

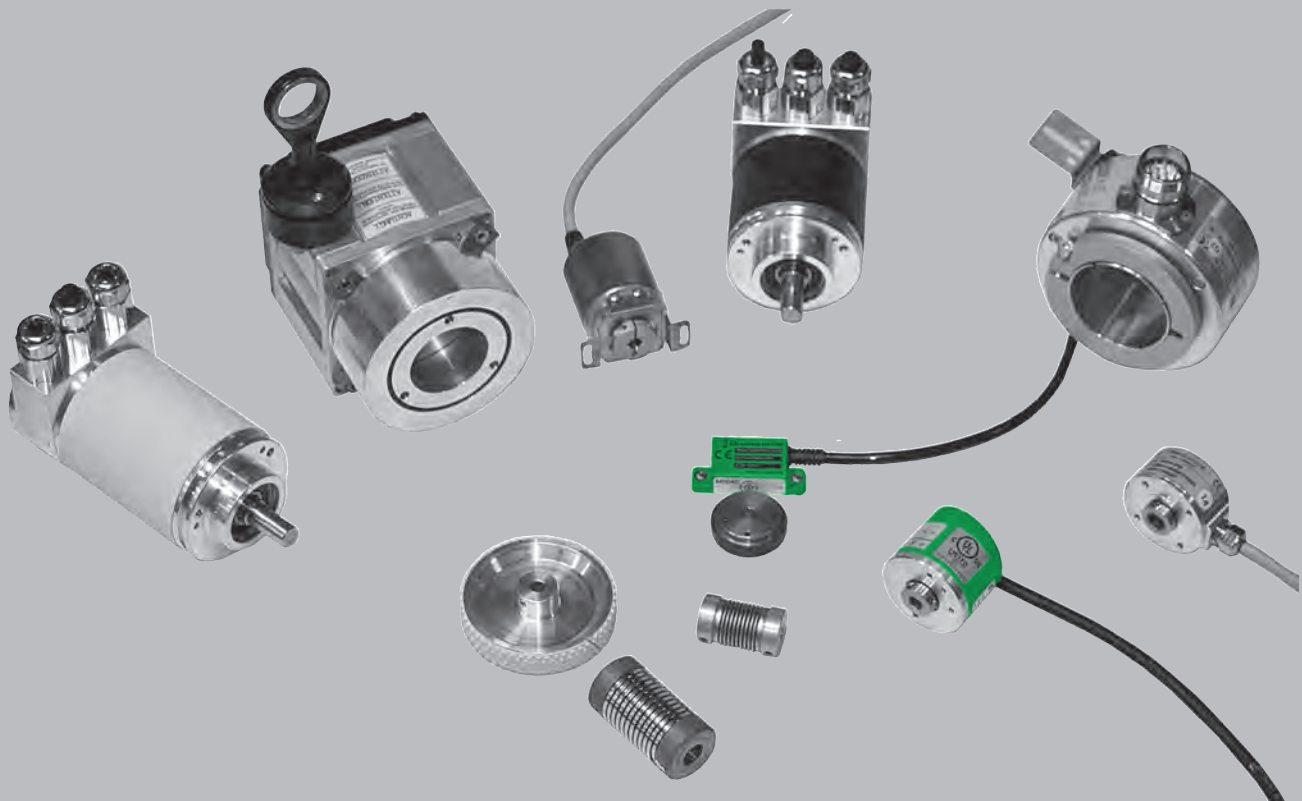


# Contents

## Rotary encoders

4

Rotary Encoders





4. Rotary Encoders

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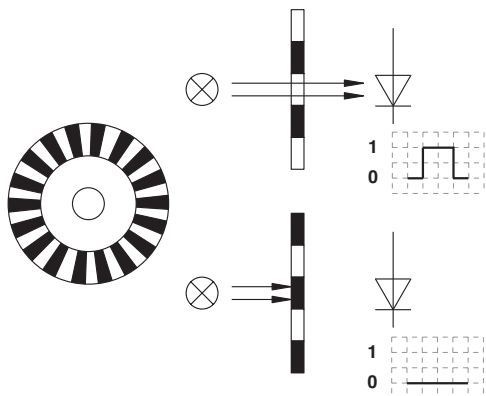
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## Technology and Functional Principle

In automation applications, rotary encoders are used as sensors for angle, position, speed and acceleration. By using spindles, gear racks, measuring wheels or cable pulls, linear movements can also be monitored by a rotary encoder. Rotary encoders convert a mechanical rotation value into an electrical signal that can be processed by counters, tachometers, logic controllers and industrial PCs.

Rotary encoders use a glass, metal, or plastic disc with alternating transparent and opaque fields, with a light source on one side and a light-sensitive sensor on the other. As the disc rotates, the light source is alternately blocked and revealed to the sensor. Whenever the light source hits the sensor, the encoder transmits an electric pulse that can be interpreted by a controller. The pulse ends when an opaque field on the disc blocks the light source. Rotation of the disc results in a square-wave pulse output.



Most rotary encoders use an infrared light-emitting diode as a light source, and photodiodes or phototransistors as receivers.

If no other functions are added to the encoder, the only output is a square wave that indicates that the disc is rotating. The direction of rotation and absolute position cannot be determined from a square wave output alone. Therefore, additional components are added to many rotary encoders to provide additional data about the rotation.



## 1. Different Functional Principles

### 1.1 Incremental rotary encoders

Incremental rotary encoders supply a certain number of pulses for each shaft revolution. Measuring the cycle duration, or counting the number of pulses during a pre-determined unit of time determines rotational speed. If the pulses are measured after a reference point is added, the calculated value represents a parameter for a scanned angle or the distance covered.

Two-channel encoders (those with a phase shift of 90°) enable the controller to determine the direction of rotation and can enable bi-directional positioning. Three-channel incremental encoders provide a "zero signal" for each revolution, giving a fixed point of reference.

For more information, please refer to the section titled "Operating Instructions for Incremental Rotary Encoders."

### 1.2 Absolute rotary encoders

Absolute encoders provide a uniquely coded numerical value for each shaft position. Absolute rotary encoders eliminate the need for expensive input components in a positioning application because they have built-in reference data. In addition, reference runs after a power failure or when the machine is switched off are not required because the encoder provides the current position value immediately.

Single-turn absolute encoders divide the shaft into a defined number of steps. The maximum resolution is 16 bits, which means that up to 65,536 positions can be defined.

By using a multi-step gear, multi-turn absolute encoders not only provide the angular position within a revolution, but also the number of revolutions. Multi-turn encoders have a 14-bit resolution to indicate the number of turns, which means that up to 16,384 revolutions can be identified. Overall resolution is 30 bits (16 bits per turn + 14 bits for the number of turns) or 1,073,741,824 measuring steps.

Parallel absolute encoders transmit the position value to external analyzing electronics through multiple wires, one for each bit.

In the case of serial absolute encoders, the output data can be transmitted by means of standardized interfaces and protocols. In the past, point-to-point wiring was used for serial data; today, fieldbus systems are becoming increasingly popular.

For more information on encoder operation, please refer to the section titled "Operating Instructions for Absolute Encoders."

## 2. Different Designs and Mounting

### 2.1 Rotary encoders with solid shaft

Solid shaft encoders feature a solid drive shaft that must use an additional coupling to link the encoder shaft to the application's drive shaft. The spring-based coupling compensates for misalignment. Belts, pinions, measuring wheels and cable pulls can also be mounted to the solid drive shaft. Depending on the type of coupling used, it is important to observe the maximum shaft load, since excessively high radial or axial forces can damage the encoder.



### Advantages of rotary encoders with solid shaft:

- Simple construction
- Higher environmental protection
- Can be mechanically and electrically disengaged from the application, depending on the coupling

## 2.2 Hollow shaft rotary encoders

Hollow shaft encoders use a continuous borehole or a blind hole (recessed hollow shaft encoder) which houses the drive shaft. Integrated hub and shaft connections make linking the encoder and the drive simple and easy. Built-in torque rests compensate for axial misalignment of the encoder and drive, making a compensating coupling unnecessary.



### Advantages of hollow shaft rotary encoders:

- Simple mounting
- Easy mounting

## 2.3 Mounting

### Clamping flange

This encoder can be mounted using the clamping flange, which ensures that the rotational axis is centered. The threaded holes on the encoder face can also be used.



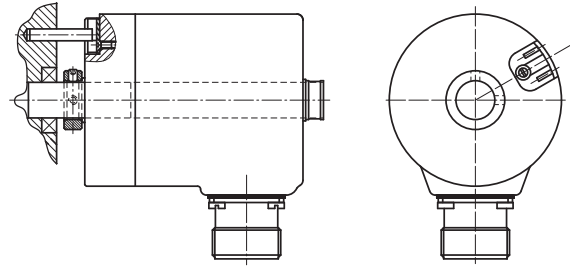
### Servo flange (synchro flange)

This encoder can be mounted using the synchro groove with mounting components, by using the threaded holes on the encoder face, or by using a mounting bracket.



## Hollow shaft rotary encoder

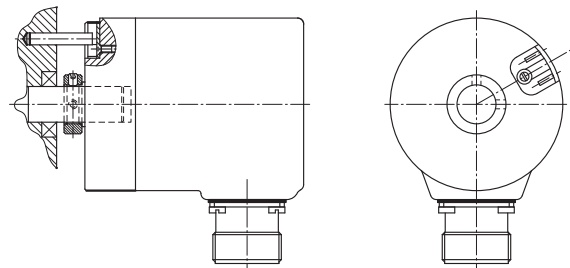
Hollow shaft rotary encoders have a thru-hole for the drive shaft.



With hollow shaft encoders, the shaft and hub connection is already integrated, but it is vital to mount the encoder so that the correct torque is transmitted to the drive shaft and not to the body of the encoder. Typically, hollow shaft encoders are mounted in such a way that the weight of the encoder is placed on the drive shaft, while a pin securing the body of the encoder prevents it from rotating around the drive shaft as torque is applied. Encoder motion should not be restricted in any other way, as it could affect the accuracy of the encoder.

### Rotary encoder with recessed hollow shaft

Recessed hollow shaft encoders are identical in all ways to standard hollow shaft encoders except that the hole is bored only partly through the encoder housing. Mounting techniques for recessed encoders are also the same.





## 2.4 Shaft load

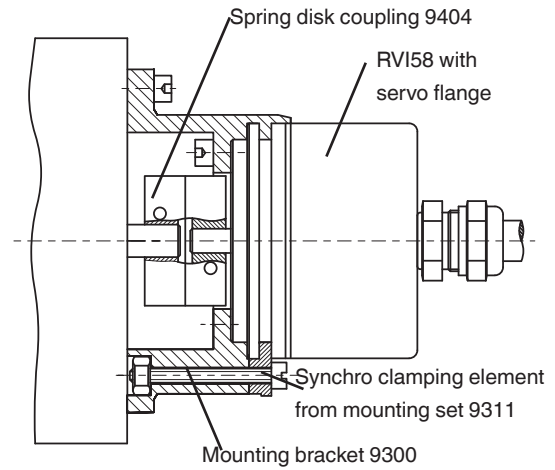
Pepperl+Fuchs' encoder shafts are mounted using two ball bearings. The encoder's service life is directly dependent upon the bearing's structural integrity, which is, in turn, dependent upon five main components:

- Speed
- Temperature
- Axial load
- Radial load
- Load location (on the shaft)

Pepperl+Fuchs specifies maximum encoder shaft loading and bearing service life based upon "worst case" permissible conditions (i.e. maximum speed, temperature and shaft forces, where the load is centered/applied on the shaft end).

With proper encoder mounting and selection of shaft couplings, Pepperl+Fuchs' encoders will provide a service life beyond the stated value. Conversely, if mechanical loading is increased beyond the catalog-specified limits, an encoder's working life will be reduced.

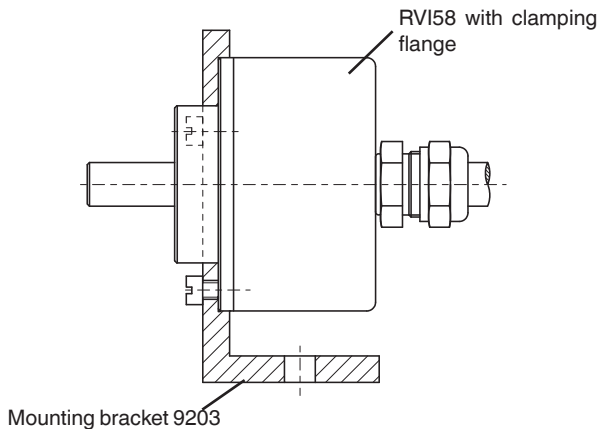
Example: At 6,000 rpm, with axial and radial shaft loads of 40 lbs, the RVI25's specified service life is  $2 \times 10^8$  revolutions. If the axial and radial shaft loads are reduced to 13 lbs and 9 lbs respectively, the guaranteed service life increases to  $2 \times 10^{10}$  revolutions.



Mounting a solid shaft encoder using a mounting bracket

## 3. Mounting Instructions

### 3.1 Mounting rotary encoders



Mounting rotary encoders with solid shaft using an L-bracket

### 3.2 Use of couplings

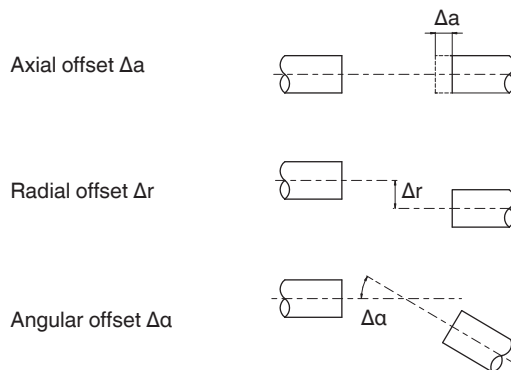
To prevent prohibited high loads on the bearing, a flexible coupling must be used to connect the rotary encoder with solid shaft and the drive shaft.

Shaft offsets such as a radial, axial, or angular offset occur despite very precise production and mounting of the drive shaft. This is often caused by temperature effects. A rigidly mounted rotary encoder creates an over-determined system with its clearance-free mount and the drive shaft mount. The forces generated destroy the rotary encoder as a result of increased axial and radial forces.

The higher the torsional rigidity of the coupling, the lower the torsional error between the rotary encoder and drive.

The restoring forces of the coupling are directly related to the compensating movement of the coupling. These forces must not exceed the permissible axial and radial forces.

See the data sheets for details on the permissible radial, axial, and angular offset.



## 4. Installation Notes

### 4.1 Anti-interference measures

Because of the sensitive nature of today's electronics, a consistently applied anti-interference and wiring protocol should be designed into any encoder system. The following procedures should be followed whenever mounting an encoder in a normal industrial environment (please note that no two environments are the same—if you have questions, please contact your local Pepperl+Fuchs representative for a detailed analysis of your application).

- Separate DC and AC circuits by metal conduit or metal divider.
- Confirm earth ground connected to metal conduit and metal divider
- Keep encoder wiring away from power cables and conduit. If crossing power cables is necessary, make sure the wires are perpendicular, not parallel.
- Encoder cable should have twisted pair wires with braided shield.
- Make sure your cable's wire has a cross section of at least 26 AWG (0.14 mm<sup>2</sup>).
- Do not kink or bend the cables.
- Do not exceed the minimum bending radius as shown on the cable data sheet. Avoid tensile and shearing loads on the cable.

### 4.2 Operating notes

- Do not strike or hammer on the encoder housing or shaft.
- Do not overload the encoder shaft, either axially or radially.
- The accuracy and service life of the encoder is guaranteed only if a suitable coupling is used.
- Power to the encoder and controller must be applied at the same time.
- Do not service wiring with power applied to the system
- Do not exceed maximum operating voltage.

### 4.3 Notes electrical shielding

The interference-resistance of a system depends on the correct shielding. This is where installation errors are frequently made. Often the shield is connected to one side and then to the ground terminal with a soldered wire. This is valid in NF technology. For EMC, however, the rules of HF technology apply. A basic goal of HF engineering is to direct the HF energy to ground at a low as possible impedance. Otherwise, it discharges into the cable. A low impedance is achieved by a large area connection to metal surfaces. The following precautions must be observed:

- Apply shielding on both sides to a common ground.
- The shield has to be installed behind the insulation and must be clamped to a large surface below the strain relief.
- With screw-type cable connections, the strain relief must be grounded.
- Use only metallic plugs (such as sub-D plugs with metallic housings).

## 5. Safety Notices



**Warning**

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 must be shut down and secured against accidental operation.

Repairs may be carried out only by the manufacturer.

Entry into and modifications of the device are not permissible.



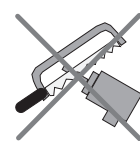
**Caution**

Do not tighten the clamping ring without the shaft being inserted. Overtightening the clamping ring without the shaft may damage the clamping ring.

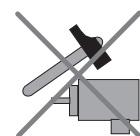
Tighten all screws and plug connectors prior to operating the encoder.



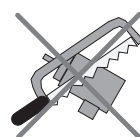
Do not stand on the rotary encoder!



Do not make modifications to the drive shaft!



Avoid impact!



Do not make modifications to the housing!

## Application Notes for Incremental Rotary Encoders

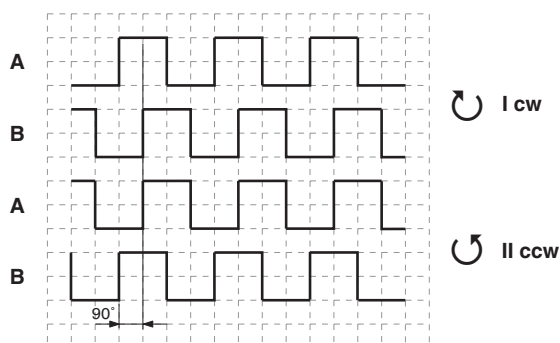
Incremental rotary encoders emit pulses as the shaft is rotated, and the number of pulses is used to calculate angular position. The resolution (Z) of an incremental encoder is the number of pulses per revolution. The signal frequency is used to determine the angular speed ( $\omega$ ) and the change in position for a given period of time is used to calculate the angular acceleration ( $\alpha$ ).

### Rotational direction monitoring with incremental rotary encoders

In order to determine the direction of rotation of a movement, the scanning principle is used on both channel A and channel B. The direction of rotation can be determined by evaluating the two signals, which are phase-shifted by 90 degrees.

In the first figure below (I cw), channel A precedes channel B. This indicates clockwise rotation. II ccw shows counter-clockwise rotation. The direction of rotation is determined by viewing the encoder shaft head-on.

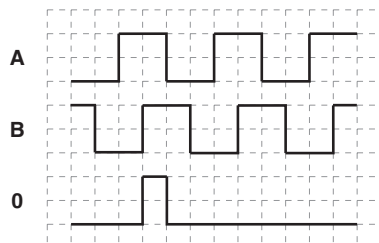
Depending on the type of incremental rotary encoder, channel A or channel B is the leading channel. For more information, refer to the encoder data sheet.



### Zero signal

Determining the frequency of the pulses is the job of the controller, PLC or tachometer. The zero signal is a pulse that occurs once per revolution at a fixed point and is transmitted using a third channel (often called channel 0 or Z). The zero signal is usually used as a reference signal for positioning.

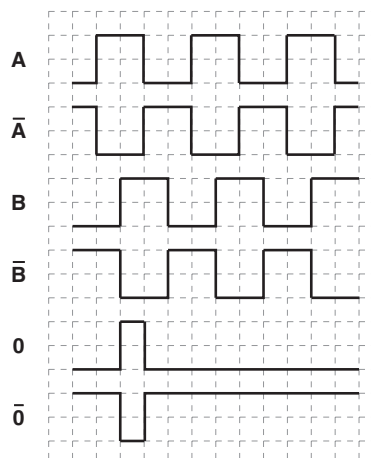
The diagram below illustrates the output of a 3-channel incremental rotary encoder.



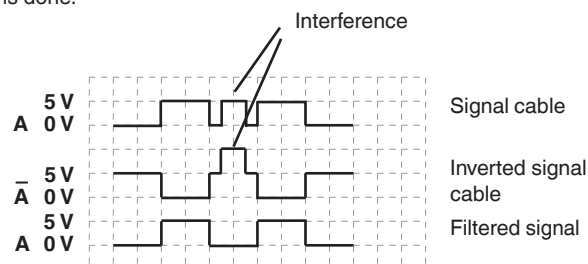
**Note:** catalog refers to zero channel signal as "Z" channel. This position signal can also be referred to as "0" channel or encoder marker pulse.

### Inverted channels

Inverted signals are transmitted in addition to channels A, B and Z to improve signal quality. Inverted signals are a standard feature in RS-422 interfaces and are optional on push-pull outputs.



The advantage of normal and inverted signal transmissions is that filtering of unwanted signals is possible. If a noise pulse occurs, it will be induced equally on all channels. Subtracting the normal and inverted encoder signals from each other eliminates the noise pulse. The figure below illustrates how this is done.

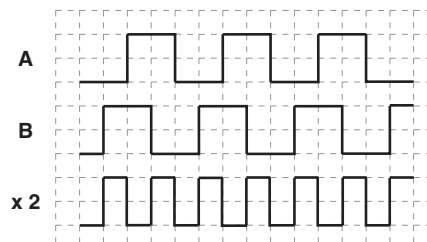


### Pulse multiplication

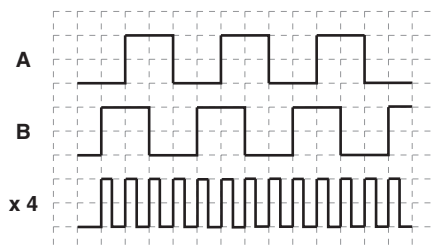
Pulse multiplication is used to increase the number of measuring steps or to reduce the output frequency of an incremental rotary encoder. The signals of an incremental rotary encoder can be doubled or quadrupled by linking channels A and B.

For example, an application may need 20,000 measuring steps for each revolution at a speed of 3000 RPM. If the control unit (PLC, counter or tachometer) provides the option to quadruple the signal, then an inexpensive rotary encoder with 5000 pulses can be used. In addition, the output frequency of the incremental rotary encoder is reduced.

- Without quadruple multiplication: 1 MHz (this frequency is too high for most control units)
- With quadruple multiplication: 250 kHz



Doubling of signals



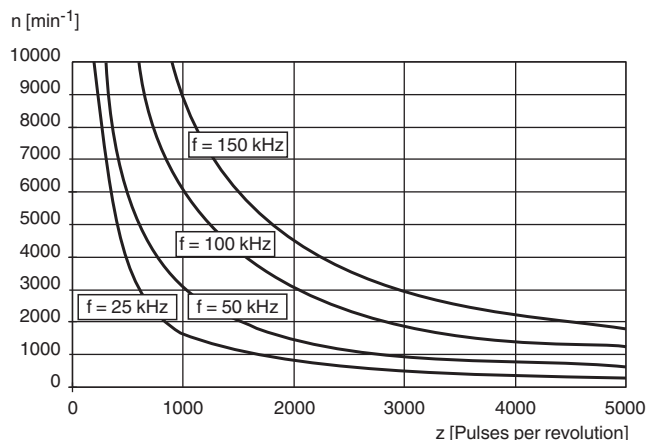
Quadrupling of signals

The information about rotational direction is lost as a result of linking both channels A and B.

### Correlation between operating speed and output frequency

$$f = \frac{n}{60 \text{ s}} \times Z \quad n \text{ in } \text{min}^{-1}$$

$$n_{\text{max}} = \frac{f_{\text{max}} \times 60 \text{ s}}{Z} \quad f_{\text{max}} \text{ in Hz, } n_{\text{max}} \text{ in } \text{min}^{-1}$$

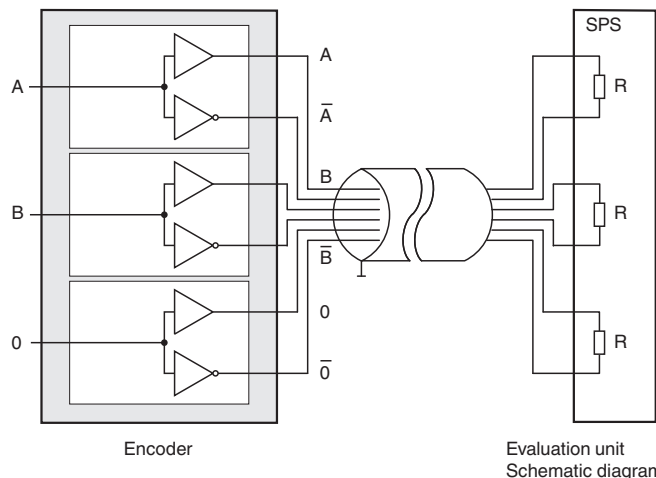


## Interfaces

### Line driver (RS422)

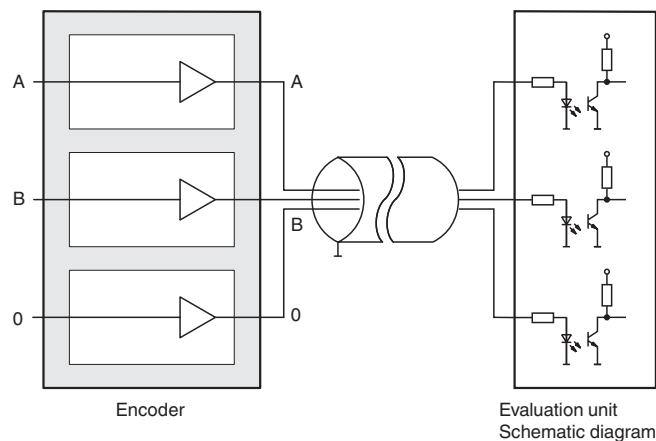
This symmetrical interface is recommended for use whenever a longer cable length is required. The corresponding core pairs must be twisted for maximum interference resistance.

This interface can also be used as a replacement for the TTL interface. In this case, the inverted outputs are not used.



### Push-pull output

The push-pull output is a combination of NPN and PNP outputs. Compared to open collector outputs, the push-pull output features an improved square wave. In addition, interference resistance is improved. No external wiring is required as in NPN or PNP outputs. Push-pull also offers inverted channels. The main applications of push-pull are within the range of median switching frequencies. The open collector outputs can be replaced by push-pull by using only the non-inverted outputs.



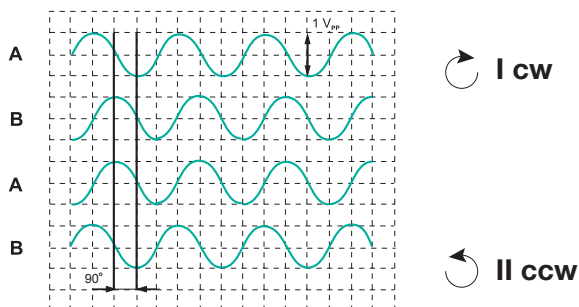
## Application Notes for Sine/Cosine Rotary Encoders

Sinusoidal encoders are similar to incremental encoders in that they produce signals from patterns inscribed on an optical disk. Also like incremental encoders, they produce two signals that are phase-shifted by 90 degrees. The difference is that the signals are output as analog sinusoidal waves.

### 1. Rotational direction monitoring in sine/cosine rotary encoders

The two sinusoidal signals are phase-shifted by 90 degrees. As with incremental rotary encoders with square wave output, the direction of rotation can be determined by evaluating the two signals.

In the top of the figure below (I cw), channel A precedes channel B. This indicates clockwise rotation. The lower half of the figure (II ccw) shows counterclockwise rotation. The direction of rotation is determined by viewing the encoder shaft head-on.



The cycles of the waveforms can be counted and used to determine velocity or position just like incremental encoders with square wave output. Because there are no real pulses generated, sine-cosine encoders are rated in cpr (cycles per revolution).

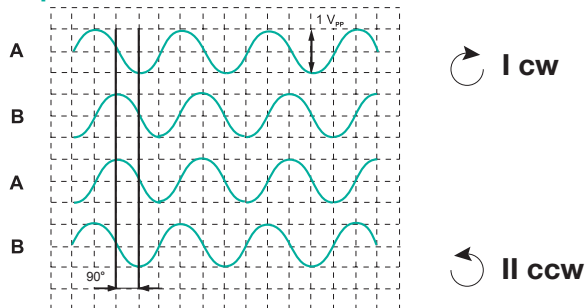
Unlike incremental encoders, however, the continuous analog voltages can be used to determine the precise position within each cycle. Also, by reading the analog voltage value of each channel and performing a mathematical process called interpolation, the equivalent of thousands of incremental encoder pulses can be generated for each cycle of the analog voltages.

### 2. Index signal

The index signal occurs once per revolution at a fixed point and is transmitted using a third channel (often called channel 0 or Z). The index signal is usually used as a reference signal for positioning.

On sine/cosine encoders the index signal is also an analog waveform. It approximates a 90 degree partial sine wave.

### 3. Interpolation



Incremental encoders with pulse outputs have a practical limit of approximately 5,000 ppr. Beyond this, the lines on the optical disk are so fine that controlling the placement and thickness of the lines to ensure accurate pulse generation is impractical.

To generate line counts greater than 5,000 ppr, sine-cosine waveforms, like those described above, are generated. By keeping the cpr fairly low (for instance 1,024 cpr) the accuracy of each cycle can be well controlled. Interpolation on the sine and cosine waveforms can then be used to generate pulses at up to 50,000 ppr.

### 4. Relationship between speed and output frequency

See the operating instructions for incremental rotary encoders.

### 5. Characteristics of sine/cosine rotary encoders

Because of the continuous nature and simple spectral characteristics of the sinusoidal output curve of a sine/cosine encoder, there are some advantages compared to incremental rotary encoders with pulse outputs:

- Longer cable runs
- Simple filtering possibilities for cable-coupled interference signals
- Very low phase jitter
- Well-suited for monitoring extremely slow speed or "dead stop" conditions

## Application Notes for Absolute Rotary Encoders

Absolute encoders do not generate pulses, but entire data strings. The sampling unit in an absolute encoder reads the code disk to determine the shaft position and the data is transmitted by parallel or serial interface.

### Single-turn

In single-turn absolute rotary encoders, each revolution of the encoder (360°) is divided into a maximum of 65,536 measuring steps (16 bit). After each complete revolution, the count begins again at the initial value. A single turn absolute rotary encoder does not count the number of revolutions.

### Multi-turn

In addition to the coded disk in a single-turn encoder, a multi-turn encoder adds a gear that counts up to 16,384 revolutions (14 bit). Overall resolution amounts to 16 bit (single-turn resolution) plus 14 bit (multi-turn resolution) for a total of 30 bits of resolution. The resulting 1,073,741,824 measuring steps can be used to divide very long linear distances into small measuring steps.

### Interfaces

The Pepperl+Fuchs encoder line includes the industry's largest range of interfaces for absolute encoders:

#### SSI-Interface:

The Synchronous Serial Interface (SSI) has been developed to transfer output data to a controller. The controller sends a bundle of timer pulses and the absolute encoder responds with the position value.

#### Parallel Interface:

With a parallel interface, data is sent directly from the Gray-coded encoder measurement. A parallel interface's primary advantage is data transfer speed.

#### AS-Interface:

AS-Interface uses a multi-slave solution to provide real-time encoder data transfer.

#### DeviceNet:

Encoders are available with fully integrated DeviceNet interfaces that support all DeviceNet functions.

#### PROFIBUS:

PROFIBUS operation is supported in accordance with Class 1 and Class 2, and satisfies the PROFIBUS profile for encoders.

#### CAN:

Pepperl+Fuchs offers encoders with a recessed hollow shaft and solid shaft design in single- and multi-turn versions. Each model is in accordance with the CAN standard DSP406 (Class 1 and Class 2).

#### Ethernet:

These encoders are available with Ethernet TCP/IP interface. The Ethernet interface is programmable via any web browser.

## Types of Code

### Binary Code

Binary code is a dual number system, consisting of the numbers 0 and 1. When using binary code, it is important to note that several bits may change at the same time from step to step. For example, counting from seven to eight, the bits 0, 1, 2 and 3 change. In order to ensure high transmission integrity, P+F recommends using a code which changes only one bit at each step. The evaluating control can then be used to determine whether the data string is accurate.

2 <sup>6</sup>																			
2 <sup>5</sup>																			
2 <sup>4</sup>																			
2 <sup>3</sup>																			
2 <sup>2</sup>																			
2 <sup>1</sup>																			
2 <sup>0</sup>																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

### Gray code

The Gray code is a one-step code.

2 <sup>6</sup>																			
2 <sup>5</sup>																			
2 <sup>4</sup>																			
2 <sup>3</sup>																			
2 <sup>2</sup>																			
2 <sup>1</sup>																			
2 <sup>0</sup>																			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

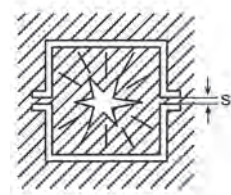
Gray code is a unit-distance code; only one bit changes from step to step. To use this code for distance calculation, it must be converted to a binary code. Gray code is recommended for encoders because the data can be transmitted by a serial interface. To check the unit-distance, every code change has to be detected by the test logic.

### Gray excess code

The Gray excess code is extracted from the complete Gray code. In the process, clipping takes place symmetrically, permitting the use of even sections only. The idea is that a different number of measuring steps other than those given by a power of 2 can be used. Frequently it is necessary to reduce a 9-bit value (512 measuring steps) to 360 measuring steps. The unit distance remains unaffected.

## Application Notes for Rotary Encoders for Hazardous Areas

### "Flameproof enclosure" type of protection (EEx d) DIN EN 50016/VDE/0170/0171 Part 5



"Ignition protection class in which the components that might ignite in an explosive atmosphere are enclosed in a housing capable of withstanding the pressure of an explosion inside and prevents the explosion from spreading to the hazardous environment outside the housing."

The housings are not constructed gas-tight, but have a gap serving as a pressure relief aperture. Escaping gases are cooled down sufficiently so that they cannot ignite the explosive atmosphere outside the housing. An ignition is prevented if the minimum ignition temperature and the minimum ignition energy of the surrounding explosive atmosphere are not reached. For this reason, devices in this ignition protection class are approved for the explosion groups I, IIA, IIB, IIC with different minimum gap lengths and maximum gap widths (see table 1 and 2 of EN 50018) depending on the type of gap.

The most important aspect of the ignition protection type Ex d is the relief aperture that may neither be enlarged (e.g., removal of rust) or reduced (e.g., lubrication with resinous oils or greases).

If devices with pressurized enclosures are used, the electrical connections must comply with the ignition protection class "Increased safety."

Series 14 and series 78E rotary encoders are designed in accordance with ignition protection class "Pressurized enclosure" and have ATEX approval.





## Properties

- SSI and CANopen interface versions
- 36 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 25 bit resolution

## Benefits

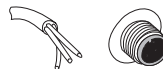
- Compact design for space saving mounting
- Magnetic encoder for improved mechanical performance

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	magnetic
Operating voltage	10 ... 30 V DC
Operating temperature	cable, flexing: -5 ... 70 °C (-23 ... 158 °F), cable, fixed: -30 ... 70 °C (-22 ... 158 °F) connector models: -30 ... 85 °C (-22 ... 185 °F)
Material	
Housing	nickel-plated steel
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	110 N
Connection	



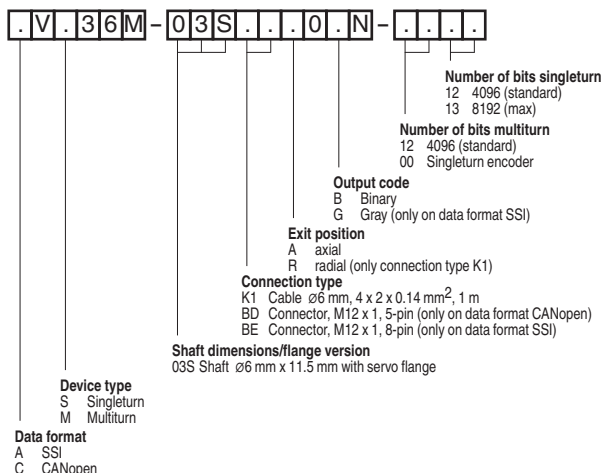
### Encoder Series

		AVS36M-*****	AVM36M-*****	CVS36M-*****	CVM36M-*****
Device type	Multiturn absolute encoder				
	Singleturn absolute encoder				
Interface type	CANopen				
	SSI				
Resolution					
Single turn	up to 13 Bit ( hysteresis: 0.1° )				
Multiturn	up to 12 Bit				
Overall resolution	up to 13 Bit				
	up to 25 Bit				
Transfer rate	max. 1 MBit/s				
	0.1 ... 2 MBit/s				
Input type	Selection of counting direction (cw/ccw)				
Input type	zero-set (PRESET 1)				

### Dimensions

Length L [mm]	46
Diameter D [mm]	36.5

## Ordering Information



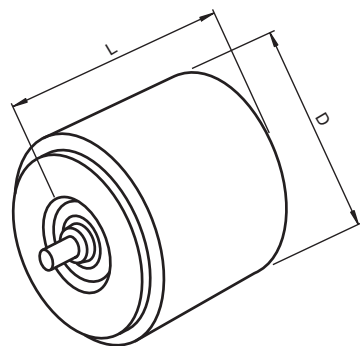
### Example of order:

AVS36M-03SK1A0BN-0012

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

V19-G-5M-PUR-ABG	Female cordset, M12, 8-pin, shielded, PUR cable, straight
V15S-TEE-V15	T-Distributor
V15-G-2M-PUR-CAN-V15-G	CAN connection cable, 2 m





## Properties

- SSI and CANopen interface versions
- 36 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 25 bit resolution

## Benefits

- Compact design for space saving mounting
- Magnetic encoder for improved mechanical performance

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	magnetic
Operating voltage	10 ... 30 V DC
Operating temperature	cable, flexing: -5 ... 70 °C (-23 ... 158 °F), cable, fixed: -30 ... 70 °C (-22 ... 158 °F) connector models: -30 ... 85 °C (-22 ... 185 °F)
Material	
Housing	nickel-plated steel
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	110 N
Connection	



### Encoder Series

		ASS36M-*****	ASM36M-*****	CSS36M-*****	CSM36M-*****
Device type	Multiturn absolute encoder		●		●
	Singleturn absolute encoder	●		●	
Interface type	CANopen			●	●
	SSI	●	●		
Resolution					
Single turn	up to 13 Bit ( hysteresis: 0.1° )	●	●	●	●
Multiturn	up to 12 Bit		●		●
Overall resolution	up to 13 Bit	●		●	
	up to 25 Bit		●		●
Transfer rate	max. 1 MBit/s			●	●
	0.1 ... 2 MBit/s	●	●		
Input type	Selection of counting direction (cw/ccw)	●	●		
Input type	zero-set (PRESET 1)	●	●		

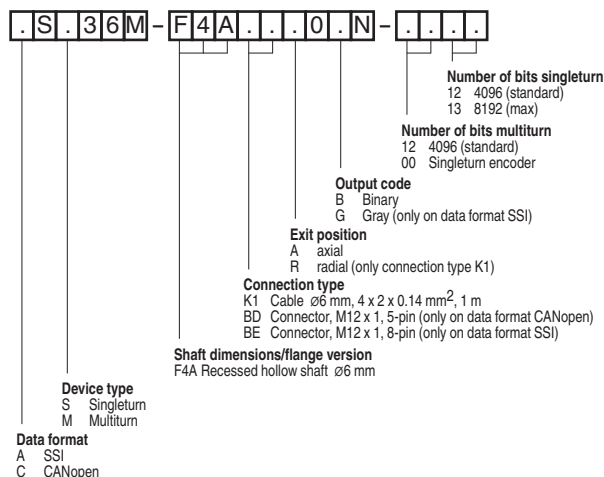
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	●
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### Dimensions

Length L [mm]	54
Diameter D [mm]	36.5

## Ordering Information



### Example of order:

CSM36-F4ABDA0BN-1212

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

V15-G-PG9	Field attachable connector, M12, 5-pin
V19-G-ABG-PG9	Field attachable connector, M12, 8-pin
V19-G-5M-PUR-ABG	Female cordset, M12, 8-pin, shielded, PUR cable, straight
V15S-TEE-V15	T-Distributor
V15-G-2M-PUR-CAN-V15-G	CAN connection cable, 2 m



## Properties

- CANopen interface
- 42 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 24 bit resolution

## Benefits

- Robust design with very high shock and vibration resistance
- Stainless steel housing with high protection degree, suitable for harsh environmental conditions
- Compact design for space saving mounting

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	magnetic
Operating voltage	10 ... 30 V DC
Interface type	CANopen
Transfer rate	max. 1 MBit/s
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Material	
Housing	Stainless steel 1.4305 / AISI 303
Flange	Stainless steel 1.4305 / AISI 303
Shaft	stainless steel 1.4104 / AISI 430F
Protection degree	IP66 / IP68 / IP69K
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Axial	270 N
Radial	270 N
Connection	



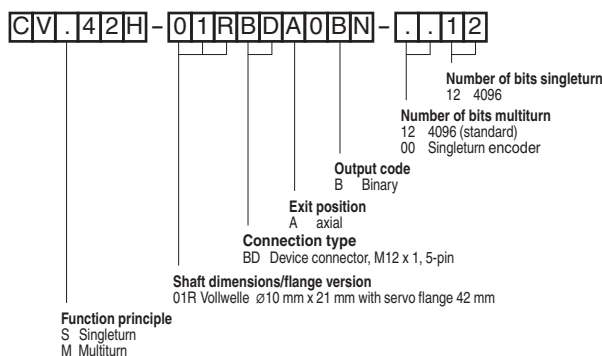
### Encoder Series

Device type	Multiturn absolute encoder	CVS42H	CVM42H
	Singleturn absolute encoder	●	●
Resolution			
Single turn	12 Bit	●	●
Multiturn	12 Bit		●
Overall resolution	12 Bit	●	
	24 Bit		●

### Dimensions

Length L [mm]	66
Diameter D [mm]	42

## Ordering Information



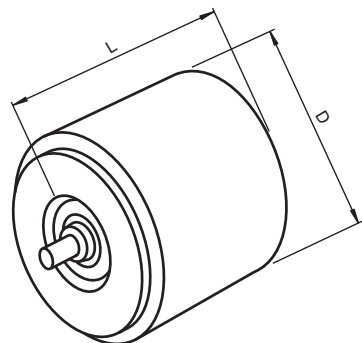
### Example of order:

CVS42H-01RBDA0BN-0012

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

V15S-TEE-V15	T-Distributor
V15-G-2M-PUR-CAN-V15-G	CAN connection cable, 2 m





## Properties

- SSI interface
- 58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Choose between standard industrial flange versions
- High-speed data transfer
- Function inputs available for zero-set (preset) and counting direction
- Optional zero-set pushbutton

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	4.5 ... 30 V DC
Interface type	SSI
Transfer rate	0.1 ... 2 MBit/s
Input type	Selection of counting direction (cw/ccw)
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)

### Material

Combination 1 housing: powder coated aluminium  
flange: aluminium  
shaft: stainless steel

Combination 2 (Inox) housing: stainless steel  
flange: stainless steel  
shaft: stainless steel

### Rotational speed

max. 12000 min<sup>-1</sup>

### Shaft load

Axial 40 N

Radial 110 N

### Connection



### Encoder Series

Device type	Multiturn absolute encoder
	Singleturn absolute encoder

### Resolution

Single turn up to 16 Bit

Multiturn 14 Bit

Overall resolution up to 16 Bit

up to 30 Bit

### Input type

zero-set (PRESET 1)

### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
-------------	---

### Dimensions

Length L [mm] depending on the version: 45 ... 63

depending on the version: 56 ... 63

depending on the version: 57 ... 64

### Diameter D [mm]

aluminum: 59  
Stainless steel: 61

## Ordering Information

AV.58.-.N-.

Bits Singleturn: 12, 13, 16 (13 not with Option -K)  
Bits Multiturn: 12, 14 (Singleturn = 00)

Output code  
B Binary  
G Gray

Option  
0 Zero-set function  
K with preset key  
H Hardware encoder

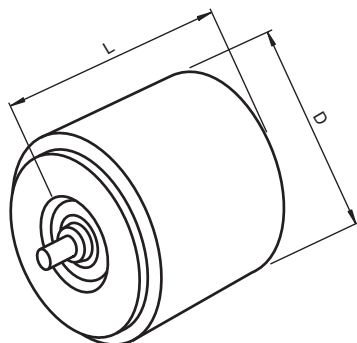
Exit position  
A axial (not with Option K)  
R radial

Connection type  
K1 Cable Ø7 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 1 m  
AA Connector, type 9416, 12-pin  
AB Connector, type 9416L, 12-pin

Shaft dimensions/flange version  
011 Shaft Ø10 mm x 20 mm, clamping flange  
032 Shaft Ø6 mm x 10 mm, servo flange

Housing material  
N Aluminium, powder coated  
Inox (with axial exit position, only)

Function principle  
S Singleturn  
M Multiturn



### Example of order:

AVM58N-011K1A0B-1212

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9203	Angled flange
9300	Mounting bracket for servo flange
9416	Field attachable female connector
9416L	Field attachable female connector
9416-03M-12P-AVM	Female cordset, 3 m



## Properties

- SSI interface
- 58 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Variety of recessed hollow shaft diameters available
- High-speed data transfer
- Function inputs available for zero-set (preset) and counting direction
- Optional zero-set pushbutton

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	4.5 ... 30 V DC
Interface type	SSI
Transfer rate	0.1 ... 2 MBit/s
Input type	Selection of counting direction (cw/ccw)
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Material	
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
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
Connection	



Encoder Series		ASS58-0	ASS58-K	ASS58-H	ASM58-0	ASM58-K	ASM58-H
Device type	Multiturn absolute encoder						
	Singleturn absolute encoder						
Resolution							
Single turn	up to 16 Bit						
Multiturn	14 Bit						
Overall resolution	up to 16 Bit						
	up to 30 Bit						
Input type	zero-set (PRESET 1)						
Approvals and Certificates							
UL approval	cULus Listed, General Purpose, Class 2 Power Source						
Dimensions							
Length L [mm]	depending on the version: 61 ... 72						
	depending on the version: 73 ... 81						
	72						
	73						
Diameter D [mm]		aluminum: 59 Stainless steel: 61					

## Ordering Information



Bits singleturn: 12, 13, 16 (13 not with option K)  
Bits multiturn: 12, 14. (Singleturn = 00)

B	Binary
G	Gray

**Option**  
 0 Zero-set function  
 K with preset key --  
 H Hardware encoder

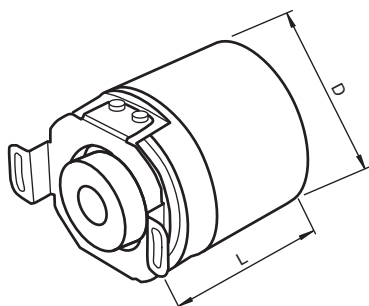
**Exit position**  
A axial (not w  
B radial

**Connection type**  
K1 Cable  $\varnothing 7$  mm,  $6 \times 2 \times 0.14$  mm<sup>2</sup>, 1 m  
AA Connector, type 9416, 12-pin  
AB Connector, type 9416L, 12-pin

**Shaft dimensions/flange version**  
 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

**Housing material**  
 N Aluminium, powder coated  
 W Aluminium, powder coated with shaft seal  
 I Inox (with axial exit position, only) — — —

**Function principle**  
S Singleturn  
M Multiturn



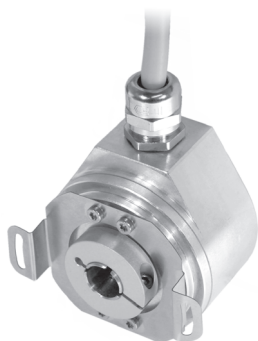
**Example of order:**

AVS58W-F3AABRKB-1212

## Accessories

**These and more accessories can be found in chapter 4.4 from page 791**

9416	Field attachable female connector
9416L	Field attachable female connector
9416-03M-12P-AVM	Female cordset, 3 m



## Properties

- SSI interface
- 58 mm housing
- Hollow shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- High-speed data transfer
- Function inputs available for zero-set (preset) and counting direction

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	4.5 ... 30 V DC
Interface type	SSI
Transfer rate	0.1 ... 2 MBit/s
Input type	Selection of counting direction (cw/ccw)
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Combination 1	Housing: aluminium Flange: aluminium Shaft: stainless steel
Rotational speed	max. 3000 min <sup>-1</sup>
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
Connection	



### Encoder Series

Device type	Multiturn absolute encoder	Singleturn absolute encoder	AHS58-0	AHS58-H	AHM58-0	AHM58-H
Resolution						
Single turn	up to 16 Bit		•	•	•	•
Multiturn	14 Bit				•	•
Overall resolution	up to 16 Bit		•	•	•	•
	up to 30 Bit				•	•
Input type	zero-set (PRESET 1)		•		•	

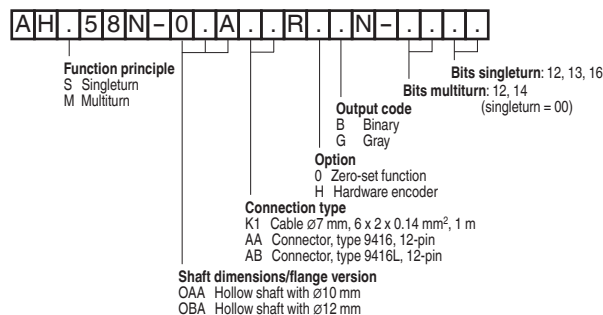
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	•	•	•	•
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### Dimensions

Length L [mm]	36	49
Diameter D [mm]	59	

## Ordering Information



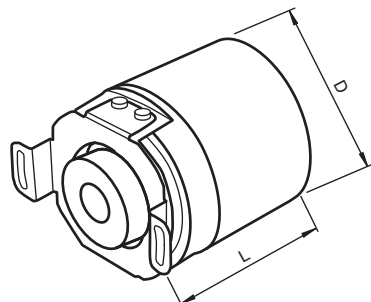
### Example of order:

AHM58N-0AAABR0BN-1213

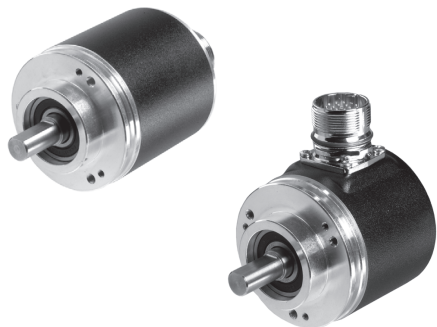
## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9416	Field attachable female connector
9416L	Field attachable female connector
9416-03M-12P-AVM	Female cordset, 3 m







## Properties

- Parallel interface
- 58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 25 bit resolution

## Benefits

- Output updates up to 400KHz
- Inputs for PRESET, LATCH and counting direction selection

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Interface type	Push-pull, parallel, short-circuit protected
Code change frequency	400 kHz
Input type	Selection of counting direction (cw/ccw)
Input type	Temporary storage (LATCH)
Input type	zero-set (PRESET)
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
	cable models: -30 ... 70 °C (rigid wiring) -5 ... 70 °C (flexible wiring)

### Material

Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel

Rotational speed max. 12000 min<sup>-1</sup>

### Shaft load

Axial	40 N
Radial	110 N

### Connection



### Encoder Series

Device type	Multiturn absolute encoder	FVS58	FVM58
Resolution	Singleturn absolute encoder	●	●
Single turn	13 Bit	●	●
Multiturn	12 Bit	●	●
Overall resolution	13 Bit	●	●
	25 Bit		●

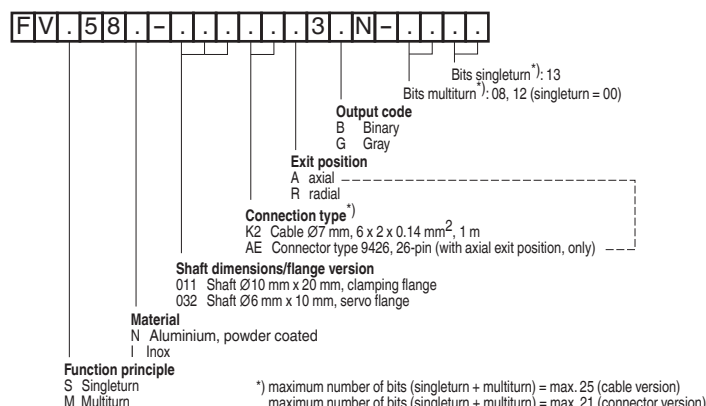
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●
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### Dimensions

Length L [mm]	depending on the version: 45 ... 63	●	
	depending on the version: 65 ... 72		●
Diameter D [mm]		aluminum: 59	Stainless steel: 61

## Ordering Information



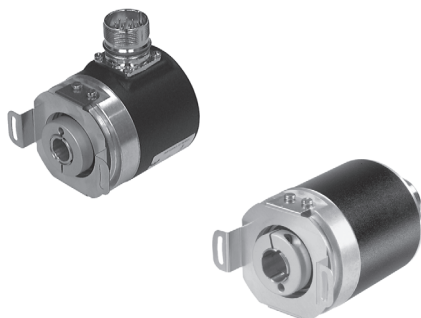
### Example of order:

FVS58N-032K2A3BN-0013

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9203	Angled flange
9300	Mounting bracket for servo flange
9426	Field attachable female connector



## Properties

- Parallel interface
- 58 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 25 bit resolution

## Benefits

- Variety of recessed hollow shaft diameters available
- Output updates up to 400KHz
- Inputs for PRESET, LATCH and counting direction selection

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Interface type	Push-pull, parallel, short-circuit protected
Code change frequency	400 kHz
Input type	Selection of counting direction (cw/ccw)
Input type	Temporary storage (LATCH)
Input type	zero-set (PRESET)
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
	cable models:
	-30 ... 70 °C (rigid wiring)
	-5 ... 70 °C (flexible wiring)

### Material

Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel

Rotational speed

max. 12000 min<sup>-1</sup>

Connection



### Encoder Series

Device type	Multiturn absolute encoder	Singleturn absolute encoder
Resolution		
Single turn	13 Bit	
Multiturn	12 Bit	
Overall resolution	13 Bit	
	25 Bit	

FSS58

FSM58

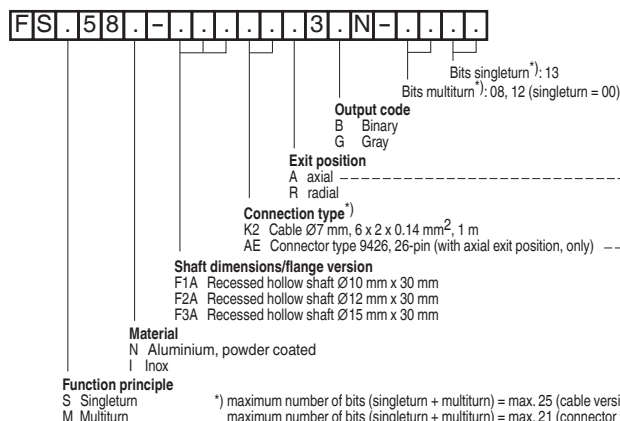
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
-------------	---

### Dimensions

Length L [mm]	72	80
Diameter D [mm]	aluminum: 59	Stainless steel: 61

## Ordering Information



\*) maximum number of bits (singleturn + multiturn) = max. 25 (cable version)  
maximum number of bits (singleturn + multiturn) = max. 21 (connector version)

### Example of order:

FSM58I-F1AK2A3GN-0813

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9426

Field attachable female connector



## Properties

- AS-Interface
- 58 mm housing
- Solid shaft
- Singleturn encoders, up to 13 bit
- Multiturn encoders, up to 16 bit resolution

## Benefits

- Position data transfer using 4 AS-Interface addresses
- Configuration and addressing via AS-Interface

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	29.5 ... 31.6 V DC
Interface type	AS-Interface
Transfer rate	max. 0.167 MBit/s
Operating temperature	-20 ... 70 °C (-4 ... 158 °F)
Material	
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel

Connection



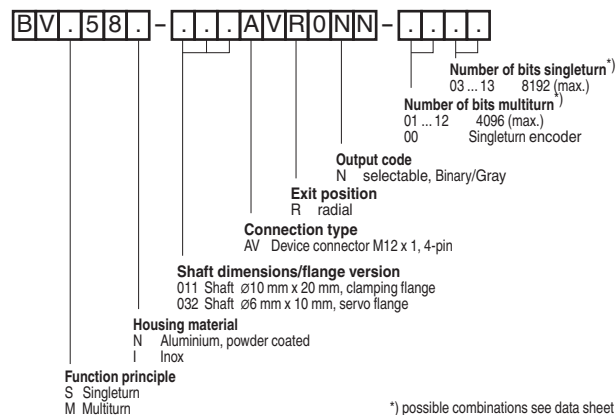
### Encoder Series

Device type		BVS58	BVM58
Multiturn absolute encoder		●	●
Singleturn absolute encoder		●	●
Resolution			
Single turn	up to 13 Bit	●	●
Multiturn	up to 12 Bit	●	●
Overall resolution	13 Bit	●	●
	16 Bit		●
Rotational speed	max. 10000 min <sup>-1</sup>	●	●
	max. 6000 min <sup>-1</sup>		●
Shaft load			
Axial	40 N		●
	40 N at max. 6000 min <sup>-1</sup>	●	
	10 N at max. 12000 min <sup>-1</sup>		
Radial	60 N		●
	60 N at max. 6000 min <sup>-1</sup>	●	
	20 N at max. 12000 min <sup>-1</sup>		

### Dimensions

Length L [mm]	depending on the version: 64 ... 67	●	●
Diameter D [mm]			58

## Ordering Information



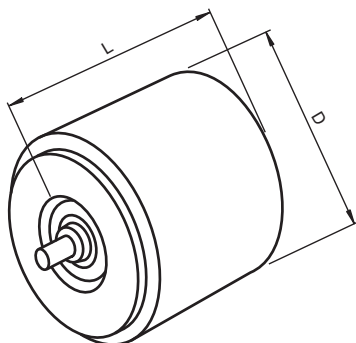
### Example of order:

BVS58N-011AVR0NN-0013

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9203	Angled flange
9300	Mounting bracket for servo flange
V11-G-2M-PVC-V11-G	Connection cable, 2 m, PVC
VBP-HH1-V3.0-KIT-110V	AS-interface Handheld with accessory





## Properties

- **AS-Interface**
- **58 mm housing**
- **Recessed hollow shaft**
- **Singleturn encoders, up to 13 bit**
- **Multiturn encoders, up to 16 bit resolution**

## Benefits

- **Position data transfer using 4 AS-Interface addresses**
- **Configuration and addressing via AS-Interface**

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	29.5 ... 31.6 V DC
Interface type	AS-Interface
Transfer rate	max. 0.167 MBit/s
Operating temperature	-20 ... 70 °C (-4 ... 158 °F)
Material	

Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel

### Shaft load

Angle offset	1 °
Axial offset	max. 1 mm

### Connection



### Encoder Series

Device type	Multiturn absolute encoder
	Singleturn absolute encoder
Resolution	
Single turn	up to 13 Bit
Multiturn	up to 12 Bit
Overall resolution	13 Bit
	16 Bit
Rotational speed	max. 10000 min <sup>-1</sup>
	max. 6000 min <sup>-1</sup>

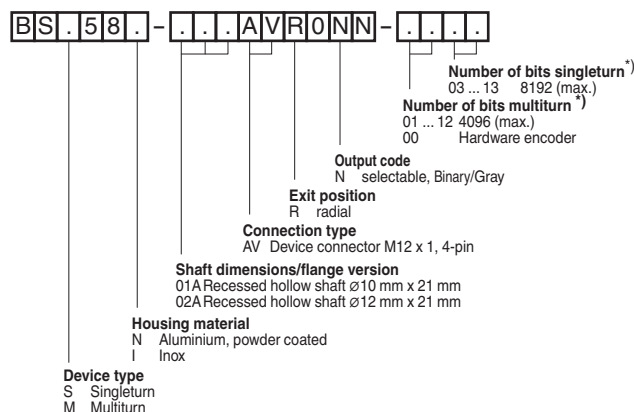
BSS58

BSM58

### Dimensions

Length L [mm]	68
Diameter D [mm]	58

## Ordering Information



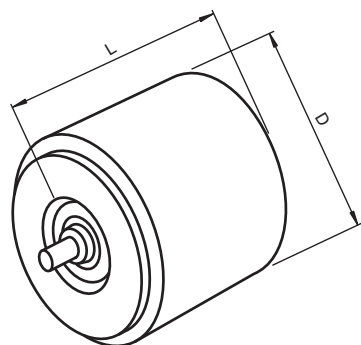
### Example of order:

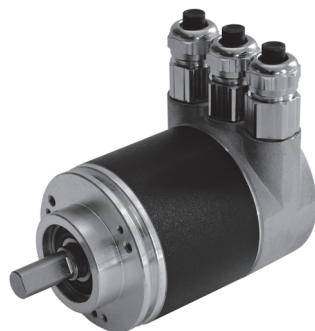
BSM58/02AAVR0NN/1213

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

V1-G	4-pin, M12 female field-attachable connector
V11-G-2M-PVC-V11-G	Connection cable, 2 m, PVC
VBP-HH1-V3.0-KIT-110V	AS-interface Handheld with accessory





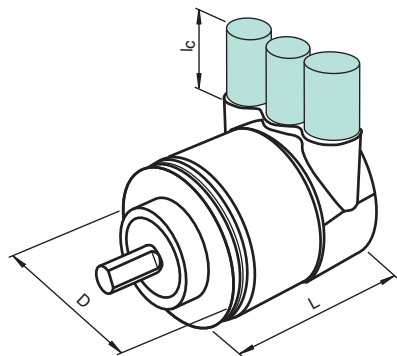
**CANopen** *DeviceNet*. **PROFI**<sup>®</sup>

## Properties

- CANopen, DeviceNet and PROFIBUS interface versions
- 58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Fast and easy installation due to removable housing cover
- Manually set baudrate, address, and termination resistor in the housing cover
- Wide range of programming functions, such as resolution, scaling, limit switches etc.
- Optional shaft seal for higher IP protection



## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Material	
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	110 N
Connection	



## Encoder Series

		CV	DV	PV	CV	DV	PV
Device type	Multiturn absolute encoder	●	●	●	●	●	●
Interface type	Singleturn absolute encoder	●			●		
	CANopen	●			●		
	DeviceNet		●			●	
	PROFIBUS			●			●
Resolution							
Single turn	up to 16 Bit	●	●	●	●	●	●
Multiturn	14 Bit				●	●	●
Overall resolution	up to 16 Bit	●		●			
	up to 30 Bit				●	●	●
Transfer rate	max. 0.5 MBit/s		●			●	
	max. 1 MBit/s	●			●		
	0.0096 ... 12 MBit/s			●			●

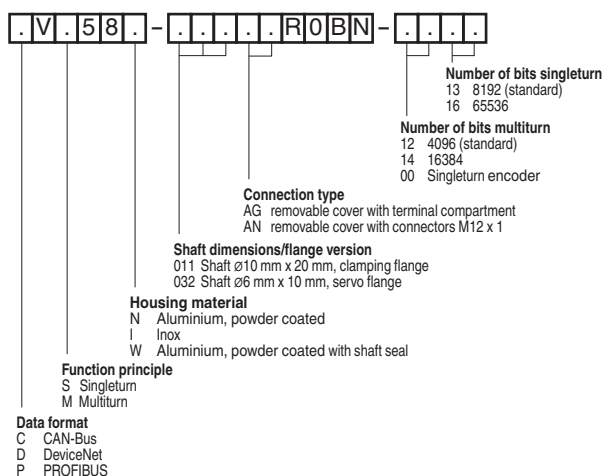
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●	●	●	●	●
-------------	---	---	---	---	---	---	---

## Dimensions

Length L [mm]	depending on the version: 73 ... 79	●	●	●	●	●	●
	depending on the version: 84 ... 90						
Diameter D [mm]					58		
Connector area $l_c$ [mm]					25		

## Ordering Information



**Example of order:**  
PVM58N-032AGR0BN-1213

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9203	Angled flange
9300	Mounting bracket for servo flange
V15-G-1M-PUR-CAN-V15-G	Connection cable, 5-pin, 1 m PUR cable, straight
V15S-TEE-V15	T-Distributor
V15B-G-2M-PUR-ABG-V15B-G	Connection cable, B-coded, 5-pin, 2 m PUR cable, shielded, straight



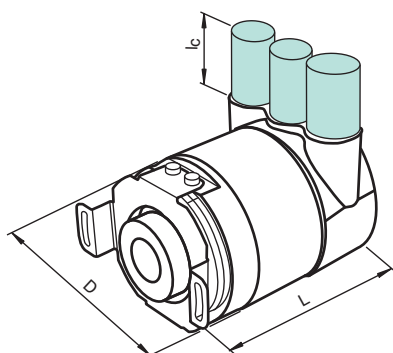
DeviceNet. CANopen PROFIBUS<sup>®</sup>

## Properties

- CANopen, DeviceNet and PROFIBUS interface versions
- 58 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Fast and easy installation due to removable housing cover
- Manually set baudrate, address, and termination resistor in the housing cover
- Wide range of programming functions, such as resolution, scaling, limit switches etc.
- Optional shaft seal for higher IP protection




## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

## General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Material	
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
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
Connection	



Encoder Series		CS58	DS58	PS58	CSM58	DSM58	PSM58
Device type	Multiturn absolute encoder						
	Singleturn absolute encoder						
Interface type	CANopen						
	DeviceNet						
	PROFIBUS						
Resolution							
Single turn	up to 16 Bit						
Multiturn	14 Bit						
Overall resolution	up to 16 Bit						
	up to 30 Bit						
Transfer rate	max. 0.5 MBit/s						
	max. 1 MBit/s						
	0.0096 ... 12 MBit/s						

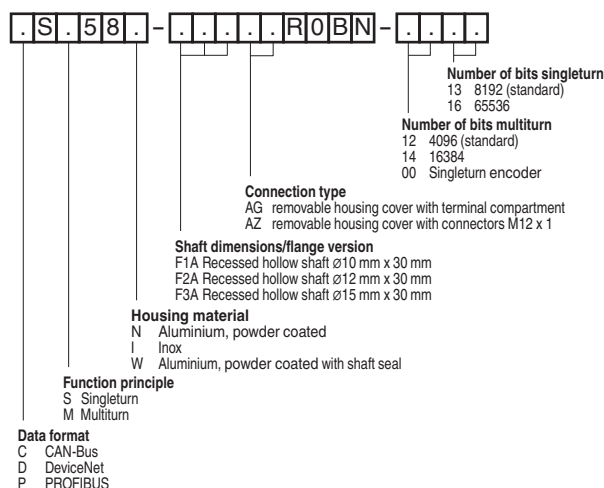
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source					
-------------	---	---	---	---	---	---

## Dimensions

Length L [mm]	87	98
Diameter D [mm]	59	
Connector area $I_c$ [mm]	25	

## Ordering Information



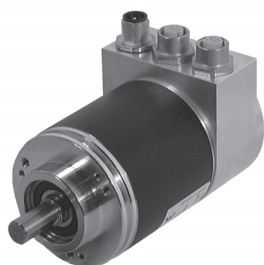
**Example of order:**  
CSS58W/F2AAGR0BN-0013

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

V15B-G-ABG-PG9	Field attachable female connector, B-coded, 5-pin, straight
V15-G-1M-PUR-CAN-V15-G	Connection cable, 5-pin, 1 m PUR cable, straight
V15B-G-TEE-V15	T-Distributor
V15B-G-2M-PUR-ABG-V15B-G	Connection cable, B-coded, 5-pin, 2 m PUR cable, shielded, straight





## Properties

- Ethernet versions with
  - TCP/IP
  - Powerlink
  - ProfiNet-IO
  - EtherNet/IP
  - Modbus
- 58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Choice of many Ethernet protocols
- Optional shaft seal for higher IP protection

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

## General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Physical	Ethernet
Material	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	110 N
Connection	



## Encoder Series

[illegible]

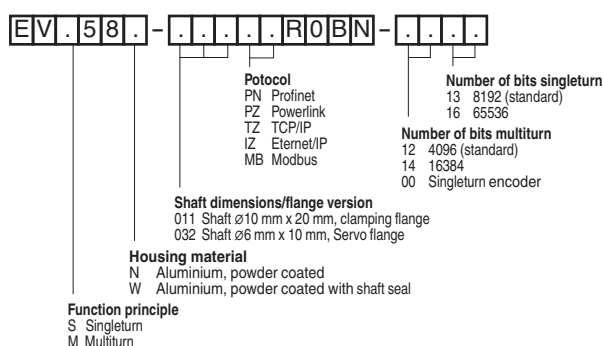
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	● ● ● ● ● ● ● ●
-------------	---	-----------------

## Dimensions

<b>Diameter D</b>	depending on the version: 81 ... 87	● ●
<b>Length L [mm]</b>	depending on the version: 83 ... 90	● ●   ●         ● ● ●
	depending on the version: 92 ... 98	●   ●       ● ● ●
<b>Diameter D [mm]</b>		59
<b>Connector area I<sub>c</sub> [mm²]</b>		23

## Ordering Information

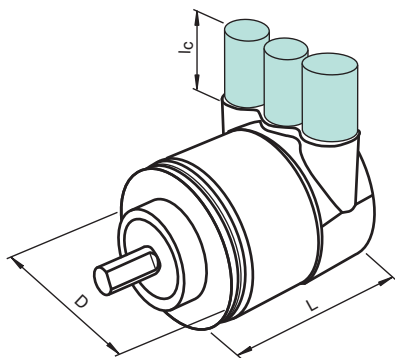


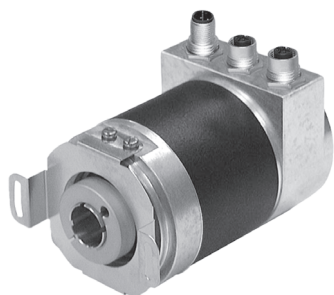
**Example of order:**  
EVM58N-032PNR0BN-1416

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>9203</b>	Angled flange
<b>9300</b>	Mounting bracket for servo flange
<b>V1-G</b>	Field attachable female connector, M12, 4-pin, straight
<b>V1SD-G-2M-PUR-ABG-V45-G</b>	Connection cable, D-coded, M12 to RJ-45, PUR cable 4-pin, CAT5e, straight
<b>V1SD-G-2M-PUR-ABG-V1SD-G</b>	Connection cable, D-coded, M12 to M12, PUR cable 4-pin, CAT5e, straight
<b>V1-G-YE2M-PVC-U</b>	Female cordset, 4-pin, 2 m PVC cable, straight





## Properties

- Ethernet versions with
  - TCP/IP
  - Powerlink
  - ProfiNet-IO
  - Ethernet/IP
- 58 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 30 bit resolution

## Benefits

- Choice of many Ethernet protocols
- Optional shaft seal for higher IP protection

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Physical	Ethernet
Material	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
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
Connection	



### Encoder Series

Device type	Multiturn absolute encoder	Singleturn absolute encoder	ESS58-TZ	ESS58-PZ	ESS58-PN	ESS58-IZ	ESM58-TZ	ESM58-PZ	ESM58-PN	ESM58-IZ
Interface type	Ethernet/IP	Powerlink								
	ProfiNet IO	TCP/IP								
Resolution										
Single turn	up to 16 Bit									
Multiturn	14 Bit									
Overall resolution	up to 16 Bit									
Transfer rate	up to 30 Bit									
	10 MBit/s / 100 MBit/s									
	100 MBit/s									
Operating temperature	0 ... 60 °C (32 ... 140 °F)									
	-40 ... 85 °C (-40 ... 185 °F)									

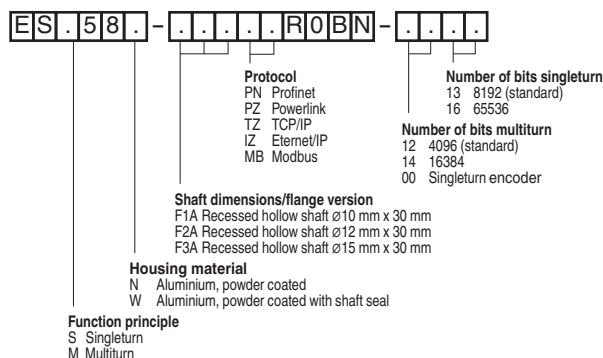
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source									
-------------	---	--	--	--	--	--	--	--	--	--

### Dimensions

Length L [mm]	95	106
Diameter D [mm]	59	
Connector area l <sub>c</sub> [mm]	23	

## Ordering Information



### Example of order:

ESS58W-F1ATZR0BN-0016

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

### V1SD-G-ABG-PG9

#### V1-G

### V1SD-G-2M-PUR-ABG-V45-G

### V1SD-G-2M-PUR-ABG-V1SD-G

### V1-G-YE2M-PVC-U

Field attachable female connector, M12, 4-pin, D-coded, shielded, straight

Field attachable female connector, M12, 4-pin, straight

Connection cable, M12 to RJ-45, PUR cable 4-pin, CAT5e, straight

Connection cable, D-coded, M12 to M12, PUR cable 4-pin, CAT5e, straight

Female cordset, 4-pin, 2 m PVC cable, straight

4  
1.1

Rotary Encoders, Absolute Rotary Encoders, Standard



## Properties

- CANopen safety interface
- 58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit resolution

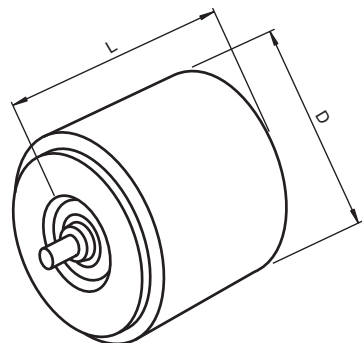
## Benefits

- Suitable for systems up to SIL3 and PLe
- Integrated functional safety by means of twin processor structure and dual sensing for extra safety



**Danger!**

For safety-related applications consider the product documentation which is available on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).














## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

## General Data

Detection type	optical
Operating voltage	12 ... 30 V DC
Interface type	CANopen / CANopen Safety
Transfer rate	max. 1 MBit/s
Output type	DSP 406/301/304, CLASS 1 and 2
Operating temperature	-30 ... 70 °C (-22 ... 158 °F)
Material	
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Combination 2 (Inox)	housing: stainless steel flange: stainless steel shaft: stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	110 N
Connection	



Encoder Series		CVS58S	CVM58S
Device type	Multiturn absolute encoder Singleturn absolute encoder		
Resolution			
Single turn	CANopen: up to 16 Bit CANopen Safety: 10 Bit		
Multiturn	14 Bit		
Overall resolution	up to 16 Bit		
	up to 30 Bit		
Approvals and Certificates			
UL approval	cULUS Listed, General Purpose, Class 2 Power Source		
Dimensions			
Length L [mm]	depending on the version: 54 ... 92 depending on the version: 83 ... 118		
Diameter D [mm]		aluminum: 59 Stainless steel: 61	

## Ordering Information

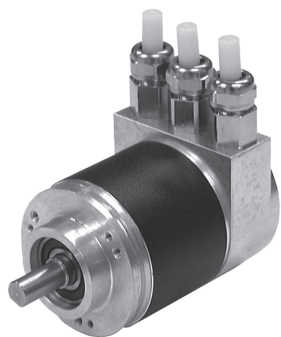
CV	5	8	S	-	.	.	.	.	.	.	0	B	-	.	.	.	.
<p><b>Number of bits singleturn</b></p> <p>13 8192 16 65536</p> <p><b>Number of bits multiturn</b></p> <p>14 16384 00 Singleturn encoder</p> <p><b>Option 2</b></p> <p>N Aluminum housing (standard) I Stainless steel housing W Aluminum housing with shaft seal</p> <p><b>Output code</b></p> <p>B Binary</p> <p><b>Exit position</b></p> <p>A axial (Connection type K1, without bus cover) R radial (Connection type AG, AN, AW)</p> <p><b>Connection type</b></p> <p>AG removable cover with terminal compartment AN 1 Device connector, M12 x 1, 5-pin AW 1 Device connector and 1 socket, M12 x 1, 5-pin K1 Cable, 1 m long</p> <p><b>Shaft dimensions/flange version</b></p> <p>011 solid shaft ø10 mm x 20 mm with clamping flange 012 solid shaft ø10 mm x 20 mm with servo flange 032 solid shaft ø6 mm x 10 mm with servo flange</p> <p><b>Function principle</b></p> <p>S Singleturn M Multiturn</p>																	

**Example of order:**  
CVM58S-032AGR0BN-1416

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9203	Angled flange
9300	Mounting bracket for servo flange
V15S-TEE-V15	T-Distributor
V15-G-2M-PUR-CAN-V15-G	CAN connection cable, 2 m



## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Interface type	PROFIBUS
Transfer rate	0.0096 ... 12 MBit/s
Operating temperature	-30 ... 55 °C (-22 ... 131 °F)
Protection degree	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65

Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
---------------	---

Rotational speed max. 6000 min<sup>-1</sup>

### Shaft load

Axial	40 N
Radial	110 N

### Connection



## Properties

- PROFIBUS interface
- Ø58 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit total resolution

## Benefits

- ATEX approval for zone 2 and zone 22
- Fast and easy installation due to removable housing cover
- Manually set baudrate, address, and termination resistor in the housing cover
- Wide range of programming functions, such as resolution, scaling, limit switches etc.

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

### Encoder Series

Device type	Multiturn absolute encoder		
	Singleturn absolute encoder		
Resolution			
Single turn	up to 16 Bit		
Multiturn	14 Bit		
Overall resolution	up to 16 Bit		
	up to 30 Bit		

PVS58X

PVM58X

### Use in the Hazardous Area

Group, category, type of protection	Ex II 3G Ex nA IIB T4		
	Ex II 3D Ex tD A22 IP64 T120°C		

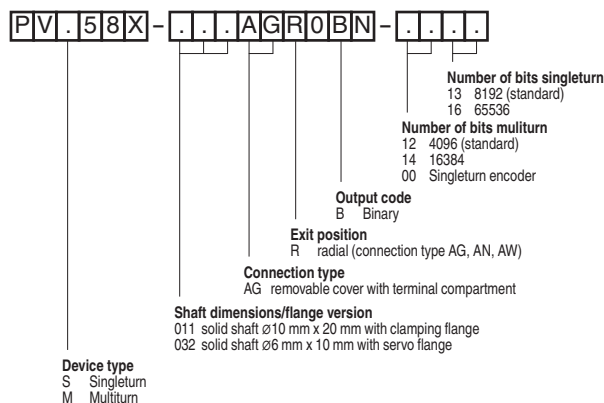
### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source		
-------------	---	--	--

### Dimensions

Length L [mm]	86	96
Diameter D [mm]	aluminum: 59	Stainless steel: 61
Connector area I <sub>c</sub> [mm]	32	

## Ordering Information



### Example of order:

PVS58X-032AGR0BN-0016

## Accessories

These and more accessories can be found in chapter 10

See pages from 970 ... for cordsets See pages 1066 ... for mounting accessories

9203

9300

Angled flange

Mounting bracket for servo flange



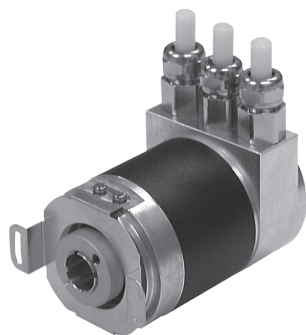
4

.13



Rotary Encoders, Absolute Rotary Encoders for hazardous areas






## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Interface type	PROFIBUS
Transfer rate	0.0096 ... 12 Mbit/s
Operating temperature	-30 ... 55 °C (-22 ... 131 °F)
Protection degree	DIN EN 60529, shaft side: IP64 (without shaft seal)/IP66 (with shaft seal) housing side: IP65
Combination 1	housing: powder coated aluminium flange: aluminium shaft: stainless steel
Rotational speed	max. 6000 min <sup>-1</sup>
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
Connection	

## Properties

- PROFIBUS interface
- Ø58 mm housing
- Recessed hollow shaft
- Single- and multiturn encoders, up to 30 bit total resolution

## Benefits

- ATEX approval for zone 2 and zone 22
- Fast and easy installation due to removable housing cover
- Manually set baudrate, address, and termination resistor in the housing cover
- Wide range of programming functions, such as resolution, scaling, limit switches etc.

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

### Encoder Series

Device type	Multiturn absolute encoder	Singleturn absolute encoder
Resolution		
Single turn	up to 16 Bit	
Multiturn	14 Bit	
Overall resolution	up to 16 Bit	up to 30 Bit

### Use in the Hazardous Area

Group, category, type of protection	II 3G Ex nA IIB T4
	II 3D Ex tD A22 IP64 T120°C

### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
-------------	---

### Dimensions

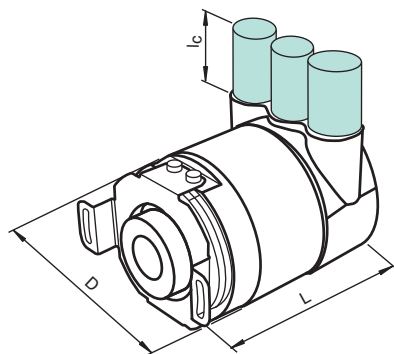
Length L [mm]	100	112
Diameter D [mm]	aluminum: 59	Stainless steel: 61
Connector area I <sub>c</sub> [mm]	32	

## Ordering Information

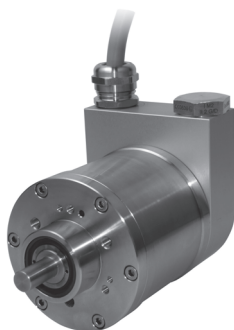
PS.58X	-	. . .	AG	R0	B	N	-	. . .	. . .
Device type			Connection type	Exit position	Output code	Number of bits multiturn	Number of bits singleturn		
S Singleturn			AG removable cover with terminal compartment	A axial (connection type AG, AN, AW)	B Binary	12 4096 (standard)	13 8192 (standard)		
M Multiturn						14 16384	16 65536		
						00 Singleturn encoder			

**Shaft dimensions/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

**Example of order:**  
 PSM58X-F1AAGR0BN-1213







DeviceNet



## Properties

- SSI, CANopen, DeviceNet and PROFIBUS versions
- Ø78 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 30 bit total resolution

## Benefits

- Suitable for global usage due to ATEX and IECEx approval for zone1 and zone 21
- Fast and easy installation by means of removable wiring cover and access to control elements
- Reliable and robust for rough environmental conditions

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

## General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Operating temperature	-40 ... 70 °C (-40 ... 158 °F)
Protection degree	DIN EN 60529, IP66

## Materia

Combination 1	housing: anodized aluminium flange: aluminium, blank shaft: Stainless steel 1.4401 / AISI 316
Combination 2 (Inox)	housing: stainless steel 1.4404 / AISI 316L flange: stainless steel 1.4404 / AISI 316L shaft: Stainless steel 1.4401 / AISI 316



Rotational speed	max. 3000 min <sup>-1</sup>
------------------	-----------------------------

Shaft load	
Axial	60 N
Radial	80 N

## Encoder Series

		A	A	C	C	E	E	E	E
Device type	Multiturn absolute encoder								
	Singleturn absolute encoder								
Interface type	SSI								
	CANopen								
	DeviceNet								
	PROFIBUS								
Resolution									
Single turn	up to 16 Bit								
Multiturn	up to 14 Bit								
Overall resolution	up to 30 Bit								
Transfer rate	0.1 ... 2 MBit/s								
	max. 1 MBit/s								
	max. 0.5 MBit/s								
	0.0096 ... 12 MBit/s								
Input 1, Input type	Selection of counting direction (cw/ccw)								
Input 2, Input type	zero-set (PRESET)								

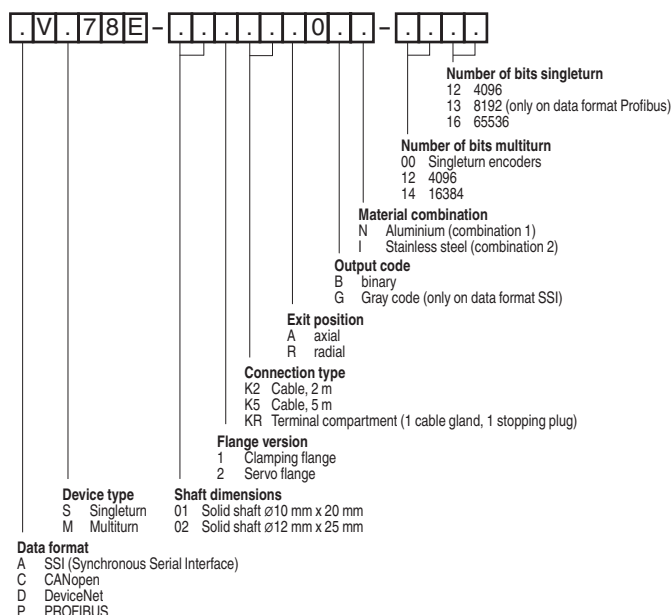
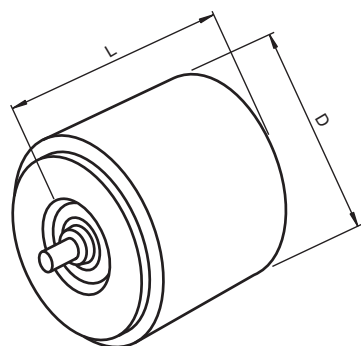
### Use in the Hazardous Area

EC-Type Examination Certificate	TÜV 11 ATEX 084272X IECEx TUN 11.0017X	●	●	●	●	●	●	●
Group, category, type of protection	 II 2G Ex d IIC T5 Gb	●	●	●	●	●	●	●
	 II 2D Ex tb IIIC T100°C Db IP6X							

## Dimensions

Length L [mm]	depending on the version: 109 ... 125
Diameter D [mm]	78

## Ordering Information



**Example of order:**

AVM78E-011K2R0BI-1212





DeviceNet.

## Properties

- SSI, CANopen and DeviceNet interface versions
- Ø116 mm housing
- Solid shaft
- Single- and multiturn encoders, up to 25 bit total resolution

## Benefits

- ATEX approval for zone 1 and zone 21
- Reliable and robust for rough environmental conditions

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Detection type	optical
Operating voltage	10 ... 30 V DC
Gas Ex-area	-40 ... 55 °C (-40 ... 131 °F)
Dust Ex-area	-30 ... 55 °C (-22 ... 131 °F)
Protection degree	DIN EN 60529, IP66
Housing	aluminum
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 6000 min <sup>-1</sup>
Axial	60 N
Radial	80 N
Connection	

### Encoder Series

Encoder Series	AVS14	AVM14	CVM14	DVM14
Device type				
Multiturn absolute encoder				
Singleturn absolute encoder				
Interface type				
CANopen				
DeviceNet				
SSI				
Single turn				
12 Bit				
13 Bit				
Multiturn				
12 Bit				
24 Bit				
25 Bit				
Transfer rate				
0.05 ... 1.5 MBit/s				
max. 0.5 MBit/s				
max. 1 MBit/s				
Input type				
Selection of counting direction (cw/ccw)				
zero-set (PRESET 1)				

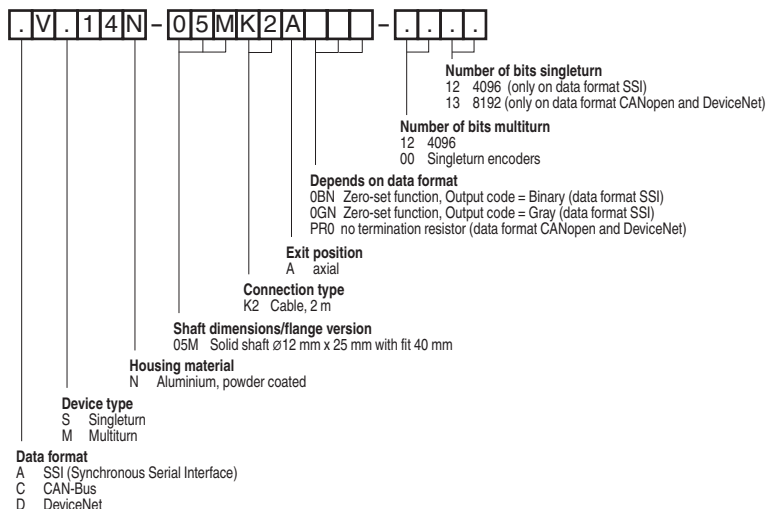
### Use in the Hazardous Area

EC-Type Examination Certificate	ZELM 02 ATEX 0078 X				
Group, category, type of protection	II 2G Ex db IIC T6 Gb				
	II 2D Ex tb IIIC T80°C Db IP66				

### Dimensions

Length L [mm]	139				
Diameter D [mm]	116				

## Ordering Information



### Example of order:

AVS14N-05MK2A0BN-0012





## Properties


- Surface mount 32 x 22 mm housing
- Separate magnetic wheel
- Up to 5,000 pulses per revolution
- Encapsulated sensor housing

## Benefits

- Cost-effective, bearing-free encoder for rotational speed measurement
- Loose wheel to be mounted on customer hub or wheel
- Status LED
- Robust and flexible magnetic wheel provides resistance to dirt as well as thermal and mechanical shock
- Long service life at high speeds and temperatures

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	MNI20
Detection type	magnetic
Pulse count	max. 5000
Operating voltage	10 ... 30 V DC 5 V DC for RS 422
Output type	push-pull, incremental (RS 422, incremental)
Output frequency	max. 800 kHz
Operating temperature	-25 ... 85 °C (-13 ... 185 °F)
Protection degree	DIN EN 60529, IP67
Housing	PA
Rotational speed	max. 20000 min <sup>-1</sup>
Connection	

Dimensions	
Length L [mm]	32
Width W [mm]	22.4
Diameter D [mm]	depending on the version: 15 or 25
Connector area l <sub>c</sub> [mm]	15

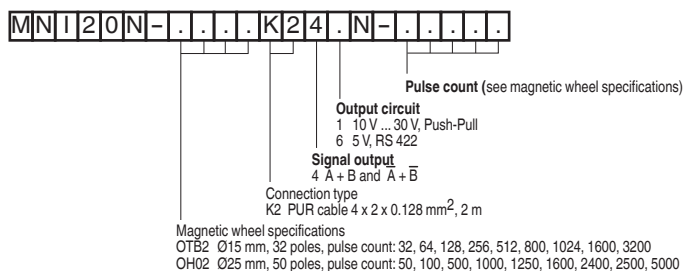
4

21



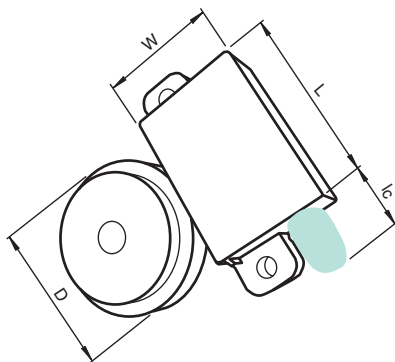
Rotary Encoders, Incremental Rotary Encoders with pulse outputs

## Ordering Information



### Example of order:

MNI20N-OH02K241N-02400





## Properties

- Surface mount 32 x 22 mm housing
- Separate magnetic wheel
- Up to 3600 pulses per revolution
- Encapsulated sensor housing

## Benefits

- Two-color (red, green) LEDs provide clear indication of magnetic wheel alignment
- Simple installation and adjustment reduce costs
- An elastomer-coated magnetic wheel resists dirt as well as thermal and mechanical shock
- Long service life at high speeds and temperatures

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	MNI40
Detection type	magnetic
Pulse count	max. 3600
Operating voltage	10 ... 30 V DC 5 V DC for RS 422
Output type	push-pull, incremental (RS 422, incremental)
Output frequency	max. 1 MHz
Operating temperature	-40 ... 100 °C (-40 ... 212 °F)
Protection degree	DIN EN 60529, IP67, IP68, IP69K
Housing	PA
Rotational speed	max. 30000 min <sup>-1</sup>
Connection	

## Dimensions

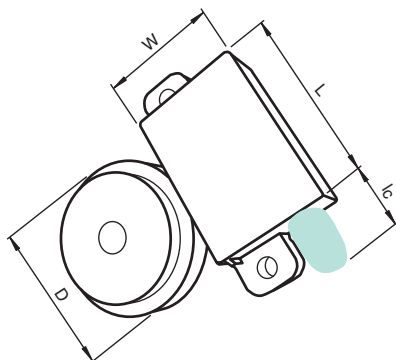
Length L [mm]	32
Width W [mm]	22.4
Diameter D [mm]	depending on the version: 31.7 ... 45.7
Connector area l <sub>c</sub> [mm]	15

## Ordering Information

MNI40N- . . . K26 . N- . . . .	
	Pulse count see below
	Output circuit 1 10 V ... 30 V, Push-Pull 6 5 V, RS 422
	Signal output 6 A + B + 0 and $\bar{A} + \bar{B} + \bar{0}$
	Connection type K2 PUR cable 4 x 2 x 0.128 mm <sup>2</sup> , 2 m
	Magnetic wheel properties
	01 50 Poles, Ø31.7 mm pulse numbers: 100, 500, 1000, 1250, 1600, 2400, 2500
	A1 64 Poles, Ø40.6 mm pulse numbers: 128, 512, 1024, 2048, 3072, 3200
	E1 72 Poles, Ø46 mm pulse numbers: 360, 1800, 3600
	Magnetic wheel center borehole
	0S Ø6 mm
	0A Ø10 mm
	0B Ø12 mm
	0T Ø15 mm

### Example of order:

MNI40N-0A01K261N-01000





## Properties


- Ø40 mm housing
- Solid shaft
- Up to 1024 pulses per revolution

## Benefits

- Economical design
- Small housing for space restricted area
- Optimum cable exit location

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

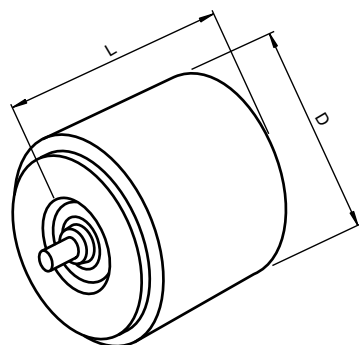
<b>Encoder Series</b>	<b>TVI40</b>
Detection type	optical
Pulse count	max. 1024
Operating voltage	4.75 ... 30 V DC 5 V DC for RS 422
Output type	push-pull, incremental (RS 422, incremental)
Output frequency	max. 100 kHz (max. 100 kHz)
Nickel disk	-10 ... 70 °C (14 ... 158 °F)
Protection degree	DIN EN 60529, IP54
Material	
Housing	Polycarbonate
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Axial	max. 20 N
Radial	max. 30 N
Connection	

## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

Length L [mm]	42
Diameter D [mm]	40



## Ordering Information

<b>TVI40N-...TK...T6TN-... ..</b>	
	<b>Pulse numbers</b> 25, 50, 100, 200, 360, 400 500, 1000, 1024
	<b>Signal output</b> 6 A + B + 0 und $\bar{A} + \bar{B} + \bar{0}$
	<b>Exit position</b> T tangential
	<b>Connection type</b> K0 Cable Ø6 mm, 8 x 0.128 mm <sup>2</sup> , 0.5 m K2 Cable Ø6 mm, 8 x 0.128 mm <sup>2</sup> , 2 m
	<b>Flange version</b> T Clamping flange
	<b>Shaft dimensions</b> 09 Shaft Ø8 mm x 15 mm 14 Shaft Ø6 mm x 15 mm 17 Shaft Ø1/4" x 15 mm 19 Shaft Ø1/8" mm x 15 mm

## Example of order:

TVI40N-14TK2T6TN-01024



## Properties

- Ø40 mm housing
- Recessed hollow shaft
- Up to 1024 pulses per revolution

## Benefits

- Economical design
- Small housing for space restricted area
- Optimum cable exit location

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	TSI40
Detection type	optical
Pulse count	max. 1024
Operating voltage	4.75 ... 30 V DC 5 V DC for RS 422
Output type	push-pull, incremental (RS 422, incremental)
Output frequency	max. 100 kHz (max. 100 kHz)
Nickel disk	-10 ... 70 °C (14 ... 158 °F)
Protection degree	DIN EN 60529, IP54
Material	
Housing	Polycarbonate
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	

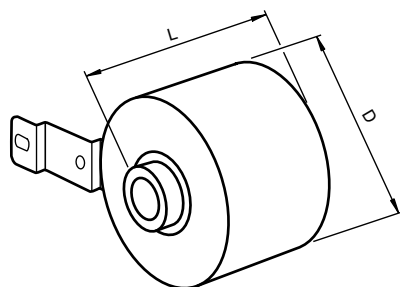
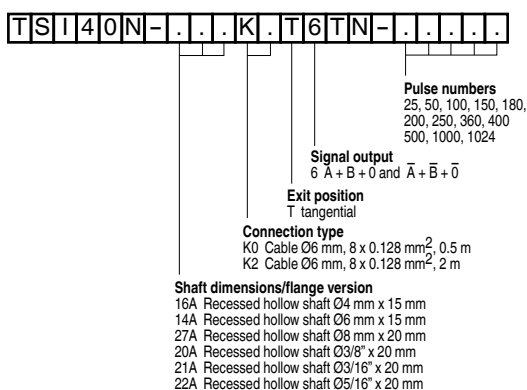
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

Length L [mm]	43
Diameter D [mm]	40

## Ordering Information



## Example of order:

TSI40N-27AK0T6TN-00250



## Properties


- Ø40 mm housing
- Hollow shaft
- Up to 1024 pulses per revolution

## Benefits

- Economical design
- Small housing for space restricted area

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>TH140</b>
Detection type	optical
Pulse count	max. 1024
Operating voltage	4.75 ... 30 V DC 5 V DC for RS 422
Output type	push-pull, incremental (RS 422, incremental)
Output frequency	max. 100 kHz (max. 100 kHz)
Nickel disk	-10 ... 70 °C (14 ... 158 °F)
Protection degree	DIN EN 60529, IP54
Material	
Housing	aluminum
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 6000 min <sup>-1</sup>
Connection	

## Approvals and Certificates

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

## Dimensions

Length L [mm]	20.7
Diameter D [mm]	40

4  
21



Rotary Encoders, Incremental Rotary Encoders with pulse outputs

## Ordering Information

TH140N-...AK2R6TN-...-...

**Pulse numbers**  
25, 50, 100, 150, 180, 200, 250,  
360, 400, 500, 1000, 1024

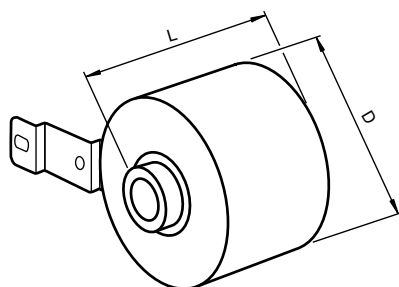
**Signal output**  
6 A + B + 0 and A + B + 0

**Exit position**  
R radial

**Connection type**  
K2 Cable Ø5 mm, 8 x 0.08 mm<sup>2</sup>, 2 m

### Shaft dimensions/flange version

- 09 Shaft Ø8 mm x 15 mm
- 0S Hollow shaft Ø6 mm, clamping ring on both sides
- 0U Hollow shaft Ø6.35 mm, clamping ring on flange side
- 0C Hollow shaft Ø8 mm, clamping ring on flange side
- 0X Hollow shaft Ø3/16", clamping ring on flange side
- 2A Hollow shaft Ø5/16", clamping ring on flange side
- 1S Hollow shaft Ø6 mm, clamping ring on cover side
- 1U Hollow shaft Ø6.35 mm, clamping ring on cover side
- 1C Hollow shaft Ø8 mm, clamping ring on cover side
- 1X Hollow shaft Ø3/16", clamping ring on cover side
- 3A Hollow shaft Ø5/16", clamping ring on cover side



### Example of order:

TH140N-0CAK2R6TN-00500





## Properties

- Ø50 mm housing
- Solid shaft
- Up to 1024 pulses per revolution

## Benefits

- Sturdy and compact design
- Cost-effective version

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series		TVI50
Detection type		optical
Pulse count		max. 1024
Operating voltage		4.75 ... 30 V DC 5 V DC for RS 422
Output type		push-pull, incremental (RS 422, incremental)
Output frequency		max. 100 kHz (max. 100 kHz)
Nickel disk		-10 ... 70 °C (14 ... 158 °F)
Protection degree		DIN EN 60529, IP40, IP54
Material		
Housing		aluminium, blank
Flange		3.1645 aluminum
Shaft		Stainless steel 1.4305 / AISI 303
Rotational speed		max. 6000 min <sup>-1</sup>
Shaft load		
Axial		20 N
Radial		40 N
Connection		

## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

Length L [mm]	44
Diameter D [mm]	50

## Ordering Information

TVI50N-...K...6TN-... ..

Pulse numbers  
50, 100, 200, 360, 400,  
500, 1000, 1024

Signal output  
6 A + B + 0 and  $\bar{A} + \bar{B} + \bar{0}$

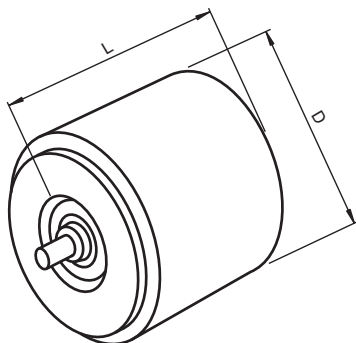
Exit position  
A axial  
R radial

Connection type  
K0 Cable Ø6 mm, 8 x 0.128 mm<sup>2</sup>, 0.5 m  
K2 Cable Ø6 mm, 8 x 0.128 mm<sup>2</sup>, 2 m

Flange version  
B Clamping flange  
U Square flange 2"  
W Servo flange 2" (4)  
X Servo flange 2" (3)

Shaft dimensions  
09 Shaft Ø8 mm x 15 mm  
24 Shaft Ø1/4" x 19 mm  
25 Shaft Ø1/8" x 19 mm  
26 Shaft Ø3/8" x 19 mm

Housing material  
N Aluminum, IP40  
T Aluminum, IP54



## Example of order:

TVI50N-25BK2A6TN-01024





## Properties

- Ø50 mm housing
- Solid shaft
- Up to 2500 pulses per revolution

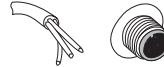
## Benefits

- Sturdy and compact design
- Choice of mechanical and electrical options

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RVi50</b>
Detection type	optical
Pulse count	max. 2500
Output frequency	max. 160 kHz
Operating temperature	
Glass disk	-20 ... 70 °C (-4 ... 158 °F)
Plastic disk	-20 ... 60 °C (-4 ... 140 °F)
Protection degree	DIN EN 60529, IP50
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 10000 min <sup>-1</sup>
Shaft load	
Axial	30 N
Radial	50 N
Connection	



### Model Number

Operating voltage	4.75 ... 30 V DC		
	5 V DC ± 5 %	●	●
Output type	push-pull, incremental		
	RS 422, incremental	●	●

### Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●
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### Dimensions

Length L [mm]	55
Diameter D [mm]	50

## Ordering Information

RVI50N-09B...A...N-...-...

#### Pulse numbers

30, 60, 90, 100, 180, 200, 250, 300,  
314, 360, 400, 500, 600, 720, 900,  
1000, 1024, 1200, 1250, 1440, 1500,  
1800, 2000, 2048, 2400, 2500

#### Connection type, Exit position, Signal output, Output circuit

AAA3T Connector type 9416, 12-pin, axial,

A + B + 0, 4.75 V ... 30 V, Push-Pull

AAA66 Connector type 9416, 12-pin, axial,

A + B + 0 und A + B + 0.5 V<sub>RS</sub> RS 422

K0A3T Cable Ø6 mm, 5 x 0.38 mm<sup>2</sup>, 0.5 m, axial,

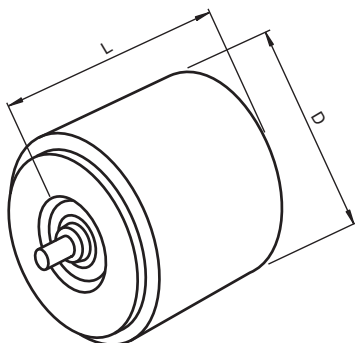
A + B + 0, 4.75 V ... 30 V, Push-Pull

#### Flange version

B Clamping flange

#### Shaft dimensions

09 Shaft Ø8 mm x 15 mm



### Example of order:

RVI50N-09BK0A3TN-00360

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9416

Field attachable female connector

9416-02M-12P-RXI58

Female cordset, 2 m



## Properties

- Ø58 mm housing
- Solid shaft
- Up to 1500 pulses per revolution

## Benefits

- Cost-effective version

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series		TVI58
Detection type		optical
Pulse count		max. 1500
Operating voltage		4.75 ... 30 V DC 5 V DC for RS 422
Output type		push-pull, incremental (RS 422, incremental)
Output frequency		max. 100 kHz (max. 100 kHz)
Nickel disk		-10 ... 70 °C (14 ... 158 °F)
Protection degree		DIN EN 60529, IP54
Material		
Housing		aluminium, blank
Flange		3.1645 aluminum
Shaft		Stainless steel 1.4305 / AISI 303
Rotational speed		max. 6000 min <sup>-1</sup>
Shaft load		
Axial		20 N
Radial		40 N
Connection		

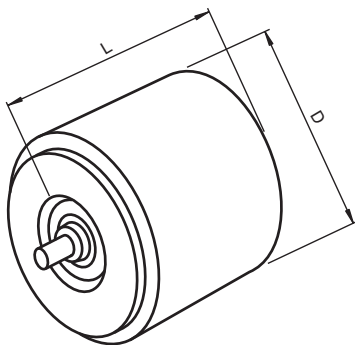
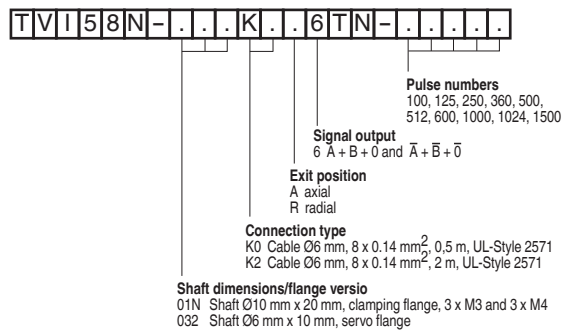
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

Length L [mm]	47
Diameter D [mm]	58

## Ordering Information



**Example of order:**  
TVI58N-032K2R6TN-00512



## Properties

- Ø58 mm housing
- Hollow shaft
- Up to 1500 pulses per revolution

## Benefits

- Cost-effective version

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>THI58</b>
Detection type	optical
Pulse count	max. 1500
Nickel disk	-10 ... 70 °C (14 ... 158 °F)
Protection degree	DIN EN 60529, IP54
<b>Material</b>	
Housing	aluminium, blank
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	

Model Number		THI58N	THI58N-*****X
Operating voltage	10 ... 30 V DC 4.75 ... 30 V DC 5 V DC for RS 422	●	●
Output type	push-pull, incremental (RS 422, incremental) RS 422, incremental	●	●
Output frequency	max. 100 kHz max. 100 kHz (max. 100 kHz)	●	●

## Approvals and Certificates

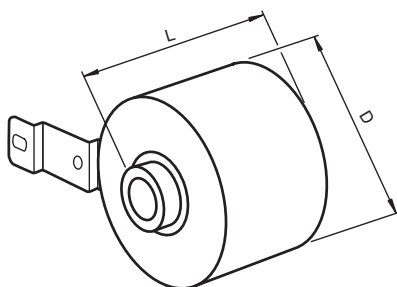
UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●
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## Dimensions

Length L [mm]	31
Diameter D [mm]	58

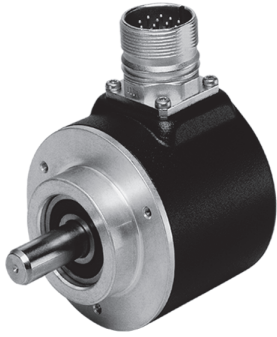
## Ordering Information

<b>THI58N-...AK.R6.N-... . . . .</b>
<b>Pulse numbers</b> 100, 125, 250, 360, 500, 512, 600, 1000, 1024, 1500
<b>Output circuit</b> T 4.75 V ... 30 V, Push-Pull X 10 V ... 30 V, RS 422
<b>Signal output</b> 6 A + B + 0 and A̅ + B̅ + 0̅
<b>Exit position</b> R radial
<b>Connection type</b> K0 Cable Ø6 mm, 8 x 0.14 mm <sup>2</sup> , 0.5 m, UL-Style 2571 K2 Cable Ø6 mm, 8 x 0.14 mm <sup>2</sup> , 2 m, UL-Style 2571
<b>Shaft dimensions/flange version</b> 0A Hollow shaft Ø10 mm, clamping ring on flange side 0B Hollow shaft Ø12 mm, clamping ring on flange side 0T Hollow shaft Ø15 mm, clamping ring on flange side 1A Hollow shaft Ø10 mm, clamping ring on cover side 1B Hollow shaft Ø12 mm, clamping ring on cover side 1T Hollow shaft Ø15 mm, clamping ring on cover side



## Example of order:

THI58N-0AAK2R6XN-01500



## Properties

- Ø58 mm housing
- Solid shaft
- Up to 5000 pulses per revolution

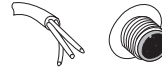
## Benefits

- General-purpose encoder series
- Choice of mechanical and electrical options

## Technical Data

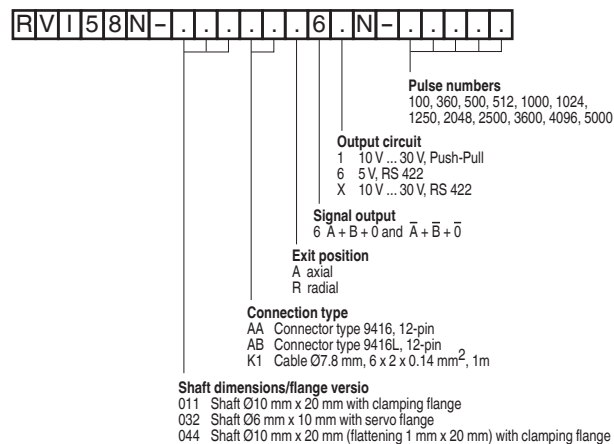
For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	RVI58
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 200 kHz
Operating temperature	
Glass disk	-5 ... 80 °C (23 ... 176 °F) , movable cable -20 ... 80 °C (-4 ... 176 °F) , fixed cable
Plastic disk	-5 ... 60 °C (23 ... 140 °F) , movable cable -20 ... 60 °C (-4 ... 140 °F) , fixed cable
Protection degree	DIN EN 60529, IP65
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>
Connection	



Model Number		RV158N-*****1	RV158N-*****6	RV158N-*****X
Operating voltage	10 ... 30 V DC	●		●
	5 V DC ± 5 %		●	
Output type	push-pull, incremental	●		
	RS 422, incremental		●	●
Approvals and Certificates				
UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●	●
Dimensions				
Length L [mm]	depending on the version: 46 ... 56			
Diameter D [mm]	58			

## Ordering Information

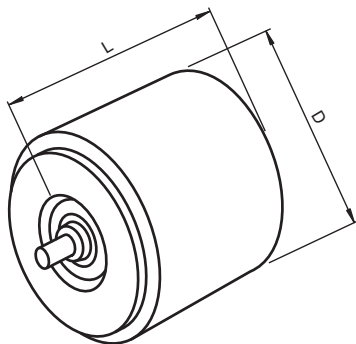


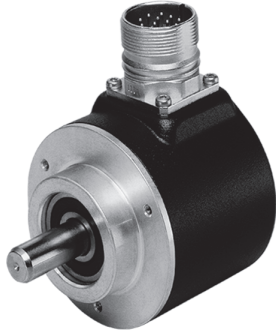
**Example of order:**  
RVI58N-032AAR6XN-02500

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>9416</b>	Field attachable female connector
<b>9416L</b>	Field attachable female connector
<b>9416-02M-12P-RXI58</b>	Female cordset, 2 m
<b>9300</b>	Mounting bracket for servo flange
<b>9203</b>	Angled flange





## Properties

- Ø58 mm housing
- Solid shaft
- Up to 50,000 pulses per revolution

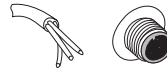
## Benefits

- Designed for applications that require the highest resolutions
- Choice of mechanical and electrical options
- Optional extended temperature

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RVi58</b>
Detection type	optical
Pulse count	max. 50000
Output frequency	max. 200 kHz
Operating temperature	-5 ... 80 °C (23 ... 176 °F) , movable cable -20 ... 80 °C (-4 ... 176 °F) , fixed cable -40 ... 80 °C (-40 ... 176 °F) with Option T , fixed cable
Protection degree	DIN EN 60529, IP65
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>
Connection	



Model Number	RVi58N-*****1	RVi58N-*****6	RVi58N-*****X
Operating voltage	10 ... 30 V DC 5 V DC ± 5 %		
Output type	push-pull, incremental RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]	depending on the version: 50 ... 56		
Diameter D [mm]	58		

## Ordering Information

RVi58N- . . . . . 6 . . . . .

**Pulse numbers**  
1024, 2048, 2500, 4096, 5000,  
8192, 10000, 20000, 50000

**Option**  
N normal  
T extended temperature range, -40 °C

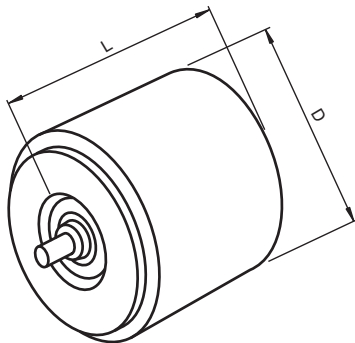
**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

**Signal output**  
6 A + B + 0 and  $\bar{A} + \bar{B} + \bar{0}$

**Exit position**  
A axial  
R radial

**Connection type**  
AA Connector type 9416, 12-pin  
AB Connector type 9416L, 12-pin  
K1 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 1 m

**Shaft dimensions/flange versio**  
011 Shaft Ø10 mm x 20 mm with clamping flange  
032 Shaft Ø6 mm x 10 mm with servo flange  
044 Shaft Ø10 mm x 20 mm (flattening 1 mm x 20 mm) with clamping flange



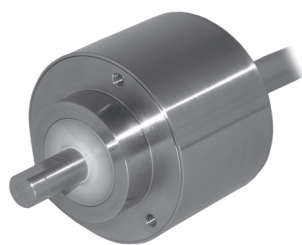
**Example of order:**  
RVi58N-011K1A66T-10000

## Accessories

These and more accessories can be found in chapter 4.4 from page 791


<b>9416</b>	Field attachable female connector
<b>9416L</b>	Field attachable female connector
<b>9416-02M-12P-RXi58</b>	Female cordset, 2 m
<b>9300</b>	Mounting bracket for servo flange
<b>9203</b>	Angled flange





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series		RVI58L
Detection type	optical	
Pulse count	50, 100, 150, 200, 360, 500, 1000, 1024, 1250, 2048, 2500, 4096, 5000	
Operating voltage	10 ... 30 V DC or 5 V DC	
Output type	push-pull, incremental or RS 422, incremental	
Output frequency	max. 600 kHz	
Operating temperature	-20 ... 80 °C (-4 ... 176 °F)	
Material		
Housing	stainless steel V4A	
Flange	stainless steel V4A	
Shaft	stainless steel V4A	
Rotational speed	max. 3600 min <sup>-1</sup>	
Shaft load		
Axial	max. 40 N	
Radial	max. 60 N	
Connection		

## Properties

- Ø58 mm housing
- Solid shaft
- Up to 5000 pulses per revolution

## Benefits

- High-grade stainless steel version, especially suitable in applications for food and beverage industry
- Cleaning compatible according to EHEDG
- Approval for ECOLAB detergents
- IP69K protection degree

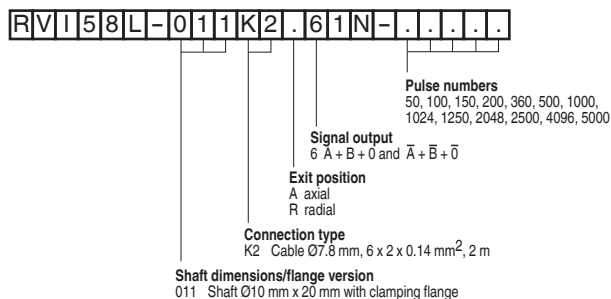
## Approvals and Certificates

ECOLAB	material compatibility attested for: P3-topactive DES P3-topax 19 P3-topax 56 P3-topax 66 P3-topax 91 de-mineralized water as zero value
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## Dimensions

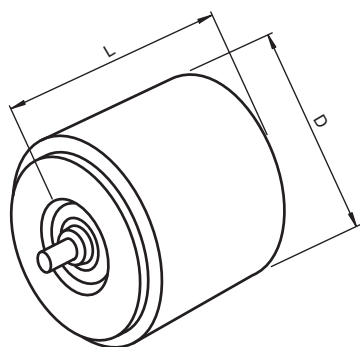
Length L [mm]	depending on the version: 52 ... 63
Diameter D [mm]	58

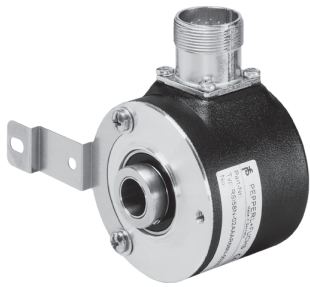
## Ordering Information



## Example of order:

RVI58L-011K2A61N-01024





## Properties

- Ø58 mm housing
- Recessed hollow shaft
- Up to 5000 pulses per revolution

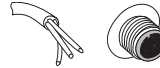
## Benefits

- General-purpose encoder series
- Choice of mechanical and electrical options

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

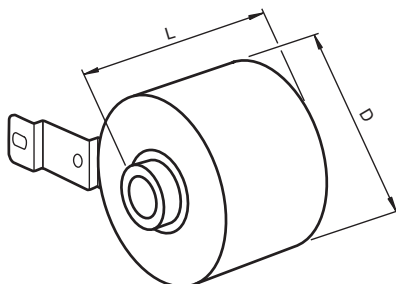
<b>Encoder Series</b>	<b>RSI58</b>
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 200 kHz
Operating temperature	
Glass disk	-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Plastic disk	-5 ... 60 °C (23 ... 140 °F), movable cable -20 ... 60 °C (-4 ... 140 °F), fixed cable
Protection degree	DIN EN 60529, IP54
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	



Model Number	RSI58N-*****1	RSI58N-*****6	RSI58N-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]	depending on the version: 42.4 ... 50		
Diameter D [mm]	58		

## Ordering Information

RSI58N- . . A . . . 6 . N - . . . . .	
	Pulse numbers 100, 360, 500, 512, 1000, 1024, 1250, 2048, 2500, 3600, 4096, 5000
	Output circuit 1 10 V ... 30 V, Push-Pull 6 5 V, RS 422 X 10 V ... 30 V, RS 422
	Signal output 6 A + B + 0 and $\bar{A}$ + $\bar{B}$ + $\bar{0}$
	Exit position A axial R radial
	Connection type AA Connector type 9416, 12-pin AB Connector type 9416L, 12-pin K1 Cable Ø7.8 mm, 6 x 2 x 0.14 mm <sup>2</sup> , 1 m
	Flange version A Hollow shaft
	Shaft dimensions 01 Recessed hollow shaft Ø10 mm x 20 mm 02 Recessed hollow shaft Ø12 mm x 20 mm

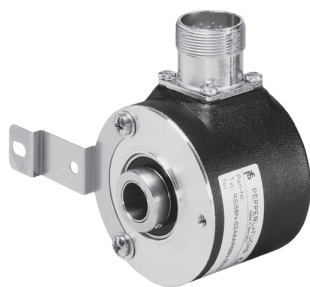


**Example of order:**  
RSI58N-01AAAR61N-01250

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>9416</b>	Field attachable female connector
<b>9416L</b>	Field attachable female connector
<b>9416-02M-12P-RXI58</b>	Female cordset, 2 m



## Properties

- Ø58 mm housing
- Recessed hollow shaft
- Up to 50,000 pulses per revolution

## Benefits

- Designed for applications that require the highest resolutions
- Choice of mechanical and electrical options

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RSI58</b>
Detection type	optical
Pulse count	max. 50000
Output frequency	max. 200 kHz
Operating temperature	-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Protection degree	DIN EN 60529, IP54
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	



Model Number	RSI58N-*****1	RSI58N-*****6	RSI58N-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]	depending on the version: 44 ... 50		
Diameter D [mm]	58		

## Ordering Information

RSI58N-...A...6.N-...-...

**Pulse numbers**  
1024, 2048, 2500, 4096, 5000,  
8192, 10000, 20000, 50000

**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

**Signal output**  
6 A + B + 0 and  $\bar{A} + \bar{B} + \bar{0}$

**Exit position**  
A axial  
R radial

**Connection type**  
AA Connector type 9416, 12-pin  
AB Connector type 9416L, 12-pin  
K1 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 1 m

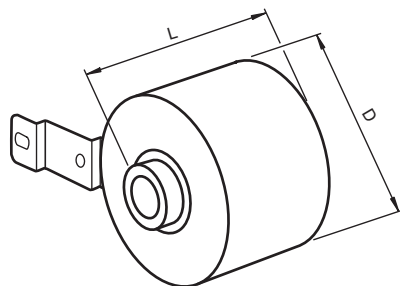
**Shaft dimensions/flange version**  
01 Recessed hollow shaft Ø10 mm x 20 mm  
02 Recessed hollow shaft Ø12 mm x 20 mm

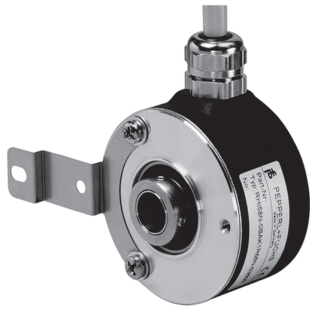
**Example of order:**  
RSI58N-02AK1A61N-20000

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>9416</b>	Field attachable female connector
<b>9416L</b>	Field attachable female connector
<b>9416-02M-12P-RXI58</b>	Female cordset, 2 m





## Properties

- Ø58 mm housing
- Hollow shaft
- Up to 5000 pulses per revolution

## Benefits

- General-purpose encoder series
- Choice of mechanical and electrical options

## Technical Data

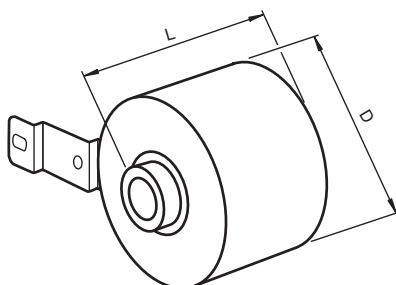
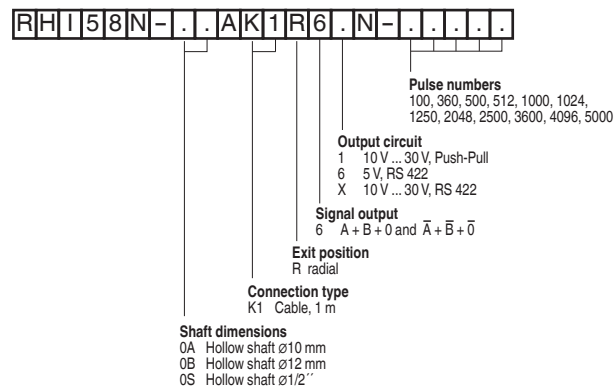
For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RH158</b>
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 200 kHz
Operating temperature	
Glass disk	-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Plastic disk	-5 ... 60 °C (23 ... 140 °F), movable cable -20 ... 60 °C (-4 ... 140 °F), fixed cable
Protection degree	DIN EN 60529, IP54
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	



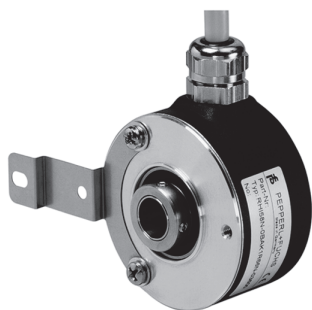
Model Number	RH158N-*****1	RH158N-*****6	RH158N-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]		38	
Diameter D [mm]		58	

## Ordering Information



**Example of order:**  
RH158N-0AAK1R61N-00512





## Properties

- Ø58 mm housing
- Hollow shaft
- Up to 50,000 pulses per revolution

## Benefits

- Designed for applications that require the highest resolutions
- Choice of mechanical and electrical options

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RH158</b>
Detection type	optical
Pulse count	max. 50000
Output frequency	max. 200 kHz
Operating temperature	-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Protection degree	DIN EN 60529, IP54
Material	
Housing	powder coated aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	



Model Number	RH158N-*****1	RH158N-*****6	RH158N-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]		44.1	
Diameter D [mm]		58	

## Ordering Information

RH158N-...AK1R6...N-...-...

**Pulse numbers**  
1024, 2048, 2500, 4096, 5000,  
8192, 10000, 20000, 50000

**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

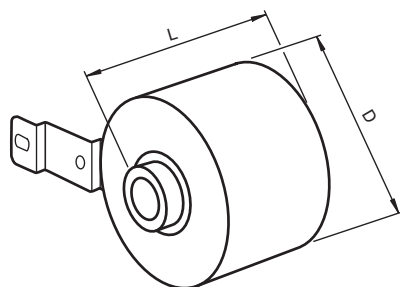
**Signal output**  
6 A + B + 0 and  $\bar{A}$  +  $\bar{B}$  + 0

**Exit position**  
R radial

**Connection type**  
K1 Cable Ø6.5 mm, 4 x 2 x 0.14 mm<sup>2</sup>, 1 m

### Shaft dimensions

2A Hollow shaft Ø10 mm, clamps on both sides  
2B Hollow shaft Ø12 mm, clamps on both sides  
2T Hollow shaft Ø15 mm, clamps on both sides



### Example of order:

RH158N-2BAK1R6XN-50000



## Properties

- Ø2.5" housing
- Solid shaft
- Up to 5000 pulses per revolution

## Benefits

- General-purpose encoder series
- Choice of mechanical and electrical options

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RVI25</b>
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 100 kHz
Operating temperature	
Glass disk	-20 ... 80 °C (-4 ... 176 °F)
Plastic disk	-20 ... 60 °C (-4 ... 140 °F)
Protection degree	DIN EN 60529, IP54 (without shaft seal)/IP65 (with shaft seal)
Material	
Housing	diecast zinc, not laquered or coated
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>
Connection	



Model Number	RVI25*-*****1	RVI25*-*****6	RVI25*-*****X
Operating voltage	10 ... 30 V DC	5 V DC ± 5 %	
Output type	push-pull, incremental	RS 422, incremental	
Approvals and Certificates			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
Dimensions			
Length L [mm]		55.5	
Diameter D [mm]		57.8	

## Ordering Information

RVI25-.-.-.-.-N-.-.-.-.-

**Pulse numbers**  
100, 360, 500, 512, 1000,  
1024, 1250, 2048, 2500,  
3600, 4096, 5000

**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

**Signal output**  
3 A + B + 0  
6 A + B + 0 and  $\bar{A}$  +  $\bar{B}$  + 0

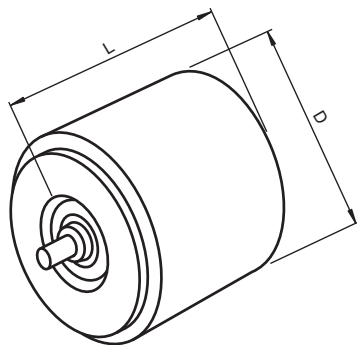
**Exit position**  
A axial  
R radial

**Connection type**  
AR Connector type 9415, 7-pin  
AS Connector type 9419, 10-pin  
BF Connector type 9419, 10-pin, industrial  
K2 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 2 m  
K5 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 5 m

**Flange version**  
D Square flange 2,65" x 2,65"  
E Servo flange Ø2,625"  
F Clamping flange Ø2,5"  
G Clamping flange Ø2,5"  
H Clamping flange Ø2,5"

**Shaft dimensions**  
06 Shaft Ø3/8" x 0.875"  
11 Shaft Ø1/4" x 0.875"

**Housing**  
N Normal, protection degree IP54  
P with shaft seal, protection degree IP65



### Example of order:

RVI25P-06DK2R61N-02500

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

MS16-10FT

Female cordset, 7-pin

MS18-10FT

Female cordset, 10-pin





## Properties

- Ø90 mm housing
- Hollow shaft
- Up to 50,000 pulses per revolution

## Benefits

- Designed for applications that require the highest resolutions
- Choice of mechanical and electrical options
- Other hollow shaft diameters available

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RH190</b>
Detection type	optical
Pulse count	max. 50000
Output frequency	max. 200 kHz
Operating temperature	-5 ... 70 °C (23 ... 158 °F), movable cable -20 ... 70 °C (-4 ... 158 °F), fixed cable
Protection degree	DIN EN 60529, IP65
Material	
Housing	aluminium, blank
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 3500 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	



Model Number	RH190N-*****1	RH190N-*****6	RH190N-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]		48.5	
Diameter D [mm]		87.1	

## Ordering Information

RH190N-...A...R6...N-...-...-...

**Pulse numbers**  
100, 360, 500, 512, 1000, 1024,  
1250, 2048, 2500, 4096, 5000,  
8192, 10000, 25000, 50000

**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

**Signal output**  
6 A + B + 0 and  $\bar{A}$  +  $\bar{B}$  +  $\bar{0}$

**Exit position**  
R radial

**Connection type**  
AA Connector type 9416, 12-pin  
AB Connector type 9416L, 12-pin  
K1 Cable Ø6.5 mm, 4 x 2 x 0.14 mm<sup>2</sup>, 1m

**Shaft dimensions/flange version**  
0E Hollow shaft Ø16 mm  
0F Hollow shaft Ø20 mm  
0G Hollow shaft Ø24 mm  
0H Hollow shaft Ø25 mm  
0Z Hollow shaft Ø1" <sup>1</sup>  
0I Hollow shaft Ø30 mm  
0L Hollow shaft Ø38 mm  
0N Hollow shaft Ø45 mm

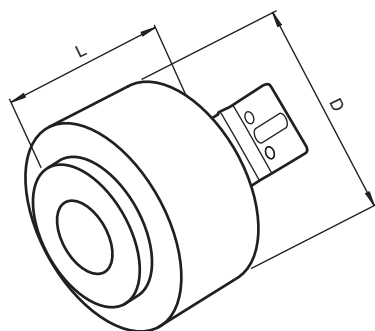
### Example of order:

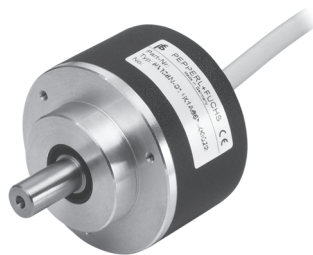
RH190N-0HAAAR61N-05000

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>9416</b>	Field attachable female connector
<b>9416L</b>	Field attachable female connector
<b>9416-02M-12P-RXI58</b>	Female cordset, 2 m





## Properties


- Ø58 mm housing
- Solid shaft
- Up to 2048 signal periods per revolution

## Benefits

- Choice of mechanical options
- Sine/cosine output enables position and speed computation

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	RVS58
Detection type	optical
Pulse count	1024 and 2048
Operating voltage	5 V ± 5 %
Output type	sine / cosine
Amplitude	1 V <sub>SS</sub> ± 10 %
Output frequency	max. 200 kHz (3 dB limit)
Operating temperature	-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Protection degree	DIN EN 60529, IP65
Material	
Housing	powder coated aluminum
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 12000 min <sup>-1</sup>
Shaft load	
Axial	40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>
Radial	60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>
Connection	

## Approvals and Certificates

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

## Dimensions

Length L [mm]	depending on the version: 50 ... 56
Diameter D [mm]	58

## Ordering Information

RVS58N-...-6ZN-...-...

Signal periods  
1024, 2048

Signal output  
6 A + B + 0 and  $\bar{A} + \bar{B} + \bar{0}$

Exit position  
A axial  
R radial

Connection type  
AA Connector type 9416, 12-pin  
AB Connector type 9416L, 12-pin  
K1 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 1 m

Shaft dimensions/flange version  
011 Shaft Ø10 mm x 20 mm with clamping flange  
032 Shaft Ø6 mm x 10 mm with servo flange  
041 Shaft Ø10 mm x 20 mm with clamping flange, flattening 1 mm x 20 mm  
282 Shaft Ø6 mm x 10 mm with servo flange, flattening 1 mm x 20 mm

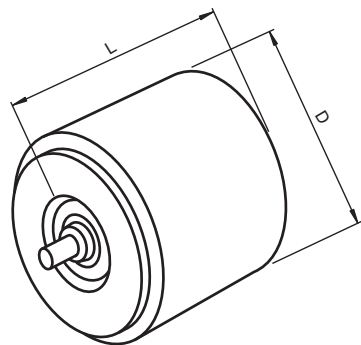
## Example of order:

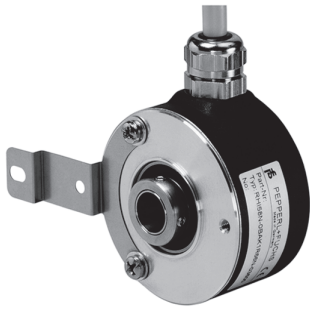
RVS58N-011ABR6ZN-02048

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9416	Field attachable female connector
9416L	Field attachable female connector
9416-02M-12P-RXI58	Female cordset, 2 m
9300	Mounting bracket for servo flange
9203	Angled flange





## Properties


- Ø58 mm housing
- Hollow shaft
- Up to 2048 signal periods per revolution

## Benefits

- Choice of mechanical options
- Sine/cosine output enables position and speed computation

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series		RHS58
Pulse count		max. 2048
Operating voltage		5 V DC $\pm$ 5 %
Output type		sine / cosine
Amplitude		1 V <sub>SS</sub> $\pm$ 10 %
Output frequency		max. 200 kHz (3 dB limit)
Operating temperature		-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Protection degree		DIN EN 60529, IP54
Material		
Housing		powder coated aluminum
Flange		3.1645 aluminum
Shaft		Stainless steel 1.4305 / AISI 303
Rotational speed		max. 6000 min <sup>-1</sup>
Shaft load		
Angle offset		1 °
Axial offset		max. 1 mm
Connection		

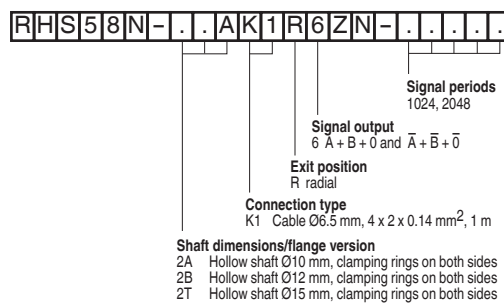
## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

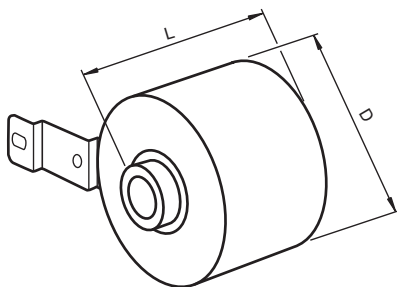
Length L [mm]	44.1
Diameter D [mm]	58

## Ordering Information



## Example of order:

RHS58N-2TAK1R6ZN-01024





## Properties


- Ø90 mm housing
- Hollow shaft
- Up to 2048 signal periods per revolution

## Benefits

- Choice of mechanical options
- Sine/cosine output enables position and speed computation
- Other hollow shaft diameters available

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	RHS90
Detection type	optical
Pulse count	max. 2048
Operating voltage	5 V DC $\pm$ 5 %
Output type	sine / cosine
Amplitude	1 V <sub>ss</sub> $\pm$ 10 %
Output frequency	max. 200 kHz (3 dB limit)
Operating temperature	-5 ... 70 °C (23 ... 158 °F), movable cable -20 ... 70 °C (-4 ... 158 °F), fixed cable
Protection degree	DIN EN 60529, IP65
Material	
Housing	aluminium, blank
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 3500 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection	

## Approvals and Certificates

UL approval	cULus Listed, General Purpose, Class 2 Power Source
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## Dimensions

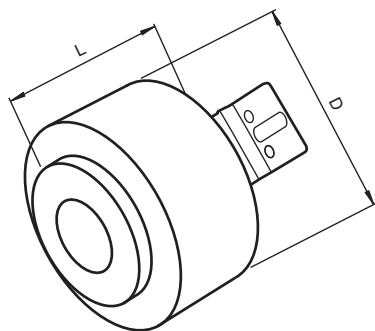
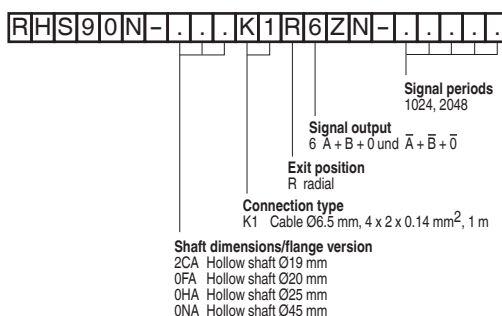
Length L [mm]	48.5
Diameter D [mm]	87.1

4  
22



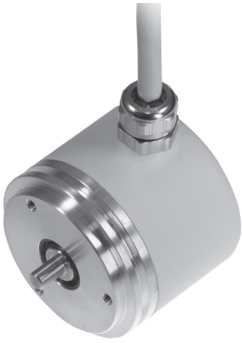
Rotary Encoders, Incremental Rotary Encoders, Sine/Cosine

## Ordering Information



### Example of order:

RHS90N-0FAK1R6ZN-01024



## Properties

- Ø58 mm housing
- Solid shaft
- Up to 2048 signal periods per revolution

## Benefits

- Suitable for systems up to SIL3 and PLe
- Integrated functional safety
- TÜV certified
- Suitable as motor feedback system for safe drives in accordance with IEC 61800-5-2
- Thermally stabilized for high resolution interpolation



**Danger!**  
For safety-related applications consider the product documentation which is available on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series		RVS58S
Detection type		optical
Pulse count		1024 and 2048
Operating voltage		5 V DC ± 5 %
Output type		sine / cosine
Amplitude		1 V <sub>SS</sub> ± 10 %
Output frequency		max. 200 kHz (3 dB limit)
Operating temperature		-5 ... 80 °C (23 ... 176 °F), movable cable -20 ... 80 °C (-4 ... 176 °F), fixed cable
Protection degree		DIN EN 60529, IP65
Material		
Housing		powder coated aluminum
Flange		3.1645 aluminum
Shaft		Stainless steel 1.4305 / AISI 303
Rotational speed		max. 12000 min <sup>-1</sup>
Shaft load		
Axial		40 N at max. 6000 min <sup>-1</sup> 10 N at max. 12000 min <sup>-1</sup>
Radial		60 N at max. 6000 min <sup>-1</sup> 20 N at max. 12000 min <sup>-1</sup>
Connection		

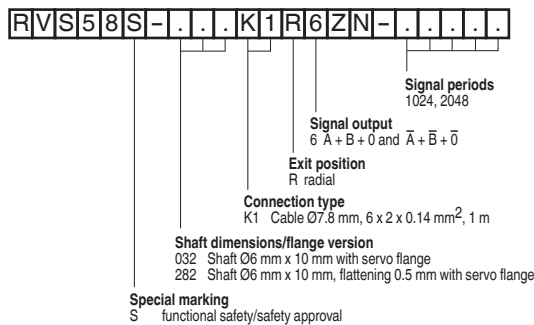
## Approvals and Certificates

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

## Dimensions

Length L [mm]	50.5
Diameter D [mm]	58

## Ordering Information



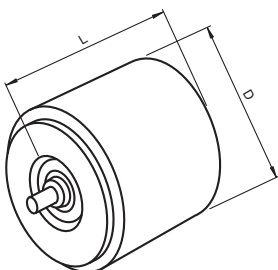
## Example of order:

RVS58S-032K1R6ZN-02048

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>Safe Speed Monitor</b>	Safety speed monitor
<b>VAS/M-2A8L-KE4-8SE-C1</b>	AS-interface safety monitor
<b>VBA-2E-KE4-ENC-S</b>	AS-interface safety module
<b>VAZ-ENC-1,5M-PVC</b>	Connection cable





## Properties

- Ø58 mm housing
- Recessed hollow shaft
- Up to 5000 pulses per revolution

## Benefits

- ATEX approval for zone 2 and zone 22

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RSI58X</b>
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 200 kHz
Protection degree	DIN EN 60529, IP54
Operating temperature	
Glass disk	-30 ... 60 °C (-22 ... 140 °F), fixed cable
Plastic disk	-30 ... 60 °C (-22 ... 140 °F), fixed cable
Material	
Housing	powder coated aluminum
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Angle offset	1 °
Axial offset	max. 1 mm
Connection type	



Model Number	RSI58X-*****1	RSI58X-*****6	RSI58X-*****X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Use in the Hazardous Area</b>			
Group, category, type of protection	Ex II 3G Ex nA IIB T4		
	Ex II 3D Ex tD A22 IP54 T105°C		
<b>Approvals and Certificates</b>			
UL approval	cULus Listed, General Purpose, Class 2 Power Source		
<b>Dimensions</b>			
Length L [mm]		44.5	
Diameter D [mm]		58	

## Ordering Information

RSI58X-...A...6.N-...-...

**Pulse numbers**  
100, 360, 500, 512, 1000, 1024, 1250, 2048, 2500, 3600, 4096, 5000

**Output circuit**  
1 10 V ... 30 V, Push-Pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

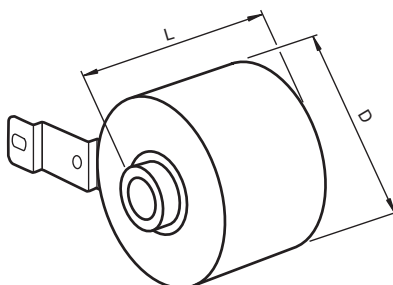
**Signal output**  
6 A + B + 0 and  $\bar{A}$  +  $\bar{B}$  + 0

**Exit position**  
A axial  
R radial

**Connection type**  
K1 Cable Ø7.8 mm, 6 x 2 x 0.14 mm<sup>2</sup>, 1 m

**Flange version**  
A Hollow shaft

**Shaft dimensions**  
01 Recessed hollow shaft Ø10 mm x 20 mm  
02 Recessed hollow shaft Ø12 mm x 20 mm



**Example of order:**  
RSI58X-01AK1R61N-00512





## Properties

- Ø58 mm housing
- Solid shaft
- Up to 5000 pulses per revolution

## Benefits

- ATEX approval for zone 2 and zone 22



**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

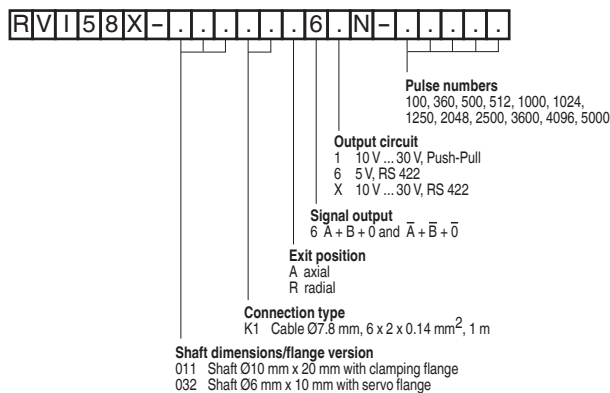
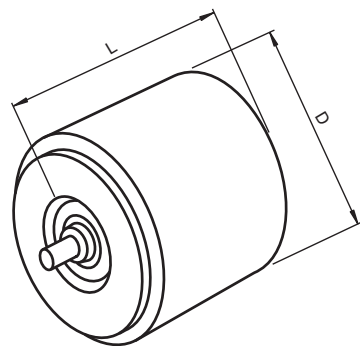
For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Encoder Series	RV158X
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 200 kHz
Protection degree	DIN EN 60529, IP64
Operating temperature	
Glass disk	-30 ... 70 °C (-22 ... 158 °F) , fixed cable
Plastic disk	-30 ... 60 °C (-22 ... 140 °F) , fixed cable
Material	
Housing	powder coated aluminum
Flange	aluminum
Shaft	Stainless steel
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Axial	40 N
Radial	60 N
Connection type	

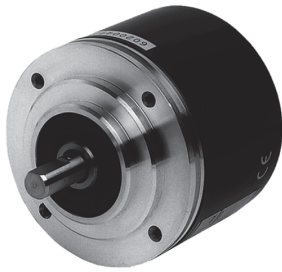


Model Number		RV158X-*****1	RV158X-*****6	RV158X-*****X
Operating voltage	10 ... 30 V DC	●		●
	5 V DC ± 5 %		●	
Output type	push-pull, incremental	●		
	RS 422, incremental		●	●
Use in the Hazardous Area				
Group, category, type of protection	 II 3G Ex nA IIB T4	●	●	●
	 II 3D Ex tD A22 IP64 T105°C			
Approvals and Certificates				
UL approval	cULus Listed, General Purpose, Class 2 Power Source	●	●	●
Dimensions				
Length L [mm]			50.5	
Diameter D [mm]			58	

## Ordering Information



**Example of order:**  
RVI58X-032K1A66N-02500



## Properties

- Ø78 mm housing
- Solid shaft, Ø10 mm
- Up to 25 pulses per revolution

## Benefits

- ATEX approval up to zone 1
- Intrinsically safe when connected to approved device

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>RV184</b>
Pulse count	max. 25
Operating voltage	8 V DC
Output type	NAMUR (SJ2-N)
Output frequency	max. 5 kHz
Protection degree	DIN EN 60529, IP65
Operating temperature	
Plastic disk	-20 ... 60 °C (-4 ... 140 °F)
<b>Material</b>	
Housing	aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 3000 min <sup>-1</sup>
<b>Shaft load</b>	
Axial	50 N
Radial	100 N

## Use in the Hazardous Area

EC-Type Examination Certificate PTB 99 ATEX 2219 X, for additional certificates see [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

Group, category, type of protection II 2G EEx ia IIC T6

## Dimensions

Length L [mm]	70
Diameter D [mm]	78



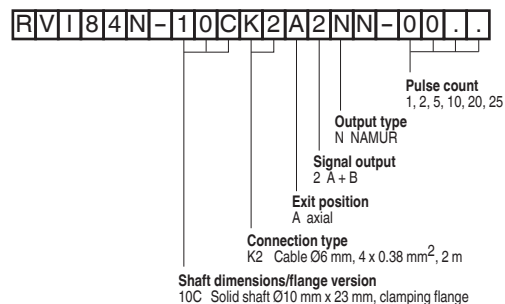
4

24



Rotary Encoders, Incremental Rotary Encoders for hazardous areas

## Ordering Information



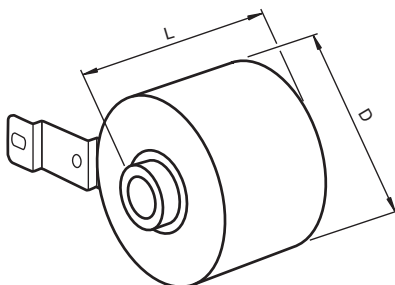
**Example of order:**  
RV184N-10CK2A2N-0005

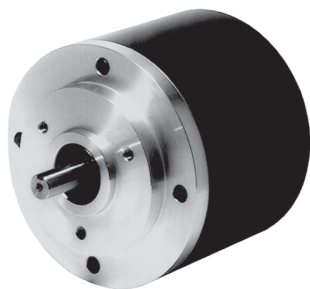
## Accessories

These and more accessories can be found in chapter 4.4 from page 791

9312-3

Synchro clamping element





## Properties

- Ø116 mm housing
- Solid shaft
- Up to 5000 pulses per revolution

## Benefits

- ATEX approval for zone 1 and zone 21

**Application Note:** Reference appendix, data sheet, operating instructions, and appropriate standards. To be used within the electrical, environmental, and mechanical limitations of the device and area.

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Encoder Series</b>	<b>14</b>
Detection type	optical
Pulse count	max. 5000
Output frequency	max. 100 kHz
Protection degree	DIN EN 60529, IP66
Operating temperature	
Gas Ex-area	-40 ... 55 °C (-40 ... 131 °F)
Dust Ex-area	-30 ... 55 °C (-22 ... 131 °F)
Material	
Housing	3.1645 aluminum
Flange	3.1645 aluminum
Shaft	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 6000 min <sup>-1</sup>
Shaft load	
Axial	60 N
Radial	80 N
Connection type	



Model Number	14-14361	14-14366	14-1436X
Operating voltage	10 ... 30 V DC		
	5 V DC ± 5 %		
Output type	push-pull, incremental		
	RS 422, incremental		
<b>Use in the Hazardous Area</b>			
Group, category, type of protection	Ex II 2G Ex d IIC T6		
	Ex II 2D Ex tD A21 IP66 T80°C		
EC-Type Examination Certificate	ZELM 02 ATEX 0078 X		
<b>Dimensions</b>			
Length L [mm]		132	
Diameter D [mm]		116	

## Ordering Information

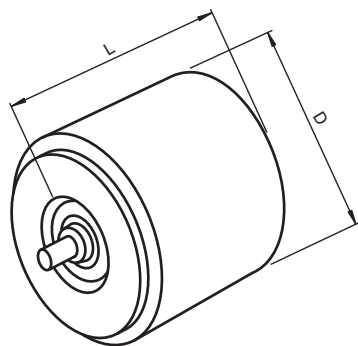
14-14361-04096

**Pulse count**  
60, 100, 120, 180, 200, 250, 300, 314, 360, 400, 500,  
512, 600, 720, 900, 1000, 1024, 1200, 1250, 1500, 1800,  
2000, 2048, 2400, 2500, 3000, 3600, 4000, 4096, 5000

**Output circuit**  
1 10 V ... 30 V, Push-pull  
6 5 V, RS 422  
X 10 V ... 30 V, RS 422

**Signal output**  
6 A + B + 0 und  $\bar{A} + \bar{B} + \bar{0}$

**Example of order:**  
14-14361-04096





CE

## Properties

- 5 m measuring range
- Fits to Ø6 x 10 mm solid shaft encoders with servo flange

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Model Number</b>	<b>SL05-X1/GS130-333</b>
Measuring range	5000 mm
Drum perimeter	333.3 mm
Resolution	333.3 mm / steps per revolution of mounted encoder
Scope of delivery	Cable pull , Coupling
Ambient temperature	-30 ... 70 °C (-22 ... 158 °F)
Shock resistance	25 g
Shaft dimensions	6 mm x 10 mm , servo flange
Protection degree	IP65
Housing	anodized aluminium
Rope	Stainless steel 1.4401/316

## Dimensions

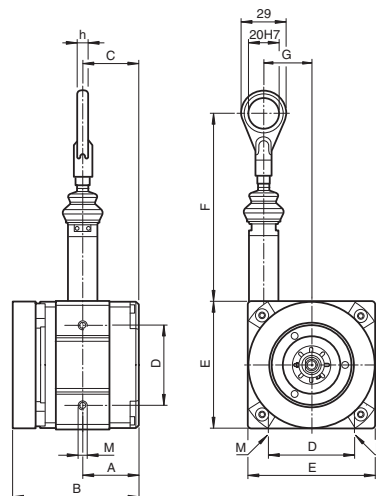
A [mm]	59.5
B [mm]	106
C [mm]	59.5
D [mm]	80
E [mm]	130
F [mm]	approx. 115 mm
G [mm]	54
M	M8 x 8

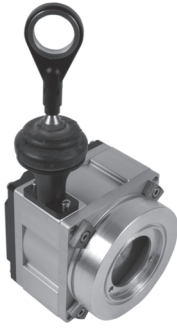
## Accessories

These and more accessories can be found in chapter 4.4 from page 791

SL-RP/GS80	Guide pulley
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## Dimensions





CE

## Properties

- 2 m measuring range
- Fits to Ø10 x 20 mm solid shaft encoders with clamping flange

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

<b>Model Number</b>	<b>SL02-X2/GS80-200</b>
Measuring range	2000 mm
Drum perimeter	200 mm
Resolution	200 mm / steps per revolution of mounted encoder
Scope of delivery	Cable pull , Coupling
Ambient temperature	-30 ... 70 °C (-22 ... 158 °F)
Shock resistance	25 g
Shaft dimensions	10 mm x 20 mm , clamping flange
Protection degree	IP65
Housing	anodized aluminium
Rope	Stainless steel 1.4401/316

## Dimensions

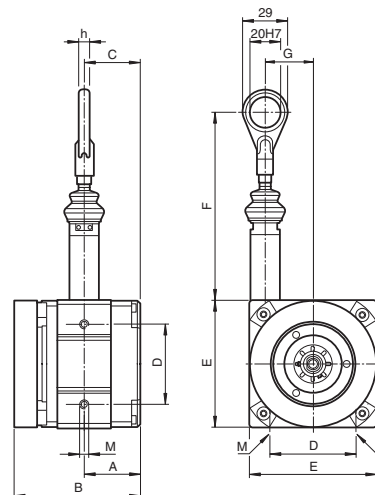
A [mm]	34.7
B [mm]	78.2
C [mm]	34.7
D [mm]	50
E [mm]	80
F [mm]	approx. 115
G [mm]	30.5
M	M6 x 7

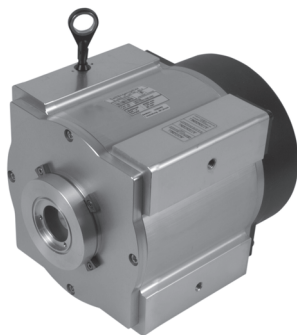
## Accessories

These and more accessories can be found in chapter 4.4 from page 791

<b>SL-RP/GS80</b>	Guide pulley
-------------------	--------------

## Dimensions





CE

## Properties

- Up to 10 m measuring range
- Fits to Ø6 x 10 mm solid shaft encoders with servo flange

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Scope of delivery	Cable pull , Coupling
Ambient temperature	-30 ... 70 °C (-22 ... 158 °F)
Shock resistance	25 g
Shaft dimensions	6 mm x 10 mm , servo flange
Protection degree	IP65
Housing	anodized aluminium
Rope	Stainless steel 1.4401/316

### Model Number

		SL3002-X1/GS80	SL3005-X1/GS130	SL3010-X1/GS130
Measuring range	[m]	2	5	10
Drum perimeter	[mm]	200	334.1	334.1
Resolution	200 mm / steps per revolution of mounted encoder	●		
	334.1 mm / steps per revolution of mounted encoder		●	●
Spring housing	PPO/PS		●	

### Dimensions

A	[mm]	41.5	77.2	99.6
B	[mm]	92	141.3	186.3
C	[mm]	41.5	77.2	99.6
D	[mm]	50	80	
E	[mm]	80	130	
F	[mm]		approx. 60	
G	[mm]	31.5	52	
M		M6 x 7	M8 x 8	

## Accessories

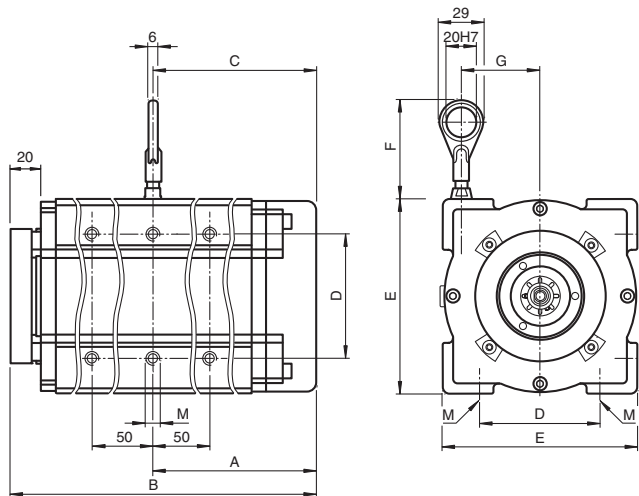
These and more accessories can be found in chapter 4.4 from page 791

SL-RP/GS130/GS190	Guide pulley for cable pulls SL30.../GS130 and SL30.../GS190
SL-RP/GS80	Guide pulley

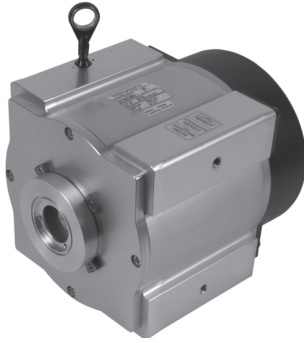
4

3

## Dimensions







CE

## Properties

- Up to 10 m measuring range
- Fits to Ø10 x 20 mm solid shaft encoders with clamping flange

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Scope of delivery	Cable pull , Coupling
Ambient temperature	-30 ... 70 °C (-22 ... 158 °F)
Shock resistance	25 g
Shaft dimensions	10 mm x 20 mm , clamping flange
Protection degree	IP65
Housing	anodized aluminium
Rope	Stainless steel 1.4401/316

### Model Number

		SL3002-X2/GS80	SL3005-X2/GS130	SL3010-X2/GS130
Measuring range	[m]	2	5	10
Drum perimeter	[mm]	200	334.1	334.1
Resolution	200 mm / steps per revolution of mounted encoder	●		
	334.1 mm / steps per revolution of mounted encoder		●	●

### Dimensions

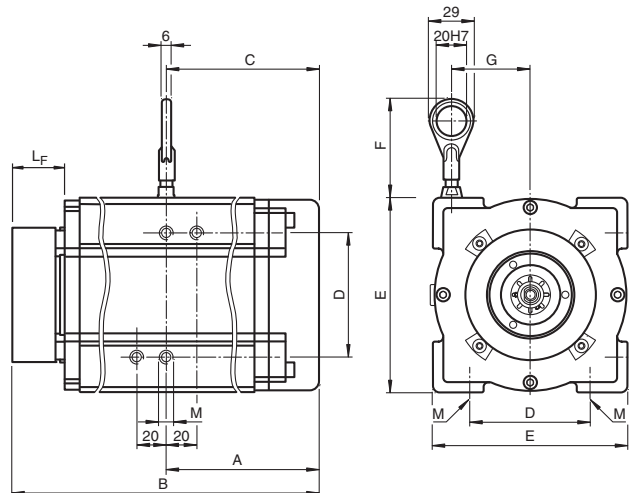
A	[mm]	41.5	77.2	99.7
B	[mm]	108.8	156.1	201.1
C	[mm]	41.5	77.2	99.7
D	[mm]	50	80	
E	[mm]	80	130	
F	[mm]		approx. 60	
G	[mm]	31.5	52	
L <sub>F</sub>	[mm]	36.8	36.8	
M		M6 x 7	M8 x 8	

## Accessories

These and more accessories can be found in chapter 4.4 from page 791

SL-RP/GS130/GS190	Guide pulley for cable pulls SL30.../GS130 and SL30.../GS190
SL-RP/GS80	Guide pulley

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Material	anodized aluminium
Rotational speed	max. 8000 min <sup>-1</sup>
Max. torque	1 Nm
Radial offset	max. ± 0.3 mm
Axial offset	max. ± 0.5 mm
Angle error	max. ± 4 °
Torsion spring stiffness	18 Nm / rad
Radial spring stiffness	50 N / mm
Moment of inertia	30 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamp screws M4 x 6, DIN 916

### Model Number

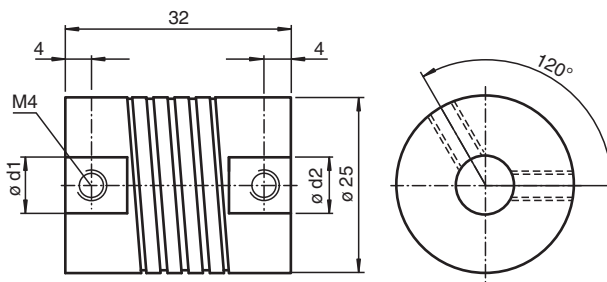
Shaft diameter	d1 = 6 mm , d2 = 6 mm
	d1 = 6 mm , d2 = 8 mm
	d1 = 6 mm , d2 = 10 mm
	d1 = 8 mm , d2 = 8 mm
	d1 = 8 mm , d2 = 10 mm
	d1 = 10 mm , d2 = 10 mm

KW-6/6	KW-6/8	KW-6/10	KW-8/8	KW-8/10	KW-10/10
●	●	●	●	●	●

## Properties

- Shafts from Ø6 to Ø10 mm
- Anodized aluminium
- Helical coupling

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Spring	spring steel, nickel plated
End piece	Diecast zinc
Rotational speed	max. 3000 min <sup>-1</sup>
Max. torque	1.5 Nm
Radial offset	max. ± 1.5 mm
Axial offset	max. ± 1 mm
Angle error	max. ± 5 °
Torsion angle	at torque 0.75 Nm drive shaft view
CW rotation direction	40 °
CCW rotation direction	60 °
Moment of inertia	95 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamp screws M5 x 6, DIN 916

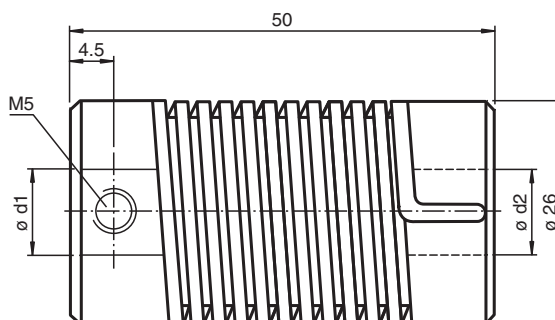
### Model Number

		9401 6*6	9401 6*10	9401 8*8	9401 8*10	9401 10*10	9401 10*12	9401 12*12
Shaft diameter	d1 = 6 mm , d2 = 6 mm	●						
	d1 = 6 mm , d2 = 10 mm		●					
	d1 = 8 mm , d2 = 8 mm			●				
	d1 = 8 mm , d2 = 10 mm				●			
	d1 = 10 mm , d2 = 10 mm					●		
	d1 = 10 mm , d2 = 12 mm						●	
	d1 = 12 mm , d2 = 12 mm							●

## Properties

- Shafts from Ø6 to Ø12 mm
- Spring steel, nickel plated

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Spring	spring steel, nickel plated
End piece	Diecast zinc
Rotational speed	max. 3000 min <sup>-1</sup>
Max. torque	0.5 Nm
Radial offset	max. ± 1 mm
Axial offset	max. ± 1 mm
Angle error	max. ± 5 °
Torsion angle	at torque 0.25 Nm drive shaft view
CW rotation direction	50 °
CCW rotation direction	70 °
Moment of inertia	10 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamp screws M4 x 4, DIN 916

### Model Number

Shaft diameter	d1 = 6 mm , d2 = 6 mm
	d1 = 8 mm , d2 = 8 mm

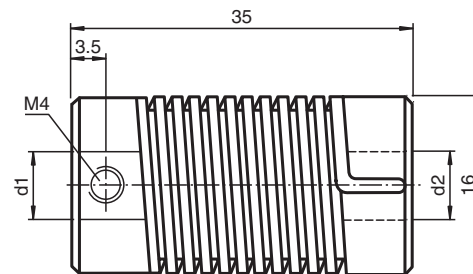
9402 6\*6

9402 8\*8

## Properties

- Shafts from Ø6 to Ø8 mm
- Spring steel, nickel plated

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Flange	aluminum
Spring washers	plastic
Rotational speed	max. 12000 min <sup>-1</sup>
Max. torque	0.6 Nm
Radial offset	max. ± 0.3 mm
Axial offset	max. ± 0.4 mm
Angle error	max. ± 2.5 °
Torsional rigidity	50 Nm / rad
Mounting	clamping flange

### Model Number

		9404 6*6	9404 10*10	9404 12*12
Shaft diameter	d1 = 6 mm , d2 = 6 mm	●		
	d1 = 10 mm , d2 = 10 mm		●	
	d1 = 12 mm , d2 = 12 mm			●

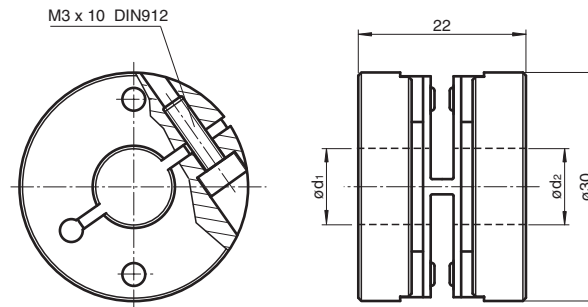
## Properties

- Shafts from Ø6 to Ø12 mm
- Aluminium
- Spring disk coupling

4  
.4

Rotary Encoders, Accessories

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Material	CuZn20, nickel-plated
Rotational speed	max. 8000 min <sup>-1</sup>
Max. torque	0.8 Nm
Radial offset	max. ± 0.3 mm
Axial offset	max. ± 0.5 mm
Angle error	max. ± 4 °
Moment of inertia	22 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamp screws

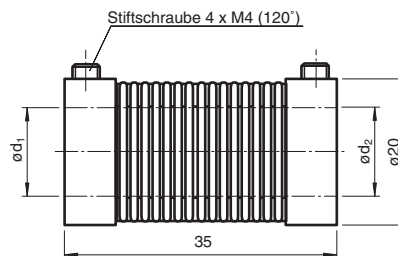
### Model Number

		9409 6*6	9409 6*10	9409 8*8	9409 10*10	9409 12*12
Shaft diameter	d1 = 6 mm , d2 = 6 mm	●				
	d1 = 6 mm , d2 = 10 mm		●			
	d1 = 8 mm , d2 = 8 mm			●		
	d1 = 10 mm , d2 = 10 mm				●	
	d1 = 12 mm , d2 = 12 mm					●

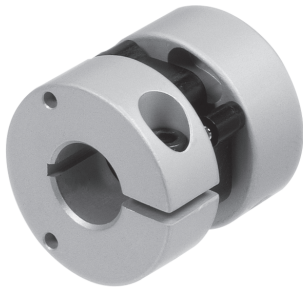
## Properties

- Shafts from Ø6 to Ø12 mm
- Brass, nickel plated
- Bellows coupling

## Dimensions







## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Material	Delrin 107, AlMgSi1, hard coated
Rotational speed	max. 15000 min <sup>-1</sup>
Max. torque	1 Nm
Radial offset	max. ± 0.5 mm
Axial offset	max. ± 0.3 mm
Angle error	max. ± 1.5 °
Torsional rigidity	50 Nm / rad
Moment of inertia	20 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamping flange

### Model Number

		9410 6*6	9410 10*10	9410 12*12
Shaft diameter	d1 = 6 mm , d2 = 6 mm	●		
	d1 = 10 mm , d2 = 10 mm		●	
	d1 = 12 mm , d2 = 12 mm			●

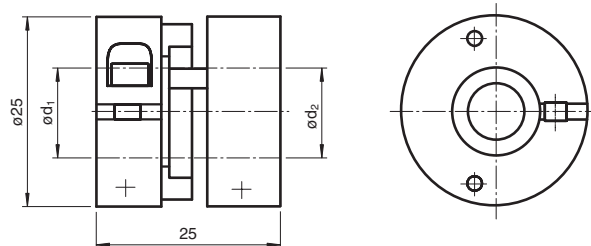
## Properties

- Shafts from Ø6 to Ø12 mm
- Aluminium, hard coated, electrically isolated
- Precision coupling

4  
.4

Rotary Encoders, Accessories

## Dimensions





## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

### General Data

Material	Stainless steel 1.4305 / AISI 303
Rotational speed	max. 10000 min <sup>-1</sup>
Max. torque	0.8 Nm
Radial offset	max. ± 0.3 mm
Axial offset	max. ± 0.5 mm
Angle error	max. ± 4 °
Torsion spring stiffness	140 Nm / rad
Radial spring stiffness	10 N / mm
Moment of inertia	18.81 kg m <sup>2</sup> x 10 <sup>-7</sup>
Mounting	clamp screws , M4 DIN 916

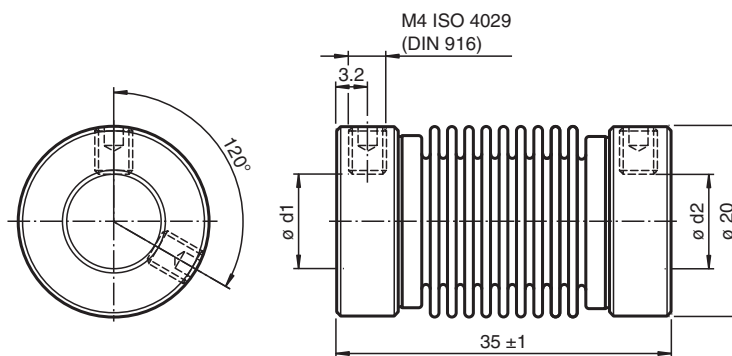
### Model Number

		9460 6*6	9460 10*10	9460 12*12
Shaft diameter	d1 = 6 mm , d2 = 6 mm	●		
	d1 = 10 mm , d2 = 10 mm		●	
	d1 = 12 mm , d2 = 12 mm			●

## Properties

- Shafts from Ø6 to Ø12 mm
- Stainless steel
- Bellows coupling

## Dimensions



## 9101 series



## Properties

- Plastic coating
- 500 mm circumference

## General data

Surface	plastic, Hytrel 4056
Application	Smooth Hytrel - used for cardboard, wood, plastic, and paper
Diameter	D = 159 mm
Circumference	500 mm
Width	B = 25 mm

## Model Number

	9101, 8	9101, 10	9101, 12
Shaft diameter	d = 8 mm		
	d = 10 mm		
	d = 12 mm		

## 9102 series



## Properties

- Dimpled rubber coating
- 500 mm circumference

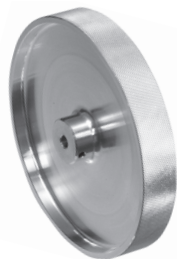
## General data

Surface	dimpled rubber, Nitril (NBR)-Blend
Application	dimpled rubber - used for textile, varnished surfaces, and bare metals
Diameter	D = 159 mm
Circumference	500 mm
Width	B = 25 mm

## Model Number

	9102, 8	9102, 10	9102, 12
Shaft diameter	d = 8 mm		
	d = 10 mm		
	d = 12 mm		

## 9103 series



## Properties

- Knurled aluminum
- 500 mm circumference

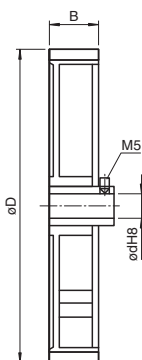
## General data

Surface	knurled aluminum
Application	knurled aluminum - used for rubber, wood, and coarse textile
Diameter	D = 159 mm
Circumference	500 mm
Width	B = 25 mm

## Model Number

	9103, 8	9103, 10	9103, 12
Shaft diameter	d = 8 mm		
	d = 10 mm		
	d = 12 mm		

## Dimensions



## 9108 series



## Properties

- Plastic coating
- 200 mm circumference

## General data

Surface	plastic, Hytrel 4056
Application	Smooth Hytrel - used for cardboard, wood, plastic, and paper
Diameter	D = 63.7 mm
Circumference	200 mm
Width	B = 12 mm

## Model Number

Model Number	9108, 6	9108, 8	9108, 10
Shaft diameter	d = 6 mm		
	d = 8 mm		
	d = 10 mm		

## 9109 series



## Properties

- Dimpled rubber coating
- 200 mm circumference

## General data

Surface	dimpled rubber, Nitril (NBR)-Blend
Application	dimpled rubber - used for textile, varnished surfaces, and metals
Diameter	D = 63.7 mm
Circumference	200 mm
Width	B = 12 mm

## Model Number

Model Number	9109, 6	9109, 8	9109, 10
Shaft diameter	d = 6 mm		
	d = 8 mm		
	d = 10 mm		

## 9110 series



## Properties

- Knurled aluminum
- 500 mm circumference

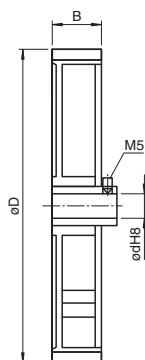
## General data

Surface	knurled aluminum
Application	knurled aluminum - used for rubber, wood, and coarse textile
Diameter	D = 63.7 mm
Circumference	200 mm
Width	B = 12 mm

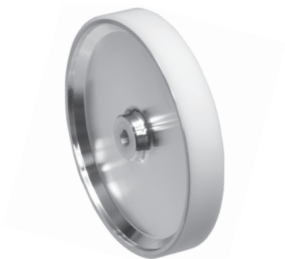
## Model Number

Model Number	9110, 6	9110, 8	9110, 10
Shaft diameter	d = 6 mm		
	d = 8 mm		
	d = 10 mm		

## Dimensions



## 9112 series



## Properties

- Knurled plastic
- 500 mm circumference

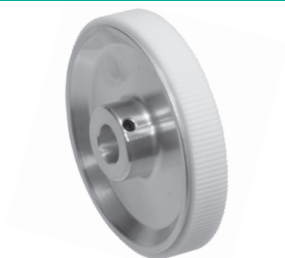
## General data

Surface	knurled plastic, Hytrel 4056
Application	Knurled Hytrel - used for plastic, paper, cardboard, wood, metal, and textile
Diameter	D = 159 mm
Circumference	500 mm
Width	B = 25 mm

## Model Number

		9112, 8	9112, 10
Shaft diameter	d = 8 mm	●	
	d = 10 mm		●

## 9113 series



## Properties

- Knurled plastic
- 200 mm circumference

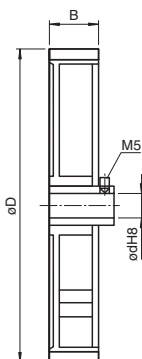
## General data

Surface	knurled plastic, Hytrel 4056
Application	Knurled Hytrel - used for plastic, paper, cardboard, wood, metal, and textile
Diameter	D = 63.7 mm
Circumference	200 mm
Width	B = 12 mm

## Model Number

		9113, 6	9113, 8	9113, 10
Shaft diameter	d = 6 mm	●		
	d = 8 mm		●	
	d = 10 mm			●

## Dimensions



## Model number

**9416**

Cable connector

**General specifications**

Type	Cable connector
Number of pins	12-pin round connection
Construction type	straight, increasing pin number clockwise (connector view)

**Standard conformity**

Protection degree	IP68
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## Model number

**9416L**

Cable connector

**General specifications**

Type	Cable connector
Number of pins	12-pin round connection
Construction type	straight, increasing pin number counter clockwise (connector view)

**Standard conformity**

Protection degree	IP68
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## Model number

**9424**

Cable connector

**General specifications**

Type	Cable connector
Number of pins	19-pin
Construction type	straight

**Standard conformity**

Protection degree	IP68
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## Model number

**9426**

Cable connector

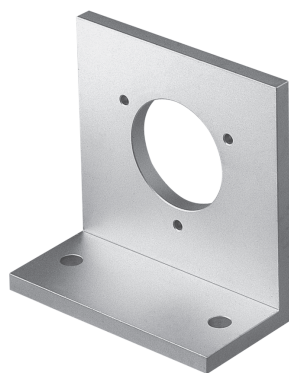
**General specifications**

Type	Cable connector
Number of pins	26-pin
Construction type	straight

**Standard conformity**

Protection degree	IP67
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## Model number

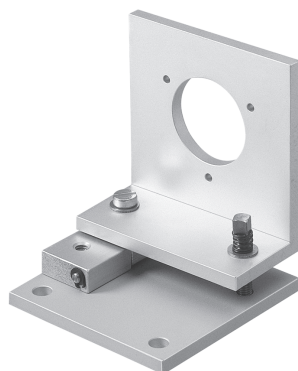
**9203**

Angled flange

**General specifications**

Suitable for	Series 58 encoders
Material	Aluminium

## Model number

**9213**

Mounting bracket, spring-loaded for clamping flange

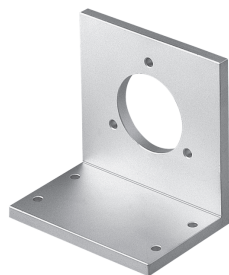
**Ambient conditions**

Ambient temperature	-25 ... 70 °C (-13 ... 158 °F)
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**Mechanical specifications**

Material	aluminum
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## Model number

**9250**

Angled flange

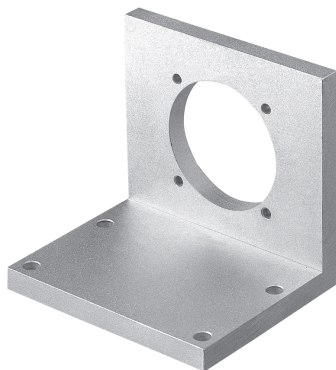
**General specifications**

Suitable for	Series RVI50 encoders
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**Mechanical specifications**

Material	aluminum
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## Model number

**9278**

Angled flange

**General specifications**

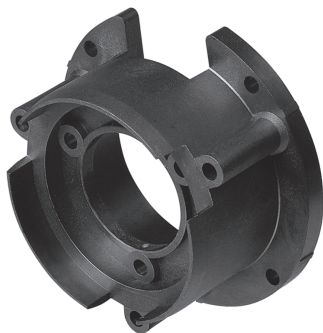
Suitable for	Series RVI78 encoders
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**Mechanical specifications**

Material	aluminum
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Model number



9300

Mounting bracket for servo flange

Mechanical specifications

Material plastic

Model number



9311

Mounting set

General information

Scope of delivery 3 screws  
3 nuts  
3 Synchro clamping element 9310-3



## Properties

- Applicable up to SIL 3 / PLe
- Connection of 2 safety incremental encoders
- DIN rail mounting
- Terminal version

## Benefits

- Monitors safe standstill, safe speed and safe direction of rotation
- Fulfills safety requirements up to SIL 3 / PLe with a single safety encoder per axis
- User friendly configuration by PC software
- Expandable up to 40 axes



### Danger!

For safety-related applications consider the product documentation which is available on [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

## Technical Data

For detailed data and product description refer to the data sheets at [www.pepperl-fuchs.us](http://www.pepperl-fuchs.us)

Safe Speed Monitor	
Rated operational voltage	20 ... 30 V DC, PELV at AUX
Rated operational current	≤ 350 mA / ≤ 4 A off AUX
Interface 1	
Interface type	Chip card slot
Interface 2	
Interface type	Micro USB
Input	
Number/Type	2 inputs for incremental rotary encoders AMP mini-IO connector
Output	
Number/Type	Output circuits 1 and 2 max. contact rating: 700 m A <sub>DC-13</sub> at 24 V
Ambient temperature	0 ... 55 °C (32 ... 131 °F)
Protection degree	IP20
Housing	PA 66-FR
Mounting	DIN rail
Connection	removable terminals
Scope of delivery	1 AS-Interface safety module VAS/M-2A8L-KE4-8SE-C1 1 AS-Interface safety module VBA-2E-KE4-ENC-S

## Dimensions

Safety Integrity Level (SIL)	SIL 3
Performance level (PL)	PL e
Mission Time (T <sub>M</sub> )	20 a
PFH <sub>d</sub>	7.85 E-9

## Dimensions

Length L [mm]	113
Width W [mm]	45
Height H [mm]	99

## Accessories

RVS58S	RVS58S safety incremental encoder family
VAZ-SW-SIMON+	Software for configuration of K30 Master Monitors/K31 Safety Monitors
VAZ-ENC-1,5M-PVC	Connection cable for connecting encoders to a speed monitor
VAZ-SIMON-USB	computer connection cable

## Electrical Connection

