LEDs for Powerlink

LED	Color	Status	Meaning
Error	red	on	- not allowed node number - internal communication error - buffer underrun/overflow - collision - CRC error - loss of SoC
		off	no error
Status	green	off	not active
		flickering	Basic Ethernet mode
		flashes 1x	Pre-Operational 1
		flashes 2x	Pre-Operational 2
		flashes 3x	ready to operate
		on	Operational
		blinking	Stopped



Node number adjustment

The setting of the controlled node number is achieved by 2 hexadecimal switches x16 and x1. Allowed node numbers range is 1 ... 239. The adjusted node number is calculated as follows:

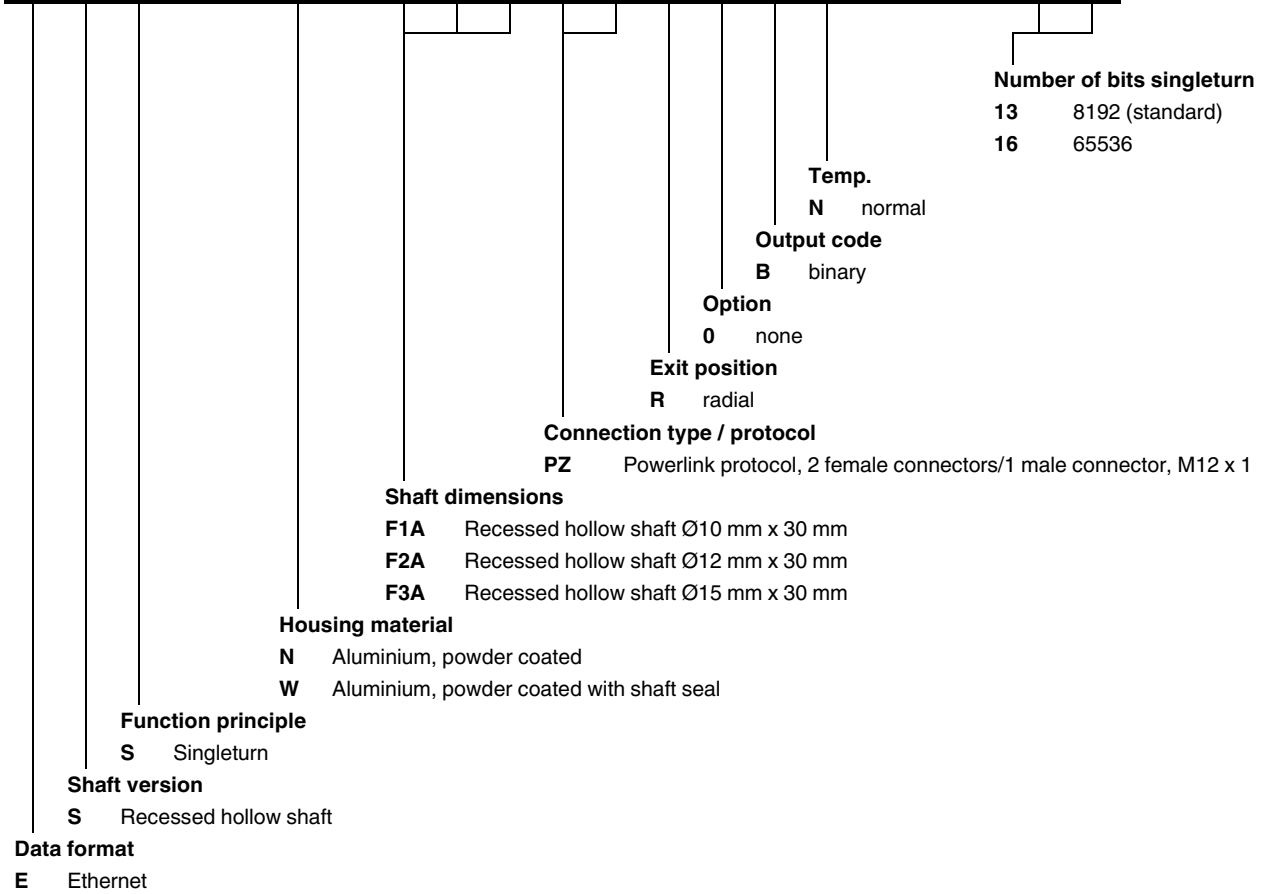
$$\text{Node number} = \text{Decimal value}_{[\text{switch } x16]} \times 16 + \text{Decimal value}_{[\text{switch } x1]} \times 1$$

Example:

$$[\text{switch } x16] = A, [\text{switch } x1] = 5$$

$$A_{\text{hex}} = 10_{\text{dec}} \times 16 = 160 + 5 = 165$$

Order code



Dimensions

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

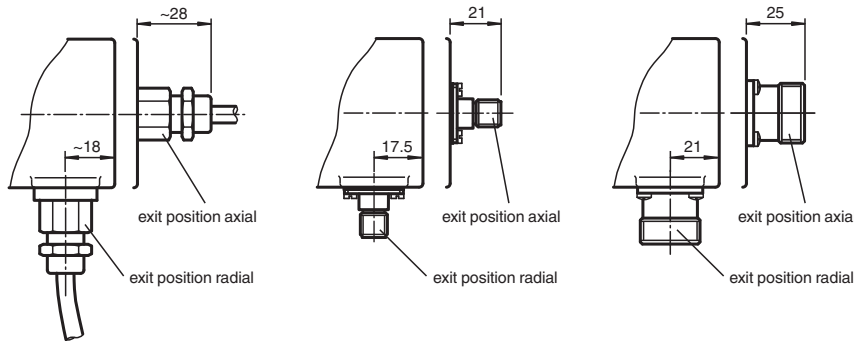
Connections

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 _d	700 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)
No-load supply current	I ₀ typ. 50 mA
Power consumption	P ₀ approx. 1.5 W
Time delay before availability	t _v < 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





Technical Data

Input 1	
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
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
Output	
Output type	RS422, Push/Pull
Signal output	A+B+/A+/B
Pulses	1024, 2048, 4096
Connection	
Connector	M12 connector, 8-pin or M23 connector, 12-pin
Cable	Ø7 mm, 6 x 2 x 0.14 mm ² , 1 m (cable length, see order code)
Standard conformity	
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
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 , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g , with cable
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

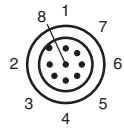
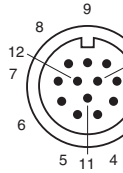
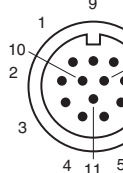
Accessories

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

Accessories

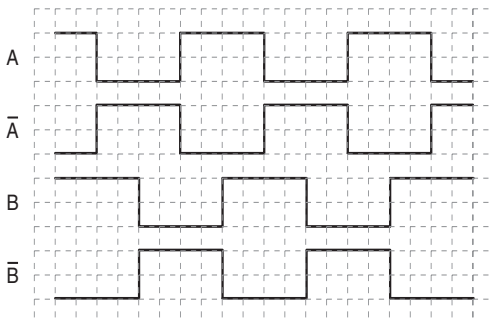
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
	V19-G-10M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable
	V19-G-2M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable
	V19-G-5M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable

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_B (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

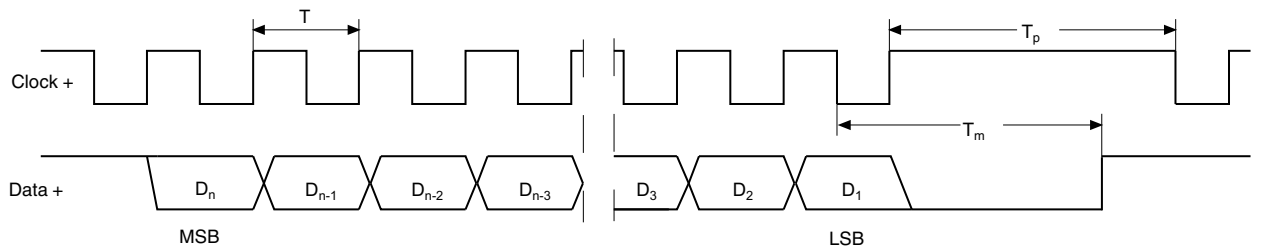


cw - with view onto the shaft

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_1, \dots, D_n : Position data
 MSB: Most significant bit
 LSB: Least significant bit

$T = 1/f$: Duration of period of clock signal ≤ 2 MHz
 T_m : Monoflop time $20 \mu s \pm 1 \mu s$
 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)) 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.

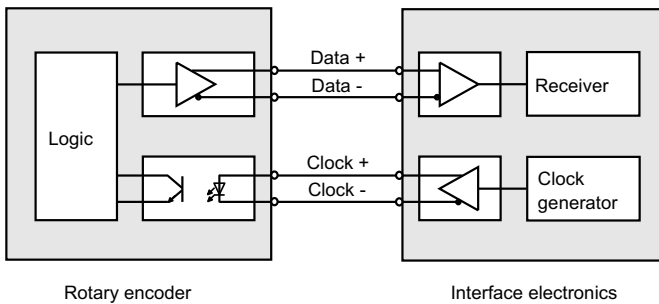
SSI output format ring slide operation (multiple transmission)

- 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

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



Absolute rotary encoder

ENA58IL-R***-SSI

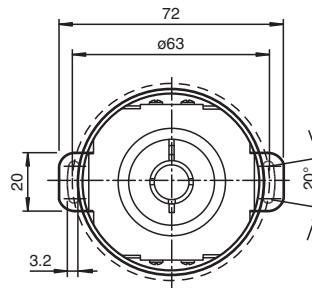
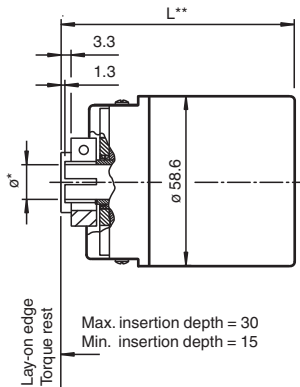
- Recessed hollow shaft
- SSI interface
- Up to 32 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Additionally push buttons for preset function (only model characteristic SB2, SG2)
- Up to 4096 pulses on incremental track



Function

The ENA58IL series are high precision encoders with internal magnetic sampling. This 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



* See type code
 ** Singleturn design with axial output: L = 60.6
 All other designs: L = 71 mm

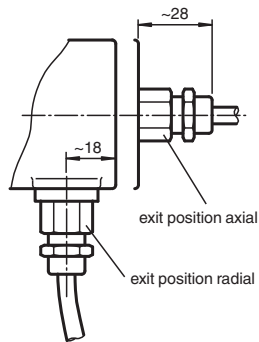
Recessed hollow shaft

Dimensions

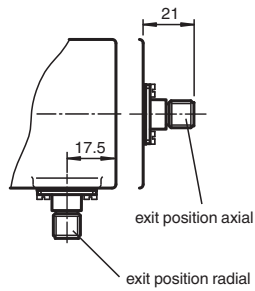
Connections

Dimensions in mm

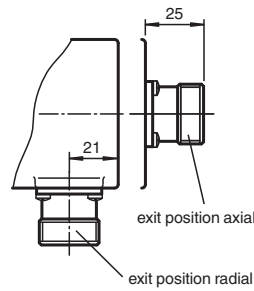
Cable



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 _d		700 a at 40 °C
Mission Time (T _M)		20 a
L ₁₀		5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Electrical specifications		
Operating voltage	U _B	4.5 ... 30 V DC (SSI, SSI + RS422) ; 10 ... 30 V DC (SSI + Push/Pull)
No-load supply current	I ₀	typ. 50 mA
Power consumption	P ₀	approx. 1.5 W
Time delay before availability	t _v	< 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
Input 1		
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











Technical Data

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
Output		
Output type		RS422, Push/Pull
Signal output		A+B+/A+/B
Pulses		1024, 2048, 4096
Connection		
Connector		M12 connector, 8-pin or M23 connector, 12-pin
Cable		Ø7 mm, 6 x 2 x 0.14 mm ²
Standard conformity		
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
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 , painted
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 300 g , with cable
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		50 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		24 N
Radial		198 N
Angle offset		± 0.9 °
Axial offset		± 0.3 mm static
Radial offset		± 0.5 mm static

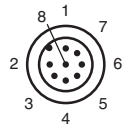
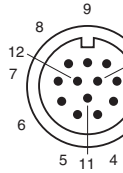
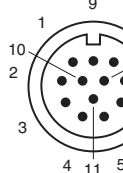
Accessories

	V19-G-2M-PUR-ABG-V19-G	Cordset M12 socket straight to M12 plug straight A-coded, 8-pin, PUR cable grey, shielded
	V19-G-2M-PUR-ABG	Female cordset single-ended M12 straight A-coded, 8-pin, PUR cable grey, shielded

Accessories

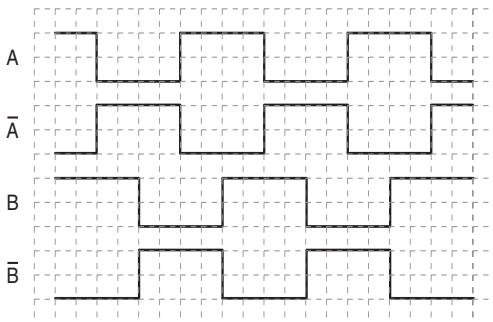
	V19-G-5M-PUR-ABG	Female cordset single-ended M12 straight A-coded, 8-pin, PUR cable grey, shielded
	V19-W-ABG-PG9	Female connector M12 angled A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	V19-G-2M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable
	V19-G-5M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable
	V19-G-10M-PVC-TP	Female cordset, M12, 8-pin, shielded, PVC cable
	ACC-PACK-ABS-_S_58 ø15	Accessory kit for Ø58 absolute rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolute rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolute rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessory kit for Ø58 absolute rotary encoder with recessed hollow shaft 10 mm

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_B (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

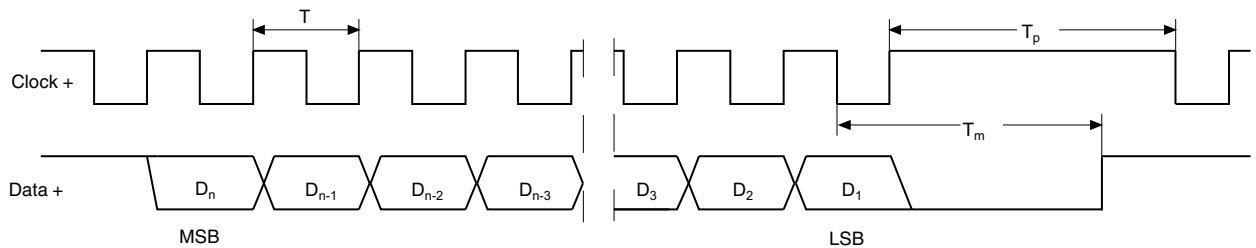


cw - with view onto the shaft

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_1, \dots, D_n : Position data
 MSB: Most significant bit
 LSB: Least significant bit

$T = 1/f$: Duration of period of clock signal ≤ 2 MHz
 T_m : Monoflop time $20 \mu s \pm 1 \mu s$
 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)) 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.

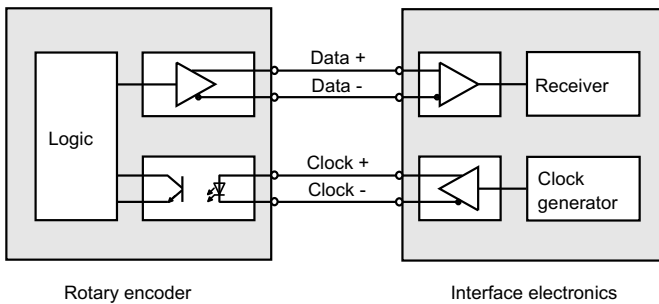
SSI output format ring slide operation (multiple transmission)

- 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 multturn 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

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



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

- DA** Dual spring plate

Shaft diameter

- 06** 6 mm (d = 6F7)
- 10** 10 mm (d = 10 F7)
- 12** 12 mm (d = 12 F7)
- 14** 14 mm (d = 14 F7)
- 15** 15 mm (d = 15 F7)

Shaft type

- R** Recessed hollow 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

Absolute encoders

ENA36IL-S***-SSI



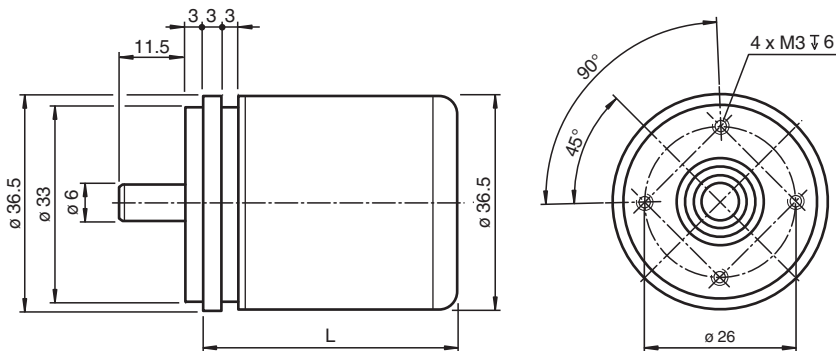
- Very small housing
- Up to 32 Bit multiturn
- SSI interface
- Free of wear magnetic sampling
- High resolution and accuracy



Function

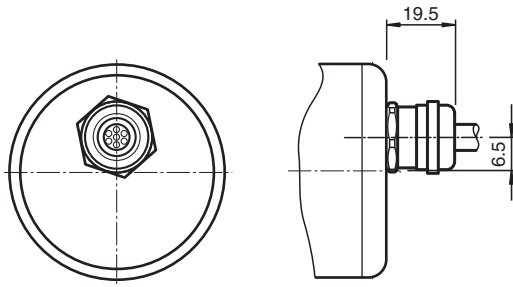
The ENA36IL series are high precision encoders with internal magnetic sampling. This multiturn absolute encoder transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The control module sends a start sequence to the absolute encoder to obtain 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

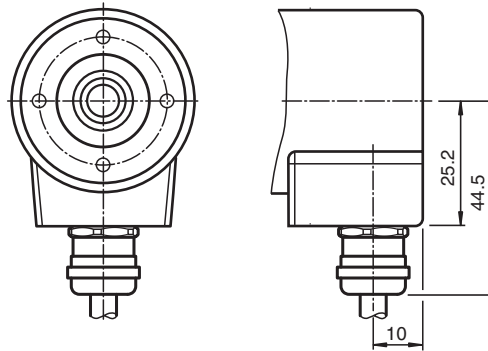


Degree of protection	L [mm]	
	Axial output	Radial output
IP54	43	
IP64/IP65	43	39

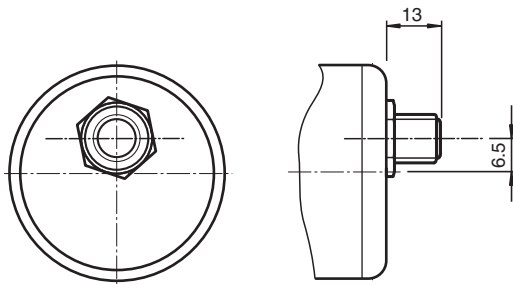
Dimensions



Output, axial, IP64/IP65

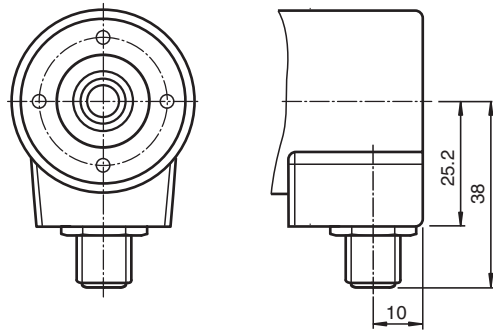


Output, radial, IP64/IP65

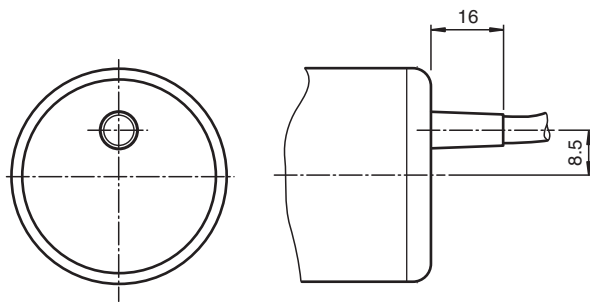


Output, axial, IP64/IP65

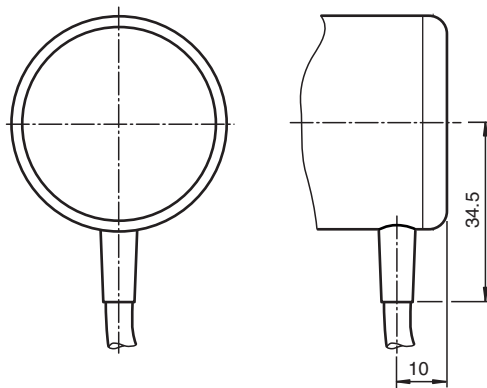
Dimensions



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

Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: t168923_eng.pdf







Technical Data

Mission Time (T_M)		20 a
L_{10}		40 E-8 revolutions at 20/40 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 μ s
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		$\varnothing 6$ 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

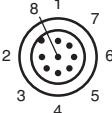
Technical Data

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	20 N
Radial	40 N

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
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection Assignment

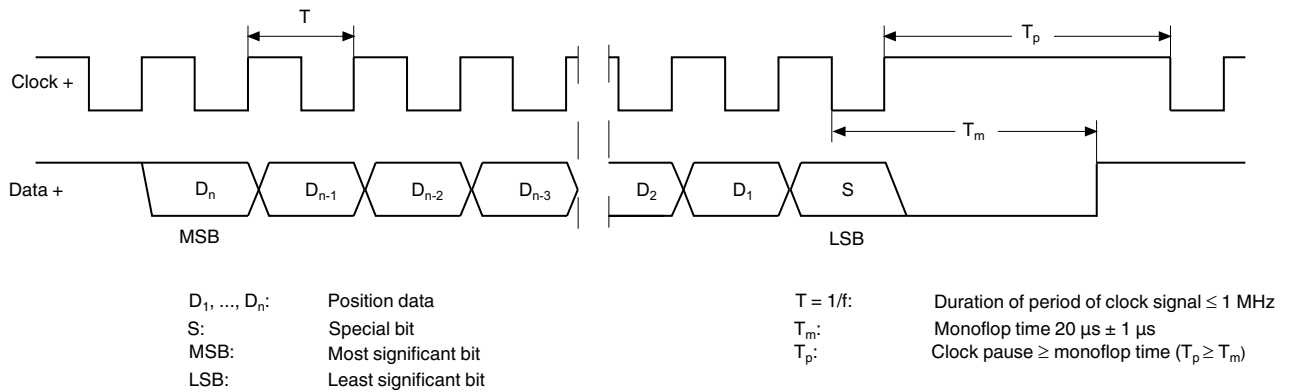
Signal	Wire end	Connector
GND (encoder)	White	1
U _b (encoder)	Brown4	2
Clock (+)	Green	3
Clock (-)	Yellow	4
Data (+)	Grey	5
Data (-)	Pink	6
Preset	Black or Blue	7
Counting direction	Red	8
Shielding	Shielding	Housing
Pinout	-	

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.

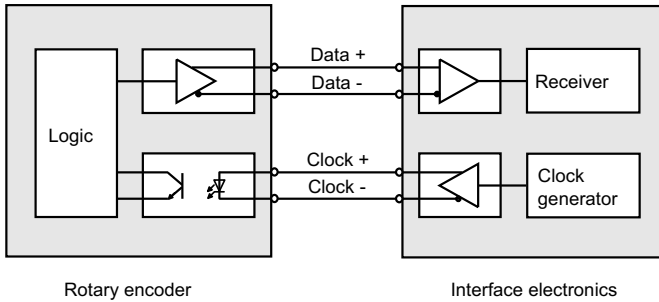
As an example: a multiturn encoder with a resolution of 8192 steps/revolution (13 bit) and a max. number of 4096 revolutions (12 bit) has a total resolution of $n = 25$ bit.

- 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

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 binary, $U_B = 4.75\text{ V} \dots 30\text{ V}$

Singleturn resolution
12 12 bit
13 13 bit
14 14 bit
16 16 bit

Multiturn resolution
00 Singleturn 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

Degree of protection
4 IP54
5 IP65

Flange
SA Servo flange

Shaft diameter
06 6 mm

Shaft type
S Solid 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.

- 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



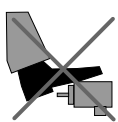
Safety instructions

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

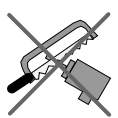
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

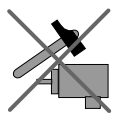
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA36IL-R***-SSI



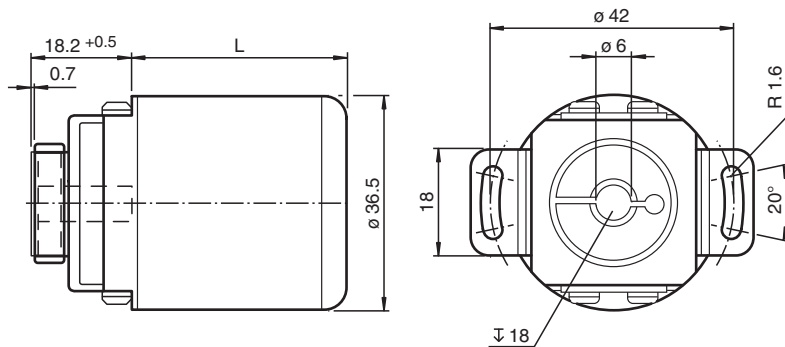
- Very small housing
- Up to 32 Bit multiturn
- SSI interface
- Free of wear magnetic sampling
- High resolution and accuracy



Function

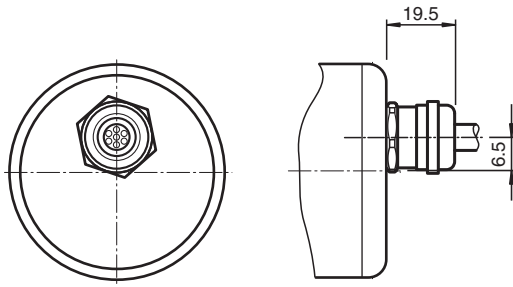
The ENA36IL series are high precision encoders with internal magnetic sampling. This multiturn absolute encoder transmits a position value corresponding to the shaft setting via the SSI interface (Synchronous Serial Interface). The control module sends a start sequence to the absolute encoder to obtain 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

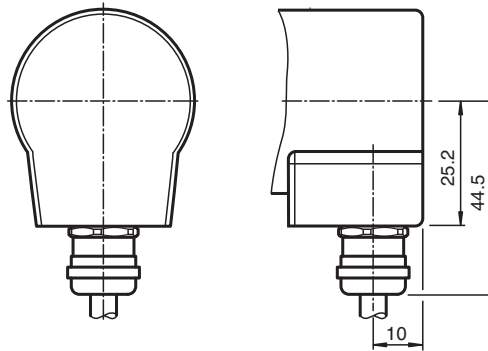


Degree of protection	L [mm]	
	Axial output	Radial output
IP54	36	
IP64/IP65	36	32

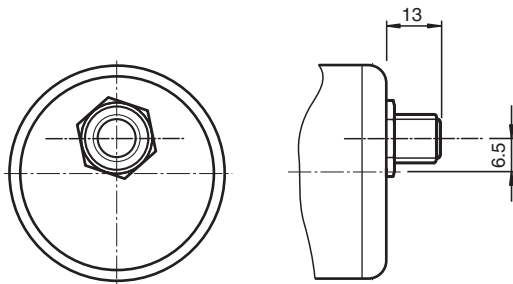
Dimensions



Output, axial, IP64/IP65

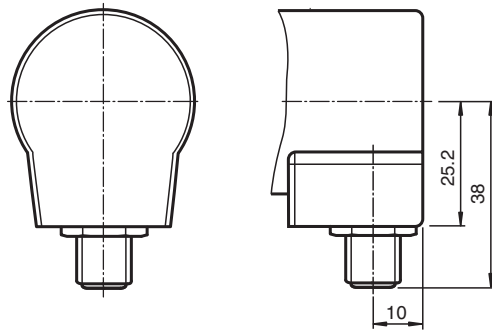


Output, radial, IP64/IP65

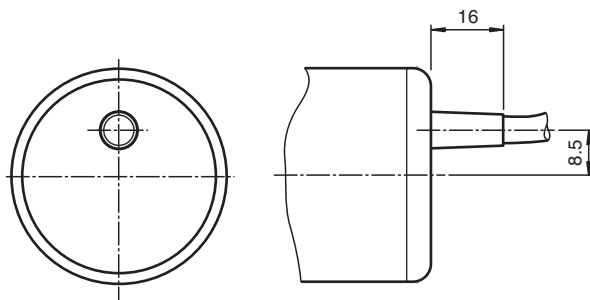


Output, axial, IP64/IP65

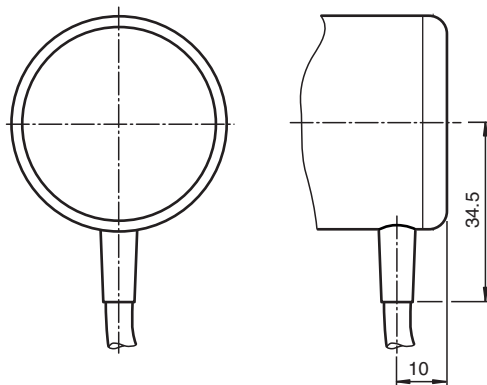
Dimensions



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

Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: t168924_eng.pdf



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

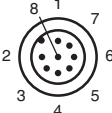
Technical Data

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

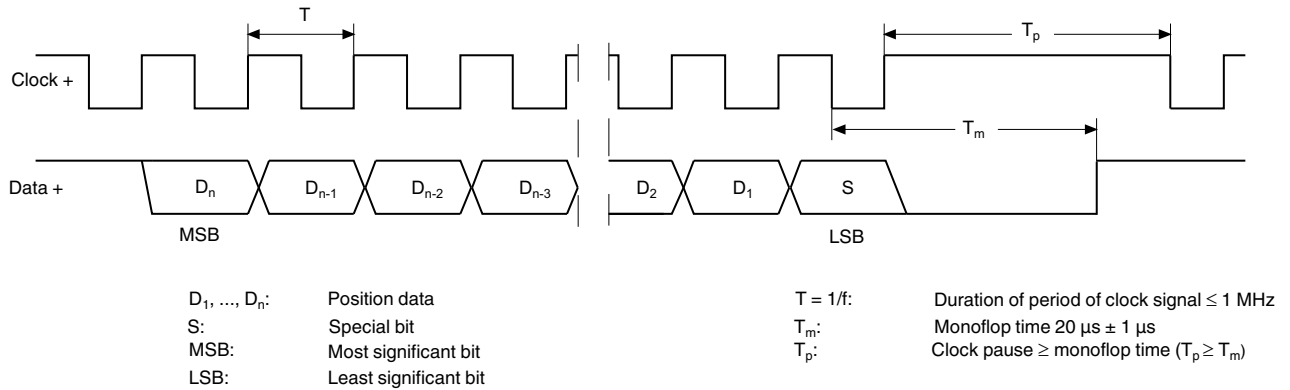
Signal	Wire end	Connector
GND (encoder)	White	1
U _b (encoder)	Brown4	2
Clock (+)	Green	3
Clock (-)	Yellow	4
Data (+)	Grey	5
Data (-)	Pink	6
Preset	Black or Blue	7
Counting direction	Red	8
Shielding	Shielding	Housing
Pinout	-	

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.

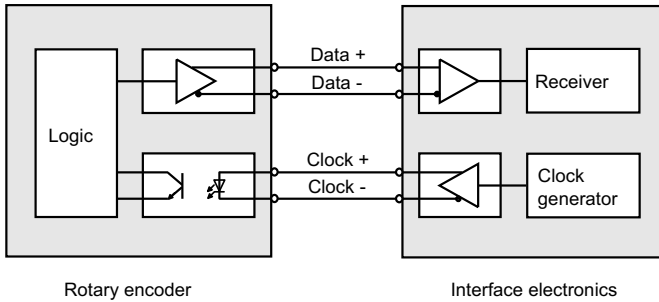
As an example: a multiturn encoder with a resolution of 8192 steps/revolution (13 bit) and a max. number of 4096 revolutions (12 bit) has a total resolution of $n = 25$ bit.

- 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

- 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.

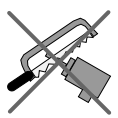
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

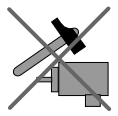
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA58IL-S***-EtherCAT



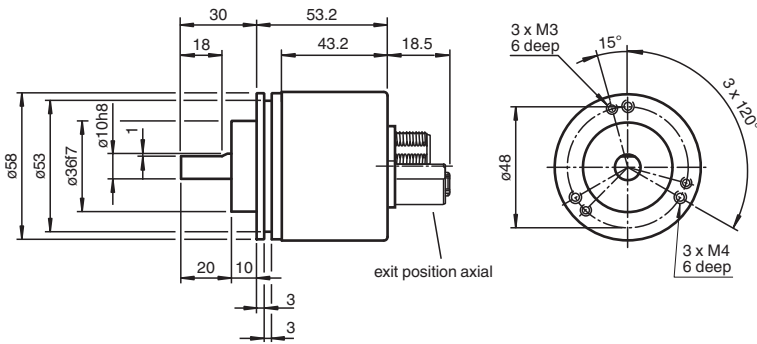
- Solid shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



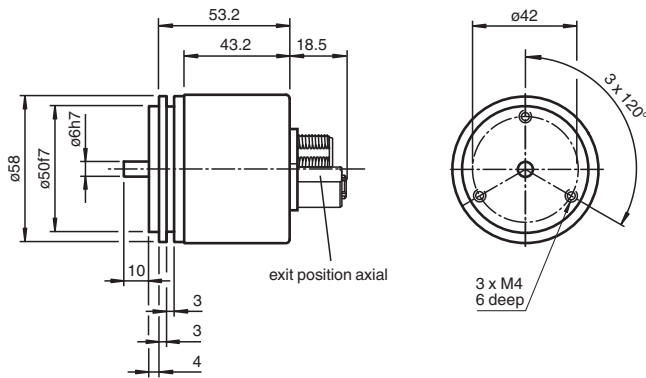
Function

The ENA58IL series are high precision encoders with internal magnetic sampling.

Dimensions



Clamping flange








Servo flange

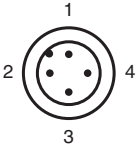
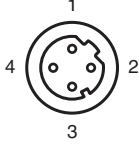
Technical Data

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	256 a at 40 °C
Mission Time (T _M)	12 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 10 ... 30 V DC
Power consumption	P ₀ approx. 4 W
Time delay before availability	t _v < 250 ms
Output code	binary code
Code course (counting direction)	adjustable
Interface	
Interface type	EtherCAT CoE (CANopen over EtherCAT, according to CiA DS-301 and DS-406 device profile CiA)
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	10 MBit/s / 100 MBit/s
Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 %, no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -
		

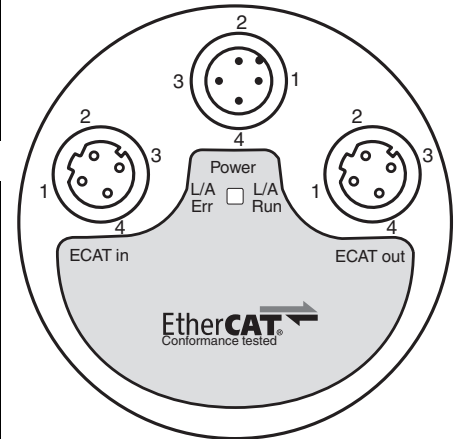
Indication

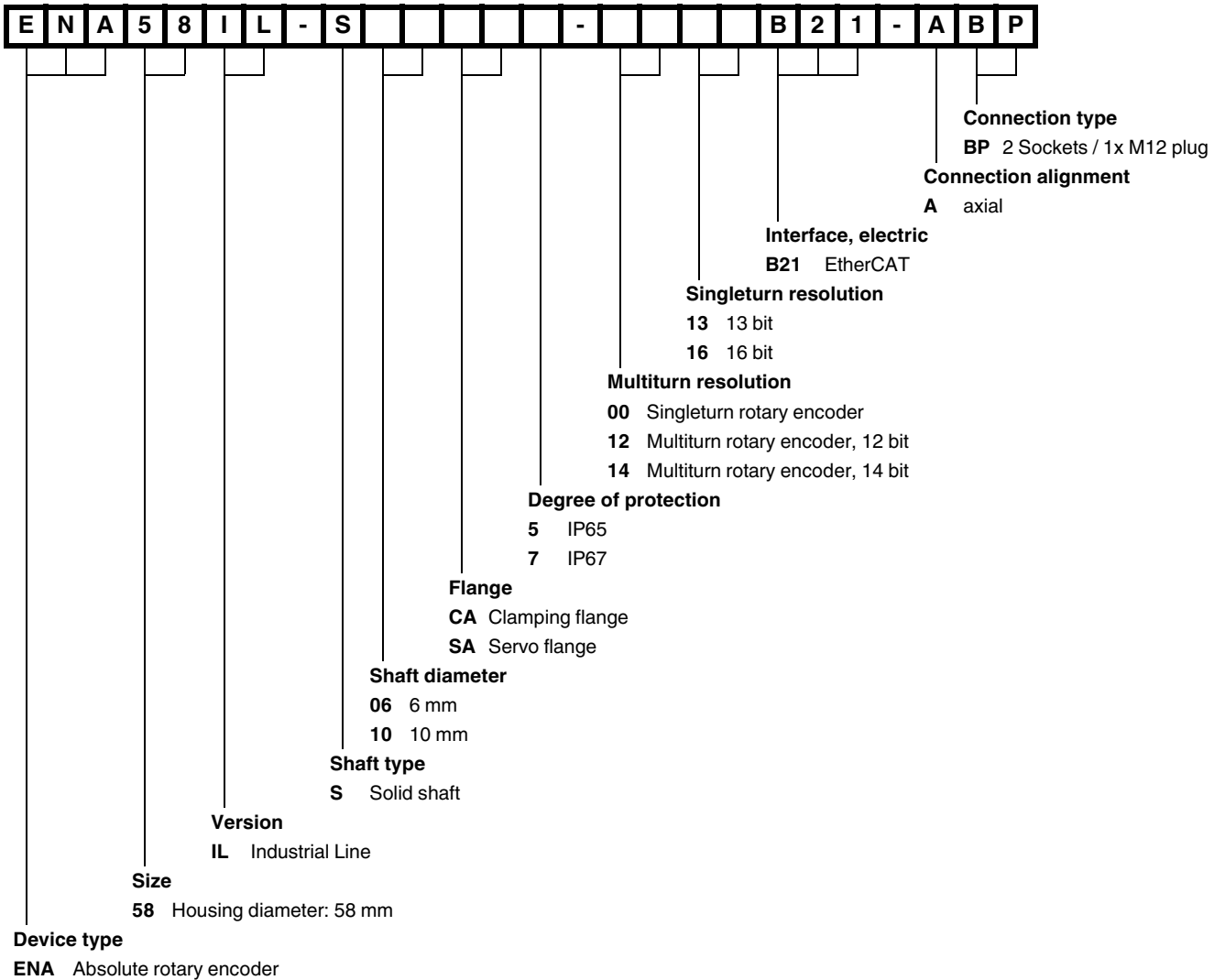
Port LEDs

LED	Color	Status	Description
Link/Act IN	green	on	LINK active for HUB port 1
		blinking	Activity on HUB port 1
Link/Act OUT	green	on	LINK active for HUB port 2
		blinking	Activity on HUB port 2

EtherCAT LEDs

LED	Color	Status	Description
Error	red	off	no error
		blinking	invalid configuration
		single flash	local error
		double flash	process data watchdog timeout/ EtherCAT watchdog timeout
		flickering	booting error
		on	application failure
Run	green	off	initialization
		blinking	Pre-Operational
		single flash	Safe-Operational
		flickering	initialization or bootstrap
		on	Operational





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.
- 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

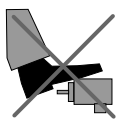
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

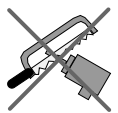
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

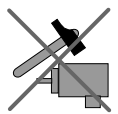
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA58IL-R***-EtherCAT



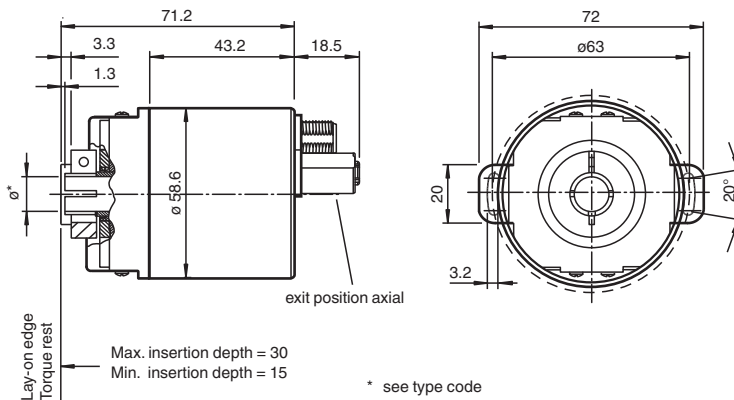
- Recessed hollow shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



Function

The ENA58IL series are high precision encoders with internal magnetic sampling.

Dimensions



Recessed hollow shaft

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	256 a at 40 °C
Mission Time (T _M)	12 a
L ₁₀	5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %




Electrical specifications

Operating voltage	U _B	10 ... 30 V DC
Power consumption	P ₀	approx. 4 W






Technical Data

Time delay before availability	t_v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		EtherCAT CoE (CANopen over EtherCAT, according to CiA DS-301 and DS-406 device profile CiA)
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 14 Bit
Overall resolution		up to 30 Bit
Transfer rate		10 MBit/s / 100 MBit/s
Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, IP65, IP66, IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		Zinc plated steel, painted
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 300 g
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		50 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		24 N
Radial		198 N
Angle offset		± 0.9 °
Axial offset		± 0.3 mm static
Radial offset		± 0.5 mm static

Accessories

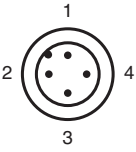
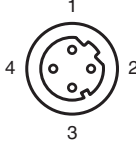
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm

Accessories

	9113, 6	Measuring wheel for shaft diameter 6 mm
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

	
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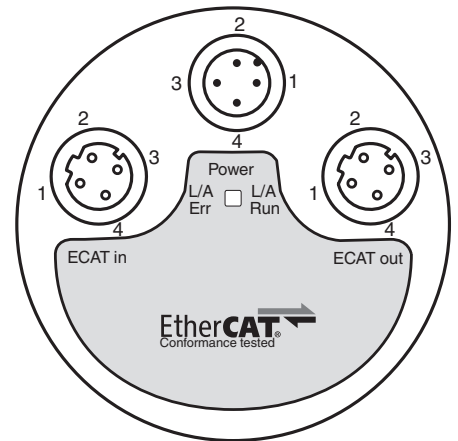
Indication

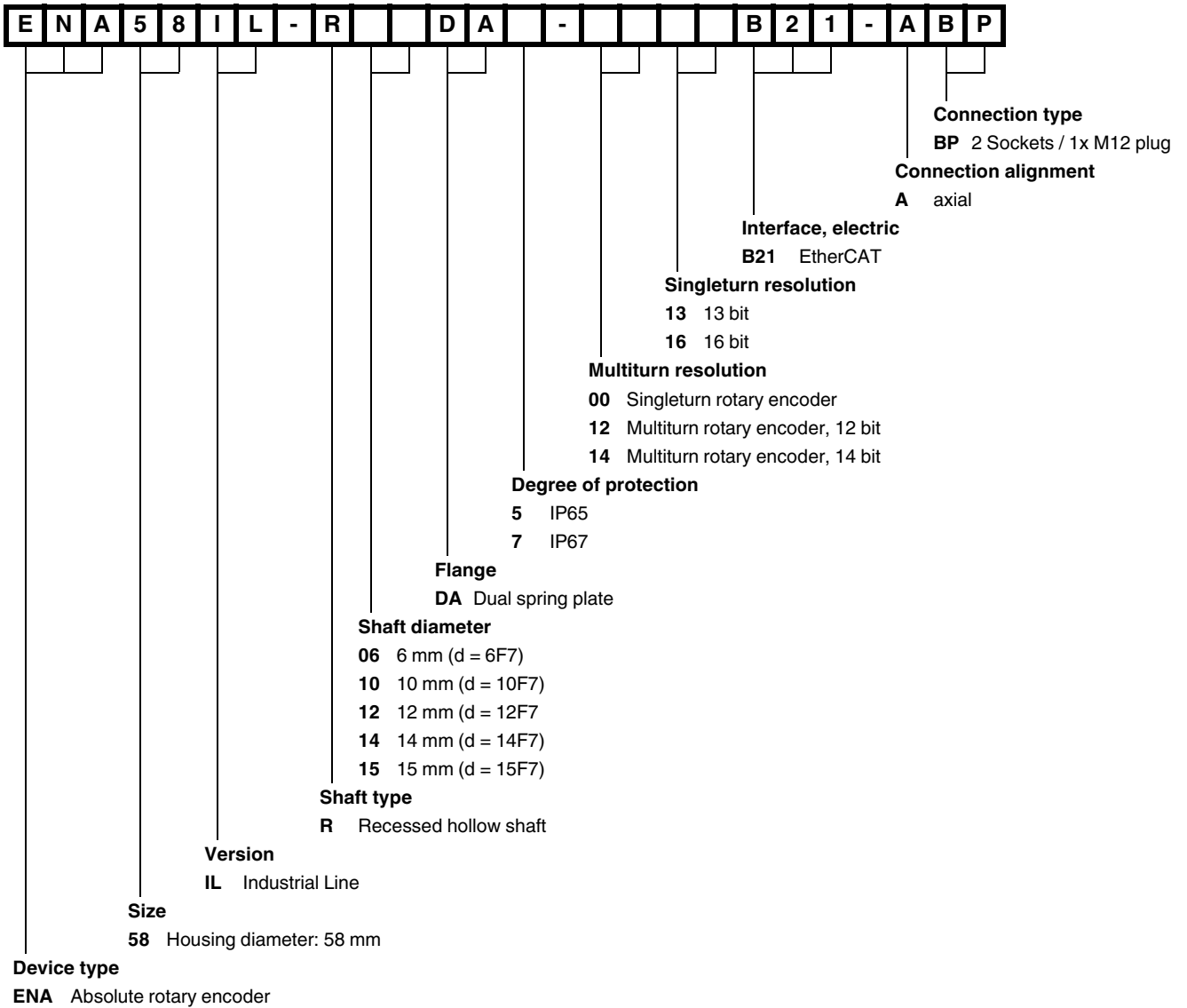
Port LEDs

LED	Color	Status	Description
Link/Act IN	green	on	LINK active for HUB port 1
		blinking	Activity on HUB port 1
Link/Act OUT	green	on	LINK active for HUB port 2
		blinking	Activity on HUB port 2

EtherCAT LEDs

LED	Color	Status	Description
Error	red	off	no error
		blinking	invalid configuration
		single flash	local error
		double flash	process data watchdog timeout/ EtherCAT watchdog timeout
		flickering	booting error
		on	application failure
Run	green	off	initialization
		blinking	Pre-Operational
		single flash	Safe-Operational
		flickering	initialization or bootstrap
		on	Operational





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.
- 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: metalised connector,
shield
clamped with the strain
relief
clamp

Disadvantage: soldering shield on



Safety instructions

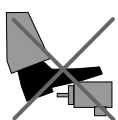
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

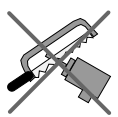
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

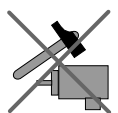
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA42HD-S***-SSI



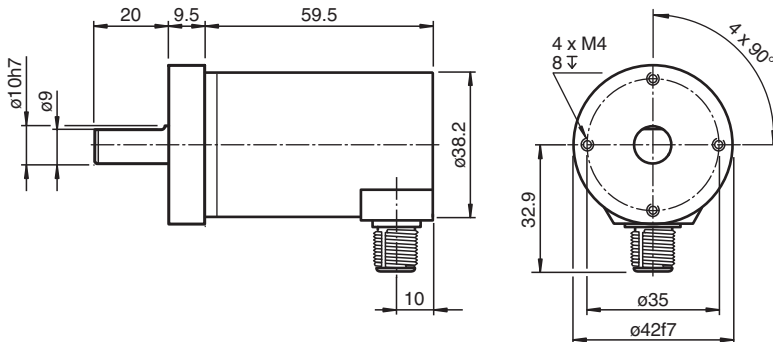
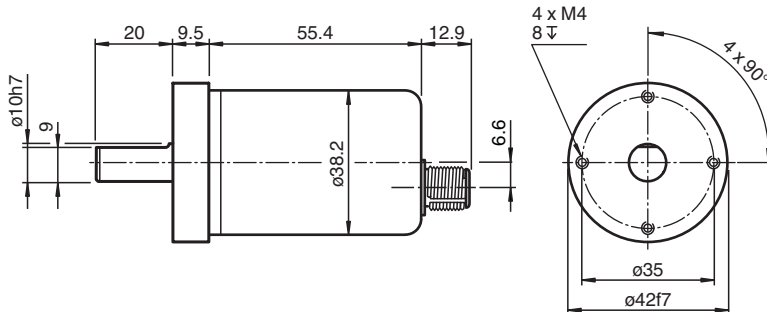
- Solid shaft
- SSI interface
- Up to 32 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Highly shock / vibration and soiling resistant
- Sturdy construction
- Increased shaft load capacity
- Stainless steel housing
- IP69K



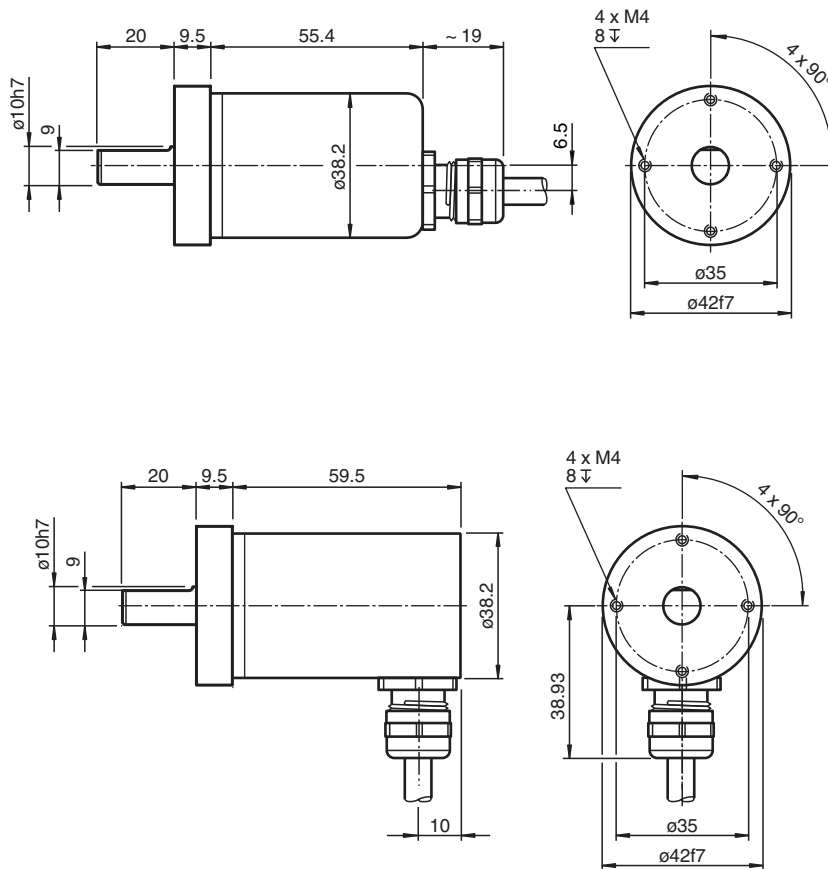
Function

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.

Dimensions



Dimensions



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
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions
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






Technical Data

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	Ø7 mm, 6 x 2 x 0.14 mm ² , 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
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	-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 ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	270 N
Radial	270 N

Accessories

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

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

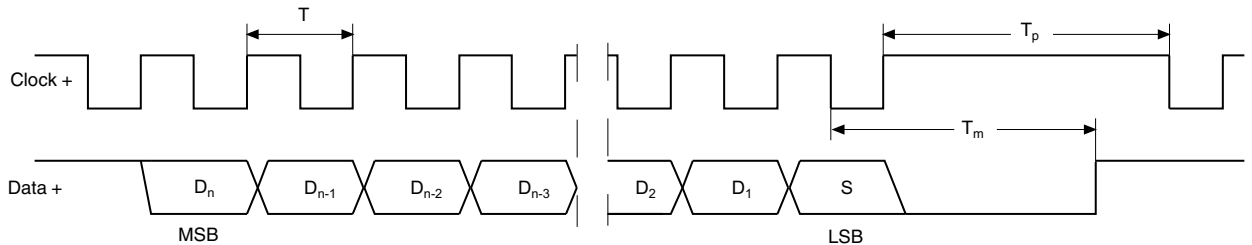
Signal	Cable, 12-core	Connector M12, 8-pin	Explanation
GND (encoder)	White	1	Power supply
U _b (encoder)	Brown	2	Power supply
Clock (+)	Green	3	Positive cycle line
Clock (-)	Yellow	4	Negative cycle line
Data (+)	Grey	5	Positive transmission data
Data (-)	Pink	6	Negative transmission data
V/R	Red	8	Input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

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



- | | | | |
|--|-----------------------|------------------|--|
| D ₁ , ..., D _n : | Position data | T = 1/f: | Duration of period of clock signal ≤ 1 MHz |
| S: | Special bit | T _m : | Monoflop time 20 μs ± 1 μs |
| MSB: | Most significant bit | T _p : | Clock pause ≥ monoflop time (T _p ≥ T _m) |
| LSB: | Least significant bit | | |

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

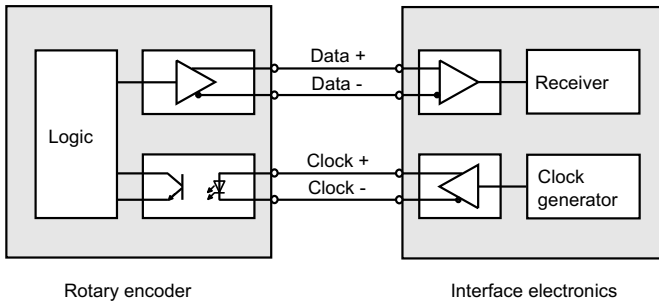
possibility of detecting transmission errors.

- 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

Type Code

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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



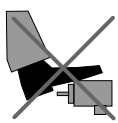
Safety instructions

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

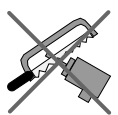
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

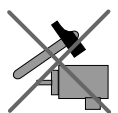
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute encoders ENA36HD-S***-SSI

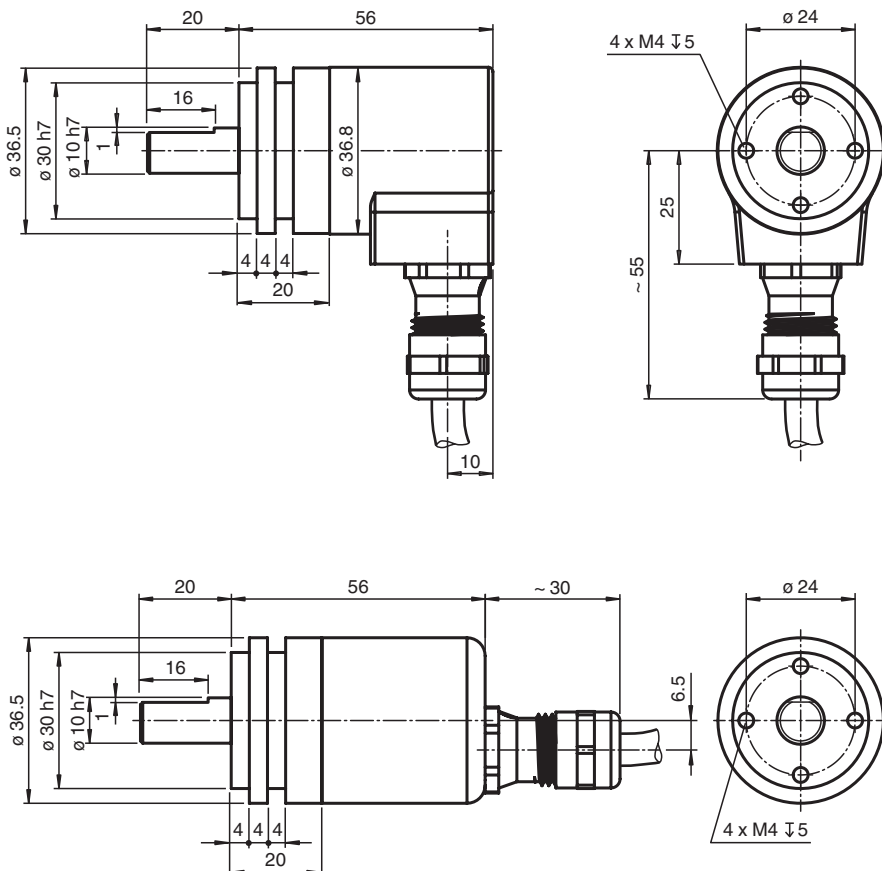
- Very small housing
- Up to 32 bit overall resolution
- SSI interface
- Free of wear magnetic sampling
- High resolution and accuracy
- High climatic resistance



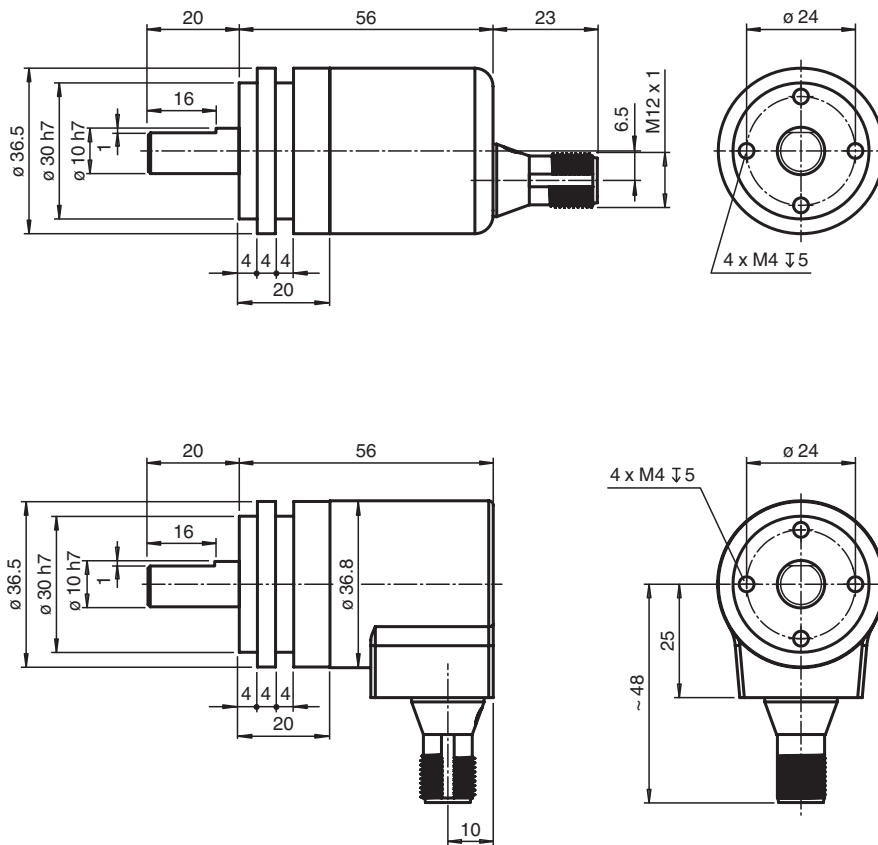
Function

The ENA36HD 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



Dimensions



Technical Data

General specifications

Detection type	magnetic sampling
Device type	Absolute encoders
Linearity error	$\pm 0.1^\circ$
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
Mission Time (T _M)	12 a
L ₁₀	10 E+8 revolutions
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






Technical Data

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 , 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, 200 g, 11 ms
Vibration resistance	DIN EN 60068-2-6, 30 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	powder coated steel
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 150 g
Rotational speed	max. 6000 min ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	180 N
Radial	180 N

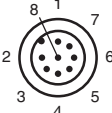
Accessories

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

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

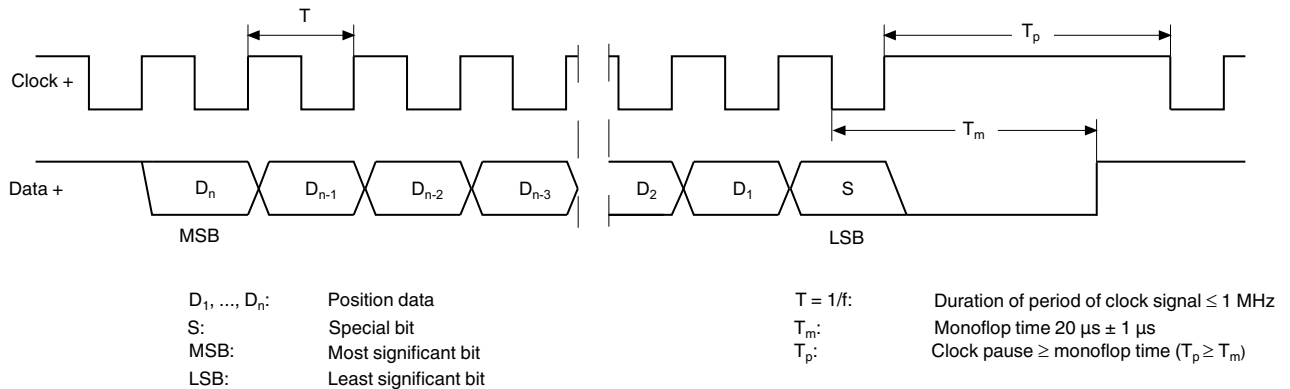
Signal	Wire end	Connector
GND (encoder)	White	1
U _b (encoder)	Brown	2
Clock (+)	Green	3
Clock (-)	Yellow	4
Data (+)	Grey	5
Data (-)	Pink	6
Preset	Blue	7
Counting direction	Red	8
Shielding	Shielding	Housing
Pinout	-	

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.
 As an example: a multiturn encoder with a resolution of 8192 steps/revolution (13 bit) and a max. number of 4096 revolutions

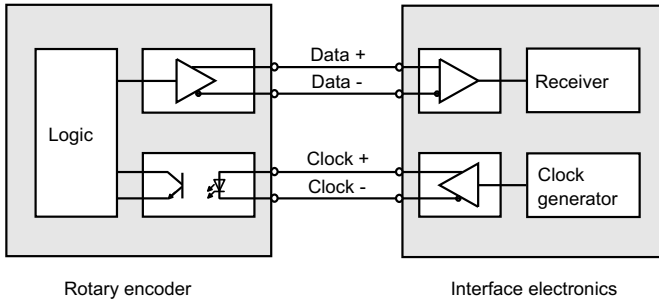
(12 bit) has a total resolution of $n = 25$ bit.

- 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

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.
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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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



Safety instructions

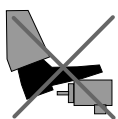
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

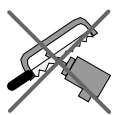
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

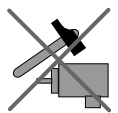
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA36IL-S***-CANopen



- Very small housing
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy



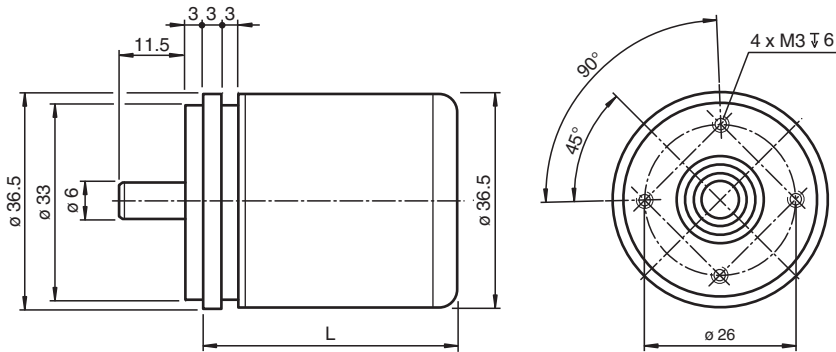
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated CAN bus interface. The integrated CAN-bus interface supports all CANopen functions.

Thus the following modes can be programmed to either enabled or disabled:

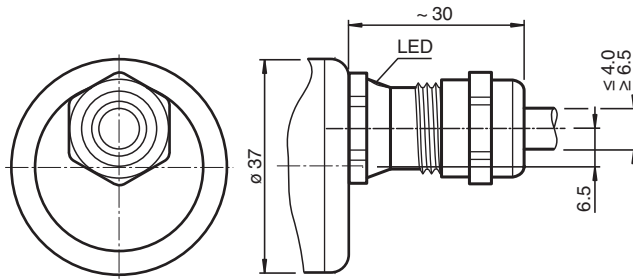
- Polled mode
- Cyclic mode
- Sync mode

Dimensions

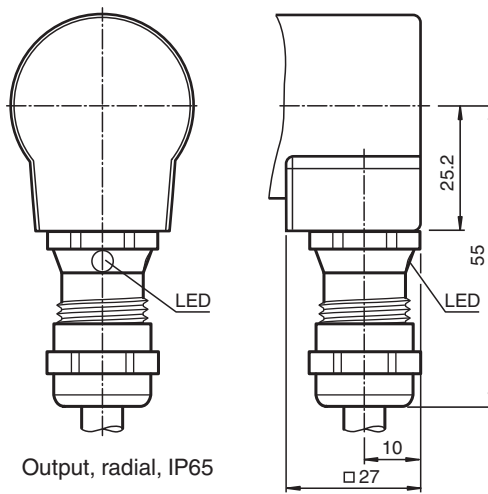


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP54	43	
IP65	43	39

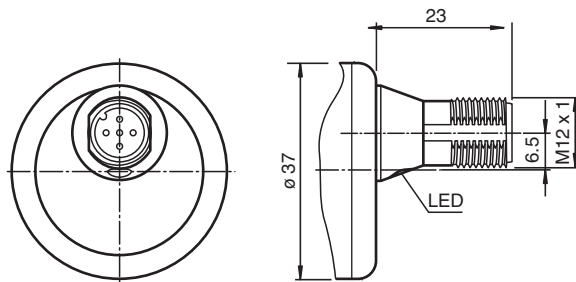
Dimensions



Output, axial, IP65

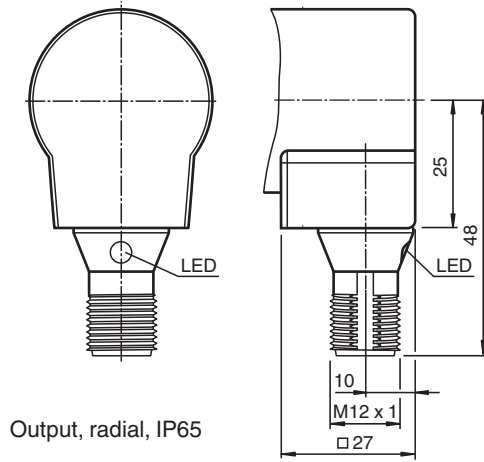


Output, radial, IP65

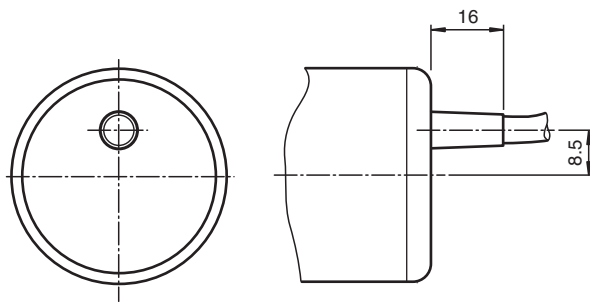


Output, axial, IP65

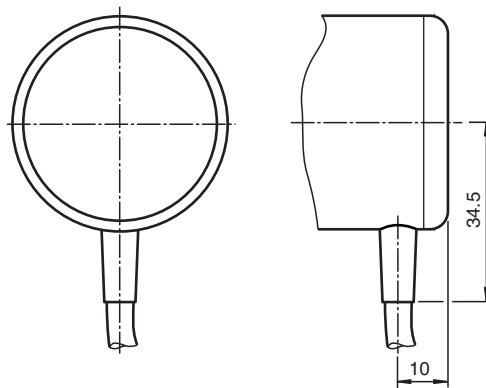
Dimensions



Output, radial, 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	480 a at 40 °C
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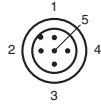
Technical Data

Mission Time (T _M)		20 a
L ₁₀		40 E-8 revolutions at 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Electrical specifications		
Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		DSP 406
Connection		
Connector		M12 connector, 5 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
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		20 N
Radial		40 N

Accessories

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply
Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBaudrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in state bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

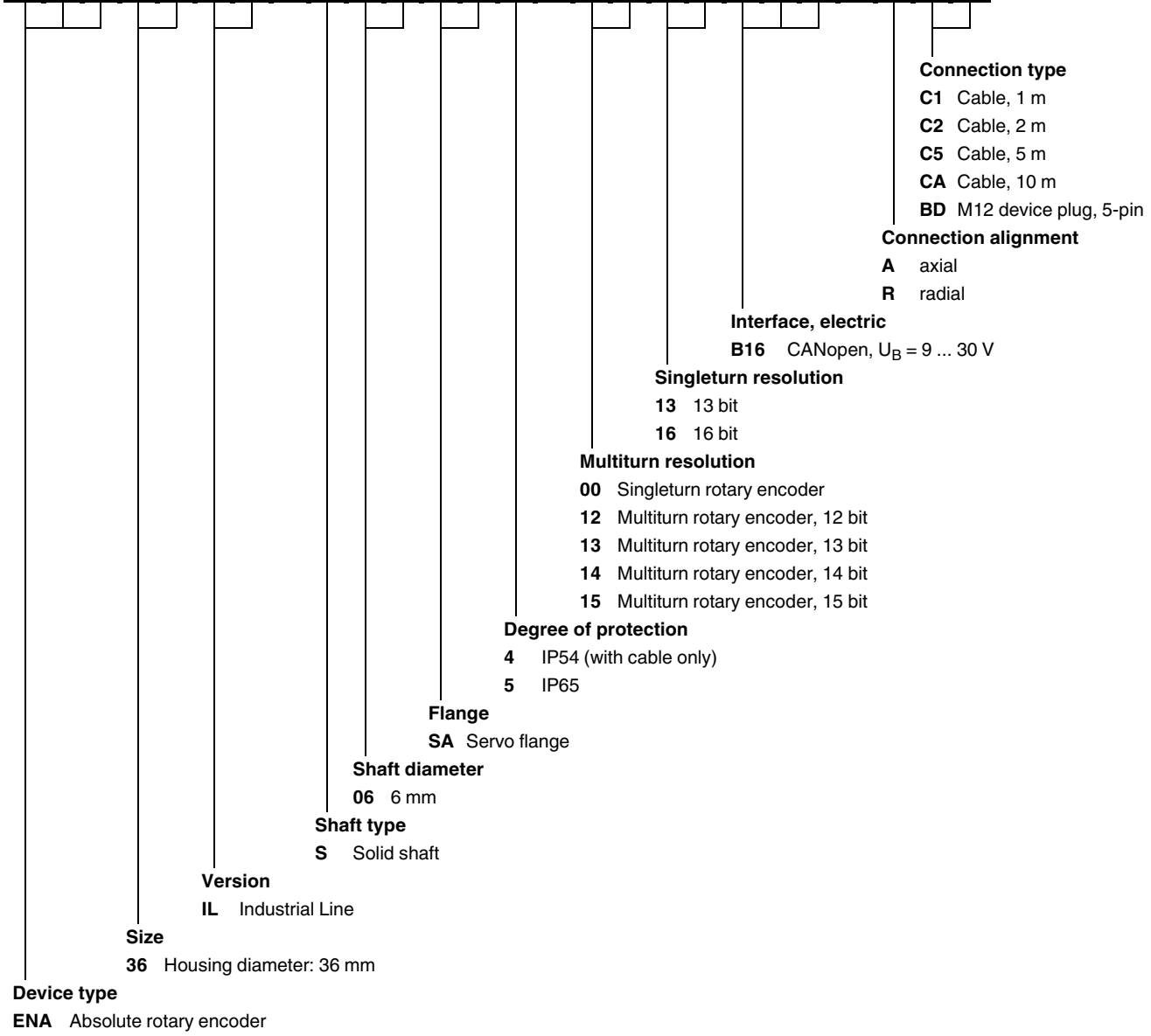
Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Type Code

Model number

E N A 3 6 I L - S 0 6 S A - - - - - B 1 6 - - - -



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.
- 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



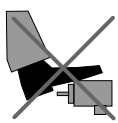
Safety instructions

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

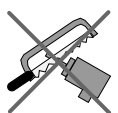
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

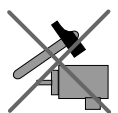
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA36IL-R***-CANopen



- Very small housing
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy



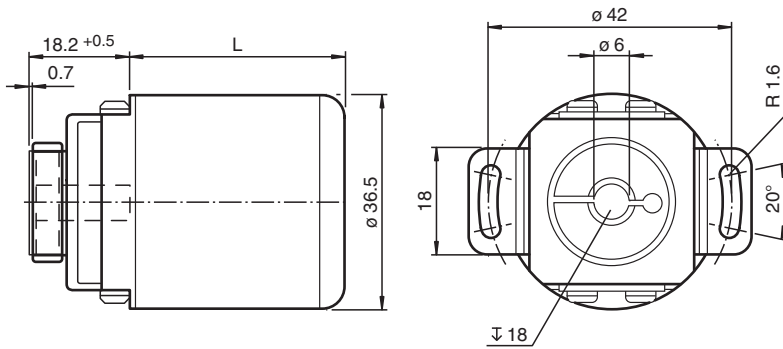
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated CAN bus interface. The integrated CAN-bus interface supports all CANopen functions.

Thus the following modes can be programmed to either enabled or disabled:

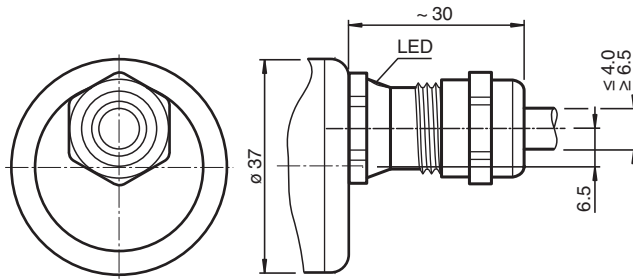
- Polled mode
- Cyclic mode
- Sync mode

Dimensions

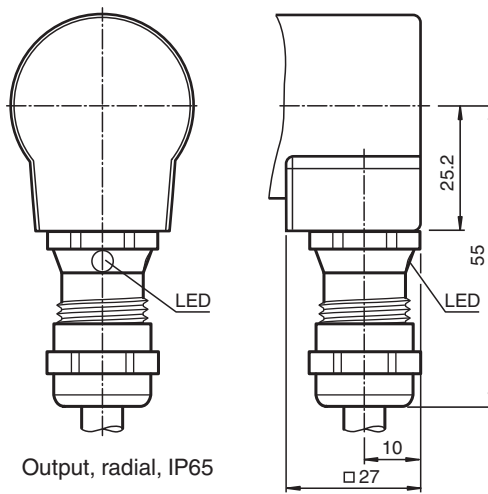


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP54	36	
IP65	36	32

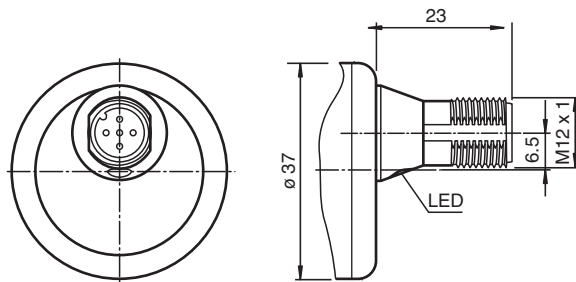
Dimensions



Output, axial, IP65

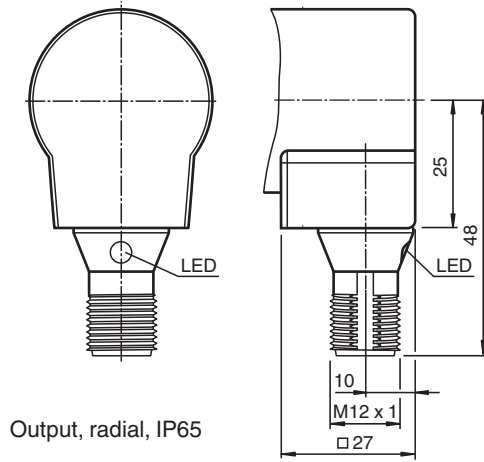


Output, radial, IP65

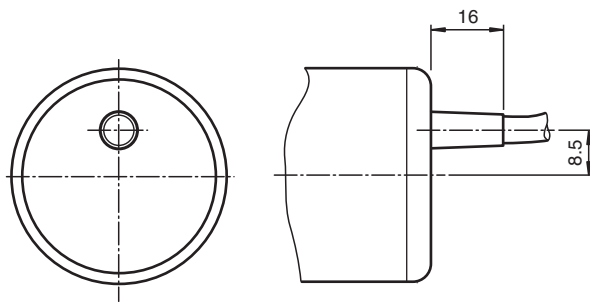


Output, axial, IP65

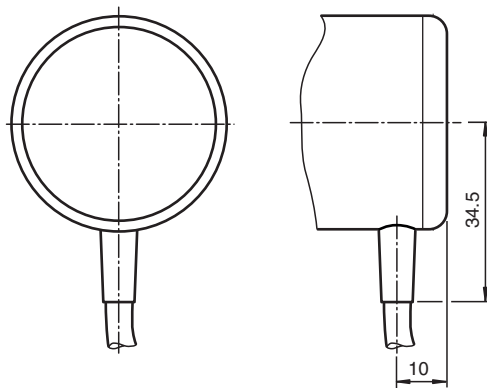
Dimensions



Output, radial, 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.

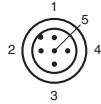
Functional safety related parameters

MTTF _d	480 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	9 ... 30 V DC (with galvanic isolation)
Power consumption	P_0	≤ 1.2 W
Time delay before availability	t_v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		DSP 406
Connection		
Connector		M12 connector, 5 pin
Cable		$\varnothing 6$ 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
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

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply

Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBaudrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in state bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

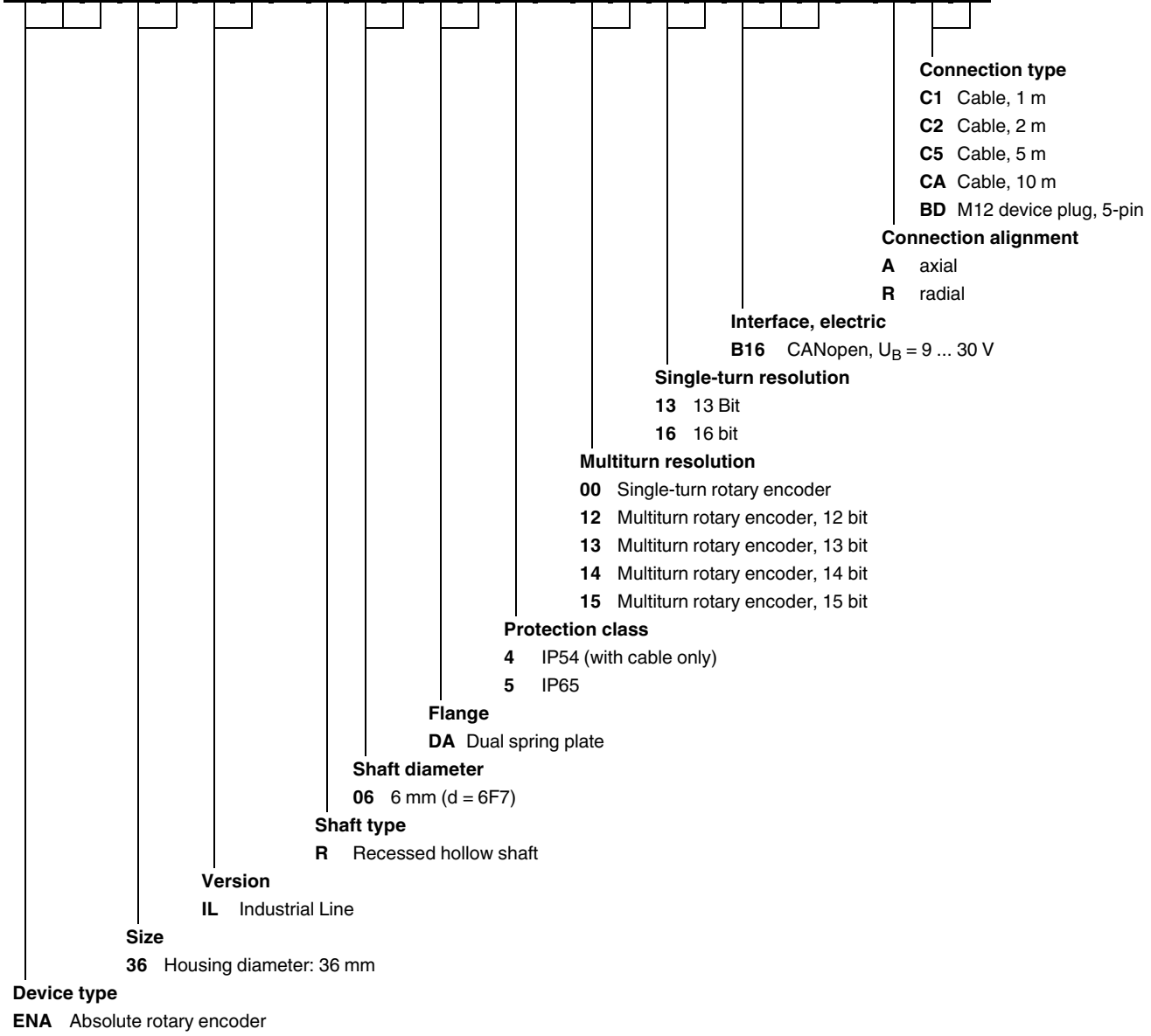
Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Model number

E N A 3 6 I L - R 0 6 D A - - - - - B 1 6 - - - -



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.
- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



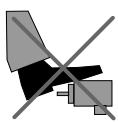
Safety instructions

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

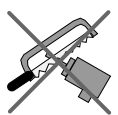
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

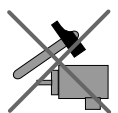
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute encoders

ENA36HD-S***-CANopen

- Very small housing
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy
- High climatic resistance



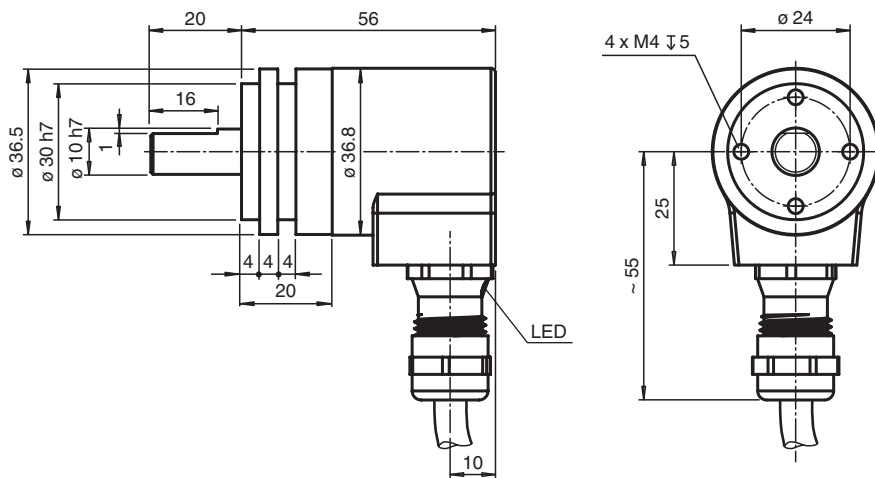
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated CAN bus interface. The integrated CAN-bus interface supports all CANopen functions.

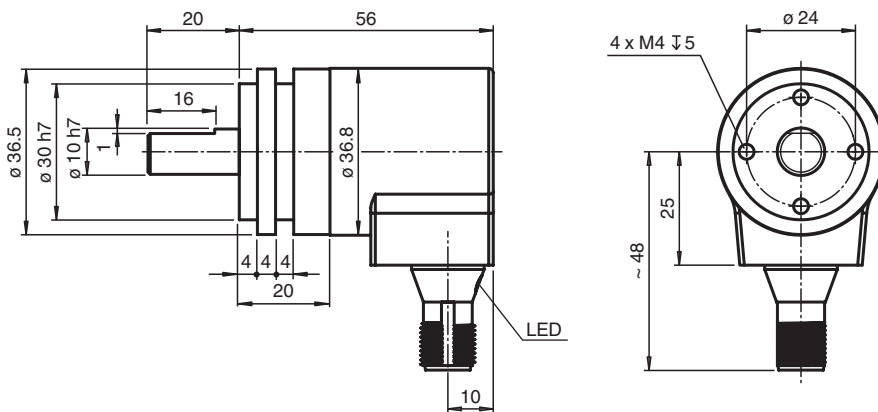
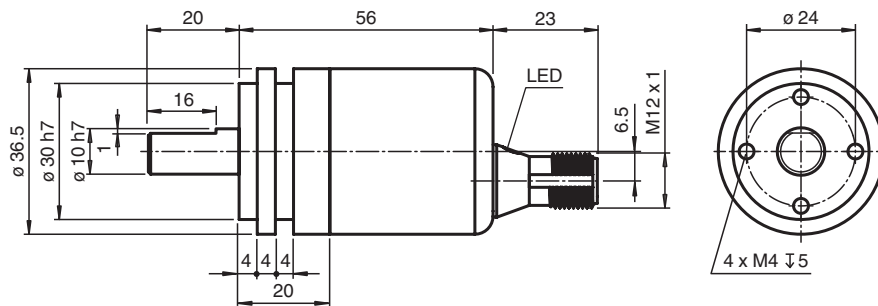
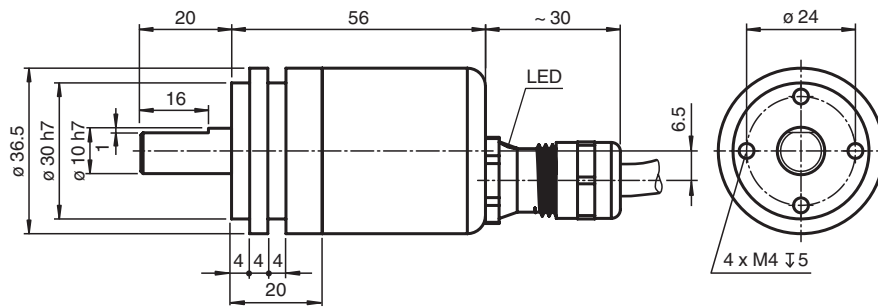
Thus the following modes can be programmed to either enabled or disabled:

- Polled mode
- Cyclic mode
- Sync mode

Dimensions



Dimensions



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	480 a at 40 °C
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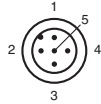
Technical Data

Mission Time (T _M)		20 a
L ₁₀		10 E+8 revolutions
Diagnostic Coverage (DC)		0 %
Electrical specifications		
Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		DSP 406
Connection		
Connector		M12 connector, 5 pin
Cable		Ø6 mm, 4 x 2 x 0.14 mm ²
Standard conformity		
Degree of protection		DIN EN 60529 , 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, 200 g, 11 ms
Vibration resistance		DIN EN 60068-2-6, 30 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		powder coated steel
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 150 g
Rotational speed		max. 6000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		180 N
Radial		180 N

Accessories

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

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply
Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBaudrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in state bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

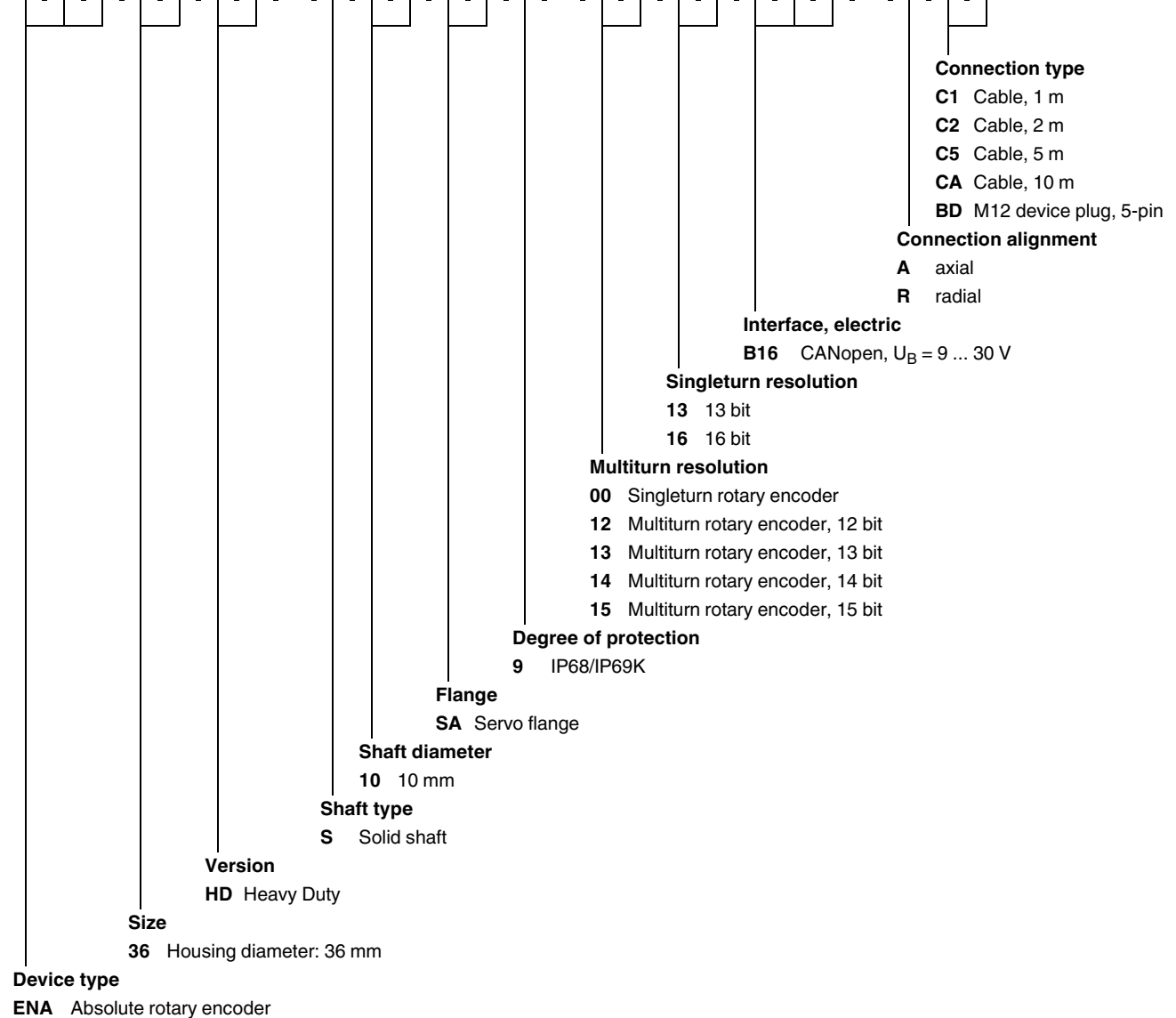
Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Type Code

Model number

E N A 3 6 H D - S 1 0 S A 9 - - - - - B 1 6 - - - - -



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.
- 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



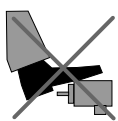
Safety instructions

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

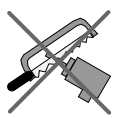
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

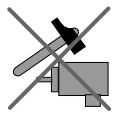
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA42HD-S***-CANopen



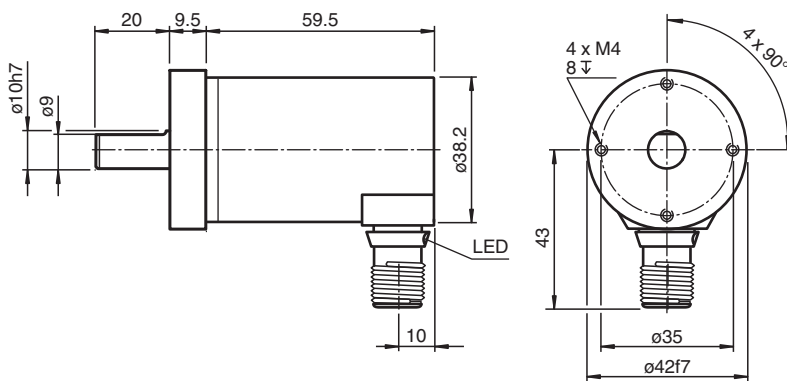
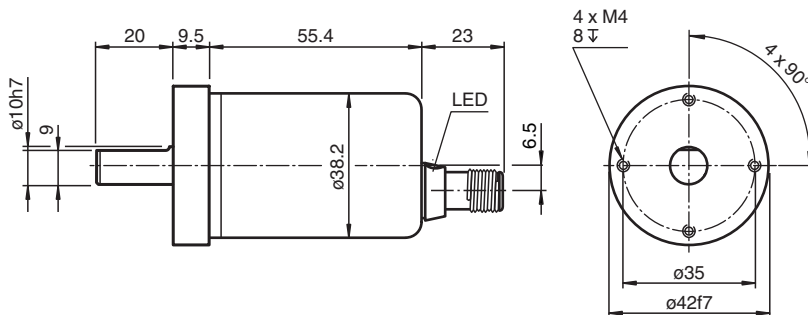
- Solid shaft
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy
- Highly shock / vibration and soiling resistant
- Sturdy construction
- Increased shaft load capacity
- Stainless steel housing
- IP69K



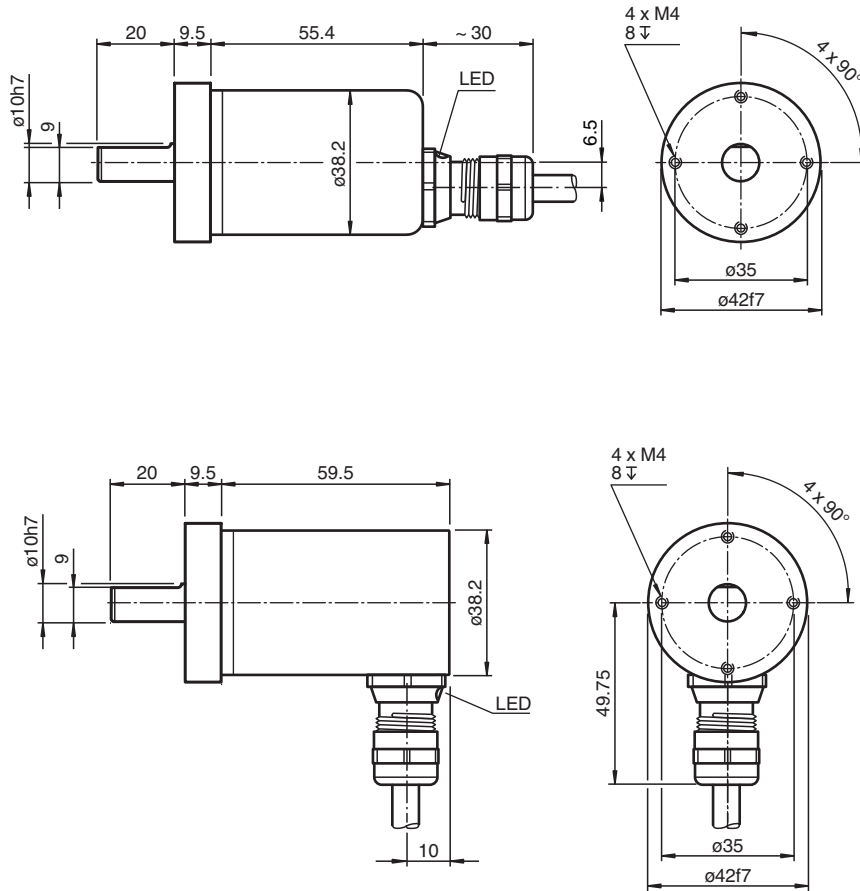
Function

The ENA42HD series are high precision encoders with internal magnetic sampling. This multturn absolute encoder transmits a position value corresponding to the shaft setting via its 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



Dimensions







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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀ ≤ 1 W
Time delay before availability	t _v < 250 ms
Output code	binary code
Code course (counting direction)	adjustable
Interface	
Interface type	CANopen
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 15 Bit

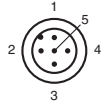
Technical Data

Overall resolution	up to 31 Bit
Transfer rate	min. 20 kBit/s , max. 1 MBit/s
Cycle time	≥ 1 ms
Standard conformity	DSP 406
Connection	
Connector	M12 connector, 5 pin
Cable	Ø6 mm, 4 x 2 x 0.14 mm ²
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
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	-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 ⁻¹
Moment of inertia	30 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	270 N
Radial	270 N

Accessories

	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply
Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBaudrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in state bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

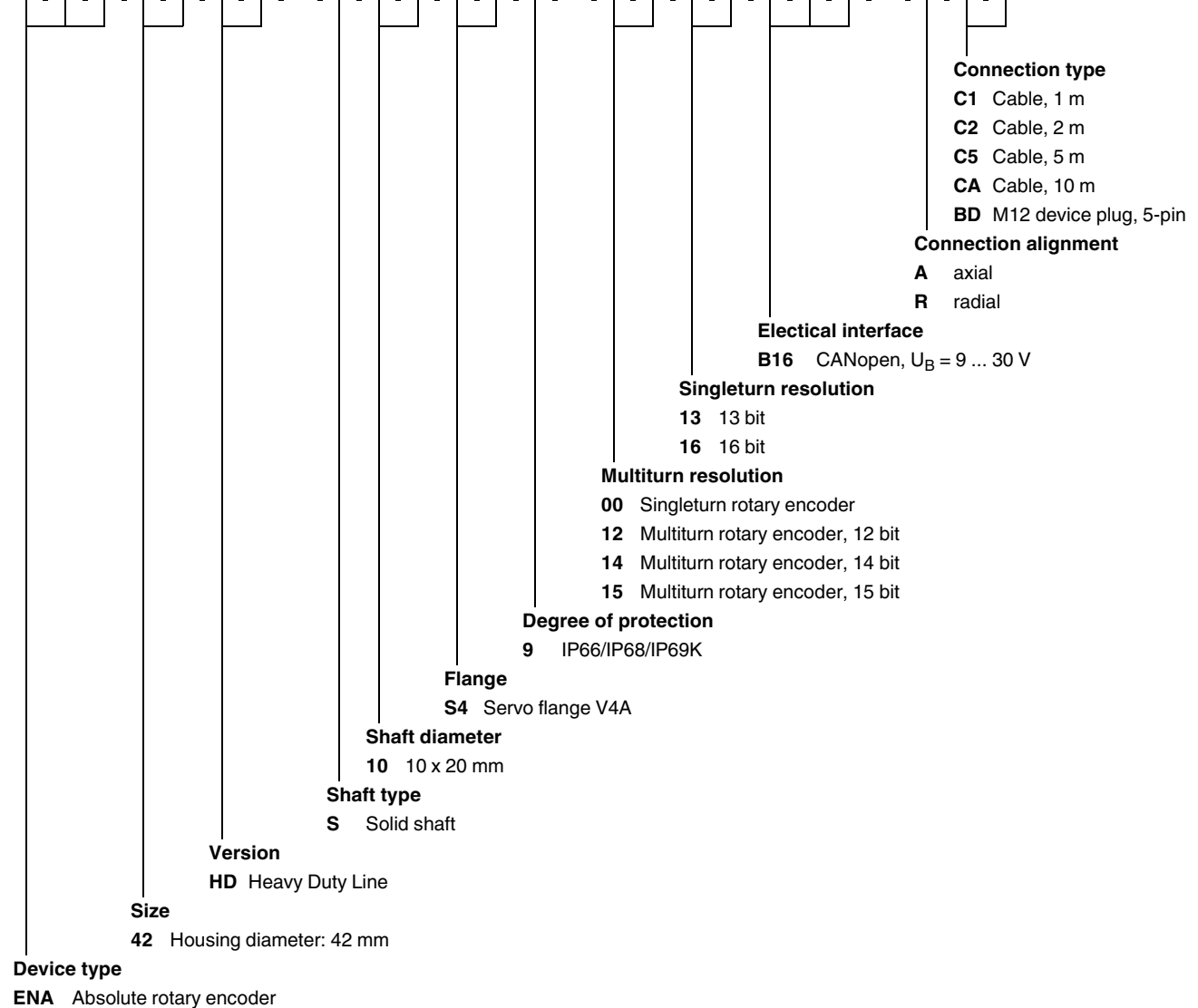
Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Type Code

Model number

E N A 4 2 H D - S 1 0 S 4 9 - - - - B 1 6 - - - -



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.
- 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

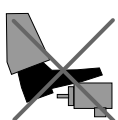
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

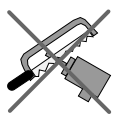
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

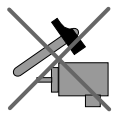
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Singleturn absolute rotary encoder

EVS78E-P



- Up to 16 Bit singleturn
- ATEX approval
- IECEx approval
- Flameproof enclosure
- Removable connection cap



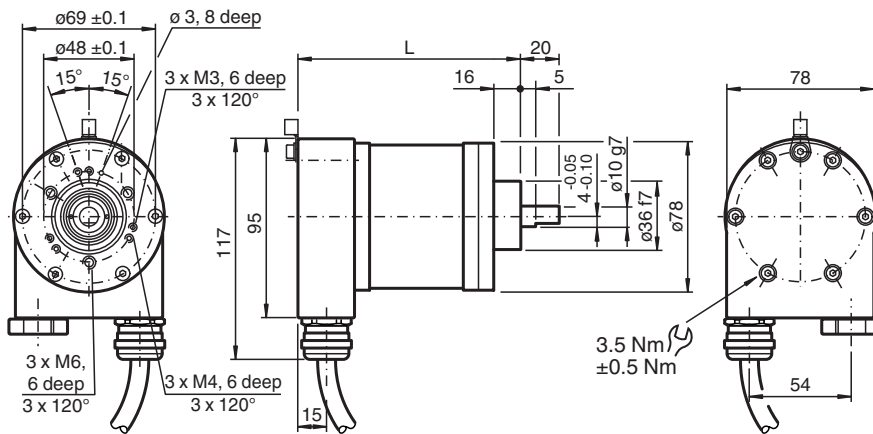
Function

Absolute singleturn rotary encoders deliver an absolute step value for each angle setting. This device has a maximum basic resolution of 65536 steps per revolution (16 bits). The absolute rotary encoder is designed for shaft assembly and is available in servo flange or clamping flange design.

Dimensions

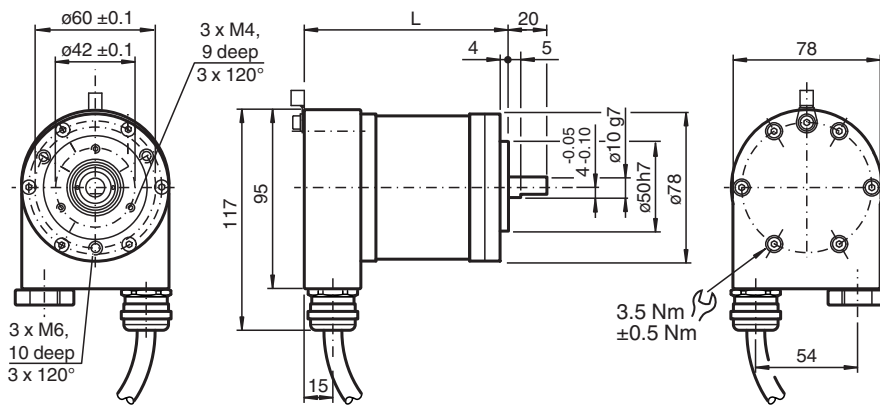
Encoder length L

Version		Length L
Radial cable exit	Clamping flange	134 mm
	Servo flange	134 mm
Axial cable exit	Clamping flange	150 mm
	Servo flange	150 mm

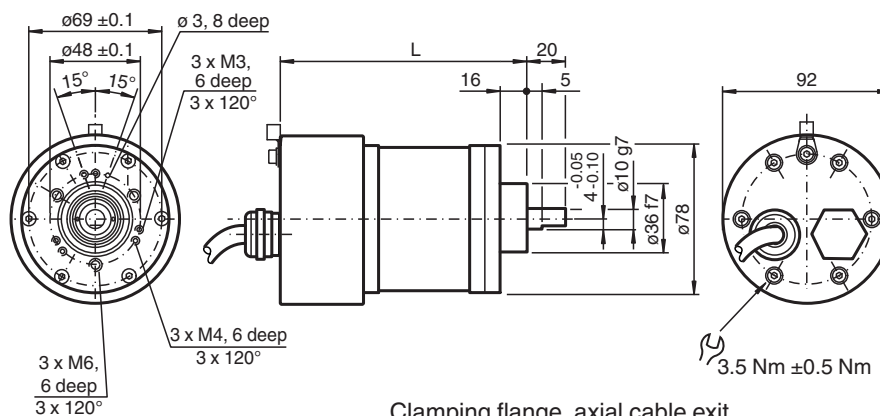


Clamping flange, cable exit radial

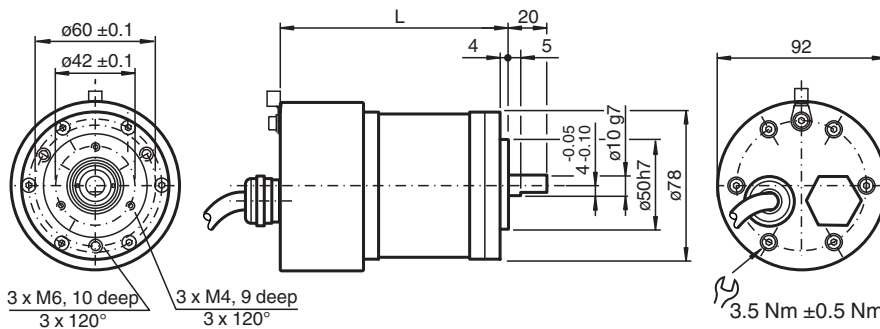
Dimensions



Servo flange, radial cable exit

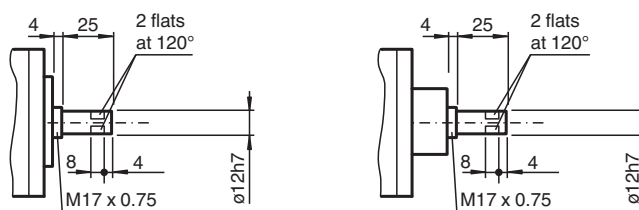


Clamping flange, axial cable exit



Servo flange, axial cable exit

Shaft 12 mm



Technical Data

General specifications

Technical Data

Detection type	photoelectric sampling	
Device type	Singleturn absolute rotary encoder	
Functional safety related parameters		
MTTF _d	120 a	
L ₁₀	7.7 E+9 at 3000 rpm	
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC
No-load supply current	I ₀	max. 230 mA at 10 V DC max. 100 mA at 24 V DC
Time delay before availability	t _v	< 250 ms
Linearity	± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit	
Output code	binary code	
Code course (counting direction)	programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)	
Interface		
Interface type	PROFINET	
Resolution		
Single turn	up to 16 Bit	
Overall resolution	up to 16 Bit	
Transfer rate	100 MBit/s	
Cycle time	≤ 1 ms (IRT) , ≤ 10 ms (RT)	
Connection		
Terminal compartment	see ordering information	
Standard conformity		
Degree of protection	DIN EN 60529, IP66	
Climatic testing	DIN EN 60068-2-78 , no moisture condensation	
Emitted interference	EN 61000-6-4:2007/A1:2011	
Noise immunity	EN 61000-6-2:2005	
Shock resistance	DIN EN 60068-2-27, 100 g, 3 ms	
Vibration resistance	DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz	
Approvals and certificates		
IECEX approval		
Equipment protection level Gb	IECEX ITS 15.0061X	
ATEX approval		
Equipment protection level Gb	ITS 15 ATEX 18372X	
Ambient conditions		
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)	
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)	
Mechanical specifications		
Material		
Combination 1	housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4404 / AISI 316L	
Combination 2 (Inox)	housing: Stainless steel 1.4404 / AISI 316L flange: Stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4404 / AISI 316L	
Mass	approx. 2600 g (combination 1) approx. 3900 g (combination 2)	
Rotational speed	max. 3000 min ⁻¹	
Moment of inertia	180 gcm ²	
Starting torque	≤ 4 Ncm	
Shaft load		
Axial	60 N	
Radial	80 N	
General information		

Technical Data

Use in the hazardous area

see instruction manuals

Type Code

Structure of the type code

E	V	S	7	8	E	-	(1)	(1)	(2)	(3)	(3)	(4)	P	B	(5)	-	0	0	(6)	(6)
---	---	---	---	---	---	---	-----	-----	-----	-----	-----	-----	---	---	-----	---	---	---	-----	-----

E	Data format
E	Ethernet

V	Shaft version
V	Solid shaft

S	Funktional principle
S	Singleturn

78	Size
78	Housing diameter 78 mm

E	Option 1
E	Explosion Proof, Standard IP66

(1) (1)	Shaft diameter
01	Shaft Ø 10 mm x 20 mm
02	Shaft Ø 12 mm x 25 mm

(2)	Flange
1	Clamping flange
2	Servo flange

(3) (3)	Connection type
00	Terminal compartment with two M20 x 1.5 6H threads each, 17 mm thread depth, for cable glands
DR	Terminal compartment, 2 cable glands
KR	Terminal compartment, 1 cable gland, 1 stopping plug

(4)	Exit position
A	Axial
R	Radial

P	Option
P	Profinet

B	Output Code
B	Binary

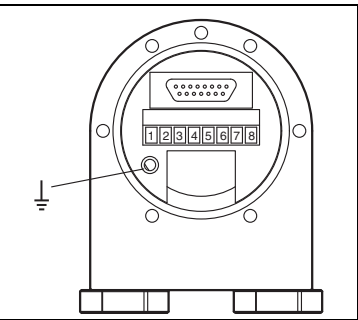
(5)	Housing material
N	Aluminum
I	INOX 1.4404 (AISI 316L)

00	Multiturn: Number of bits and puls count
00	Singleturn rotary encoder

(6) (6)	Singleturn: Number of bits and puls count
13	13 Bits, 8192 Impulse
16	16 Bits, 65536 Impulse

Connection

Signal	Terminal compartment
Ground wire	Grounding terminal
GND (rotary encoder)	1
+U _b (rotary encoder)	2
Not connected	3
Not connected	4
Rx-	5
Tx-	6
Rx+	7
Tx+	8



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.
- 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

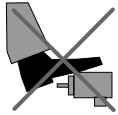


Safety instructions

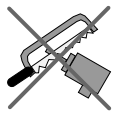
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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!

Absolute encoders

ENA58IL-S***-Profibus



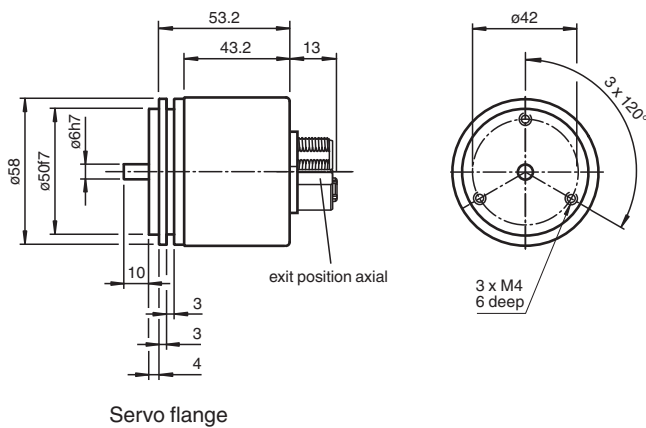
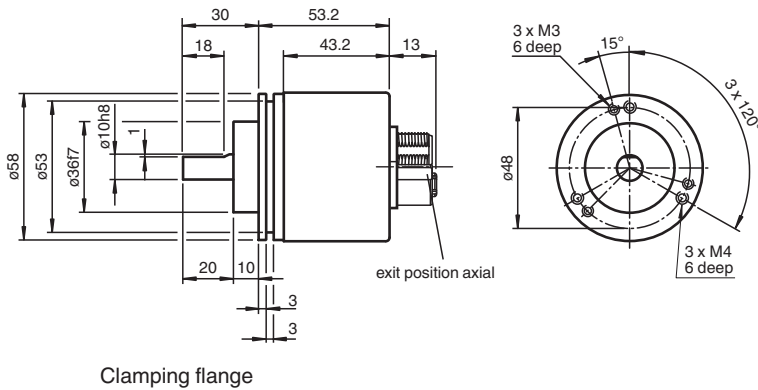
- Solid shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



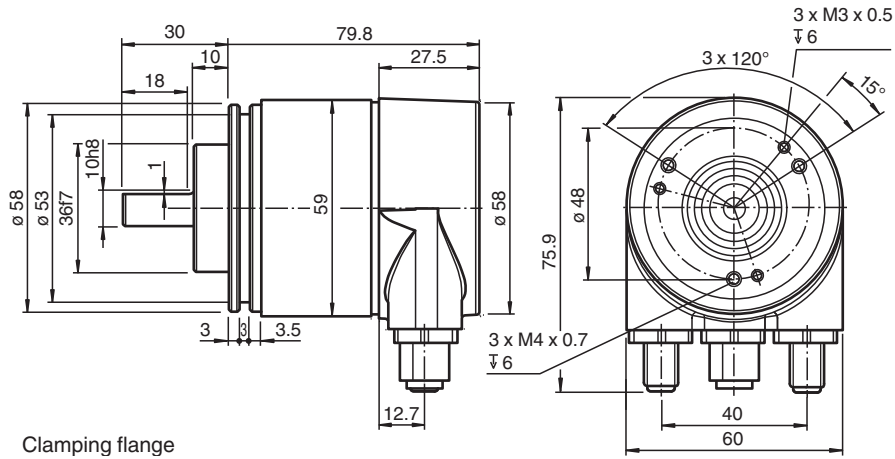
Function

The ENA58IL series with Profibus interface are high-precision rotary encoders with internal magnetic sampling. The most common mechanical interfaces are available in the ENA58IL series. For the electrical connection, models with connection cover and radial connector outlet or cable outlet or models with axial connector outlet are available. This versatility allows the use of the rotary encoder for all common applications.

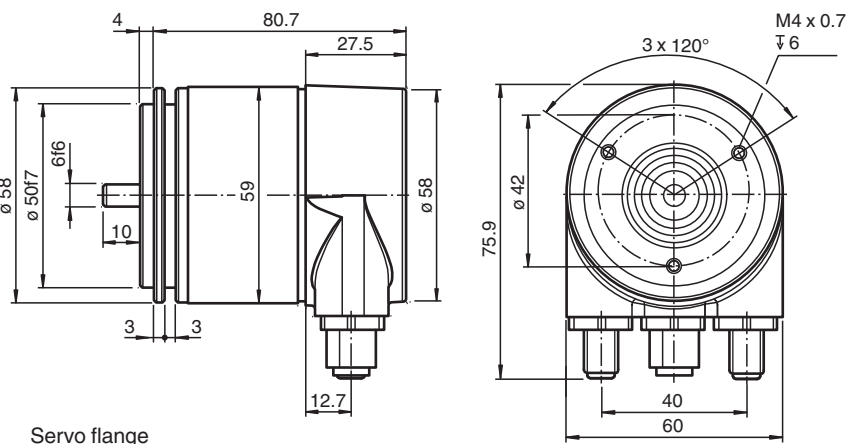
Dimensions



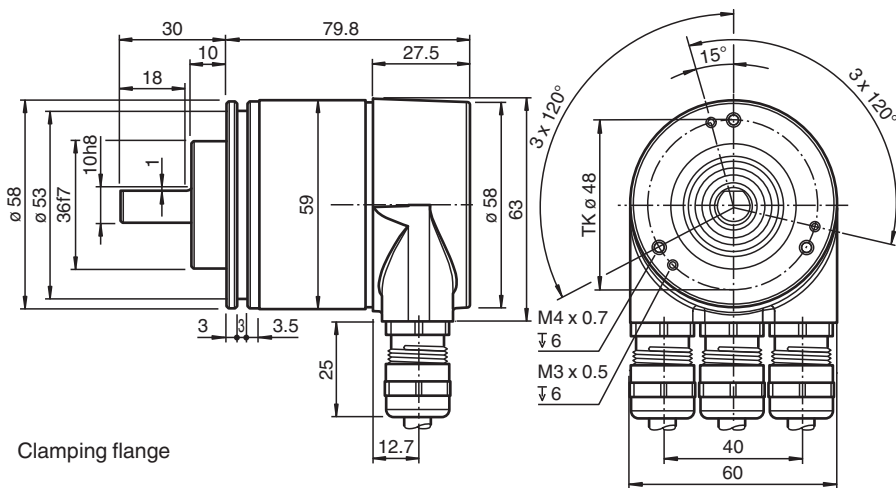
Dimensions



Clamping flange

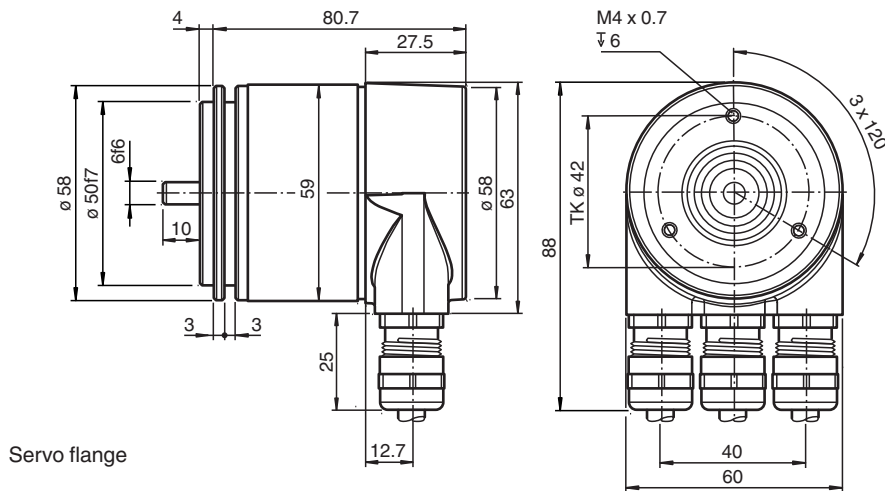


Servo flange



Clamping flange

Dimensions



Servo flange

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	280 a at 40 °C
Mission Time (T _M)	12 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 10 ... 30 V DC
Power consumption	P ₀ approx. 2.5 W
Time delay before availability	t _v < 1000 ms
Output code	binary code
Code course (counting direction)	adjustable
Interface	
Interface type	PROFIBUS DP DPV0, DPV1, DPV2
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	≤ 12 MBit/s
Connection	
Connector	For model with axial connector outlet or connection cover with radial connector outlet: Profibus: 1 plug M12 x 1, 5-pin, B-coded; 1 socket M12 x 1, 5-pin, B-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Terminal compartment	For model with connection cover with radial cable outlet
Standard conformity	
Degree of protection	DIN EN 60529 , axial connector outlet: IP54 connection cover and shaft seal: IP66/IP67 connection cover, no shaft seal: IP65
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, 100 g, 6 ms

Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: t183753_eng.pdf

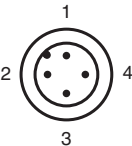
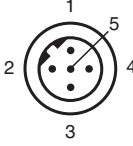
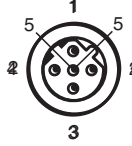
Technical Data

Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g for model without connection cover approx. 480 g for model with connection cover
Rotational speed	max. 12000 min ⁻¹ for IP54, IP65 max. 3000 min ⁻¹ for IP66/IP67
Moment of inertia	30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	40 N
Radial	110 N
Accessories	
Designation	for model without connection cover : Terminator ICZ-TR-V15B, item number 127860 (optional)

Accessories

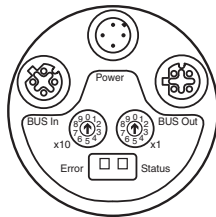
	ICZ-TR-V15B	Terminal resistor for PROFIBUS
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Male connector M12 x 1, 5-pin, B-coded	Female connector M12 x 1, 5-pin, B-coded	Terminal	Explanation
1	Supply voltage +U _B	Not connected	+ 5 V for terminator (2P5)	⊥	Ground connection for power supply
2	Not connected	Data wire A, Bus IN	Data wire A, Bus Out	B (left)	Data line B (pair 1), Bus In
3	0 V	Not connected	GND for terminator (2M)	A (left)	Data line A (pair 1), Bus In
4	Not connected	Data wire B, Bus IN	Data wire B, Bus Out	(-)	0 V
5	-	Not connected	Not connected	(+)	10 V ... 30 V
				B (right)	Data line B (pair 2), Bus Out
				A (right)	Data line A (pair 2), Bus Out
				(-)	0 V
				(+)	10 V ... 30 V
					The supply lines only have to be connected once (regardless to which terminal). The outgoing bus is being uncoupled while the terminal resistor is on.

Operation

Model with axial connector outlet



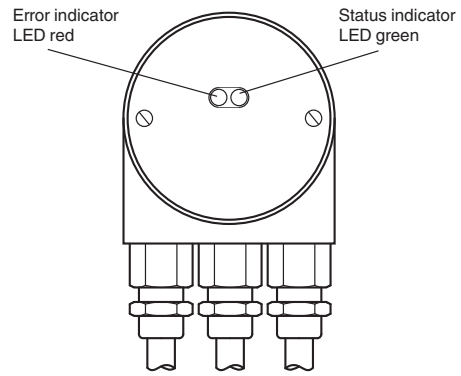
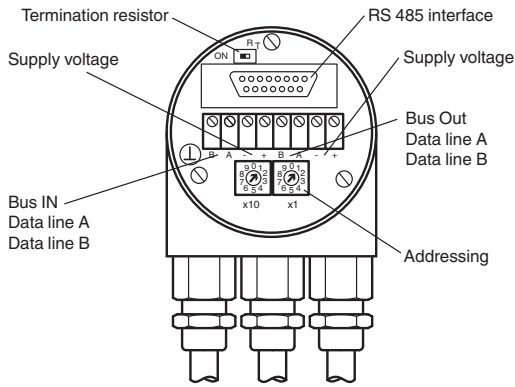
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.

LED-indicators

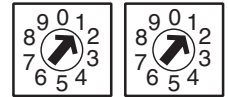
LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Model with connection cover



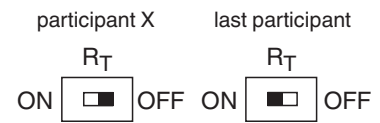
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (220 Ω) can be connected to the circuit by means of the switch:

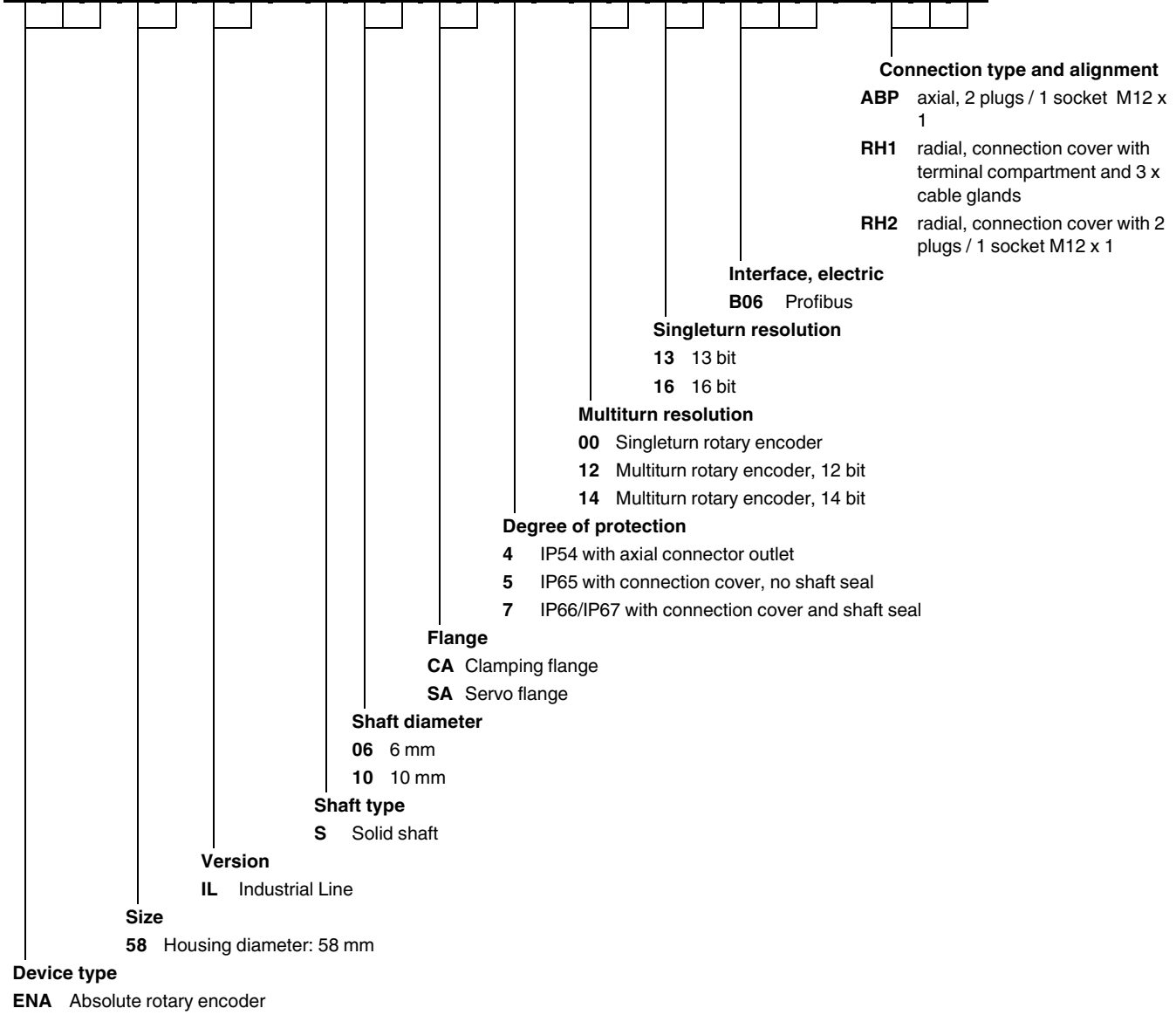


LED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Model number

E N A 5 8 I L - S - - - - - B 0 6 - - - -



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.
- 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
relief	clamped with the strain 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).

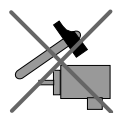
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA58IL-R***-Profibus



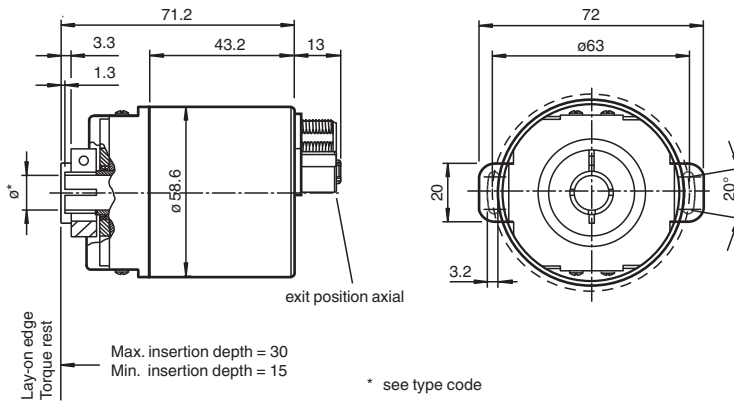
- Recessed hollow shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs



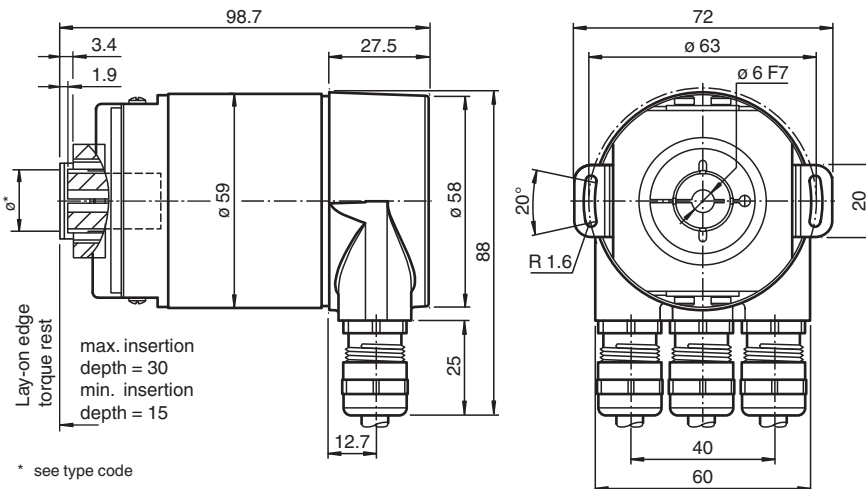
Function

The ENA58IL series with Profibus interface are high-precision rotary encoders with internal magnetic sampling. The most common mechanical interfaces are available in the ENA58IL series. For the electrical connection, models with connection cover and radial connector outlet or cable outlet or models with axial connector outlet are available. This versatility allows the use of the rotary encoder for all common applications.

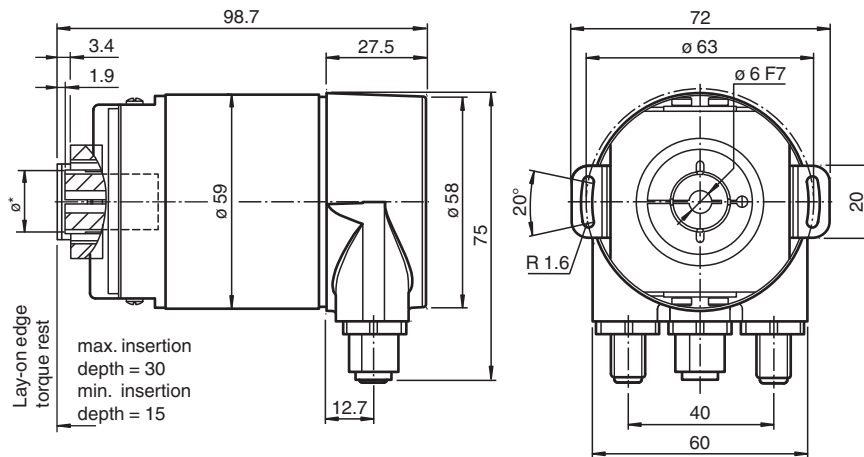
Dimensions



Recessed hollow shaft



Dimensions



* see type code

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	280 a at 40 °C
Mission Time (T _M)	12 a
L ₁₀	5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

Electrical specifications

Operating voltage	U _B	10 ... 30 V DC
Power consumption	P ₀	approx. 2.5 W
Time delay before availability	t _v	< 1000 ms
Output code		binary code
Code course (counting direction)		adjustable

Interface

Interface type	PROFIBUS DP DPV0, DPV1, DPV2
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	≤ 12 MBit/s

Connection

Connector	For model with axial connector outlet or connection cover with radial connector outlet: Profibus: 1 plug M12 x 1, 5-pin, B-coded; 1 socket M12 x 1, 5-pin, B-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Terminal compartment	For model with connection cover with radial cable outlet









Standard conformity

Degree of protection	DIN EN 60529, axial connector outlet: IP54 connection cover and shaft seal: IP66/IP67 connection cover, no shaft seal: IP65
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, 100 g, 6 ms

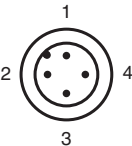
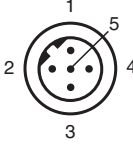
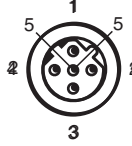
Technical Data

Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g for model without connection cover approx. 510 g for model with connection cover
Rotational speed	max. 12000 min ⁻¹ for IP54, IP65 max. 3000 min ⁻¹ for IP66/IP67
Moment of inertia	30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static
Accessories	
Designation	for model without connection cover : Terminator ICZ-TR-V15B, item number 127860 (optional)

Accessories

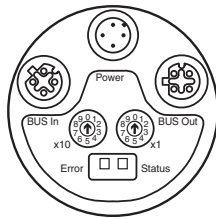
	ICZ-TR-V15B	Terminal resistor for PROFIBUS
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	ACC-PACK-ABS-S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Male connector M12 x 1, 5-pin, B-coded	Female connector M12 x 1, 5-pin, B-coded	Terminal	Explanation
1	Supply voltage +U _B	Not connected	+ 5 V for terminator (2P5)	⊥	Ground connection for power supply
2	Not connected	Data wire A, Bus IN	Data wire A, Bus Out	B (left)	Data line B (pair 1), Bus In
3	0 V	Not connected	GND for terminator (2M)	A (left)	Data line A (pair 1), Bus In
4	Not connected	Data wire B, Bus IN	Data wire B, Bus Out	(-)	0 V
5	-	Not connected	Not connected	(+)	10 V ... 30 V
				B (right)	Data line B (pair 2), Bus Out
				A (right)	Data line A (pair 2), Bus Out
				(-)	0 V
				(+)	10 V ... 30 V
					The supply lines only have to be connected once (regardless to which terminal). The outgoing bus is being uncoupled while the terminal resistor is on.

Operation

Model with axial connector outlet



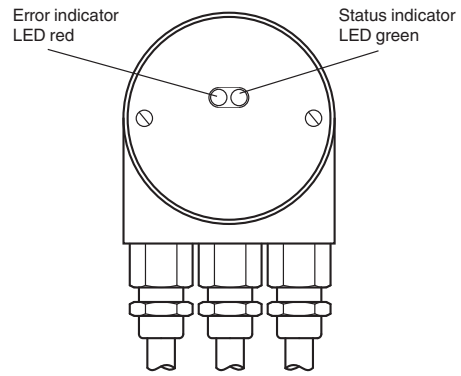
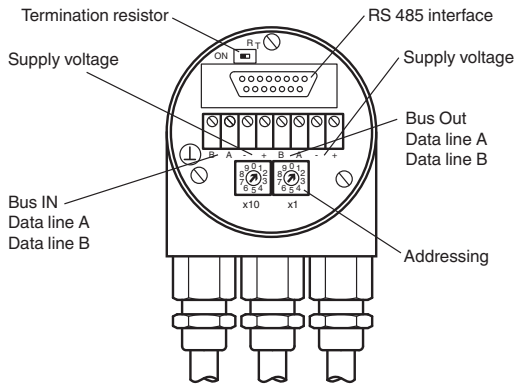
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.

LED-indicators

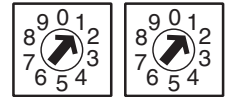
LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Model with connection cover



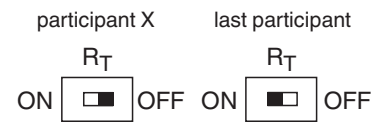
Adjusting the participant address

The participant address can be adjusted with the rotary switches. The address can be defined between 1 and 99, and may only be assigned once.



Adjusting the termination resistor

The terminating resistor R_T (220 Ω) can be connected to the circuit by means of the switch:

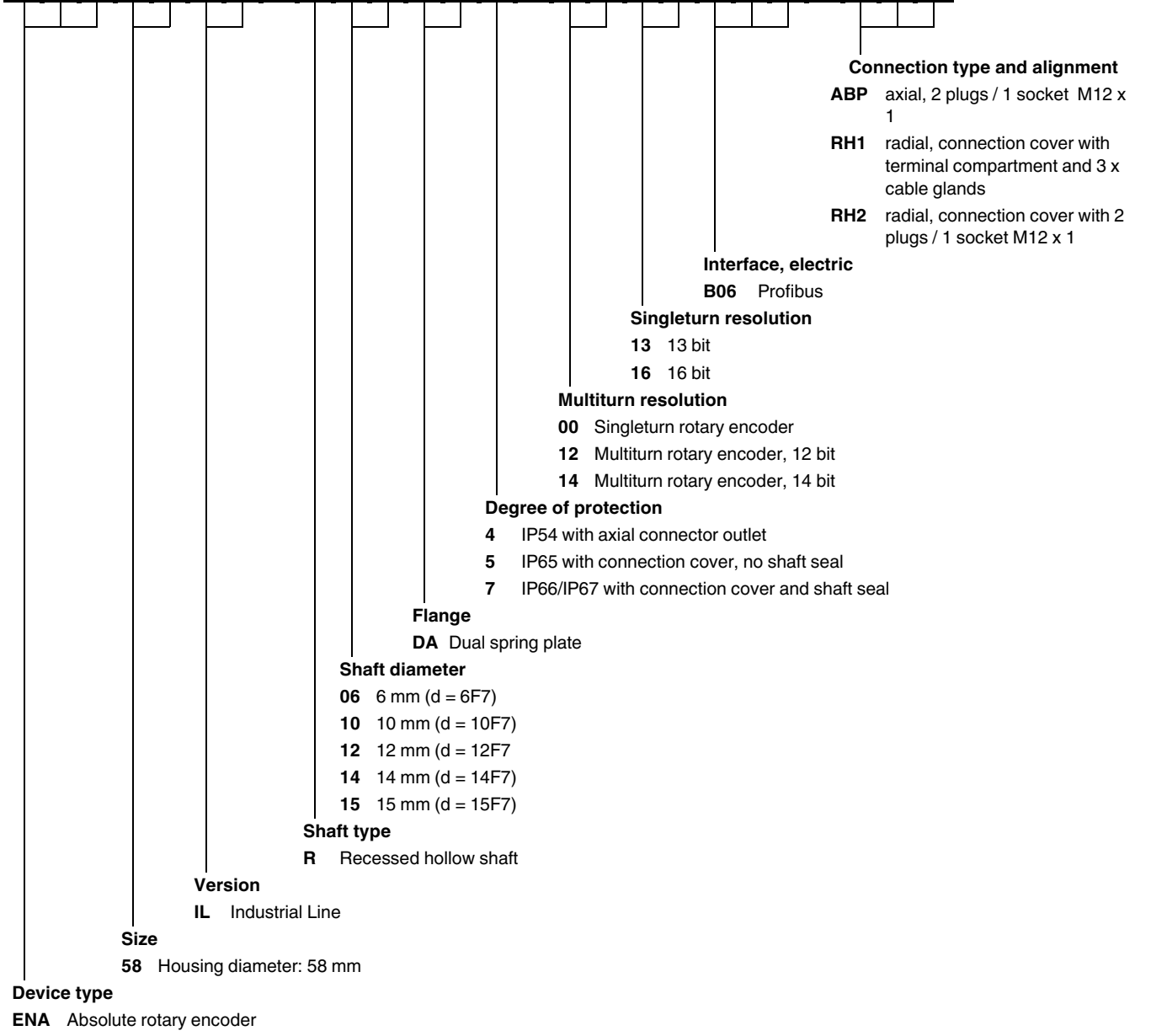


LED-indicators

LED red	LED green	Meaning
off	off	No voltage supply
on	on	Encoder ready, no configuration data received. possible reasons: - wrong address adjusted - wrong bus wiring
on	flashing	Parameterising or configuration error. Encoder receives data of incorrect length or inconsistent data. possible reason: adjusted encoder resolution exceeds
flashing	on	Encoder ready, no communication with master (i.e. wrong address setting)
on	off	Data timeout (> 40 s). (i.e. data lines interrupted)
off	on	Normal operation, Data Exchange Mode
off	flashing	Installation Mode in Data Exchange Mode.

Model number

E N A 5 8 I L - R D A - B 0 6 -



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.
- 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 relief clamp
Disadvantage:	soldering shield on



Safety instructions

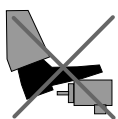
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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).

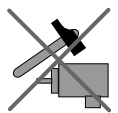
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute encoders

ENA58IL-S***-CANopen

- Solid shaft
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy



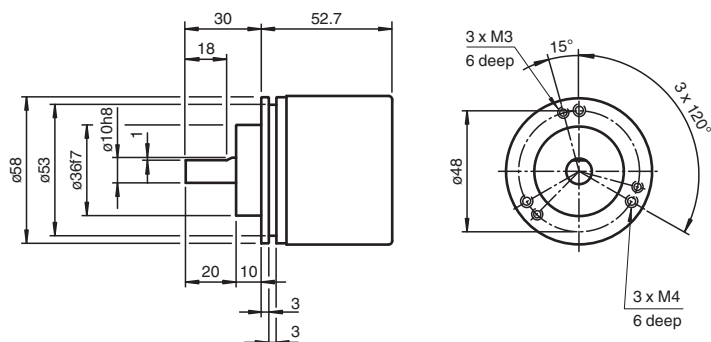
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated CAN bus interface. The integrated CAN-bus interface supports all CANopen functions.

Thus the following modes can be programmed to either enabled or disabled:

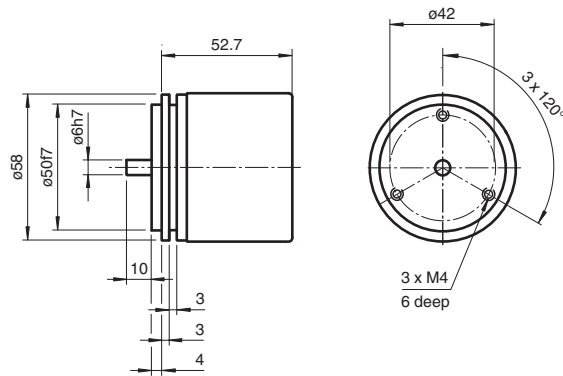
- Polled mode
- Cyclic mode
- Sync mode

Dimensions



Clamping flange

Dimensions

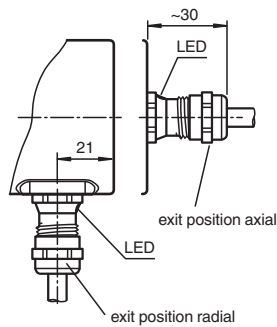


Servo flange

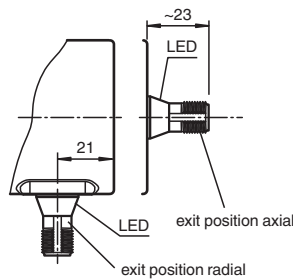
Connections

Dimensions in mm

Cable



Connector M12








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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Electrical specifications	
Operating voltage	U _B 9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀ ≤ 1.2 W
Time delay before availability	t _v < 250 ms
Output code	binary code
Code course (counting direction)	adjustable
Interface	
Interface type	CANopen
Resolution	

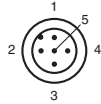
Technical Data

Single turn	up to 16 Bit
Multiturn	up to 15 Bit
Overall resolution	up to 31 Bit
Transfer rate	min. 20 kBit/s , max. 1 MBit/s
Cycle time	≥ 1 ms
Standard conformity	DSP 406
Connection	
Connector	M12 connector, 5 pin
Cable	Ø6 mm, 4 x 2 x 0.14 mm ²
Standard conformity	
Degree of protection	DIN EN 60529, IP65 or IP67
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 , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	V15-G-BK2M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK5M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK10M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply

Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBitrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in stae bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

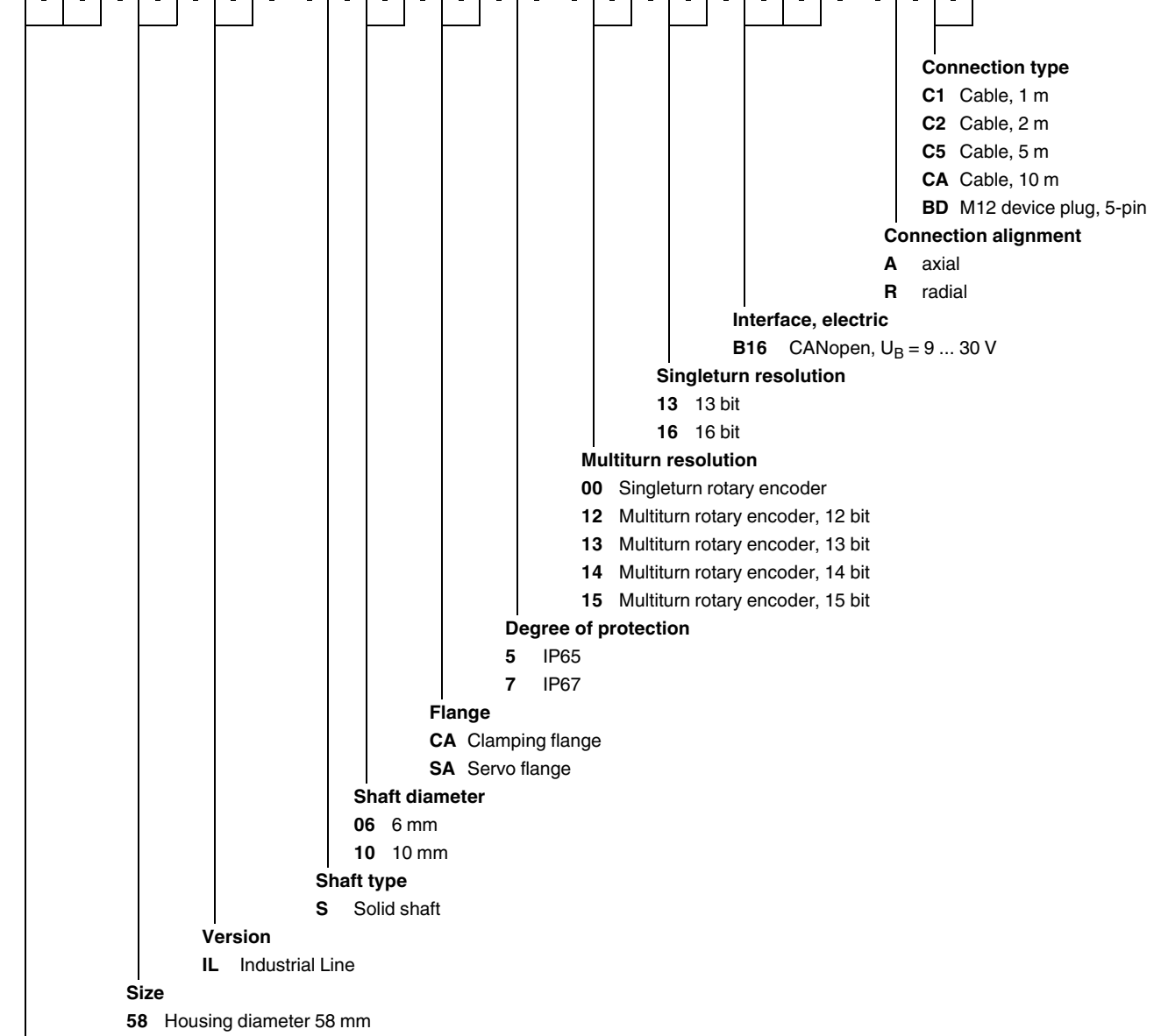
Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Type Code

Model number

E N A 5 8 I L - S - - - - - B 1 6 - - - -



- Connection type**
C1 Cable, 1 m
C2 Cable, 2 m
C5 Cable, 5 m
CA Cable, 10 m
BD M12 device plug, 5-pin
- Connection alignment**
A axial
R radial

Interface, electric
B16 CANopen, U_B = 9 ... 30 V

Singleturn resolution
13 13 bit
16 16 bit

Multiturn resolution
00 Singleturn rotary encoder
12 Multiturn rotary encoder, 12 bit
13 Multiturn rotary encoder, 13 bit
14 Multiturn rotary encoder, 14 bit
15 Multiturn rotary encoder, 15 bit

Degree of protection
5 IP65
7 IP67

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

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.

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- 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.
- 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.

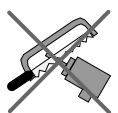
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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.



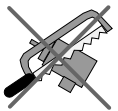
Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA58IL-R***-CANopen



- Recessed hollow shaft
- Up to 31 bit overall resolution
- CANopen interface
- Free of wear magnetic sampling
- High resolution and accuracy



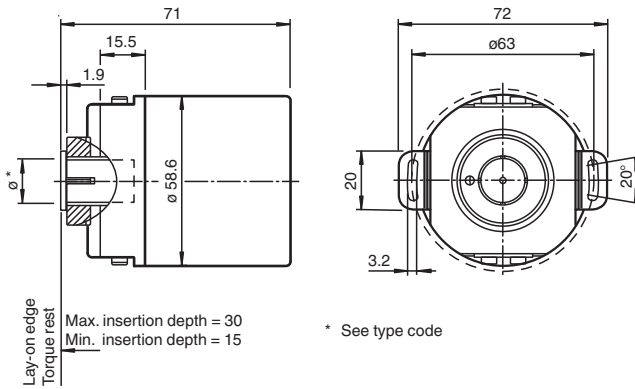
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated CAN bus interface. The integrated CAN-bus interface supports all CANopen functions.

Thus the following modes can be programmed to either enabled or disabled:

- Polled mode
- Cyclic mode
- Sync mode

Dimensions



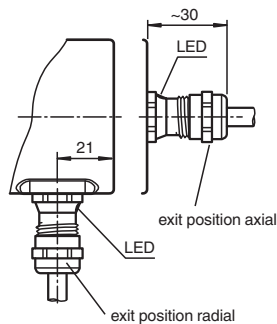
Recessed hollow shaft

Dimensions

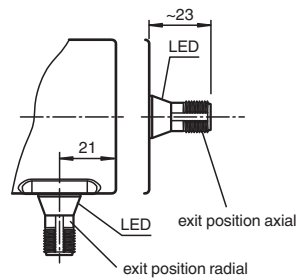
Connections

Dimensions in mm

Cable



Connector M12



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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

Electrical specifications

Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable

Interface

Interface type	CANopen
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 15 Bit
Overall resolution	up to 31 Bit
Transfer rate	min. 20 kBit/s , max. 1 MBit/s
Cycle time	≥ 1 ms
Standard conformity	DSP 406

Connection

Connector	M12 connector, 5 pin
Cable	Ø6 mm, 4 x 2 x 0.14 mm ²








Standard conformity

Degree of protection	DIN EN 60529, IP65 or IP67
Climatic testing	DIN EN 60068-2-3, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005

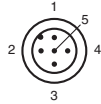
Technical Data

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 , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static

Accessories

	V15-G-BK2M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK5M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK10M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply

Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBaudrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in state bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

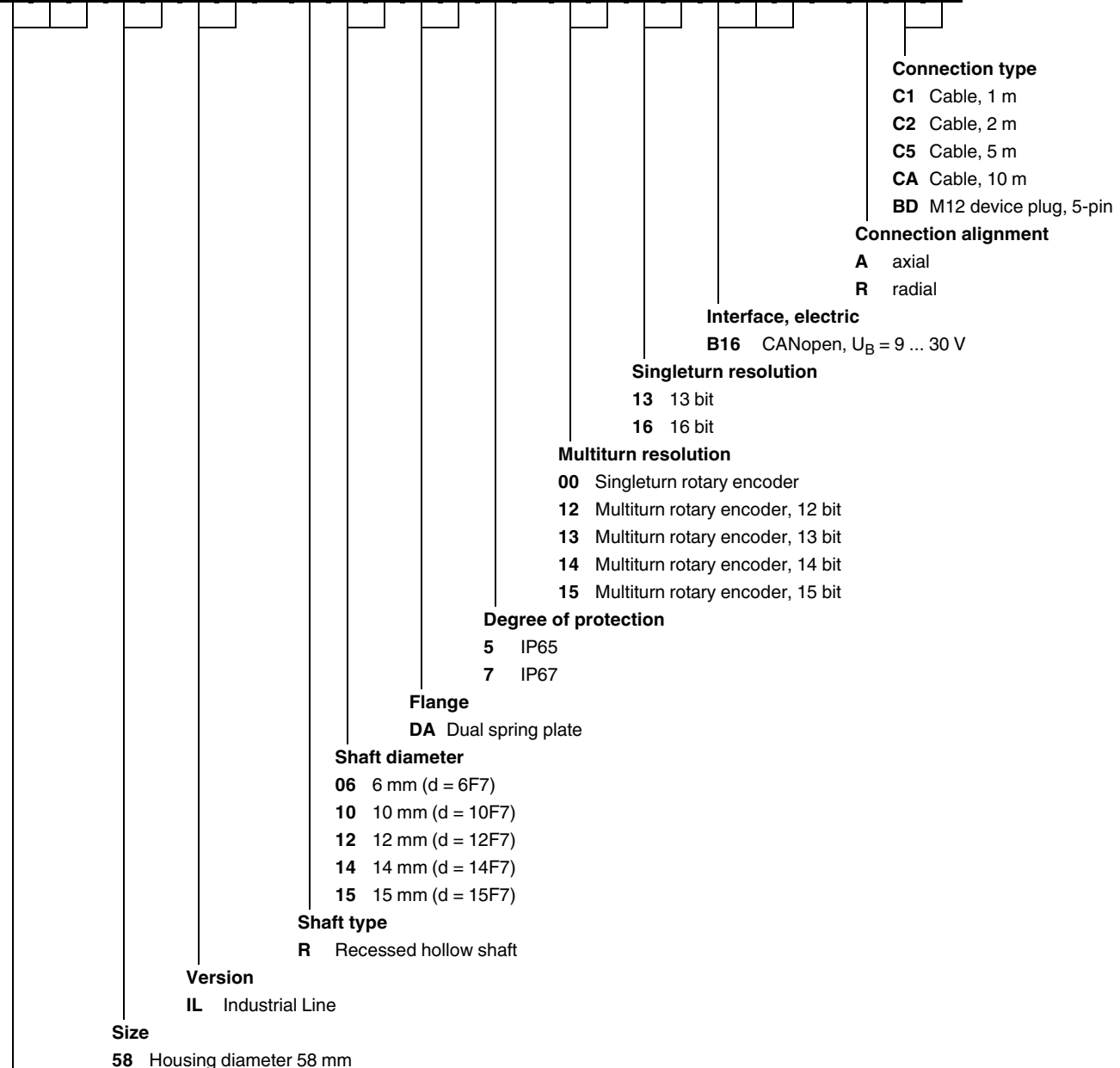
Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Type Code

Model number

E N A 5 8 I L - R D A - - - - B 1 6 - - - -



Connection type

- C1** Cable, 1 m
- C2** Cable, 2 m
- C5** Cable, 5 m
- CA** Cable, 10 m
- BD** M12 device plug, 5-pin

Connection alignment

- A** axial
- R** radial

Interface, electric

B16 CANopen, $U_B = 9 \dots 30 \text{ V}$

Singleturn resolution

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

Multiturn resolution

- 00** Singleturn rotary encoder
- 12** Multiturn rotary encoder, 12 bit
- 13** Multiturn rotary encoder, 13 bit
- 14** Multiturn rotary encoder, 14 bit
- 15** Multiturn rotary encoder, 15 bit

Degree of protection

- 5** IP65
- 7** IP67

Flange

DA Dual spring plate

Shaft diameter

- 06** 6 mm (d = 6F7)
- 10** 10 mm (d = 10F7)
- 12** 12 mm (d = 12F7)
- 14** 14 mm (d = 14F7)
- 15** 15 mm (d = 15F7)

Shaft type

R Recessed hollow shaft

Version

IL Industrial Line

Size

58 Housing diameter 58 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.
- 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

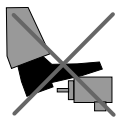
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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).

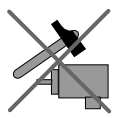
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!

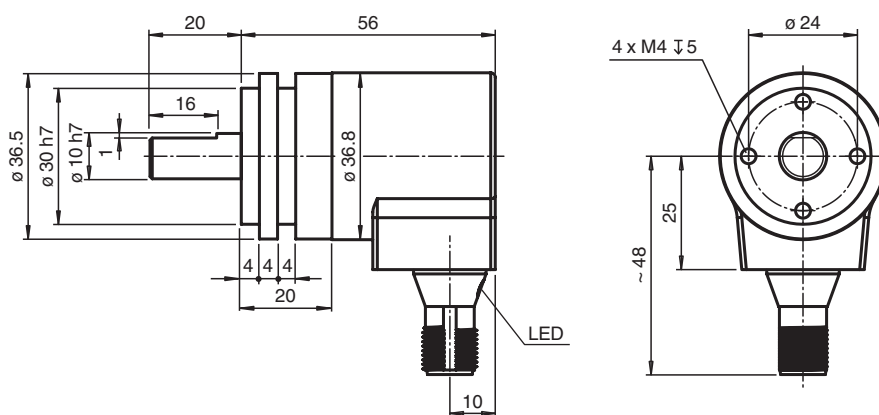
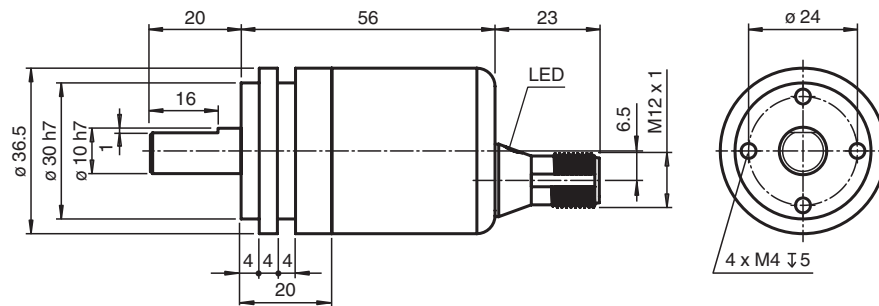


Avoid impact!



Do not remachine the housing!

Dimensions



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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions
Diagnostic Coverage (DC)	0 %

Indicators/operating means

LED green	Operating mode
LED red	wrong baud rate

Electrical specifications

Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable






Interface

Interface type	J1939
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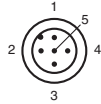
Technical Data

Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		ISO 11898
Connection		
Connector		M12 connector, 5 pin
Cable		Ø6 mm, 4 x 2 x 0.14 mm ²
Standard conformity		
Degree of protection		DIN EN 60529 , 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, 200 g, 11 ms
Vibration resistance		DIN EN 60068-2-6, 30 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		powder coated steel
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 150 g
Rotational speed		max. 6000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		180 N
Radial		180 N

Accessories

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

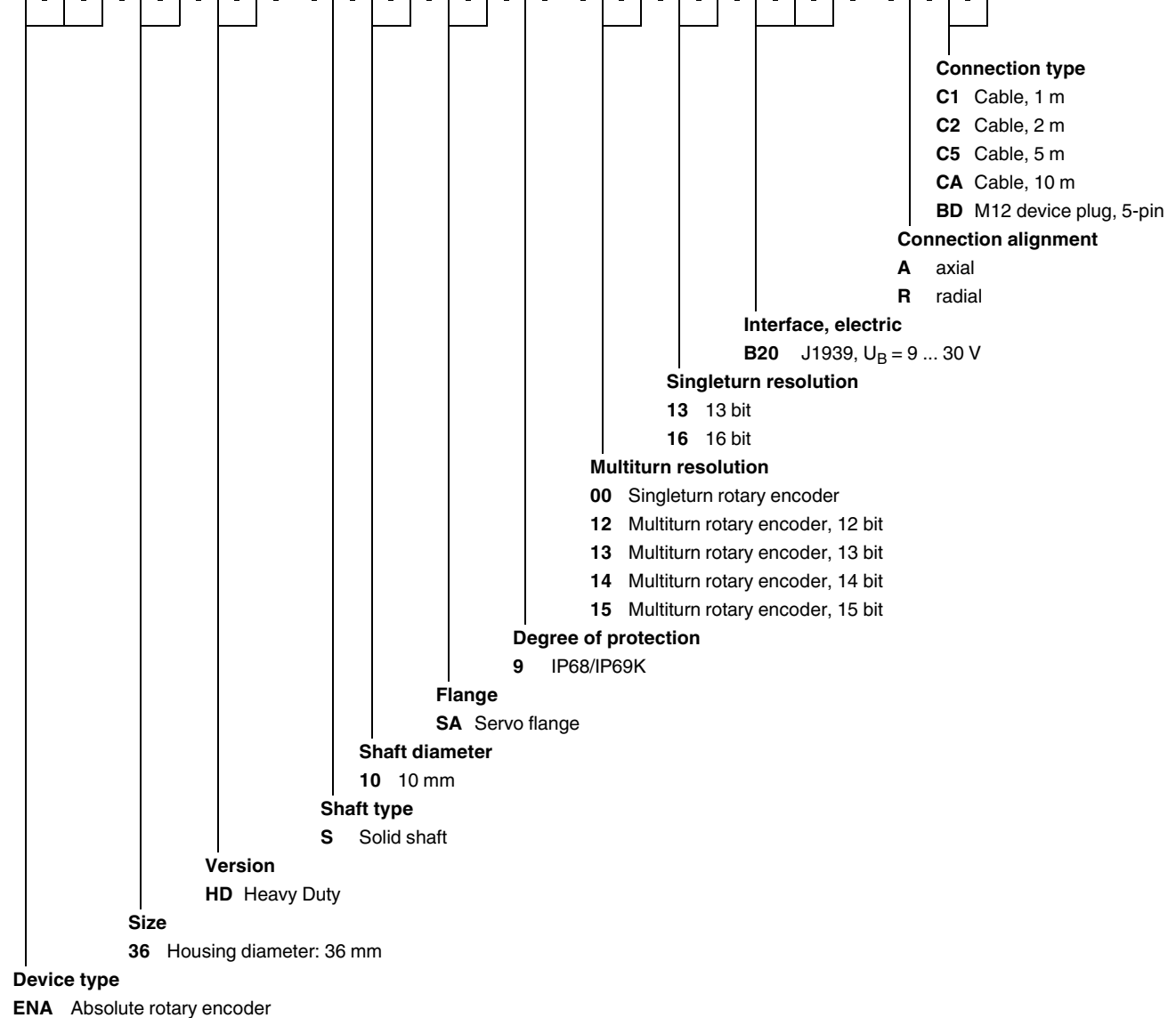
18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

Model number

E N A 3 6 H D - S 1 0 S A 9 - - - - - B 2 0 - - - -



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.
- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



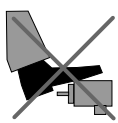
Safety instructions

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

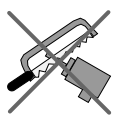
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

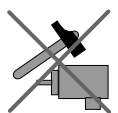
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA36IL-R***-J1939



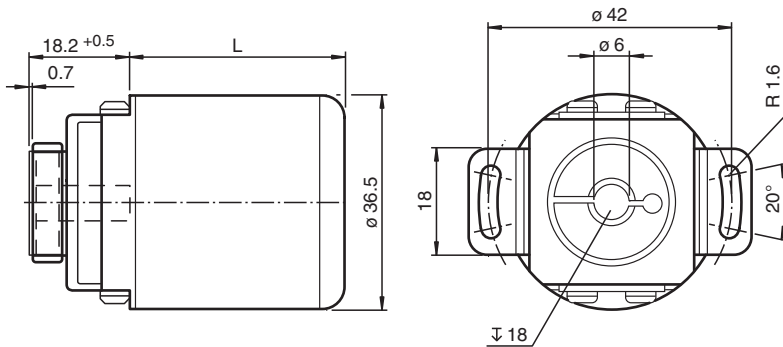
- Very small housing
- Up to 31 bit overall resolution
- CAN bus with SAE J1939 protocol
- Free of wear magnetic sampling
- High resolution and accuracy



Function

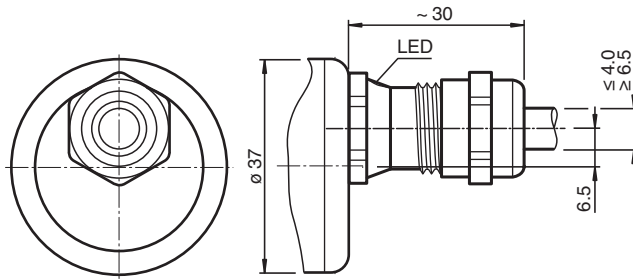
This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated J1939 interface. The rugged miniature encoders are based on magnetic sampling.

Dimensions

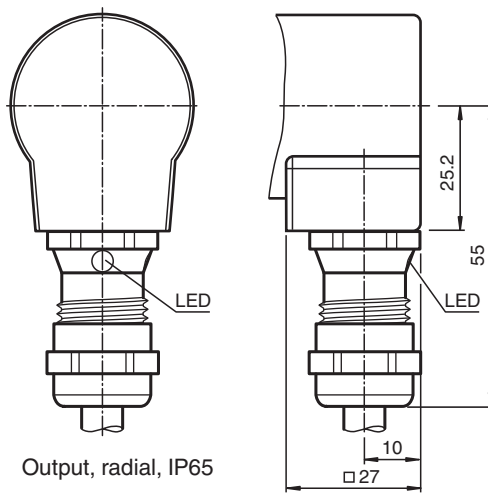


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP54	36	
IP65	36	32

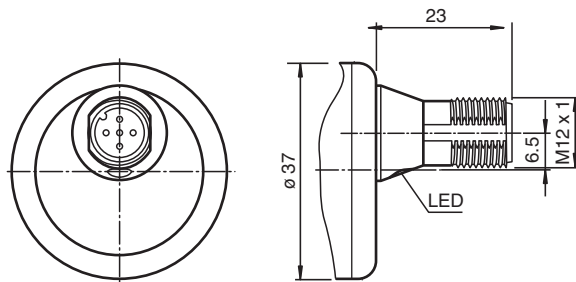
Dimensions



Output, axial, IP65

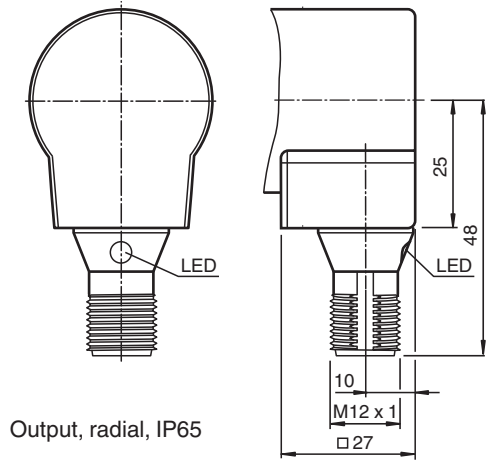


Output, radial, IP65

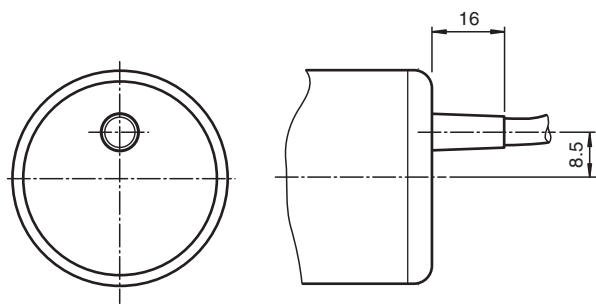


Output, axial, IP65

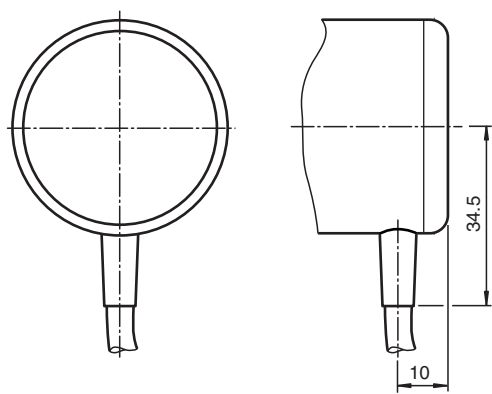
Dimensions



Output, radial, IP65



Output, axial, IP54



Output, radial, IP54

Technical Data

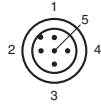
General specifications	
Detection type	magnetic sampling
Device type	Absolute encoders
Linearity error	$\leq \pm 0.1^\circ$
UL File Number	E223176 "For use in NFPA 79 Applications only" , if UL marking is marked on the product.
Functional safety related parameters	
MTTF _d	480 a at 40 °C

Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: t185498_eng.pdf

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 %
Indicators/operating means		
LED green		Operating mode
LED red		wrong baud rate
Electrical specifications		
Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		J1939
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		ISO 11898
Connection		
Connector		M12 connector, 5 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
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

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

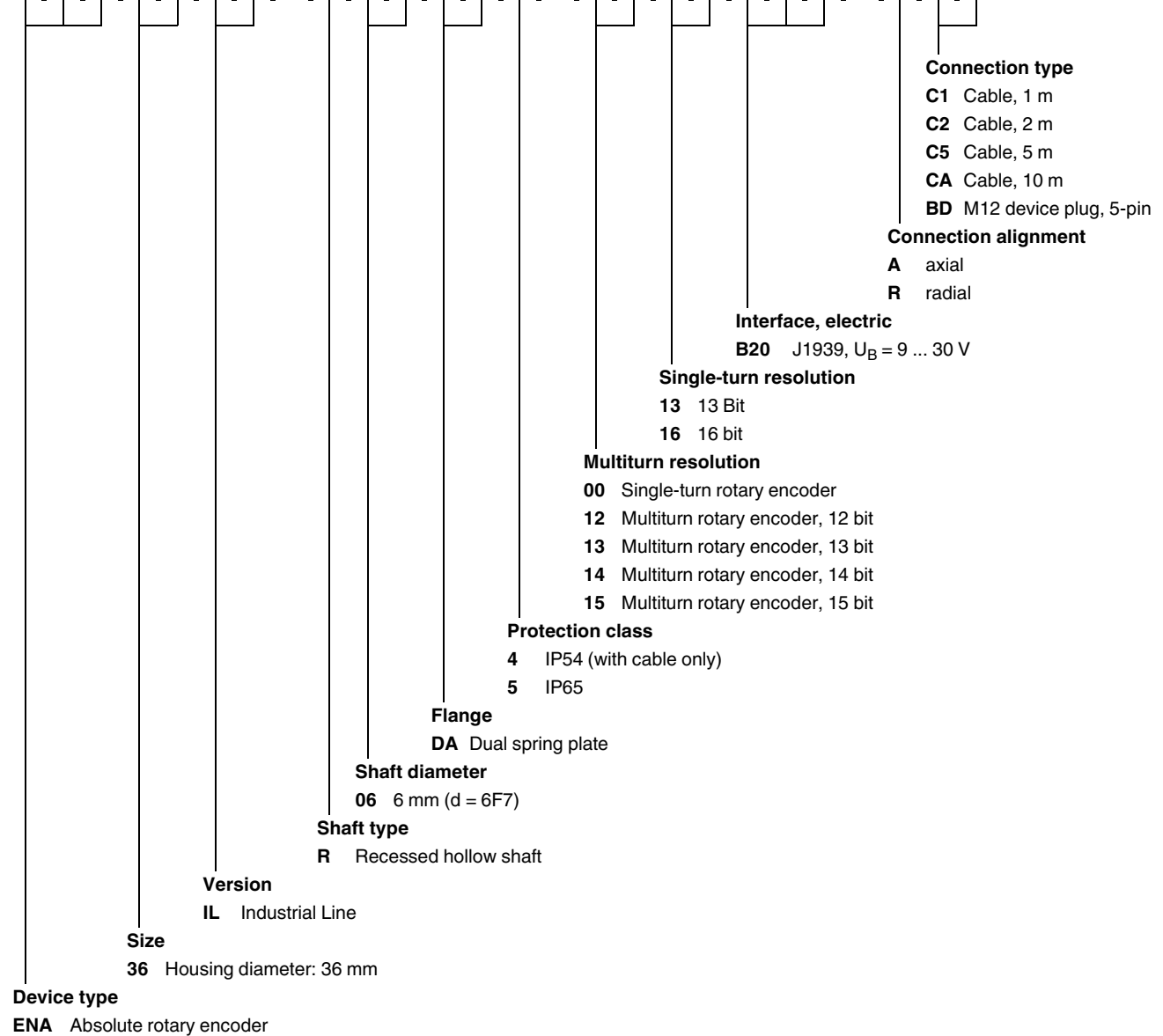
18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

Model number

E N A 3 6 I L - R 0 6 D A - - - - - B 2 0 - - - -



Installation

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- 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.
- 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.

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- 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.
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- 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
relief	clamped with the strain clamp
Disadvantage:	soldering shield on



Safety instructions

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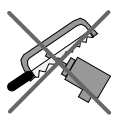
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Tighten the clamping ring only, if a shaft has been fitted in the area of the clamping ring (hollow shaft encoders).

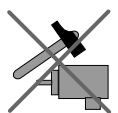
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA36IL-S***-J1939



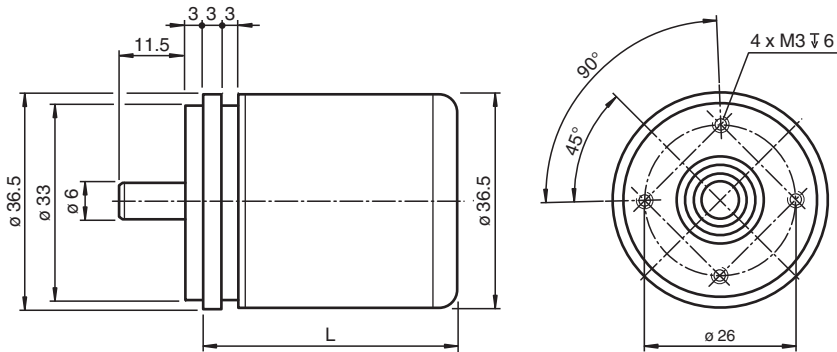
- Very small housing
- Up to 31 bit overall resolution
- CAN bus with SAE J1939 protocol
- Free of wear magnetic sampling
- High resolution and accuracy



Function

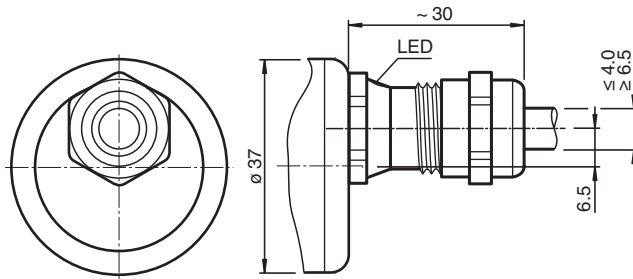
This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated J1939 interface. The rugged miniature encoders are based on magnetic sampling.

Dimensions

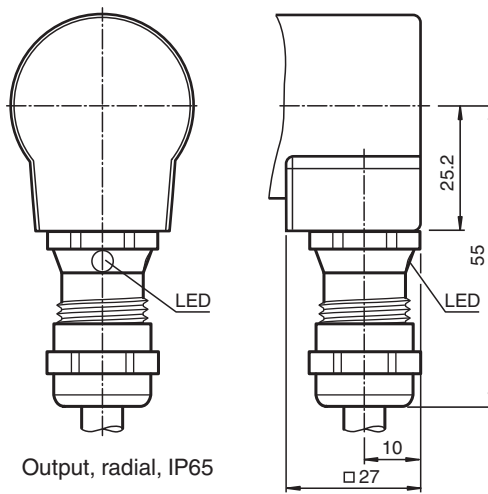


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP54	43	
IP65	43	39

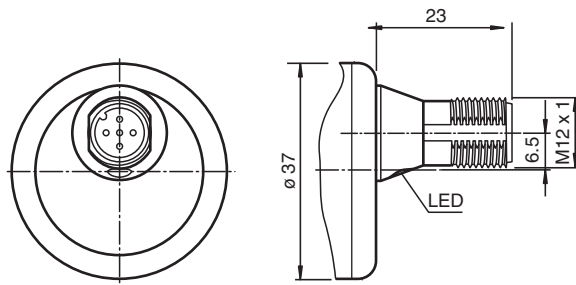
Dimensions



Output, axial, IP65

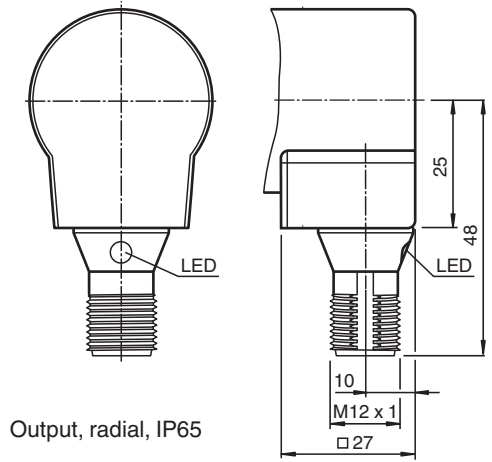


Output, radial, IP65

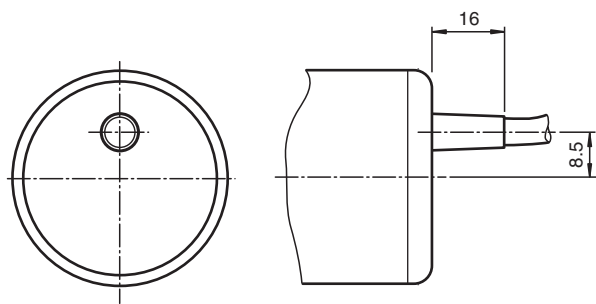


Output, axial, IP65

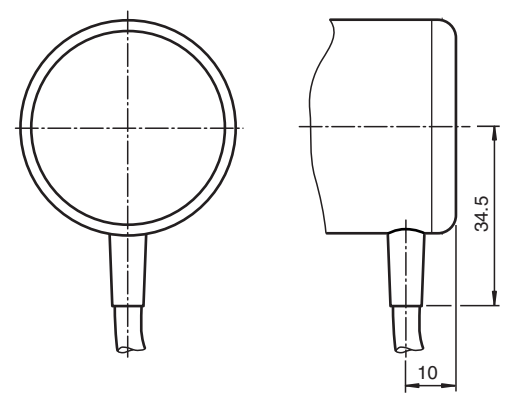
Dimensions



Output, radial, 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	480 a at 40 °C

Release date: 2022-12-12 Date of issue: 2022-12-12 Filename: t185505_eng.pdf

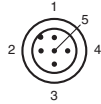
Technical Data

Mission Time (T _M)		20 a
L ₁₀		40 E-8 revolutions at 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
LED green		Operating mode
LED red		wrong baud rate
Electrical specifications		
Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		J1939
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		ISO 11898
Connection		
Connector		M12 connector, 5 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
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		20 N
Radial		40 N

Accessories

	V19-G-ABG-PG9	Female connector M12 straight A-coded 8-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

Model number

E N A 3 6 I L - S 0 6 S A - - - - - B 2 0 - - - -



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.
- 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
relief	clamped with the strain 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).

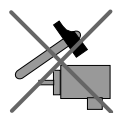
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA42HD-S***-J1939



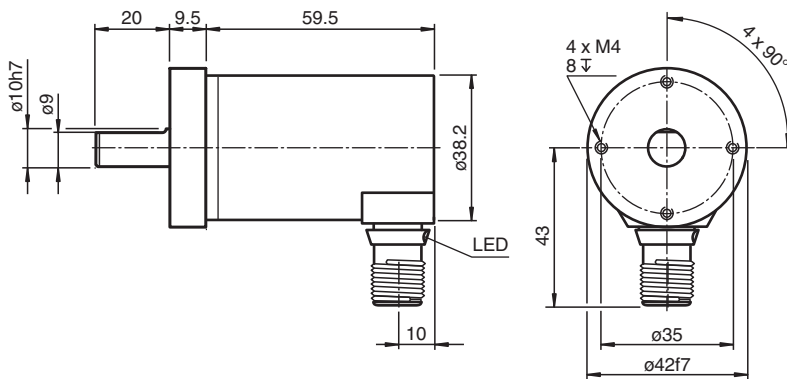
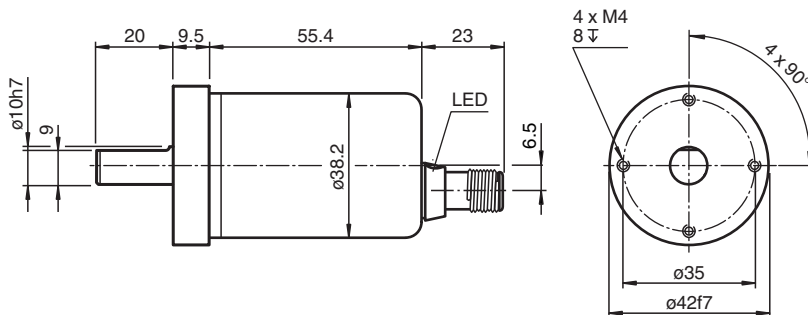
- Solid shaft
- Up to 31 bit overall resolution
- CAN bus with SAE J1939 protocol
- Free of wear magnetic sampling
- High resolution and accuracy
- Highly shock / vibration and soiling resistant
- Sturdy construction
- Increased shaft load capacity
- Stainless steel housing
- IP69K



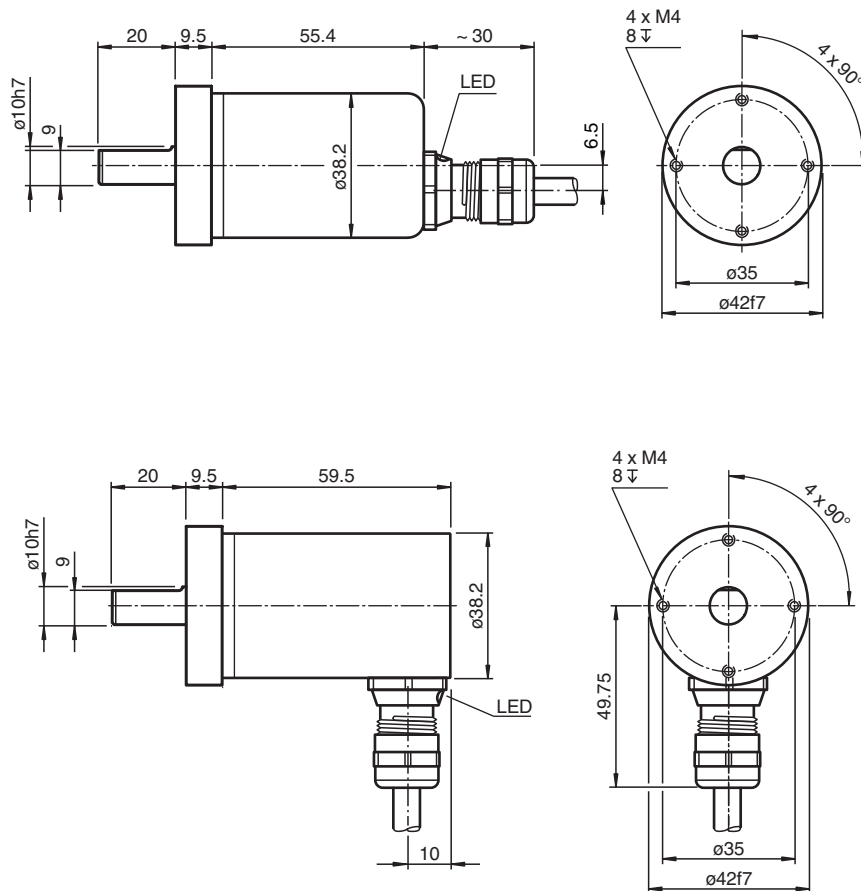
Function

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 its 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



Dimensions



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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions
Diagnostic Coverage (DC)	0 %

Indicators/operating means

LED green	Operating mode
LED red	wrong baud rate

Electrical specifications

Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable






Interface

Interface type	J1939
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Technical Data

Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		ISO 11898
Connection		
Connector		M12 connector, 5 pin
Cable		Ø6 mm, 4 x 2 x 0.14 mm ²
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
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		-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 ⁻¹
Moment of inertia		30 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		270 N
Radial		270 N

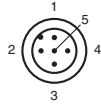
Accessories

	V15B-G-2M-PUR-ABG-V15B-G	PROFIBUS bus cable M12 socket straight to M12 plug straight B-coded, 5-pin, PUR cable 2-core violet, shielded
	V15B-G-5M-PUR-ABG-V15B-G	PROFIBUS bus cable M12 socket straight to M12 plug straight B-coded, 5-pin, PUR cable 2-core violet, shielded
	V15B-G-10M-PUR-ABG-V15B-G	PROFIBUS bus cable M12 socket straight to M12 plug straight B-coded, 5-pin, PUR cable 2-core violet, shielded
	V15B-G-2M-PUR-ABG	PROFIBUS bus cable female cordset single-ended M12 straight B-coded, 5-pin, PUR cable 2-core violet, shielded
	V15B-G-5M-PUR-ABG	PROFIBUS bus cable female cordset single-ended M12 straight B-coded, 5-pin, PUR cable 2-core violet, shielded

Accessories

	V15B-G-10M-PUR-ABG	PROFIBUS bus cable female cordset single-ended M12 straight B-coded, 5-pin, PUR cable 2-core violet, shielded
	V15B-W-ABG-PG9	Female connector M12 angled B-coded 5-pin, for cable diameter 6 - 8 mm, shielded, field-attachable
	V15B-G-ABG-PG9	Female connector M12 straight B-coded 5-pin, for cable diameter 5 - 8 mm, shielded, field-attachable
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

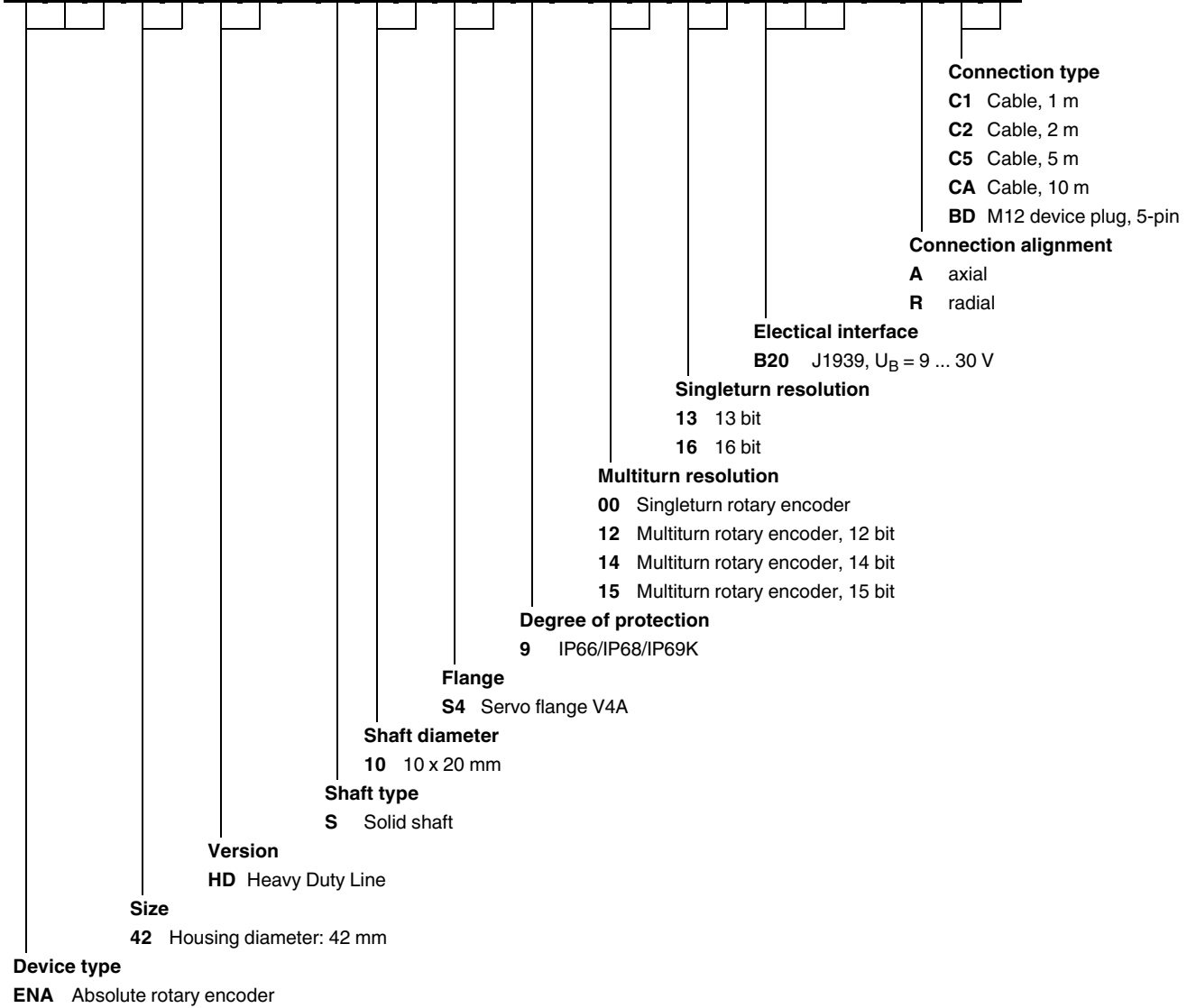
18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

Model number

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



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.
- 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

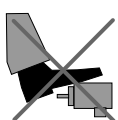
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

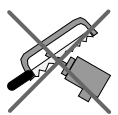
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

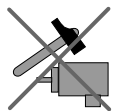
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!

Absolute encoders

ENA58IL-R***-J1939



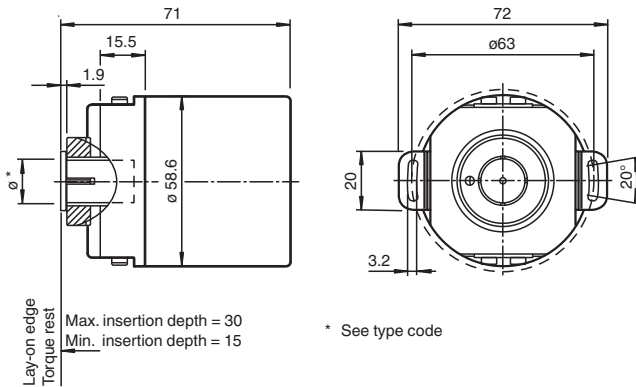
- Recessed hollow shaft
- Up to 31 bit overall resolution
- CAN bus with SAE J1939 protocol
- Free of wear magnetic sampling
- High resolution and accuracy



Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated J1939 interface. The rugged miniature encoders are based on magnetic sampling.

Dimensions

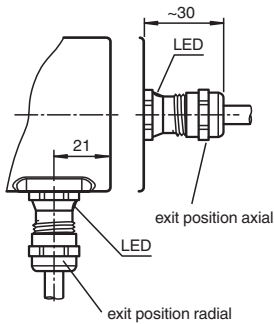


Recessed hollow shaft

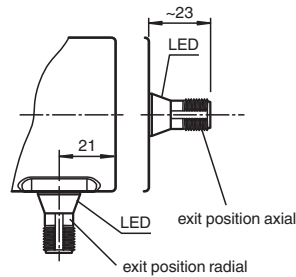
Connections

Dimensions in mm

Cable



Connector M12










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		480 a at 40 °C
Mission Time (T _M)		20 a
L ₁₀		5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
LED green		Operating mode
LED red		wrong baud rate
Electrical specifications		
Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		J1939
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 15 Bit
Overall resolution		up to 31 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		ISO 11898
Connection		
Connector		M12 connector, 5 pin
Cable		Ø6 mm, 4 x 2 x 0.14 mm ²
Standard conformity		
Degree of protection		DIN EN 60529, IP65 or IP67
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 , painted
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 300 g

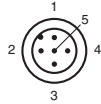
Technical Data

Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static

Accessories

	V15-G-BK2M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK5M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK10M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	ACC-PACK-ABS-_S_58 ø15	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 15 mm
	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessories set for Ø58 absolut rotary encoder with recessed hollow shaft 10 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

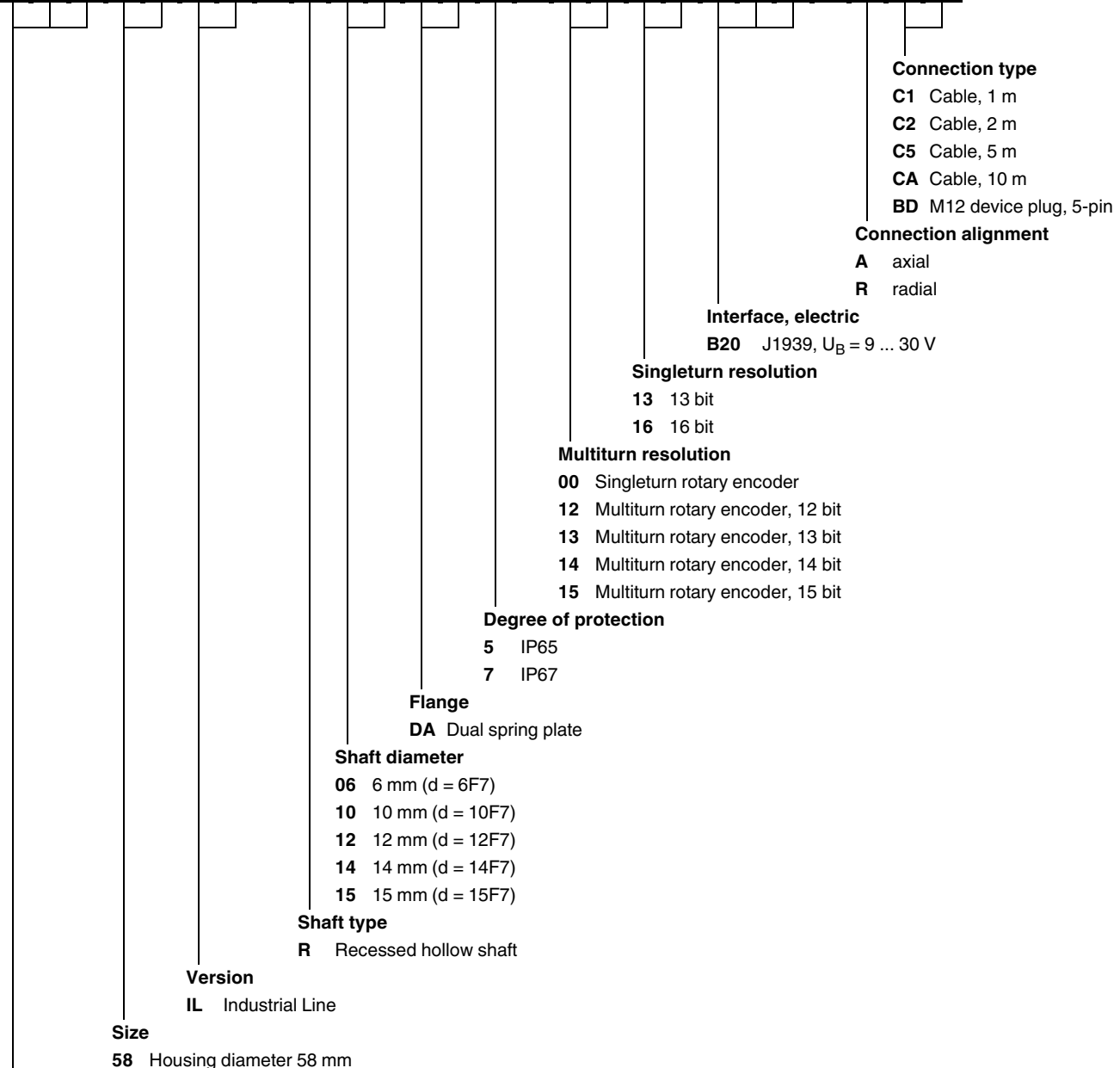
18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

Model number

E N A 5 8 I L - R D A - B 2 0 -



Device type
ENA Absolute rotary encoder

Installation

Anti-interference measures

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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.
- 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.

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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

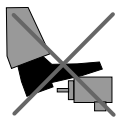
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation.

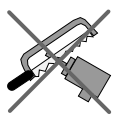
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

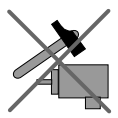
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute encoders

ENA58IL-S***-J1939

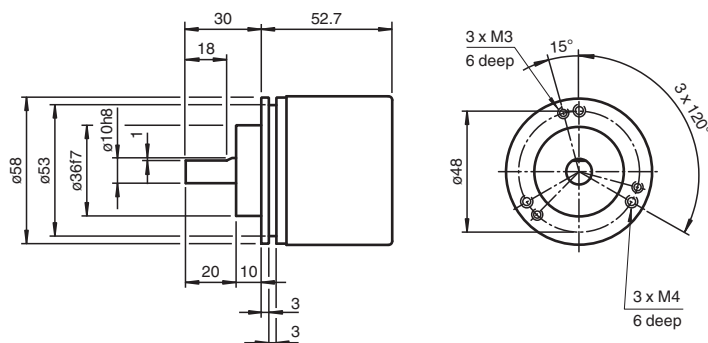
- Solid shaft
- Up to 31 bit overall resolution
- CAN bus with SAE J1939 protocol
- Free of wear magnetic sampling
- High resolution and accuracy



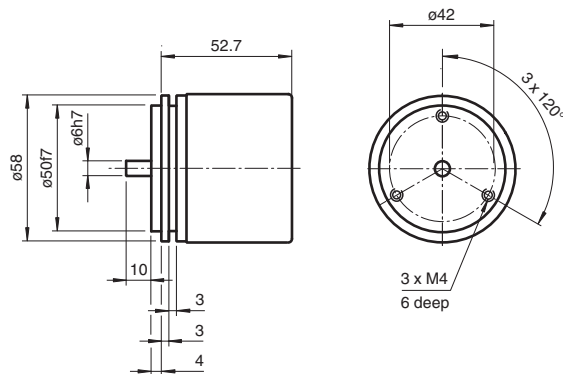
Function

This absolute rotary encoder provides a position value corresponding to the shaft position on its integrated J1939 interface. The rugged miniature encoders are based on magnetic sampling.

Dimensions



Clamping flange



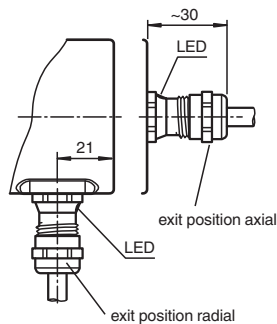
Servo flange

Dimensions

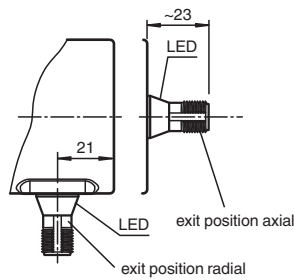
Connections

Dimensions in mm

Cable



Connector M12



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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	55 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %

Indicators/operating means

LED green	Operating mode
LED red	wrong baud rate

Electrical specifications

Operating voltage	U _B	9 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 1.2 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable

Interface

Interface type	J1939
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 15 Bit
Overall resolution	up to 31 Bit
Transfer rate	min. 20 kBit/s , max. 1 MBit/s
Cycle time	≥ 1 ms
Standard conformity	ISO 11898

Connection

Connector	M12 connector, 5 pin
Cable	$\varnothing 6$ mm, 4 x 2 x 0.14 mm ²









Standard conformity

Degree of protection	DIN EN 60529, IP65 or IP67
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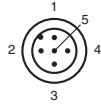
Technical Data

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 , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Accessories

	V15-G-BK2M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK5M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	V15-G-BK10M-PUR-O2/CAN	DeviceNet/CANOpen bus cable female cordset single-ended M12 straight A-coded 5-pin, PUR cable 4-core twisted pairs black, shielded, UL approved, drag chain suitable, outdoor
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm

Connection

Signal	Wire end	5-pin, M12 x 1 connector
CAN GND	green	1
+V _S	red	2
GND	yellow	3
CAN-High	white	4
CAN-Low	brown	5
Shielding	Shielding	Housing
Pinout		

Interface

Example of the transmit commands

Command	Identifier	Data	Comments
Read request Direction	18EA2000	01 EF 00 00 00 00 00 00	
Read request Node	18EA2000	08 EF 00 00 00 00 00 00	
Write Direction	00EF2000	01 01 00 00 00 FF FF FF (CCW increase position)	When you change direction it will give you a different positional value. You will then need to set your preset value.
Write PRESET	00EF2000	04 A8 61 00 00 FF FF FF (value 25.000)	The preset value should be received at positional value 18FFAA20.
Write Save	00EF2000	FA 73 61 76 65 FF FF FF	The settings saved in non-volatile memory

If you change the node number, you will need to cycle power (after you save your settings) for the node number to change. Once you cycle power, you will need to enter the new node number in your identifier. You can confirm everything is saved in non-volatile memory by cycling power.

Receive:

18FFAA20: Positional and speed data

18EA2000: Read response

Type Code

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.

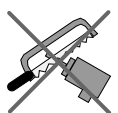
If failures cannot be remedied, the device has to be shut down and has to be secured against accidental operation. Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

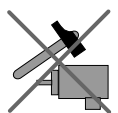
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!



Do not remachine the housing!



Absolute rotary encoder

ENA58TL-S***-IO-Link

- Absolute rotary encoder of the innovative Pure Line
- Solid shaft
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs

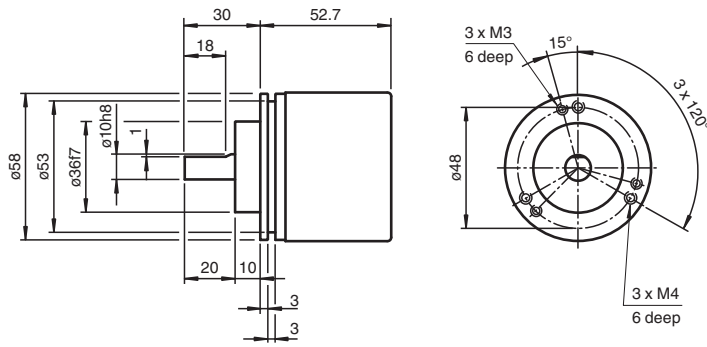


IO-Link

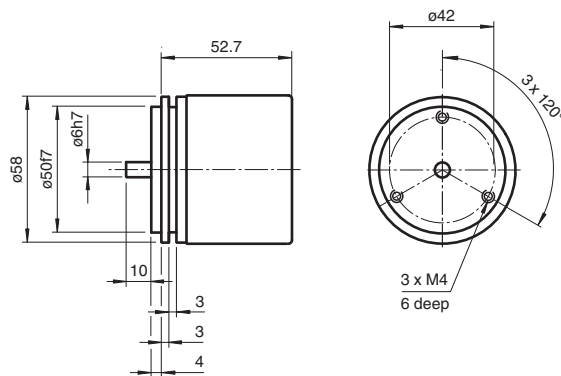
Function

Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions



Clamping flange



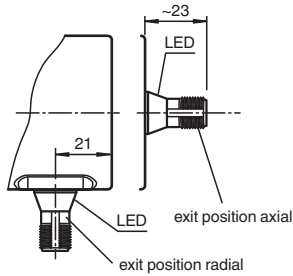
Servo flange

Dimensions

Connections

Dimensions in mm

Connector M12



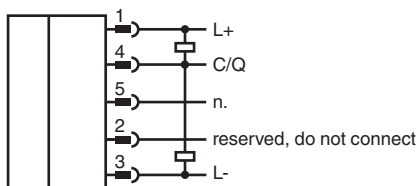
Technical Data

General specifications			
Detection type		magnetic sampling	
Device type		Absolute rotary encoder as Pure Line	
Measured variable		position Temperature	
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		566 a at 40 °C	
Mission Time (T _M)		20 a	
L ₁₀		420 E+8 revolutions at 40/110 N axial/radial shaft load	
Diagnostic Coverage (DC)		0 %	
Indicators/operating means			
LED STATUS		LED green flashing with short break (1 Hz) - IO-Link mode	
Electrical specifications			
Operating voltage	U _B	18 ... 30 V DC	
No-load supply current	I ₀	max. 50 mA	
Power consumption	P ₀	approx. 1.5 W	
Time delay before availability	t _v	< 1 s	
Interface			
Interface type		IO-Link	
IO-Link revision		1.1	
Device profile		Identification and Diagnosis - I&D	
Resolution			
Single turn		up to 16 Bit programmable	
Multiturn		up to 15 Bit programmable	
Overall resolution		up to 31 Bit programmable	
Process data		Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data	
Vendor ID		1 (0x0001)	
Device ID		5243907 (0x500403), 5243908 (0x500404), 5243911 (0x500407), 5243912 (0x500408)	
Transfer rate		COM3 (230.4 kbits/s)	

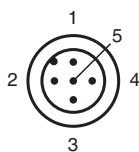
Technical Data

Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP67
Communication interface	IEC 61131-9 / IO-Link V1.1.2
Climatic testing	DIN EN 60068-2-78, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 350 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	40 N
Radial	110 N












Connection











Connection Assignment



Accessories

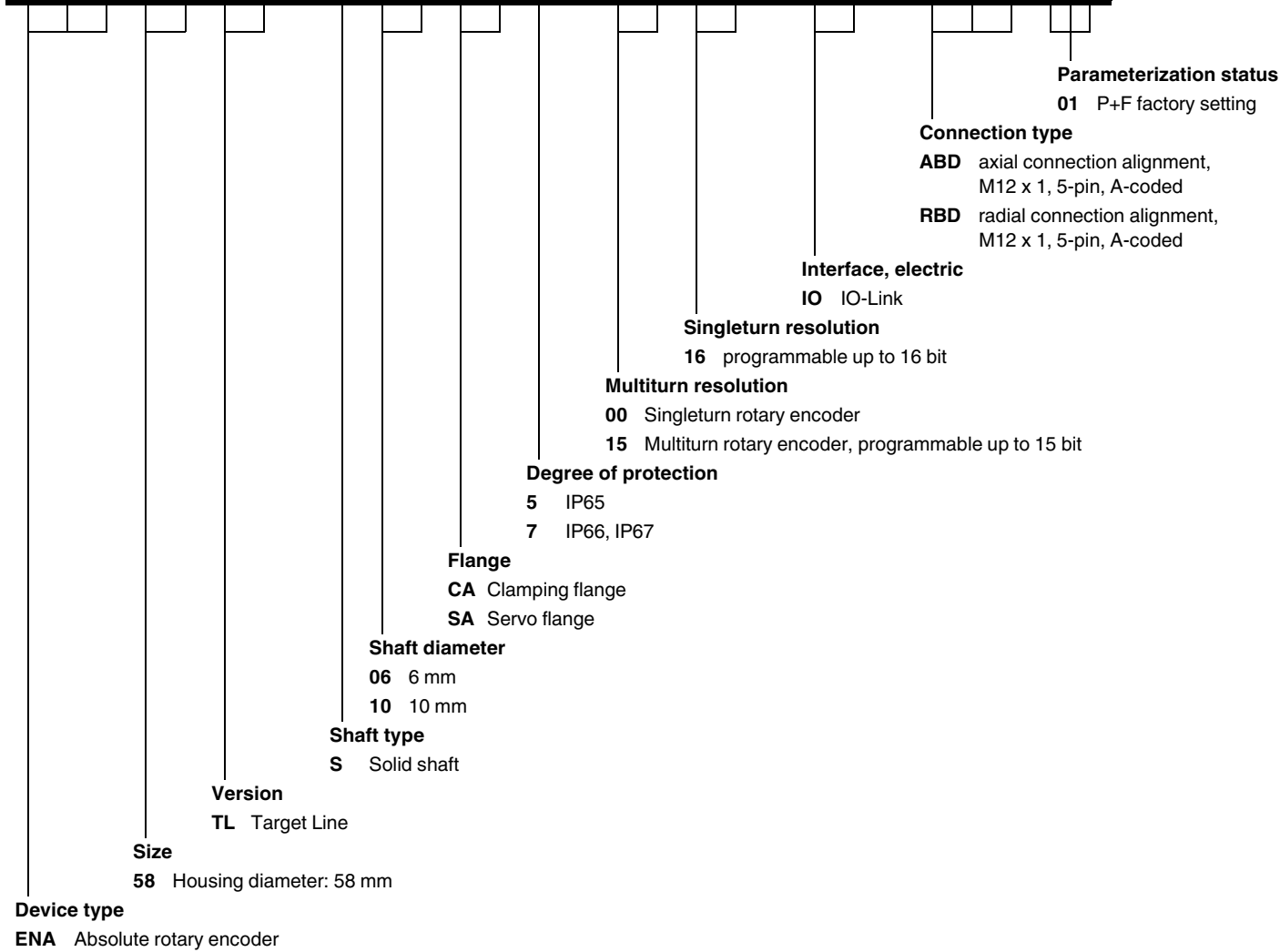
	ICE1-8IOL-G60L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	V1-G-0,6M-PUR-V1-G	Cordset M12 socket straight to M12 plug straight A-coded, 4-pin, PUR cable grey
	V15-G-1M-PUR-V15-G	Cordset M12 socket straight to M12 plug straight A-coded, 5-pin, PUR cable grey
	9401 6*10	Spring steel coupling
	9401 6*6	Spring steel coupling
	9402 6*6	Spring steel coupling
	9404 6*6	Spring disk coupling
	9409 6*10	Bellows coupling
	9409 6*6	Bellows coupling
	9409 6*8	Bellows coupling
	9410 6*6	Precision coupling
	KW-6/10	Helical coupling
	KW-6/6	Helical coupling
	KW-6/8	Helical coupling
	9108, 6	Measuring wheel
	9109, 6	Measuring wheel for shaft diameter 6 mm
	9110, 6	Measuring wheel for shaft diameter 6 mm
	9113, 6	Measuring wheel for shaft diameter 6 mm
	MBT-36ALS	Spring-loaded mounting bracket with a diameter of 36 mm
	MBT-36ALS120	Spring arm for larger spring deflections for diameter 58 rotary encoder with clamping flange

Accessories

	ICE1-8IOL-G30L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	ICE2-8IOL-G65L-V1D	EtherNet/IP IO-Link master with 8 inputs/outputs
	ICE3-8IOL-G65L-V1D	PROFINET IO IO-Link master with 8 inputs/outputs
	ICE2-8IOL-K45S-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	ICE3-8IOL-K45P-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, push-in terminals
	ICE3-8IOL-K45S-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	IO-Link-Master02-USB	IO-Link master, supply via USB port or separate power supply, LED indicators, M12 plug for sensor connection
	ICE2-8IOL-K45P-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, push-in connectors

Type Code

E N A 5 8 T L - S [] [] [] [] - [] [] [] [] 1 6 - I O - [] [] [] [] 0 1



Absolute rotary encoder

ENA58TL-R***-IO-Link



- Absolute rotary encoder of the innovative Pure Line
- Recessed hollow shaft
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs

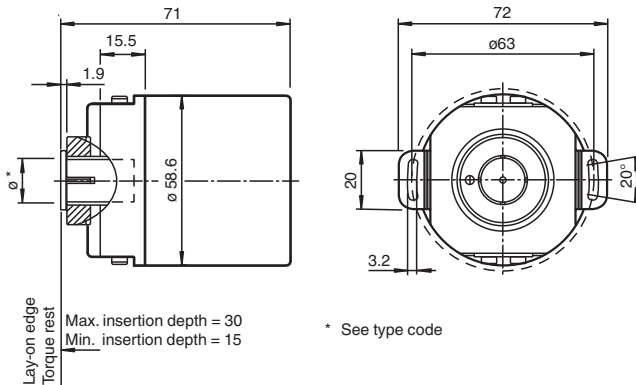


IO-Link

Function

Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions



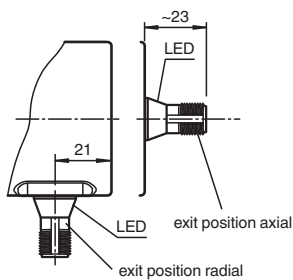
* See type code

Recessed hollow shaft

Connections

Dimensions in mm

Connector M12



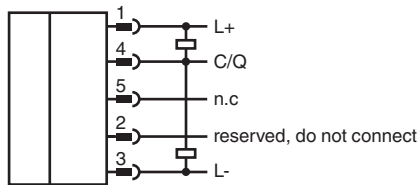
Technical Data

General specifications			
Detection type			magnetic sampling
Device type			Absolute rotary encoder as Pure Line
Measured variable			position Temperature
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			566 a at 40 °C
Mission Time (T _M)			20 a
L ₁₀			5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)			0 %
Indicators/operating means			
LED STATUS			LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications			
Operating voltage	U _B		18 ... 30 V DC
No-load supply current	I ₀		max. 50 mA
Power consumption	P ₀		approx. 1.5 W
Time delay before availability	t _v		< 1 s
Interface			
Interface type			IO-Link
IO-Link revision			1.1
Device profile			Identification and Diagnosis - I&D
Resolution			
Single turn			up to 16 Bit programmable
Multiturn			up to 15 Bit programmable
Overall resolution			up to 31 Bit programmable
Process data			Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data
Vendor ID			1 (0x0001)
Device ID			5243905 (0x500401), 5243906 (0x500402), 5243909 (0x500405), 5243910 (0x500406)
Transfer rate			COM3 (230.4 kbits/s)
Min. cycle time			1.5 ms
SIO mode support			no
Compatible master port type			Class A Class B (use 3-pole adapter or 3-wire cable)
Connection			
Connector			M12 connector, 5 pin , A-coded
Standard conformity			
Degree of protection			DIN EN 60529, IP65, IP67
Communication interface			IEC 61131-9 / IO-Link V1.1.2
Climatic testing			DIN EN 60068-2-78, no moisture condensation
Emitted interference			EN 61000-6-4:2007
Noise immunity			EN 61000-6-2:2005
Shock resistance			DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance			DIN EN 60068-2-6, 10 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.

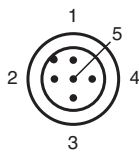
Technical Data

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		Zinc plated steel, painted
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 370 g
Rotational speed		max. 12000 min ⁻¹
Moment of inertia		< 30 gcm ²
Starting torque		< 3 Ncm
Shaft load		
Axial		24 N
Radial		198 N
Angle offset		± 0.9 °
Axial offset		± 0.3 mm static; ± 0,1 mm dynamic
Radial offset		± 0.5 mm static; ± 0,2 mm dynamic

Connection














Connection Assignment



Accessories

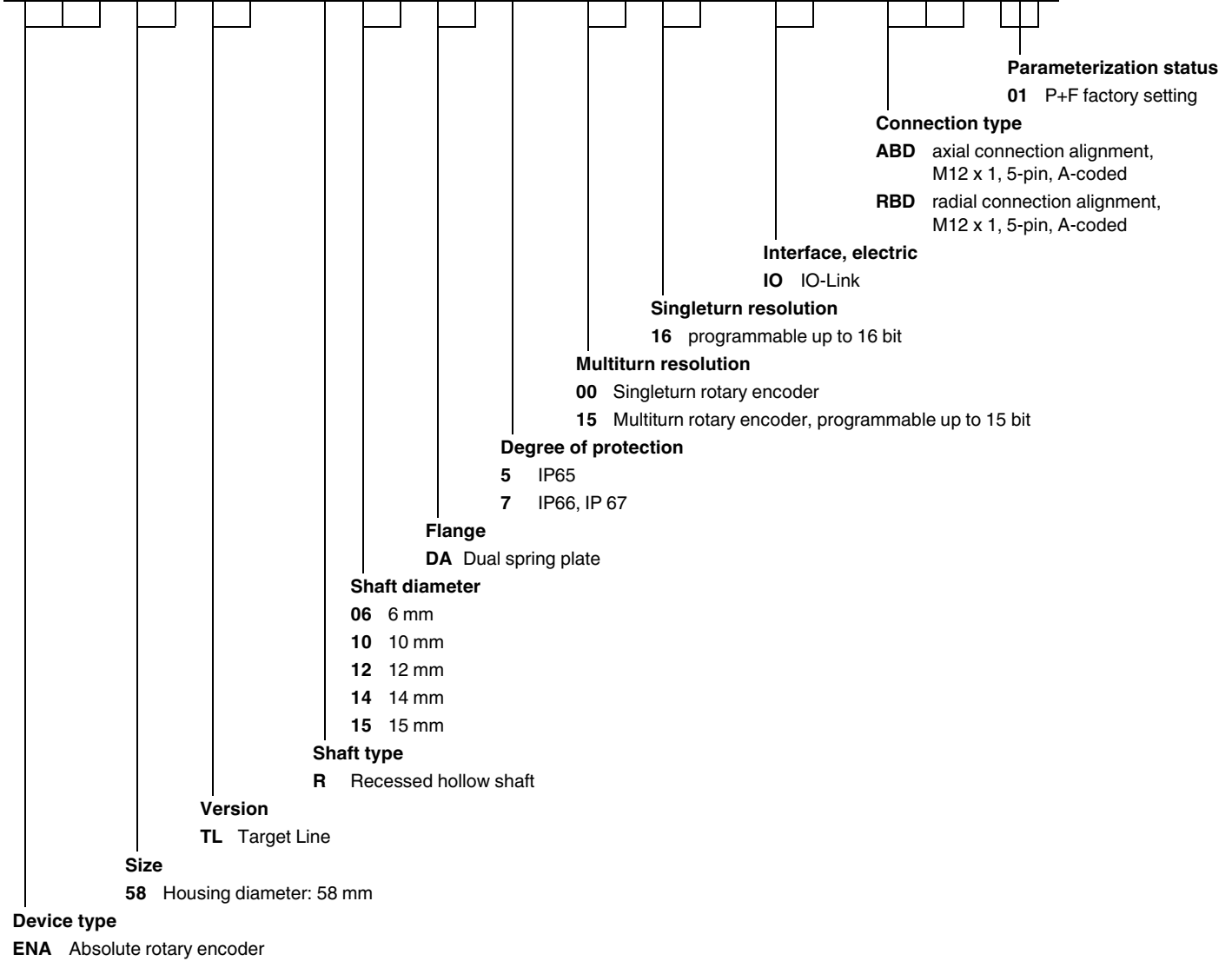
	ICE1-8IOL-G60L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	V1-G-0,6M-PUR-V1-G	Cordset M12 socket straight to M12 plug straight A-coded, 4-pin, PUR cable grey
	V15-G-1M-PUR-V15-G	Cordset M12 socket straight to M12 plug straight A-coded, 5-pin, PUR cable grey
	ACC-PACK-ABS-S_58 ø15	Accessory kit for Ø58 absolute rotary encoder with recessed hollow shaft 15 mm

Accessories

	ACC-PACK-ABS-_S_58 ø14	Accessories set for Ø58 absolute rotary encoder with recessed hollow shaft 14 mm
	ACC-PACK-ABS-_S_58 ø12	Accessories set for Ø58 absolute rotary encoder with recessed hollow shaft 12 mm
	ACC-PACK-ABS-_S_58 ø10	Accessory kit for Ø58 absolute rotary encoder with recessed hollow shaft 10 mm
	ICE1-8IOL-G30L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	ICE2-8IOL-G65L-V1D	EtherNet/IP IO-Link master with 8 inputs/outputs
	ICE3-8IOL-G65L-V1D	PROFINET IO IO-Link master with 8 inputs/outputs
	ICE2-8IOL-K45S-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	ICE3-8IOL-K45P-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, push-in terminals
	ICE3-8IOL-K45S-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	IO-Link-Master02-USB	IO-Link master, supply via USB port or separate power supply, LED indicators, M12 plug for sensor connection
	ICE2-8IOL-K45P-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, push-in connectors

Type Code

E N A 5 8 T L - R D A - 1 6 - I O - 0 1





Absolute rotary encoder

ENA36TL-R***-IO-Link

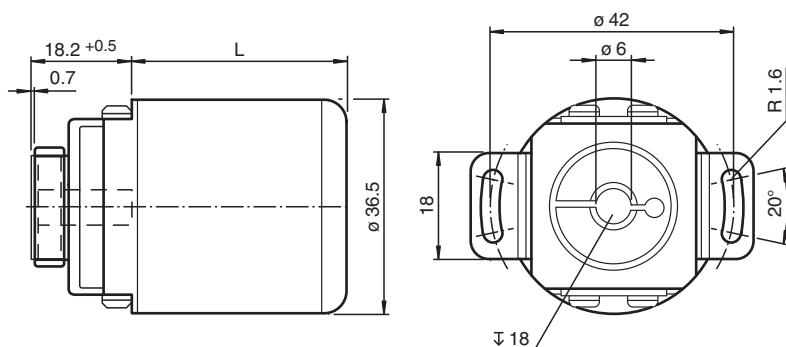
- Absolute rotary encoder of the innovative Pure Line
- Recessed hollow shaft
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs



Function

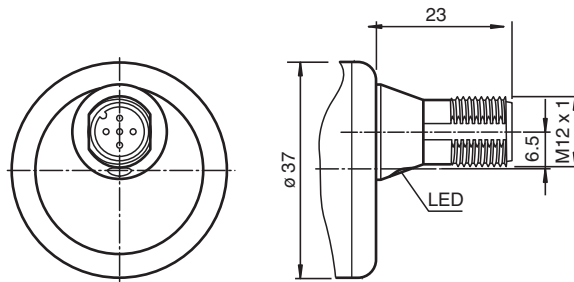
Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions

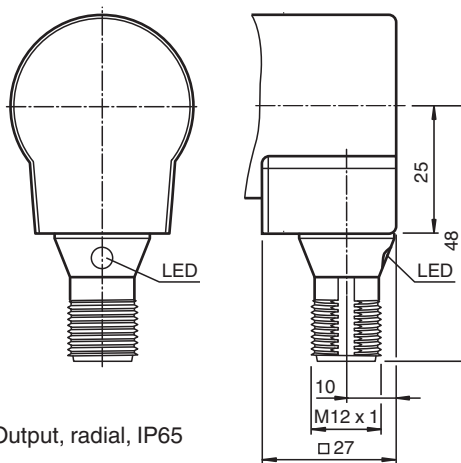


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP65	43	39

Dimensions



Output, axial, IP65



Output, radial, IP65

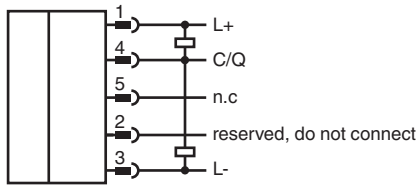
Technical Data

General specifications	
Detection type	magnetic sampling
Device type	Absolute rotary encoder as Pure Line
Measured variable	position Temperature
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	566 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	1035 E+8 revolutions at 19/44 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Indicators/operating means	
LED STATUS	LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications	
Operating voltage	U _B 18 ... 30 V DC
No-load supply current	I ₀ max. 50 mA
Power consumption	P ₀ approx. 1.5 W
Time delay before availability	t _v < 1 s
Interface	
Interface type	IO-Link

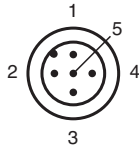
Technical Data

IO-Link revision	1.1
Device profile	Identification and Diagnosis - I&D
Resolution	
Single turn	up to 16 Bit programmable
Multiturn	up to 15 Bit programmable
Overall resolution	up to 31 Bit programmable
Process data	Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data
Vendor ID	1 (0x0001)
Device ID	5243649 (0x500301), 5243650 (0x500302)
Transfer rate	COM3 (230.4 kbits/s)
Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP67
Communication interface	IEC 61131-9 / IO-Link V1.1.2
Climatic testing	DIN EN 60068-2-78, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 190 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 18 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	19 N
Radial	44 N
Axial offset	± 0.3 mm static; ± 0,1 mm dynamic
Radial offset	± 0.5 mm static; &lusmn 0,2 mm dynamic











Connection



Connection Assignment

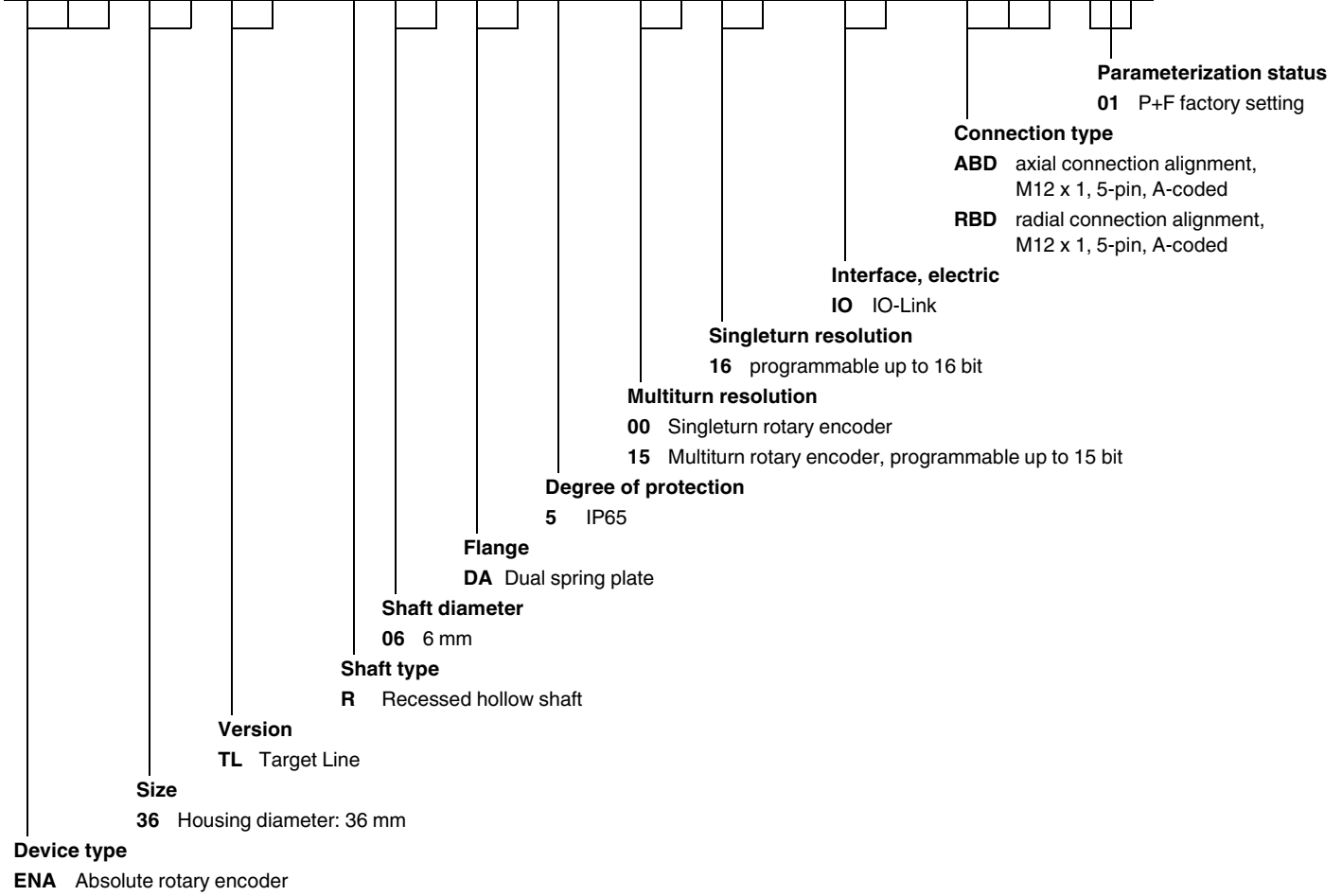


Accessories

	ICE1-8IOL-G60L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	V1-G-0,6M-PUR-V1-G	Cordset M12 socket straight to M12 plug straight A-coded, 4-pin, PUR cable grey
	V15-G-1M-PUR-V15-G	Cordset M12 socket straight to M12 plug straight A-coded, 5-pin, PUR cable grey
	ICE1-8IOL-G30L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	ICE2-8IOL-G65L-V1D	EtherNet/IP IO-Link master with 8 inputs/outputs
	ICE3-8IOL-G65L-V1D	PROFINET IO IO-Link master with 8 inputs/outputs
	ICE2-8IOL-K45S-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	ICE3-8IOL-K45P-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, push-in terminals
	ICE3-8IOL-K45S-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	IO-Link-Master02-USB	IO-Link master, supply via USB port or separate power supply, LED indicators, M12 plug for sensor connection
	ICE2-8IOL-K45P-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, push-in connectors

Type Code

E N A 3 6 T L - R 0 6 D A 5 - - - 1 6 - I O - - - 0 1





Absolute rotary encoder

ENA36TL-S***-IO-Link

- Absolute rotary encoder of the innovative Pure Line
- Solid shaft
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs

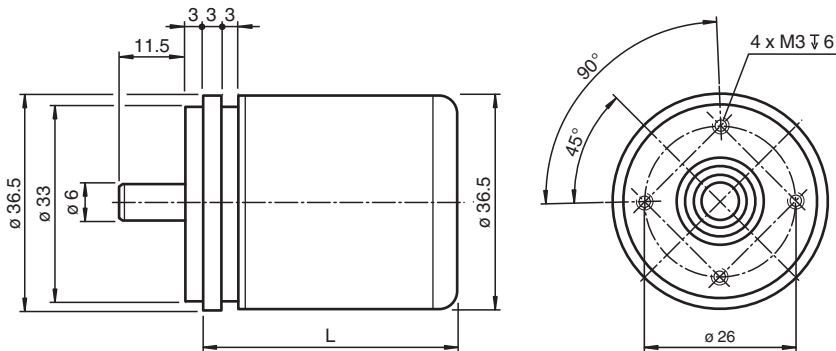


IO-Link

Function

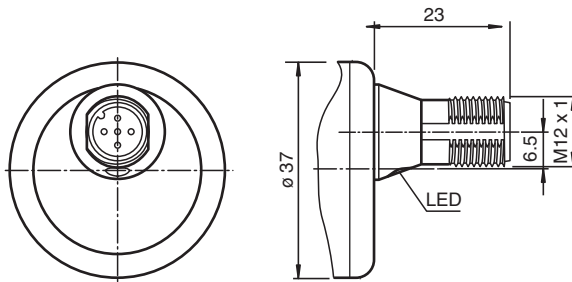
Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaptation to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions

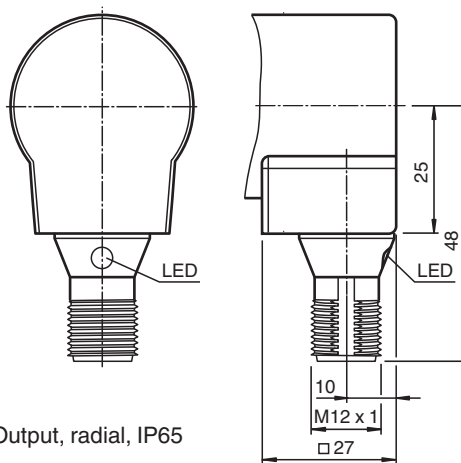


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP65	43	39

Dimensions



Output, axial, IP65



Output, radial, IP65

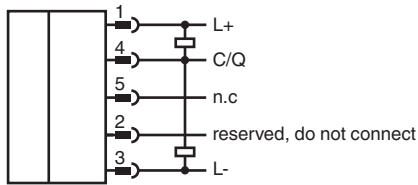
Technical Data

General specifications	
Detection type	magnetic sampling
Device type	Absolute rotary encoder as Pure Line
Measured variable	position Temperature
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	566 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	30 E+8 revolutions at 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Indicators/operating means	
LED STATUS	LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications	
Operating voltage	U _B 18 ... 30 V DC
No-load supply current	I ₀ max. 50 mA
Power consumption	P ₀ approx. 1.5 W
Time delay before availability	t _v < 1 s
Interface	
Interface type	IO-Link

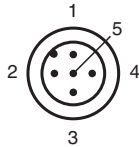
Technical Data

IO-Link revision	1.1
Device profile	Identification and Diagnosis - I&D
Resolution	
Single turn	up to 16 Bit programmable
Multiturn	up to 15 Bit programmable
Overall resolution	up to 31 Bit programmable
Process data	Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data
Vendor ID	1 (0x0001)
Device ID	5243651 (0x500303), 5243652 (0x500304)
Transfer rate	COM3 (230.4 kbits/s)
Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65
Communication interface	IEC 61131-9 / IO-Link V1.1.2
Climatic testing	DIN EN 60068-2-78, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 195 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 10 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	40 N
Radial	110 N












Connection



Connection Assignment

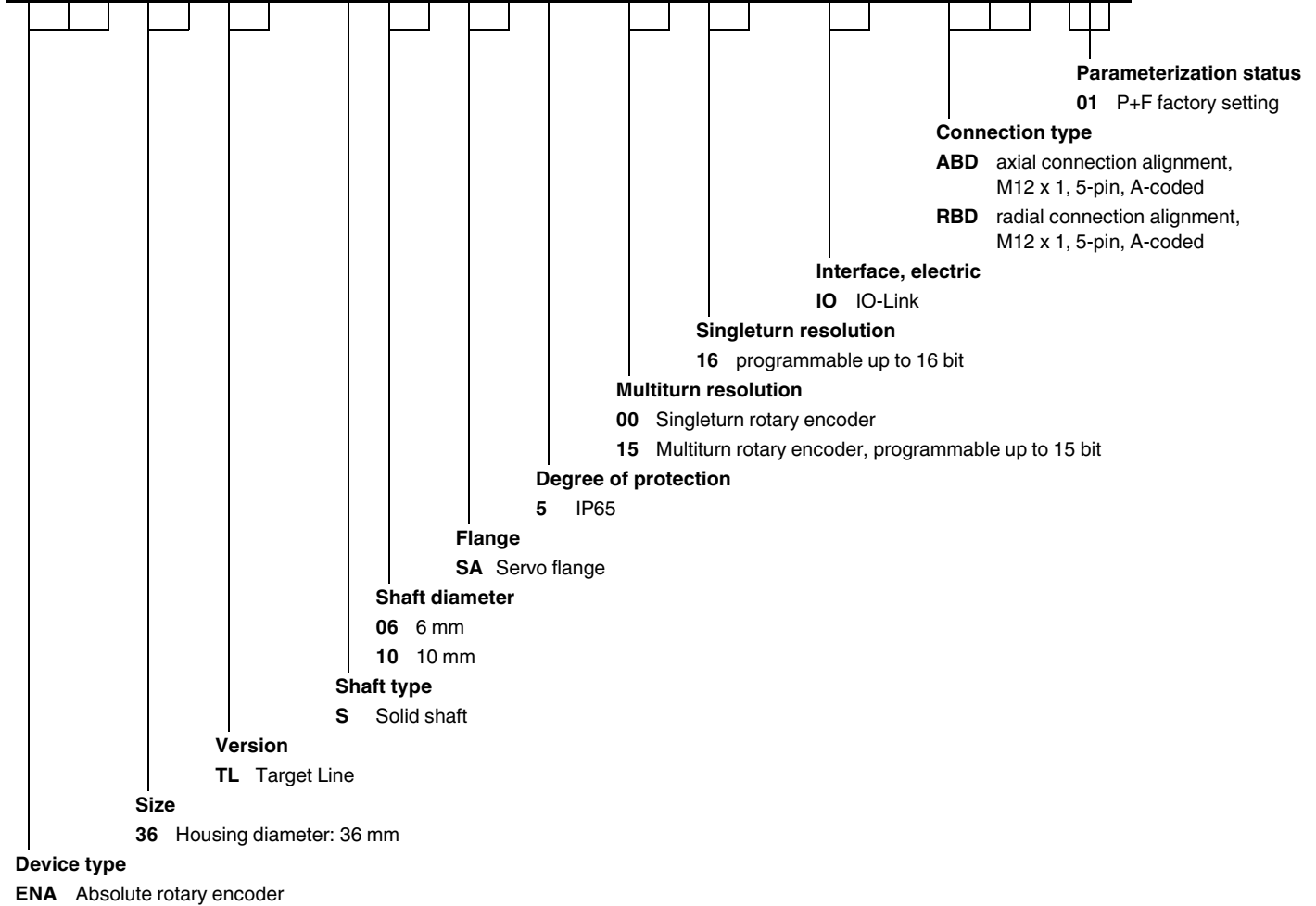


Accessories

	ICE1-8IOL-G60L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	V1-G-0,6M-PUR-V1-G	Cordset M12 socket straight to M12 plug straight A-coded, 4-pin, PUR cable grey
	V15-G-1M-PUR-V15-G	Cordset M12 socket straight to M12 plug straight A-coded, 5-pin, PUR cable grey
	ICE1-8IOL-G30L-V1D	Ethernet IO-Link module with 8 inputs/outputs
	ICE2-8IOL-G65L-V1D	EtherNet/IP IO-Link master with 8 inputs/outputs
	ICE3-8IOL-G65L-V1D	PROFINET IO IO-Link master with 8 inputs/outputs
	ICE2-8IOL-K45S-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	ICE3-8IOL-K45P-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, push-in terminals
	ICE3-8IOL-K45S-RJ45	PROFINET IO IO-Link master with 8 inputs/outputs, DIN rail, screw terminal
	IO-Link-Master02-USB	IO-Link master, supply via USB port or separate power supply, LED indicators, M12 plug for sensor connection
	ICE2-8IOL-K45P-RJ45	EtherNet/IP IO-Link master with 8 inputs/outputs, DIN rail, push-in connectors

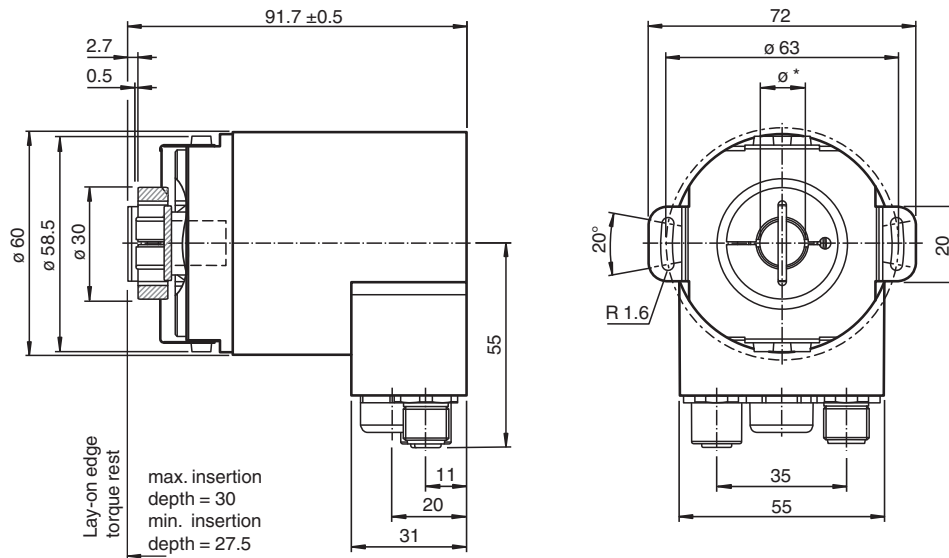
Type Code

E N A 3 6 T L - S S A 5 - 1 6 - I O - 0 1



Dimensions

Recessed hollow shaft



Technical Data

General specifications

Detection type	photoelectric and 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

Performance level (PL)	Suitable for PL d; both channels of the encoder must be connected to a safety PLC and evaluated there.
Category	Suitable for cat. 3; both channels of the encoder must be connected to a safety PLC and evaluated there.
MTTF	100 a at 40 °C (based on EN ISO 13849-1)
Mission Time (T _M)	10 a

Electrical specifications

Operating voltage	U _B	10 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 3.7 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable

Interface

Interface type	CANopen
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	min. 20 kBit/s, max. 1 MBit/s
Cycle time	≥ 1 ms
Standard conformity	DSP 406

Connection

Technical Data

Connector	1 plug M12 x 1, 5-pin, A-coded (with connection type BD) 1 plug M12 x 1, 5-pin, A-coded and 1 socket M12 x 1, 5-pin, A-coded (with connection type BN)
Standard conformity	
Degree of protection	DIN EN 60529, IP65 or IP67
Climatic testing	DIN EN 60068-2, no moisture condensation
Emitted interference	EN 61000-6-4
Noise immunity	EN 61000-6-2
Shock resistance	DIN EN 60068-2-27, 100 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	-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 , painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static
Dimensions	
Diameter	58 mm

Type Code

Aufbau des Typenschlüssels

E N A 5 8 P L - R (1) (1) D A (2) - (3) (3) (4) (4) C R D - (5) (6) (6)

ENA	Device type
ENA	Absolute rotary encoder

58	Size
58	Housing diameter 58 mm

PL	Version
PL	Performance Line

R	Shaft tye
R	Recessed hollow shaft

(1) (1)	Shaft diameter
12	12 mm (d = 12F7)
15	15 mm (d = 15F7)

DA	Flange
DA	Dual spring plate

Release date: 2024-02-16 Date of issue: 2024-02-16 Filename: t209187_eng.pdf

Type Code

(2)		Degree of protection
5		IP65
7		IP67

(3) (3)		Multiturn resolution
12		Multiturn rotary encoder, 12 Bit
14		Multiturn rotary encoder, 14 Bit

(4) (4)		Singleturn resolution
13		13 Bit
16		16 Bit

CRD		Interface, electric
CRD		CANopen redundant, U _B 5 V ... 30 V

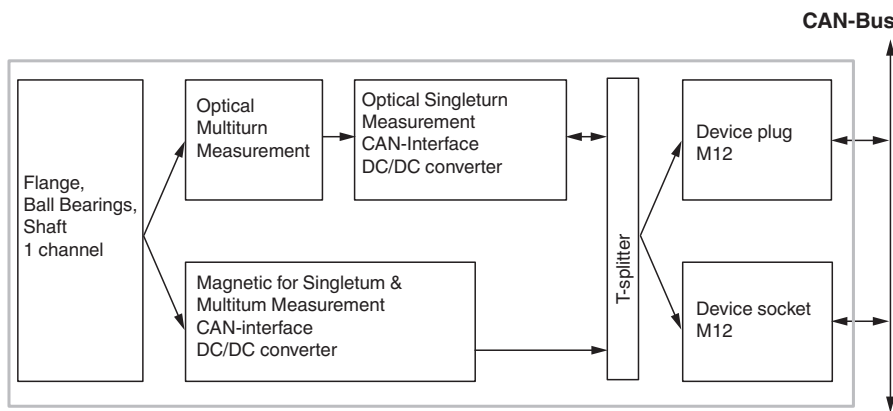
(5)		Connection alignment
A		Axial
R		Radial

(6) (6)		Connection type
BD		M12 device plug, 5-pin
BN		M12 device plug, 5-pin and M12 socket, 5-pin

Connection

Signal	Device plug M12 x 1, 5-pin, A-coded	Device socket M12 x 1, 5-pin, A-coded
	always present	only with connection type BN
CAN GND	1	1
+Vs	2	2
GND	3	3
CAN-High	4	4
CAN-Low	5	5
Shielding	Housing	Housing
Pinout		

The following scheme illustrates the relationships for the electrical connection:



Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply
Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBitrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in stae bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.

Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.
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Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Absolute rotary encoder

ENA58PL-S***-CANopen redundant

- Solid shaft
- Up to 30 bit overall resolution
- Redundant CANopen Interface
- Independent photoelectric and magnetic redundant sampling
- Redundant connection option with 2 connectors
- High resolution and accuracy



Function

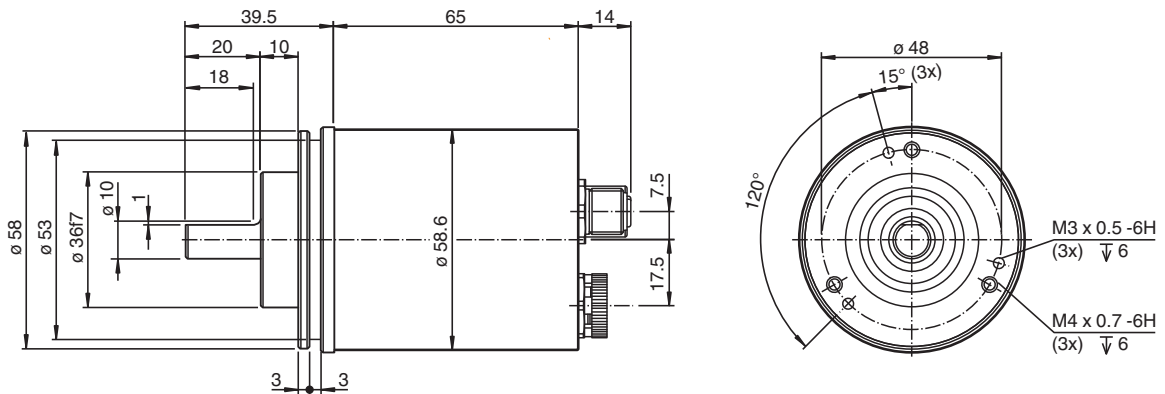
The absolute rotary encoder is equipped with an independent optical and magnetic sampling. Optionally, versions with a combined connector or separate connector outlets for each sampling technology are available. Due to the redundancy, the absolute rotary encoder is ideally suited for safety-relevant applications. The integrated CAN bus interface supports all CANopen functions.

Thus the following modes can be programmed to either enabled or disabled:

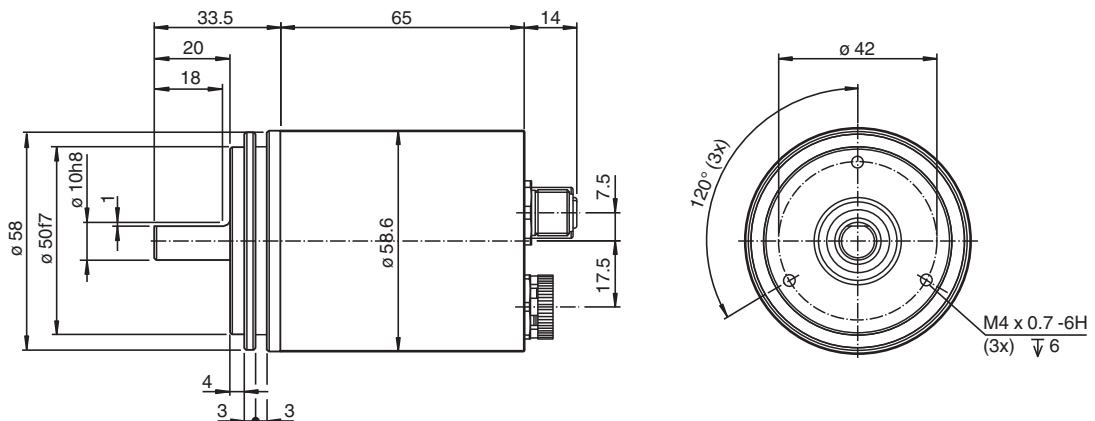
- Polled mode
- Cyclic mode
- Sync mode

Dimensions

Clamping flange

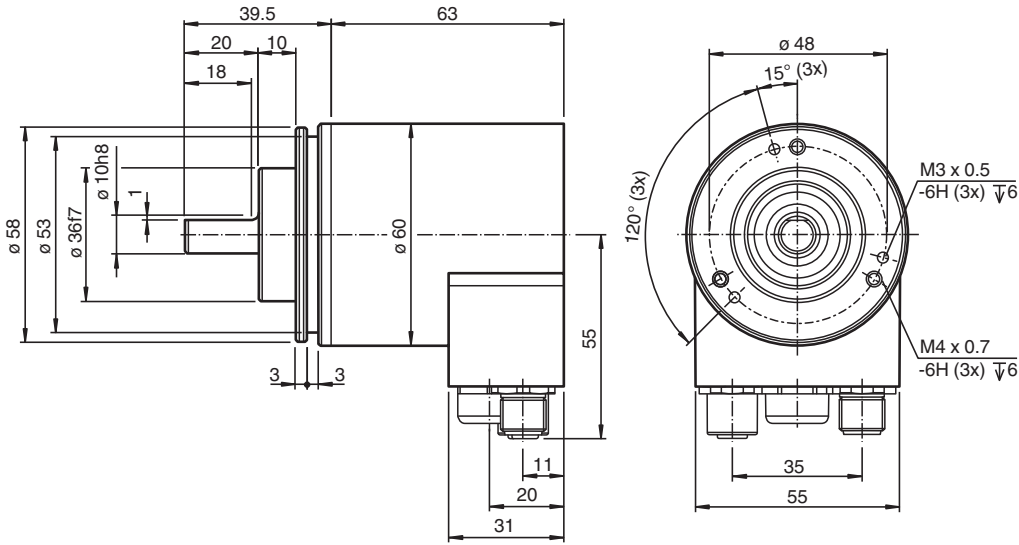


Servo flange

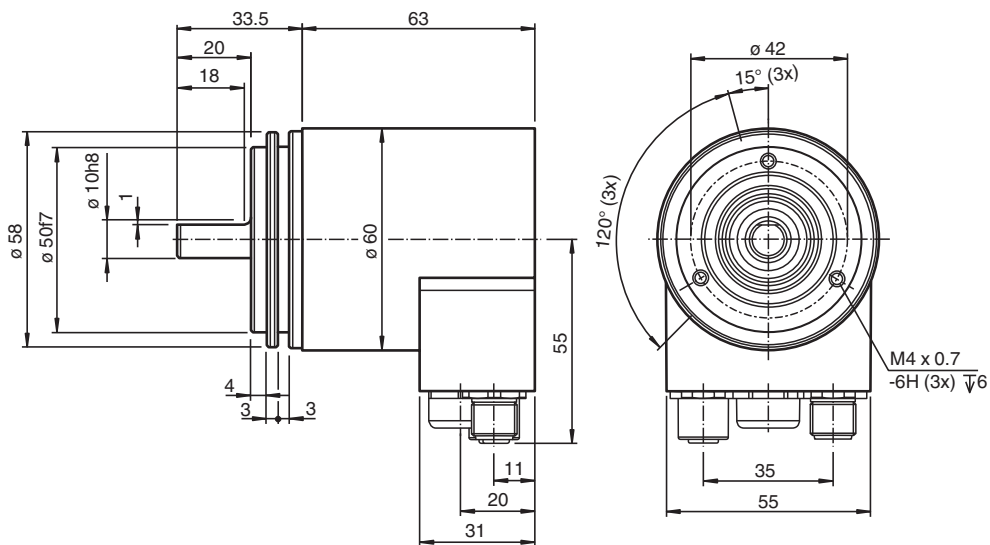


Dimensions

Clamping flange



Servo flange



Technical Data

General specifications	
Detection type	photoelectric and 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	
Performance level (PL)	Suitable for PL d; both channels of the encoder must be connected to a safety PLC and evaluated there.

Technical Data

Category	Suitable for cat. 3; both channels of the encoder must be connected to a safety PLC and evaluated there.	
MTTF		100 a at 40 °C (based on EN ISO 13849-1)
Mission Time (T _M)		10 a
Electrical specifications		
Operating voltage	U _B	10 ... 30 V DC (with galvanic isolation)
Power consumption	P ₀	≤ 3.7 W
Time delay before availability	t _v	< 250 ms
Output code		binary code
Code course (counting direction)		adjustable
Interface		
Interface type		CANopen
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 14 Bit
Overall resolution		up to 30 Bit
Transfer rate		min. 20 kBit/s , max. 1 MBit/s
Cycle time		≥ 1 ms
Standard conformity		DSP 406
Connection		
Connector		1 plug M12 x 1, 5-pin, A-coded (with connection type BD) 1 plug M12 x 1, 5-pin, A-coded and 1 socket M12 x 1, 5-pin, A-coded (with connection type BN)
Standard conformity		
Degree of protection		DIN EN 60529, IP65 or IP67
Climatic testing		DIN EN 60068-2, no moisture condensation
Emitted interference		EN 61000-6-4
Noise immunity		EN 61000-6-2
Shock resistance		DIN EN 60068-2-27, 100 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		Aluminum
Flange		Aluminum
Shaft		Stainless steel 1.4305 / AISI 303
Mass		approx. 320 g
Rotational speed		max. 3000 min ⁻¹
Moment of inertia		30 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		40 N
Radial		110 N
Dimensions		
Length		55.7 mm
Diameter		58 mm

Type Code

Structure of the type code

E	N	A	5	8	P	L	-	S	(1)	(1)	(2)	(2)	(3)	-	(4)	(4)	(5)	(5)	C	R	D	-	(6)	(7)	(7)
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ENA	Device type
ENA	Absolute rotary encoder

58	Size
58	Housing diameter 58 mm

PL	Version
PL	Performance Line

S	Shaft type
S	Solid shaft

(1) (1)	Shaft diameter
06	6 mm
10	10 mm

(2) (2)	Flange
CA	Clamping flange
SA	Servo flange (only with degree of protection B)

(3)	Degree of protection
5	IP65
7	IP67

(4) (4)	Multiturn resolution
12	Multiturn rotary encoder, 12 Bit
14	Multiturn rotary encoder, 14 Bit

(5) (5)	Singleturn resolution
13	13 Bit
16	16 Bit

CRD	Interface, electric
CRD	CANopen redundant, U_B 5 V ... 30 V

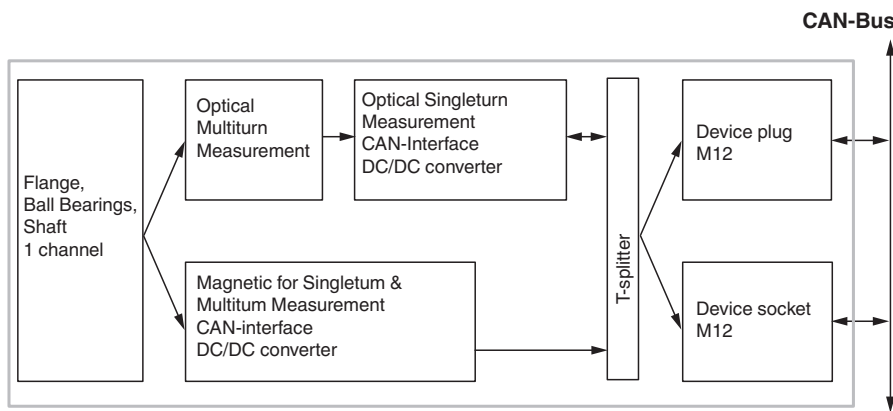
(6)	Connection alignment
A	Axial
R	Radial

(7) (7)	Connection type
BD	M12 device plug, 5-pin
BN	M12 device plug, 5-pin and M12 socket, 5-pin

Connection

Signal	Device plug M12 x 1, 5-pin, A-coded	Device socket M12 x1, 5-pin, A-coded
	always present	only with connection type BN
CAN GND	1	1
+Vs	2	2
GND	3	3
CAN-High	4	4
CAN-Low	5	5
Shielding	Housing	Housing
Pinout		

The following scheme illustrates the relationships for the electrical connection:



Indication

LED-indicator with dual color LED

CAN Run (green)	State	Description
Blinking	Pre-Operational	Boot up message is sent, device configuration is possible, device is in CAN state „Pre-Operational“
Single flash	Stopped	The Encoder is in CAN state „Stopped“
On	Operational	The encoder is in CAN state „Operational“
Off		No power supply
Err (red)	State	Description
Off	No error	The Encoder is in operating mode
Flickering	AutoBitrate	Auto baud mode is active and the encoder tries to find within the time out period a valid CAN message for baud rate measurement
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NTM slave or NTM master) or a heartbeat event has occurred
On	Bus off	The CAN controller is in stae bus off. No communication possible anymore. Too many error frames in the network.

Programming

Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.

Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.
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Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

Absolute rotary encoder

ENA58IL-R***-B17



- Recessed hollow shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs

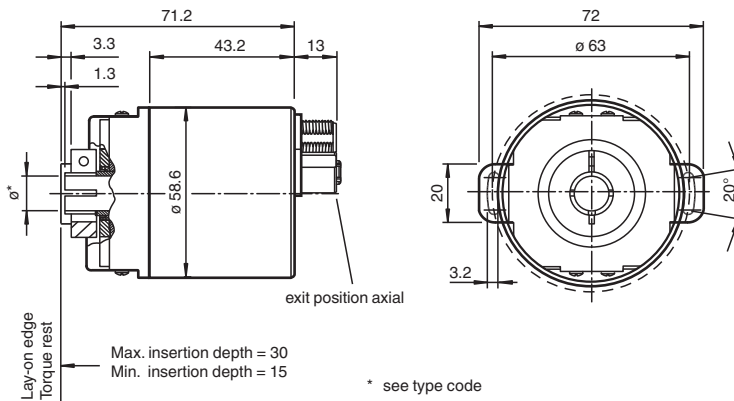
Absolute rotary encoder with magnetic sampling and PROFINET interface



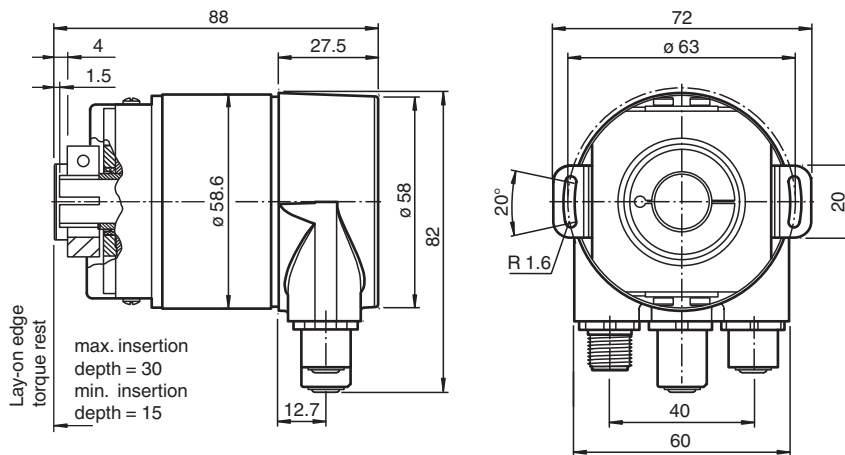
Function

The absolute rotary encoders with PROFINET IO interface and magnetic sampling can be used in all PROFINET applications. Thanks to the Encoder Profile 4.2 and the IRT mode, they are ideally suited for I4.0 applications.

Dimensions



Recessed hollow shaft



Recessed hollow shaft

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.
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
Power consumption	P_0	approx. 4 W
Time delay before availability	t_v	< 15 s
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		PROFINET IO
Device profile		Encoder Profile V4.2
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 14 Bit
Overall resolution		up to 30 Bit
Transfer rate		100 MBit/s
Cycle time		$\geq 250 \mu\text{s}$
Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, IP65, IP66, IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 % , no moisture condensation
Mechanical specifications		
Material		
Housing		Zinc plated steel, painted
Flange		Aluminum
Shaft		Stainless steel
Mass		approx. 300 g
Rotational speed		max. 12000 min ⁻¹ for IP65 max. 3000 min ⁻¹ for IP66/IP67
Moment of inertia		50 gcm ²
Starting torque		< 5 Ncm
Shaft load		
Axial		24 N
Radial		198 N
Angle offset		$\pm 0.9^\circ$
Axial offset		$\pm 0.3 \text{ mm static}$

Technical Data

Radial offset ± 0.5 mm static

Type Code

Structure of the type code

E N A 5 8 I L - R (1) (1) D A (2) - (3) (3) (4) (4) B 1 7 - (5) (5) (5)

ENA	Device type
ENA	Absolute rotary encoder

58	Size
58	Housing diameter 58 mm

IL	Version
IL	Industrial Line

R	Shaft type
R	Recessed hollow shaft

(1) (1)	Shaft diameter
06	6 mm (d = 6F7)
10	10 mm (d = 10F7)
12	12 mm (d = 12F7)
14	14 mm (d = 14F7)
15	15 mm (d = 15F7)

DA	Flange
DA	Dual spring plate

(2)	Degree of protection
5	IP65
7	IP67

(3) (3)	Multiturn resolution
00	Singleturn rotary encoder
12	Multiturn rotary encoder, 12 bit
14	Multiturn rotary encoder, 14 bit

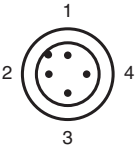
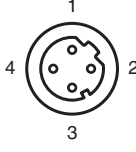
(4) (4)	Singleturn resolution
13	13 Bit
16	16 Bit

B17	Interface, electric
B17	PROFINET

(5) (5) (5)	Connection type
ABP	Axial connection alignment, 2 Sockets / plug M12 x 1
RH2	Radial connection alignment, Bus cover with 2 sockets / plug M12 x 1

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

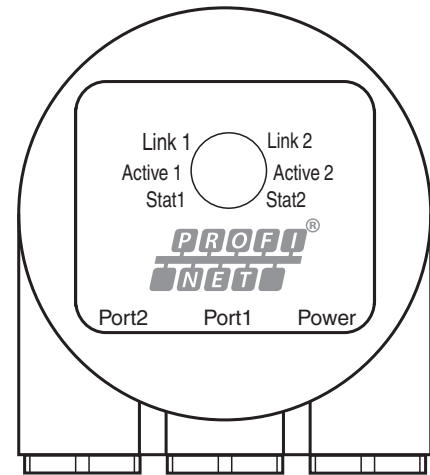
	
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Absolute rotary encoder

ENA58IL-S***-B17



- Solid shaft
- 30 Bit multiturn
- Free of wear magnetic sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs

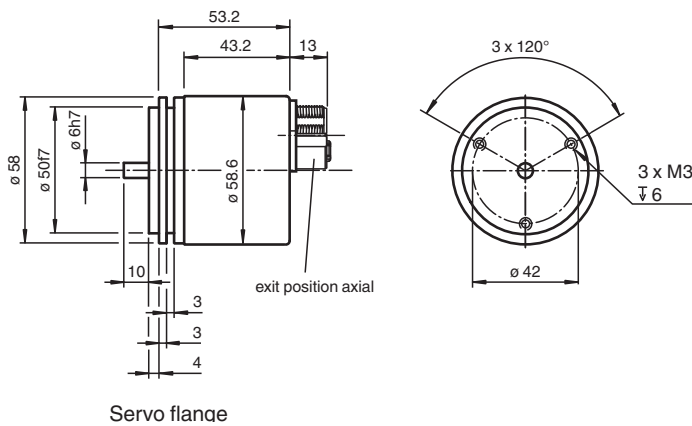
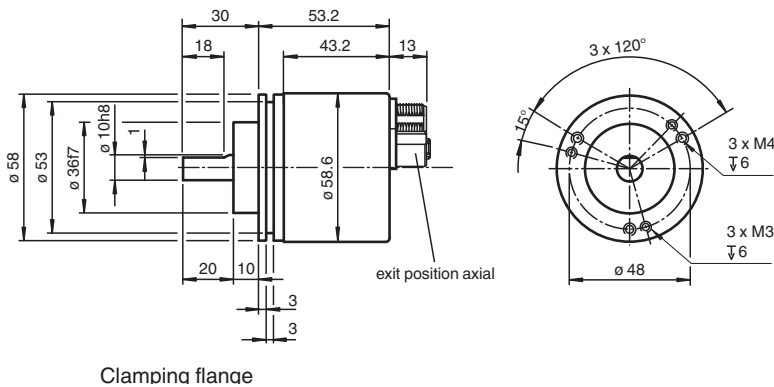
Absolute rotary encoder with magnetic sampling and PROFINET interface



Function

The absolute rotary encoders with PROFINET IO interface and magnetic sampling can be used in all PROFINET applications. Thanks to the Encoder Profile 4.2 and the IRT mode, they are ideally suited for I4.0 applications.

Dimensions



Technical Data

Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP66, IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 300 g
Rotational speed	max. 12000 min ⁻¹ for IP65 max. 3000 min ⁻¹ for IP66/IP67
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Type Code

Structure of the type code

E	N	A	5	8	I	L	-	S	(1)	(1)	(2)	(2)	(3)	-	(4)	(4)	(5)	(5)	B	1	7	-	(6)	(6)	(6)
---	---	---	---	---	---	---	---	---	-----	-----	-----	-----	-----	---	-----	-----	-----	-----	---	---	---	---	-----	-----	-----

ENA	Device type
ENA	Absolute rotary encoder

58	Size
58	Housing diameter 58 mm

IL	Version
IL	Industrial Line

S	Shaft type
S	Solid shaft

(1) (1)	Shaft diameter
06	6 mm
10	10 mm

(2) (2)	Flange
CA	Clamping flange
SA	Servo flange

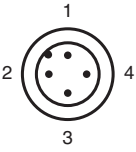
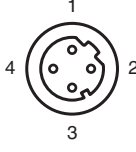
(3)	Degree of protection
5	IP65
7	IP67

Type Code

(4) (4) Multiturn resolution	
00	Singleturn rotary encoder
12	Multiturn rotary encoder, 12 bit
14	Multiturn rotary encoder, 14 bit
(5) (5) Singleturn resolution	
13	13 Bit
16	16 Bit
B17 Interface, electric	
B17	PROFINET
(6) (6) (6) Connection type	
ABP	Axial connection alignment, 2 Sockets / plug M12 x 1
RH2	Radial connection alignment, Bus cover with 2 sockets / plug M12 x 1

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

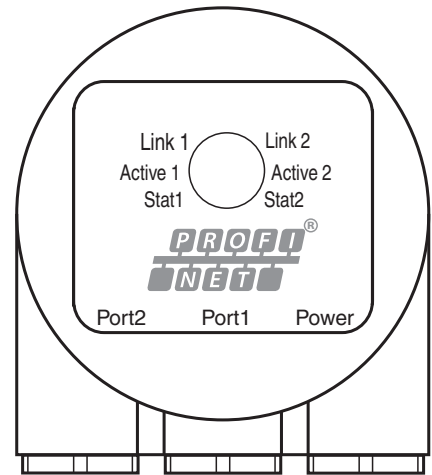
	
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds



Absolute rotary encoder

ENA58PL-R***-B17

- Recessed hollow shaft
- 30 Bit multiturn
- High accuracy due to photoelectric sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs

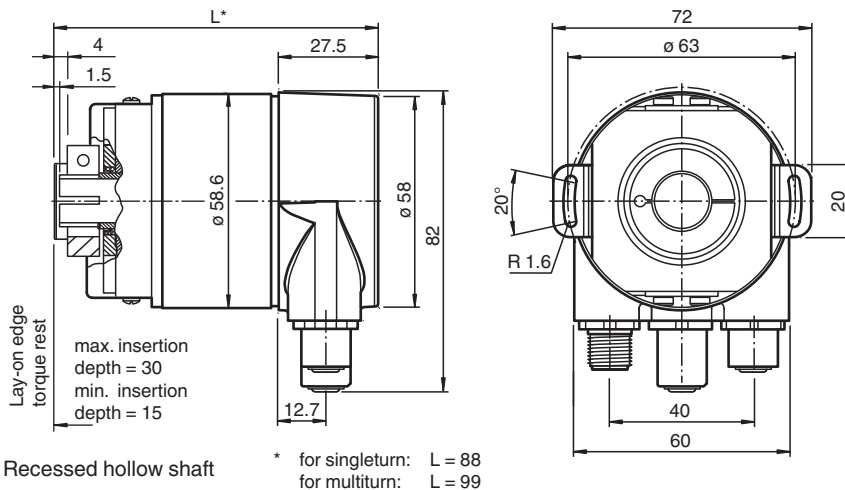
Absolute rotary encoder with photoelectric sampling and PROFINET interface



Function

The absolute encoders with PROFINET IO interface and precious photoelectric sampling can be used in all PROFINET applications. Thanks to the Encoder Profile 4.2 and the IRT mode, they are ideally suited for I4.0 applications.

Dimensions



Technical Data

General specifications			
Detection type			photoelectric sampling
Device type			Absolute rotary encoder
Linearity error			$\leq \pm 0.02^\circ$ (14 ... 16 bit)
UL File Number			E223176 "For use in NFPA 79 Applications only" , if UL marking is marked on the product.
Electrical specifications			
Operating voltage	U_B		10 ... 30 V DC
Power consumption	P_0		approx. 4 W
Time delay before availability	t_v		< 15 s
Output code			binary code
Code course (counting direction)			programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface			

Technical Data

Interface type	PROFINET IO
Device profile	Encoder Profile V4.2
Resolution	
Single turn	up to 16 Bit
Multiturn	up to 14 Bit
Overall resolution	up to 30 Bit
Transfer rate	100 MBit/s
Cycle time	≥ 250 µs
Connection	
Connector	Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity	
Degree of protection	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Combination 1	housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4305 / AISI 303 shaft: stainless steel 1.4305 / AISI 303
Mass	approx. 360 g (combination 1) approx. 910 g (combination 2)
Rotational speed	max. 12000 min ⁻¹ for IP65 max. 3000 min ⁻¹ for IP66/IP67
Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static
Radial offset	± 0.5 mm static

Type Code

Structure of the type code

E	N	A	5	8	P	L	-	R	(1)	(1)	(2)	(2)	(3)	-	(4)	(4)	(5)	(5)	B	1	7	-	R	H	2
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ENA	Device type
ENA	Absolute rotary encoder

Type Code

58	Size
58	Housing diameter 58 mm
PL	Version
PL	Performance Line
R	Shaft type
R	Recessed hollow shaft
(1) (1)	Shaft diameter
06	6 mm (d = 6F7)
10	10 mm (d = 10F7)
12	12 mm (d = 12F7)
14	14 mm (d = 14F7)
15	15 mm (d = 15F7)
(2) (2)	Flange
DA	Dual spring plate, housing and flange in aluminum, shaft in stainless
D2	Dual spring plate, housing, flange and shaft in stainless steel 1.4305 / AISI303 (V2A)
(3)	Degree of protection
5	IP65
7	IP67
(4) (4)	Multiturn resolution
00	Singleturn rotary encoder
12	Multiturn rotary encoder, 12 bit
14	Multiturn rotary encoder, 14 bit
(5) (5)	Singleturn resolution
13	13 Bit
16	16 Bit
B17	Interface, electric
B17	PROFINET
RH2	Connection type
RH2	Radial connection alignment, Bus cover with 2 sockets / plug M12 x 1

Connection

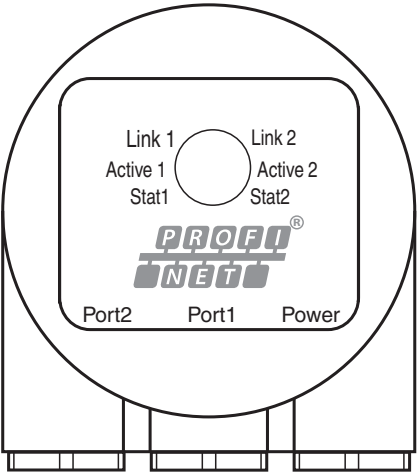
Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds

Absolute rotary encoder

ENA58PL-S***-B17



- Solid shaft
- 30 Bit multiturn
- High accuracy due to photoelectric sampling
- High resolution and accuracy
- Mechanical compatibility with all major encoders with fieldbus interface
- Status LEDs

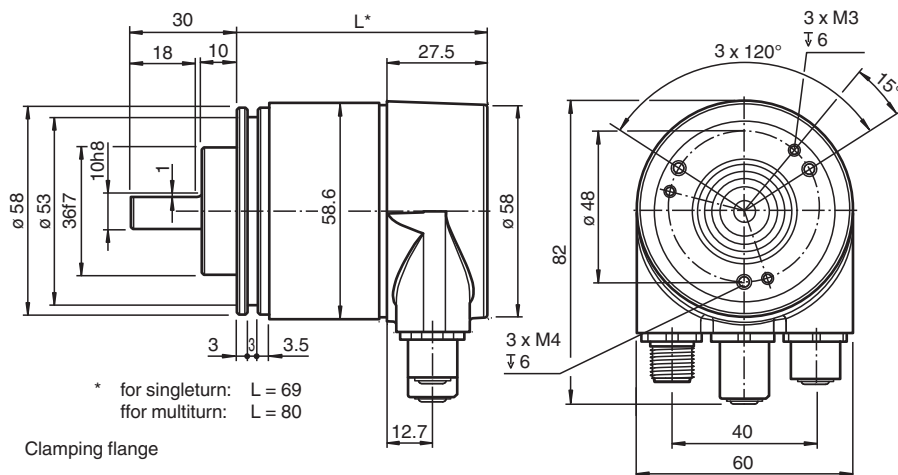
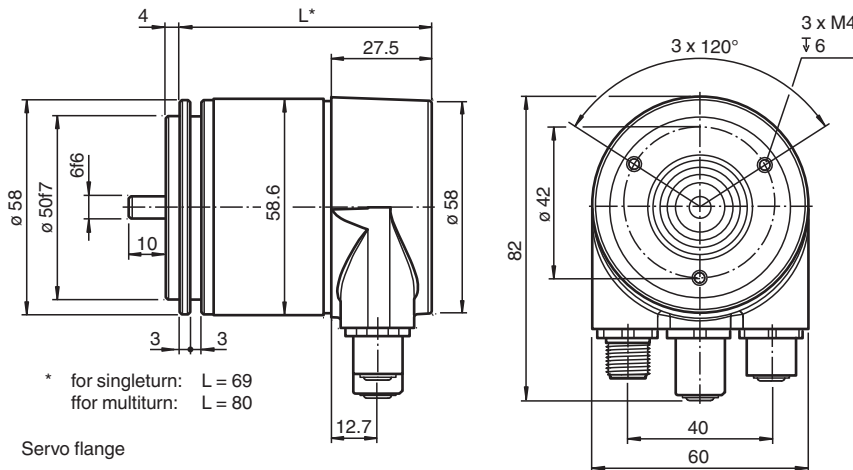
Absolute rotary encoder with photoelectric sampling and PROFINET interface



Function

The absolute encoders with PROFINET IO interface and precious photoelectric sampling can be used in all PROFINET applications. Thanks to the Encoder Profile 4.2 and the IRT mode, they are ideally suited for I4.0 applications.

Dimensions



Technical Data

General specifications		
Detection type		photoelectric sampling
Device type		Absolute rotary encoder
Linearity error		$\leq \pm 0.02^\circ$ (14 ... 16 bit)
UL File Number		E223176 "For use in NFPA 79 Applications only", if UL marking is marked on the product.
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
Power consumption	P_0	approx. 4 W
Time delay before availability	t_v	< 15 s
Output code		binary code
Code course (counting direction)		programmable, cw ascending (clockwise rotation, code course ascending) cw descending (clockwise rotation, code course descending)
Interface		
Interface type		PROFINET IO
Device profile		Encoder Profile V4.2
Resolution		
Single turn		up to 16 Bit
Multiturn		up to 14 Bit
Overall resolution		up to 30 Bit
Transfer rate		100 MBit/s
Cycle time		$\geq 250 \mu\text{s}$
Connection		
Connector		Ethernet: 2 sockets M12 x 1, 4-pin, D-coded Supply: 1 plug M12 x 1, 4-pin, A-coded
Standard conformity		
Degree of protection		DIN EN 60529, Aluminum version: shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65 Stainless steel version (INOX): completely IP67
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, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 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		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		98 %, no moisture condensation
Mechanical specifications		
Material		
Combination 1		housing: powder coated aluminum flange: aluminum shaft: stainless steel
Combination 2 (Inox)		housing: stainless steel 1.4305 / AISI 303 flange: stainless steel 1.4305 / AISI 303 shaft: stainless steel 1.4305 / AISI 303
Combination 3 (A)		housing: stainless steel 1.4404 / AISI 316L flange: stainless steel 1.4404 / AISI 316L shaft: stainless steel 1.4112 / AISI 440B
Mass		approx. 370 g (combination 1) approx. 860 g (combination 2/3)
Rotational speed		max. 12000 min ⁻¹ for IP65 max. 3000 min ⁻¹ for IP66/IP67

Technical Data

Moment of inertia	50 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Type Code

Structure of the type code

E	N	A	5	8	P	L	-	S	(1)	(1)	(2)	(2)	(3)	-	(4)	(4)	(5)	(5)	B	1	7	-	R	H	2
---	---	---	---	---	---	---	---	---	-----	-----	-----	-----	-----	---	-----	-----	-----	-----	---	---	---	---	---	---	---

ENA	Device type
ENA	Absolute rotary encoder

58	Size
58	Housing diameter 58 mm

PL	Version
PL	Performance Line

S	Shaft type
S	Solid shaft

(1) (1)	Shaft diameter
06	6 mm
10	10 mm

(2) (2)	Flange
CA	Clamping flange, housing and flange in aluminum, shaft in stainless steel
C2	Clamping flange, housing, flange and shaft in stainless steel 1.4305 / AISI303 (V2A)
C4	Clamping flange V4A, housing and flange in stainless steel 1.4404 / AISI316L (V4A), shaft in stainless steel 1.4112 / AISI440B
SA	Servo flange, housing and flange in aluminum, shaft in stainless steel
S2	Servo flange, housing, flange and shaft in stainless steel 1.4305 / AISI303 (V2A)
S4	Servo flange V4A, housing and flange in stainless steel 1.4404 / AISI316L (V4A), shaft in stainless steel 1.4112 / AISI440B

(3)	Degree of protection
5	IP65
7	IP67

(4) (4)	Multiturn resolution
00	Singleturn rotary encoder
12	Multiturn rotary encoder, 12 bit
14	Multiturn rotary encoder, 14 bit

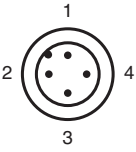
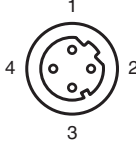
(5) (5)	Singleturn resolution
13	13 Bit
16	16 Bit

B17	Interface, electric
B17	PROFINET

RH2	Connection type
RH2	Radial connection alignment, Bus cover with 2 sockets / plug M12 x 1

Connection

Pin	Male connector M12 x 1, 4-pin, A-coded	Female connector M12 x 1, 4-pin, D-coded
1	Supply voltage +U _B	Tx +
2	-	Rx +
3	0 V	Tx -
4	-	Rx -

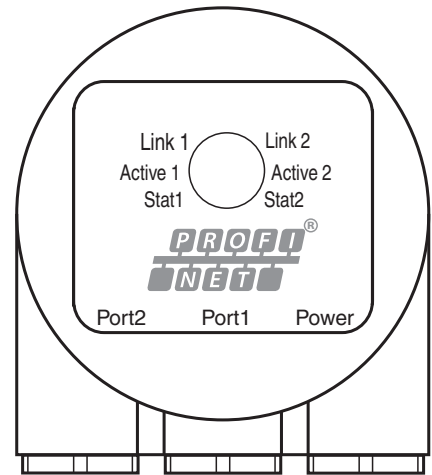
	
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Indication

Diagnostic LEDs

LED	Color	Description for LED = ON
Active1	Yellow	Incoming and outgoing data traffic for port 1
Link1*	Green	Connection to other Ethernet devices on port 1
Active2	Yellow	Incoming and outgoing data traffic for port 2
Link2*	Green	Connection to other Ethernet devices on port 2
Stat1	Green	Status 1, details see table below
Stat2	Red	Status 2, details see table below

* flashes with 2 Hz if engineering identification call is activated and link connection is available



Stat1 (green)	Stat2 (red) bus failure	Meaning	Cause
off	off	No power	
on	on	No connection to another device Criteria: no data exchange	<ul style="list-style-type: none"> • bus disconnected • Master not available / switched off
on	flashes ¹⁾	Parameterization fault, no data exchange Criteria: data exchange correct. However, the slave did not switch to the data exchange mode.	<ul style="list-style-type: none"> • Slave not configured yet or wrong configuration • Wrong station address assigned (but not outside the permitted range) • Actual configuration of the slave differs from the nominal configuration
on	off	Data exchange. Slave and operation ok.	

1) flashing frequency 0.5 Hz for at least 3 seconds



Absolute rotary encoder

ENA36HT-S***-IO-Link

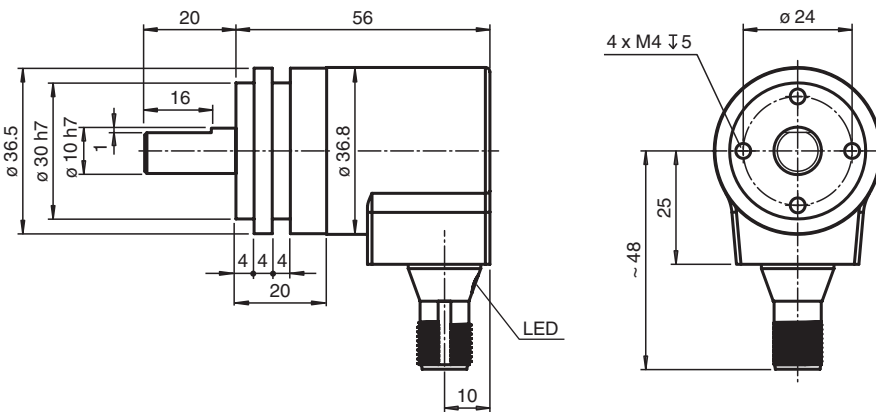
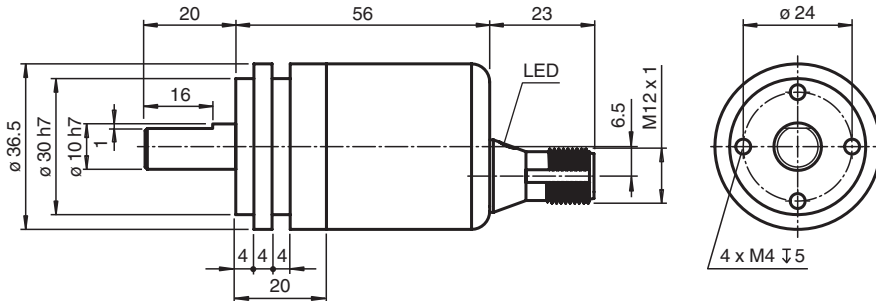
- Absolute rotary encoder of the innovative Pure Line
- Solid shaft
- High climatic resistance
- High mechanical stability
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs



Function

Heavy duty absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions



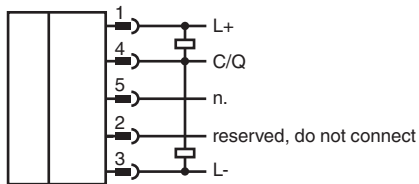
Technical Data

General specifications			
Detection type			magnetic sampling
Device type			Heavy duty absolute rotary encoder as Pure Line
Measured variable			position Temperature
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			480 a at 40 °C
Mission Time (T _M)			20 a
L ₁₀			10 E+8 revolutions at 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)			0 %
Indicators/operating means			
LED STATUS			LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications			
Operating voltage	U _B		18 ... 30 V DC
No-load supply current	I ₀		max. 50 mA
Power consumption	P ₀		approx. 1.5 W
Time delay before availability	t _v		< 1 s
Interface			
Interface type			IO-Link
IO-Link revision			1.1
Device profile			Identification and Diagnosis - I&D
Resolution			
Single turn			up to 16 Bit programmable
Multiturn			up to 15 Bit programmable
Overall resolution			up to 31 Bit programmable
Process data			Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data
Vendor ID			1 (0x0001)
Device ID			500901 (0x5245185), 500902 (0x5245186)
Transfer rate			COM3 (230.4 kbits/s)
Min. cycle time			1.5 ms
SIO mode support			no
Compatible master port type			Class A Class B (use 3-pole adapter or 3-wire cable)
Connection			
Connector			M12 connector, 5 pin , A-coded
Standard conformity			
Degree of protection			DIN EN 60529, IP68, IP69
Communication interface			IEC 61131-9 / IO-Link V1.1.2
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, 11 ms
Vibration resistance			DIN EN 60068-2-6, 30 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			

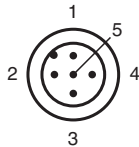
Technical Data

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	powder coated steel
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 150 g
Rotational speed	max. 6000 min ⁻¹
Moment of inertia	< 30 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	180 N
Radial	180 N

Connection



Connection Assignment



Type Code

Structure of the type code

E	N	A	3	6	H	T	-	S	1	0	S	A	9	-	(1)	(1)	1	6	-	I	O	-	(2)	(2)	(2)	0	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-----	-----	---	---	---	---	---	---	-----	-----	-----	---	---

ENA	Device type
ENA	Absolute rotary encoder

36	Size
36	Housing diameter 36 mm

HT	Version
HT	Heavy Duty as Target Line / Pure Line

S	Shaft type
S	Solid shaft

10	Shaft diameter
10	10 mm

SA	Flange
SA	Servo flange

Type Code

9	
Degree of protection	
9	IP68/IP69
(2) (2)	
Multiturn resolution	
00	Singleturn rotary encoder
15	Multiturn rotary encoder, parameterizable up to 15 bit
16	
Singleturn resolution	
16	16 Bit
IO	
Interface, electric	
IO	IO-Link
(3) (3) (3)	
Connection type	
ABP	Axial connection alignment, M12 x 1, 5-pin, A coded
RH2	Radial connection alignment, M12 x 1, 5-pin, A coded
01	
Parameterization status	
01	P+F factory setting



Absolute rotary encoder

ENA36IL-R***-IO-Link

- Absolute rotary encoder of the innovative Performance Line
- Recessed hollow shaft
- Position and shaft velocity
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy

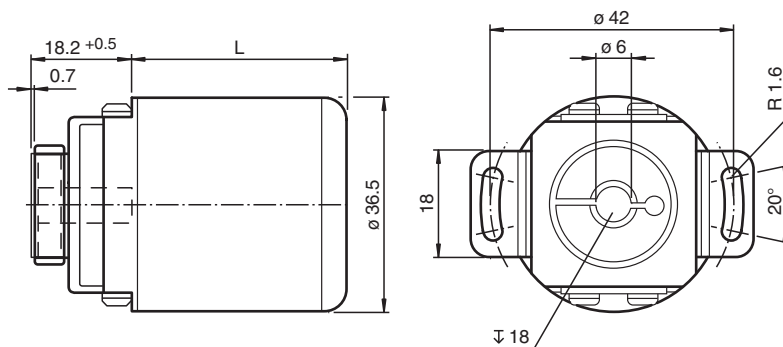


IO-Link

Function

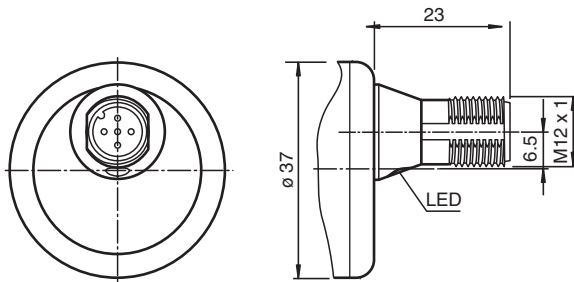
Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaptation to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions

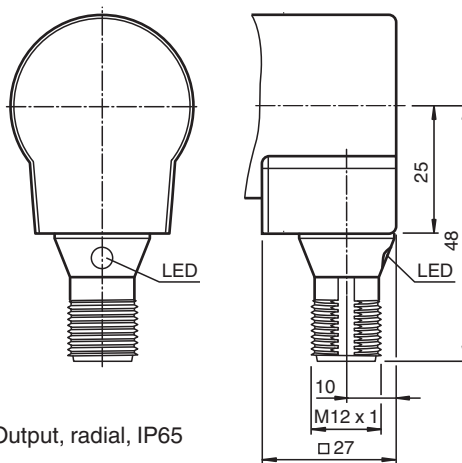


Degree of Protection	L [mm]	
	Axial Output	Radial Output
IP65	43	39

Dimensions



Output, axial, IP65



Output, radial, IP65

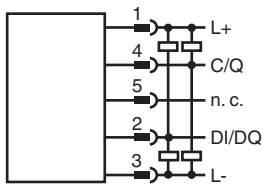
Technical Data

General specifications	
Detection type	magnetic sampling
Device type	Absolute rotary encoder as Performance Line
Measured variable	position shaft velocity Temperature
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	566 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	1035 E+8 revolutions at 19/44 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Indicators/operating means	
LED STATUS	LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications	
Operating voltage	U _B 18 ... 30 V DC
No-load supply current	I ₀ max. 50 mA
Power consumption	P ₀ approx. 1.5 W
Time delay before availability	t _v < 1 s
Interface	

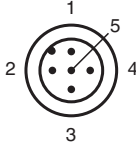
Technical Data

Interface type	IO-Link
IO-Link revision	1.1
Device profile	Identification and Diagnosis - I&D
Resolution	
Single turn	up to 16 Bit programmable
Multiturn	up to 15 Bit programmable
Overall resolution	up to 31 Bit programmable
Process data	Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 4 Bit - diagnosis signals 2 Bit - status data Output 1 Byte - Trigger 1 Bit
Vendor ID	1 (0x0001)
Device ID	5244161 (0x500501), 5244162 (0x500502)
Transfer rate	COM3 (230.4 kbits/s)
Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP67
Communication interface	IEC 61131-9 / IO-Link V1.1.2
Climatic testing	DIN EN 60068-2-78, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 190 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 18 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	19 N
Radial	44 N
Axial offset	± 0.3 mm static; ± 0,1 mm dynamic
Radial offset	± 0.5 mm static; & lusmn 0,2 mm dynamic

Connection



Connection Assignment



Type Code

Structure of the type code

E	N	A	3	6	I	L	-	R	0	6	D	A	5	-	(1)	(1)	1	6	-	I	O	-	(2)	(2)	(2)	0	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	-----	-----	---	---	---	---	---	---	-----	-----	-----	---	---

ENA	Device type
ENA	Absolute rotary encoder
36	Size
36	Housing diameter 36 mm
IL	Version
IL	Industrial Line / Performance Line
R	Shaft type
R	Recessed hollow shaft
06	Shaft diameter
06	6 mm
DA	Flange
DA	Dual spring plate
5	Degree of protection
5	IP65
(1) (1)	Multiturn resolution
00	Singleturn rotary encoder
15	Multiturn rotary encoder, parameterizable up to 15 bit
16	Singleturn resolution
16	16 Bit
IO	Interface, electric
IO	IO-Link
(2) (2) (2)	Connection type
ABP	Axial connection alignment, M12 x 1, 5-pin, A coded
RBD	Radial connection alignment, M12 x 1, 5-pin, A coded
01	Parameterization status
01	P+F factory setting

Absolute rotary encoder

ENA58IL-R***-IO-Link



- Absolute rotary encoder of the innovative Performance Line
- Recessed hollow shaft
- Position and shaft velocity
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy

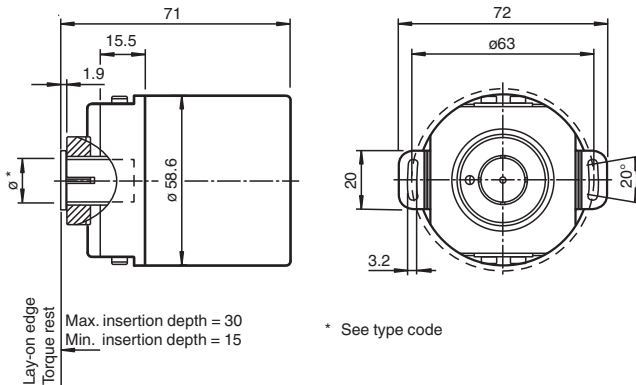


IO-Link

Function

Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions

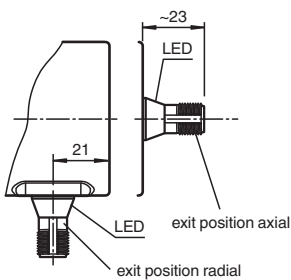


Recessed hollow shaft

Connections

Dimensions in mm

Connector M12



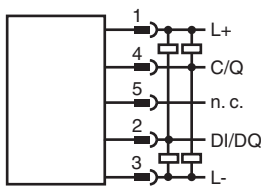
Technical Data

General specifications		
Detection type		magnetic sampling
Device type		Absolute rotary encoder as Performance Line
Measured variable		position shaft velocity Temperature
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		566 a at 40 °C
Mission Time (T _M)		20 a
L ₁₀		5 E+8 revolutions at 24/198 N axial/radial shaft load
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
LED STATUS		LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications		
Operating voltage	U _B	18 ... 30 V DC
No-load supply current	I ₀	max. 50 mA
Power consumption	P ₀	approx. 1.5 W
Time delay before availability	t _v	< 1 s
Interface		
Interface type		IO-Link
IO-Link revision		1.1
Device profile		Identification and Diagnosis - I&D
Resolution		
Single turn		up to 16 Bit programmable
Multiturn		up to 15 Bit programmable
Overall resolution		up to 31 Bit programmable
Process data		Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 4 Bit - diagnosis signals 2 Bit - status data Output 1 Byte - Trigger 1 Bit
Vendor ID		1 (0x0001)
Device ID		5244417 (0x500601), 5244418 (0x500602), 5244421 (0x500605), 5244422 (0x500606)
Transfer rate		COM3 (230.4 kbits/s)
Min. cycle time		1.5 ms
SIO mode support		no
Compatible master port type		Class A Class B (use 3-pole adapter or 3-wire cable)
Connection		
Connector		M12 connector, 5 pin , A-coded
Standard conformity		
Degree of protection		DIN EN 60529, IP65, IP67
Communication interface		IEC 61131-9 / IO-Link V1.1.2
Climatic testing		DIN EN 60068-2-78, no moisture condensation
Emitted interference		EN 61000-6-4:2007
Noise immunity		EN 61000-6-2:2005
Shock resistance		DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance		DIN EN 60068-2-6, 10 g, 10 ... 1000 Hz
Approvals and certificates		

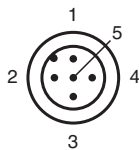
Technical Data

UL approval	cULus Listed, General Purpose, Class 2 Power Source , if UL marking is marked on the product.
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	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 370 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	24 N
Radial	198 N
Angle offset	± 0.9 °
Axial offset	± 0.3 mm static; ± 0,1 mm dynamic
Radial offset	± 0.5 mm static; &lusmn 0,2 mm dynamic

Connection



Connection Assignment



Type Code

Structure of the type code

E	N	A	5	8	I	L	-	R	(1)	(1)	D	A	(2)	-	(3)	(3)	1	6	-	I	O	-	(4)	(4)	(4)	0	1
---	---	---	---	---	---	---	---	---	-----	-----	---	---	-----	---	-----	-----	---	---	---	---	---	---	-----	-----	-----	---	---

ENA	Device type
ENA	Absolute rotary encoder
58	Size
58	Housing diameter 58 mm
IL	Version
IL	Industrial Line / Performance Line

Type Code

R	
R	Shaft type
R	Recessed hollow shaft
(1) (1)	
(1) (1)	Shaft diameter
06	6 mm
10	10 mm
12	12 mm
14	14 mm
15	15 mm
DA	
DA	Flange
DA	Dual spring plate
(2)	
(2)	Degree of protection
5	IP65
7	IP66, IP67
(3) (3)	
(3) (3)	Multiturn resolution
00	Singleturn rotary encoder
15	Multiturn rotary encoder, parameterizable up to 15 bit
16	
16	Singleturn resolution
16	16 Bit
IO	
IO	Interface, electric
IO	IO-Link
(4) (4) (4)	
(4) (4) (4)	Connection type
ABP	Axial connection alignment, M12 x 1, 5-pin, A coded
RBD	Radial connection alignment, M12 x 1, 5-pin, A coded
01	
01	Parameterization status
01	P+F factory setting



Absolute rotary encoder

ENA58IL-S***-IO-Link

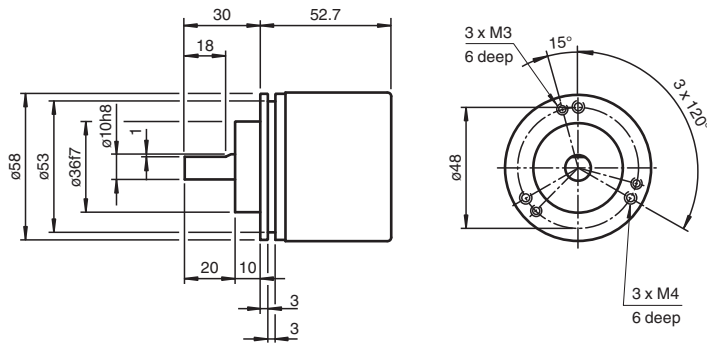
- Absolute rotary encoder of the innovative Performance Line
- Solid shaft
- Position and shaft velocity
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy



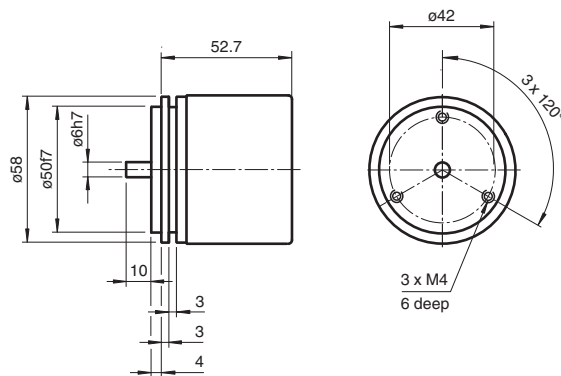
Function

Absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions



Clamping flange



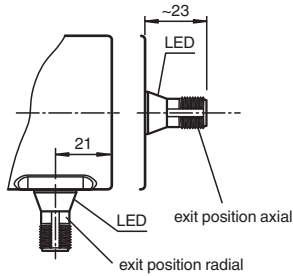
Servo flange

Dimensions

Connections

Dimensions in mm

Connector M12



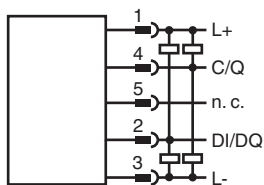
Technical Data

General specifications			
Detection type			magnetic sampling
Device type			Absolute rotary encoder as Performance Line
Measured variable			position shaft velocity Temperature
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			566 a at 40 °C
Mission Time (T _M)			20 a
L ₁₀			420 E+8 revolutions at 40/110 N axial/radial shaft load
Diagnostic Coverage (DC)			0 %
Indicators/operating means			
LED STATUS			LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications			
Operating voltage	U _B		18 ... 30 V DC
No-load supply current	I ₀		max. 50 mA
Power consumption	P ₀		approx. 1.5 W
Time delay before availability	t _v		< 1 s
Interface			
Interface type			IO-Link
IO-Link revision			1.1
Device profile			Identification and Diagnosis - I&D
Resolution			
Single turn			up to 16 Bit programmable
Multiturn			up to 15 Bit programmable
Overall resolution			up to 31 Bit programmable
Process data			Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 4 Bit - diagnosis signals 2 Bit - status data Output 1 Byte - Trigger 1 Bit
Vendor ID			1 (0x0001)

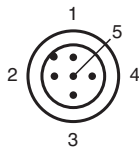
Technical Data

Device ID	5244419 (0x500603), 5244420 (0x500604), 5244423 (0x500607), 5244424 (0x500608)
Transfer rate	COM3 (230.4 kbits/s)
Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529, IP65, IP67
Communication interface	IEC 61131-9 / IO-Link V1.1.2
Climatic testing	DIN EN 60068-2-78, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 100 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 10 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	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 % , no moisture condensation
Mechanical specifications	
Material	
Housing	Zinc plated steel, painted
Flange	Aluminum
Shaft	Stainless steel
Mass	approx. 350 g
Rotational speed	max. 12000 min ⁻¹
Moment of inertia	< 30 gcm ²
Starting torque	< 3 Ncm
Shaft load	
Axial	40 N
Radial	110 N

Connection



Connection Assignment



Type Code

Structure of the type code

E	N	A	5	8	I	L	-	S	(1)	(1)	(2)	(2)	(3)	-	(4)	(4)	1	6	-	I	O	-	(5)	(5)	(5)	0	1
---	---	---	---	---	---	---	---	---	-----	-----	-----	-----	-----	---	-----	-----	---	---	---	---	---	---	-----	-----	-----	---	---

ENA	Device type
ENA	Absolute rotary encoder
58	Size
58	Housing diameter 58 mm
IL	Version
IL	Industrial Line / Performance Line
S	Shaft type
S	Solid shaft
(1) (1)	Shaft diameter
06	6 mm
10	10 mm
(2) (2)	Flange
CA	Clamping flange
SA	Servo flange
(3)	Degree of protection
5	IP65
7	IP66, IP67
(4) (4)	Multiturn resolution
00	Singleturn rotary encoder
15	Multiturn rotary encoder, parameterizable up to 15 bit
16	Singleturn resolution
16	16 Bit
IO	Interface, electric
IO	IO-Link
(5) (5) (5)	Connection type
ABP	Axial connection alignment, M12 x 1, 5-pin, A coded
RBD	Radial connection alignment, M12 x 1, 5-pin, A coded
01	Parameterization status
01	P+F factory setting

Absolute rotary encoder

ENA42HT-S***-IO-Link



- Absolute rotary encoder of the innovative Pure Line
- Solid shaft
- High climatic resistance
- High mechanical stability
- IO-Link Interface for process data, parameterization and diagnosis
- Suitable for condition monitoring
- Measuring range, direction of rotation and switching signals programmable
- Free of wear magnetic sampling
- High resolution and accuracy
- Status LEDs

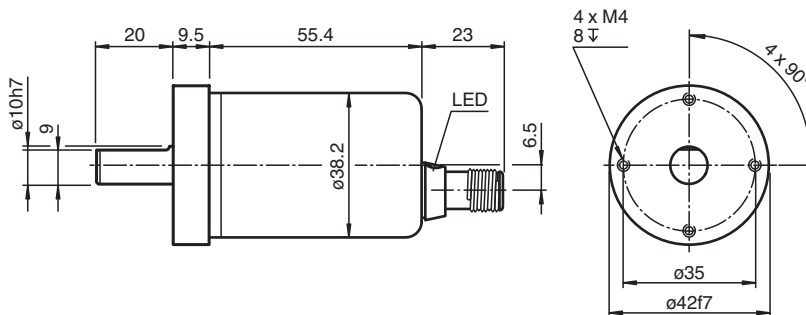


IO-Link

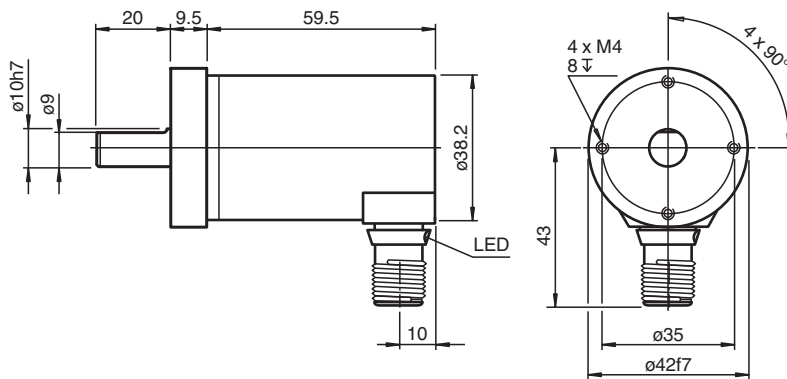
Function

Heavy duty absolute encoders with IO Link are high precision encoders with internal magnetic sampling. The integrated IO Link interface offers an optimal adaption to different applications through parameterization as well as process data transfer and condition monitoring.

Dimensions

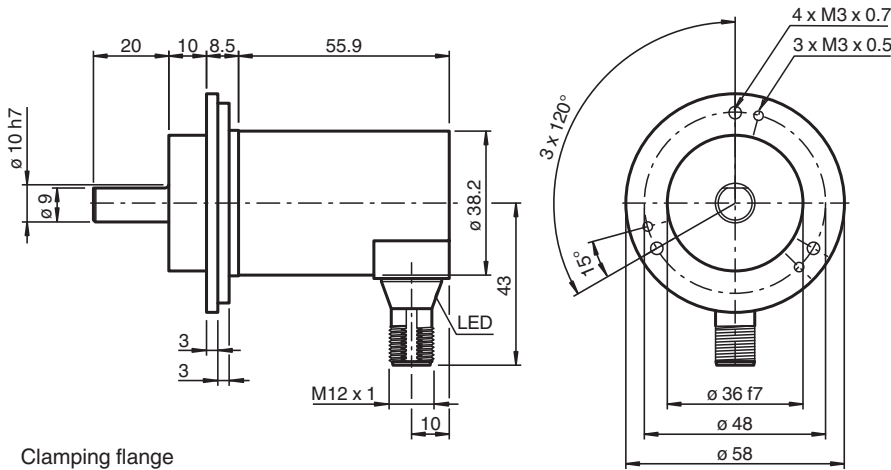


Servo flange

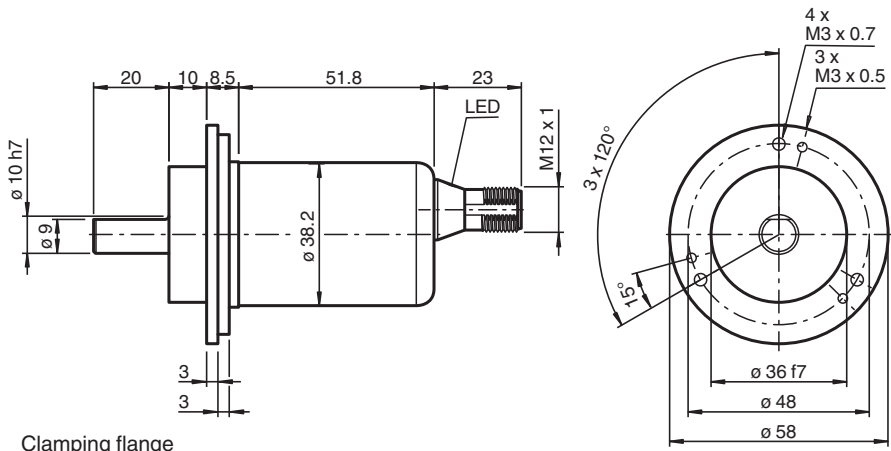


Servo flange

Dimensions



Clamping flange



Clamping flange

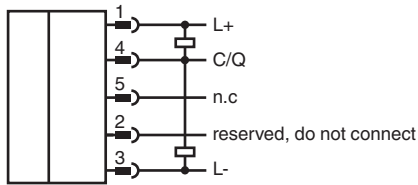
Technical Data

General specifications	
Detection type	magnetic sampling
Device type	Heavy duty absolute rotary encoder as Pure Line
Measured variable	position Temperature
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	480 a at 40 °C
Mission Time (T _M)	20 a
L ₁₀	10 E+8 revolutions at 20/40 N axial/radial shaft load
Diagnostic Coverage (DC)	0 %
Indicators/operating means	
LED STATUS	LED green flashing with short break (1 Hz) - IO-Link mode
Electrical specifications	
Operating voltage	U _B 18 ... 30 V DC
No-load supply current	I ₀ max. 50 mA
Power consumption	P ₀ approx. 1.5 W
Time delay before availability	t _v < 1 s
Interface	
Interface type	IO-Link
IO-Link revision	1.1

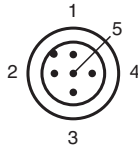
Technical Data

Device profile	Identification and Diagnosis - I&D
Resolution	
Single turn	up to 16 Bit programmable
Multiturn	up to 15 Bit programmable
Overall resolution	up to 31 Bit programmable
Process data	Input 12 Byte - measurement value 4 Byte - resolution 16 Bit - auxiliary measurement value 4 Byte - switching signals 2 Bit - diagnosis signals 2 Bit - status data
Vendor ID	1 (0x0001)
Device ID	5246977 (0x 501001), 5246978 (0x 501002)
Transfer rate	COM3 (230.4 kbits/s)
Min. cycle time	1.5 ms
SIO mode support	no
Compatible master port type	Class A Class B (use 3-pole adapter or 3-wire cable)
Connection	
Connector	M12 connector, 5 pin , A-coded
Standard conformity	
Degree of protection	DIN EN 60529 , IP66 / IP68 / IP69K
Communication interface	IEC 61131-9 / IO-Link V1.1.2
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, 11 ms
Vibration resistance	DIN EN 60068-2-6, 30 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	-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 ⁻¹
Moment of inertia	< 30 gcm ²
Starting torque	< 5 Ncm
Shaft load	
Axial	270 N
Radial	270 N

Connection



Connection Assignment



Type Code

Structure of the type code

E	N	A	4	2	H	T	-	S	1	0	(1)	(1)	9	-	(2)	(2)	1	6	-	I	O	-	(3)	(3)	(3)	0	1
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ENA	Device type
ENA	Absolute rotary encoder
42	Size
42	Housing diameter 42 mm
HT	Version
HT	Heavy Duty as Target Line / Pure Line
S	Shaft type
S	Solid shaft
10	Shaft diameter
10	10 mm
(1) (1)	Flange
C4	Clamping flange
S4	Servo flange
9	Degree of protection
9	IP66/IP66/IP69K
(2) (2)	Multiturn resolution
00	Singleturn rotary encoder
15	Multiturn rotary encoder, parameterizable up to 15 bit
16	Singleturn resolution
16	16 Bit
IO	Interface, electric
IO	IO-Link
(3) (3) (3)	Connection type
ABP	Axial connection alignment, M12 x 1, 5-pin, A coded
RBD	Radial connection alignment, M12 x 1, 5-pin, A coded
01	Parameterization status
01	P+F factory setting

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