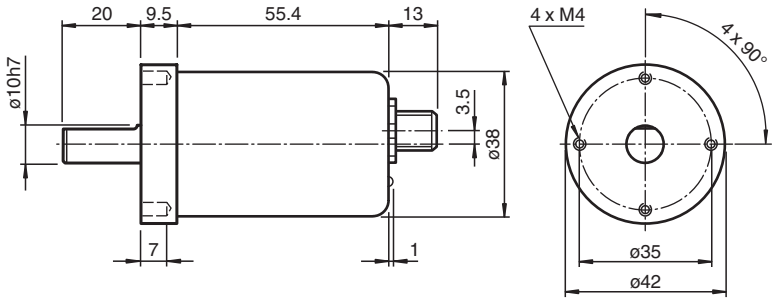
Singleturn absolute encoder

AVS42H-0

- Sturdy construction
- Highly shock / vibration and soiling resistant
- Increased shaft load capacity
- SSI interface
- Stainless steel housing
- IP69K
- Very small housing

Heavy-duty encoder

Dimensions



Technical Data

General specifications		
Detection type		magnetic sampling
Nominal ratings		
Linearity error		± 0.36 °
Electrical specifications		
Operating voltage	U_B	4.5 ... 30 V DC
Power consumption	P_0	≤ 1.5 W
Linearity		± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit
Output code		Gray code, binary code
Code course (counting direction)		cw descending (clockwise rotation, code course descending)
Interface		
Interface type		SSI
Monoflop time		20 ± 10 µs
Resolution		
Single turn		up to 13 Bit
Overall resolution		up to 13 Bit
Transfer rate		0.1 ... 2 MBit/s

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Technical Data

Voltage drop		U_B - 2.5 V
Standard conformity		RS 422
Input 1		
Input type		Selection of counting direction (cw/ccw)
Signal voltage		
High		4.5 V ... U_B (cw descending)
Low		0 ... 2 V or unconnected (cw ascending)
Input current		< 6 mA
Switch-on delay		< 1.1 s
Input 2		
Input type		zero-set (PRESET 1) with falling edge
Signal voltage		
High		4.5 V ... U_B
Low		0 ... 2 V
Input current		< 6 mA
Signal duration		min. 1.1 s
Connection		
Connector		M12 connector, 8-pin
Standard conformity		
Degree of protection		acc. DIN EN 60529
Climatic testing		DIN EN 60068-2-3 , 95 % , no moisture condensation
Emitted interference		EN 61000-6-4:2007
Noise immunity		EN 61000-6-2:2005
Shock resistance		DIN EN 60068-2-27, 300 *g*, 6 ms
Vibration resistance		DIN EN 60068-2-6, 30 g, 55 ... 2000 Hz
Ambient conditions		
Operating temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Relative humidity		95 % , no moisture condensation
Mechanical specifications		
Flange		servo flange 42 mm with 4 x Threading M4
Shaft dimensions	Ø x l	10 mm x 21 mm
Degree of protection		IP66 / IP68 / IP69K
Material		
Housing		stainless steel 1.4404 / AISI 316L
Flange		stainless steel 1.4404 / AISI 316L
Shaft		Stainless steel 1.4412 / AISI 440B
Mass		approx. 350 g
Rotational speed		max. 6000 min^{-1}
Moment of inertia		30 gcm^2
Starting torque		< 5 Ncm
Shaft load		
Axial		270 N
Radial		270 N

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Function

This absolute rotary encoder with magnetic sampling provides a position value corresponding to the shaft position on its integrated SSI interface (Synchronous Serial Interface).

The very sturdy design of this encoder has been dimensioned for use in harsh environmental conditions and high mechanical stress.

The control module sends a start sequence to the absolute encoder to obtain the position data. The rotary encoder then sends the position data synchronous to the cycles of the control module.

Connection

Electrical connection

Signal	Connector
GND (encoder)	1
U_b (encoder)	2
Clock (+)	3
Clock (-)	4
Data (+)	5
Data (-)	6
Preset	7
Counting direction	8
Shielding	Housing
Pinout	

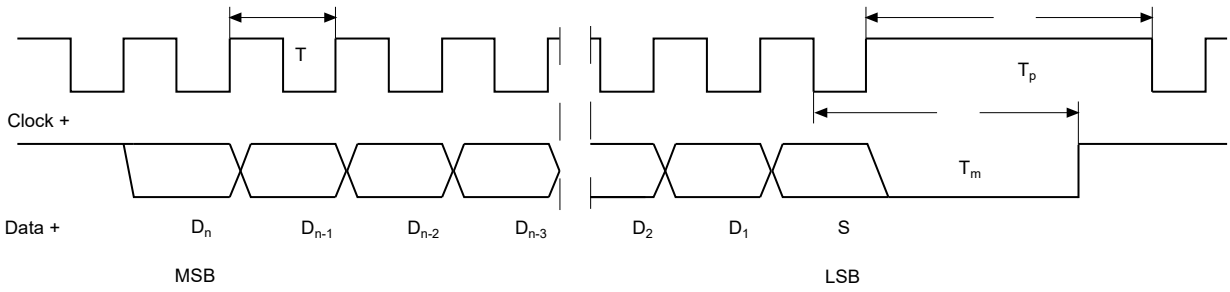
Interface

Description

The Synchronous Serial Interface was specially developed for transferring the output data of an absolute encoder to a control device. The control module sends a clock bundle and the absolute encoder responds with the position value.

Thus only 4 lines are required for the clock and data, no matter what the resolution of the rotary encoder is. The RS 422 interface is optically isolated from the power supply.

SSI signal course Standard



D_1, ..., D_n:	Position data	T = 1/f:	Duration of period of clock signal ≤ 1 MHz
S:	Special bit	T_m:	Monoflop time 10 µs ... 30 µs
MSB:	Most significant bit	T_p:	Clock pause ≥ monoflop time ($T_p \geq T_m$)
LSB:	Least significant bit		

SSI output format Standard

- At idle status signal lines "Data +" and "Clock +" are at high level (5 V).
- The first time the clock signal switches from high to low, the data transfer in which the current information (position data (D_n) and special bit (S)) is stored in the encoder is introduced.
- The highest order bit (MSB) is applied to the serial data output of the encoder with the first rising pulse edge.
- The next successive lower order bit is transferred with each following rising pulse edge.
- After the lowest order bit (LSB) has been transferred the data line switches to low until the monoflop time T_m has expired.
- No subsequent data transfer can be started until the data line switches to high again or the time for the clock pause T_p has expired.
- After the clock sequence is complete, the monoflop time T_m is triggered with the last falling pulse edge.

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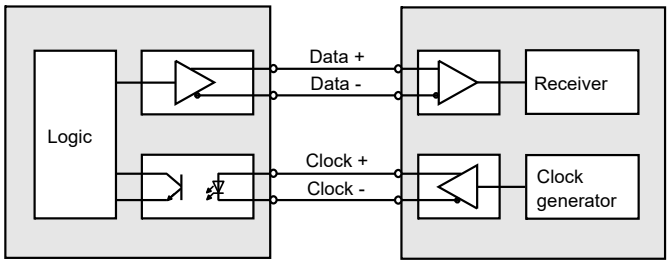
- The monoflop time T_m determines the lowest transmission frequency.

SSI output format ring slide operation (multiple transmission)

- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 25 bits are transferred per data word in standard format.
- If the clock change is not interrupted after the last falling pulse edge, ring slide operation automatically becomes active. This means that the information that was stored at the time of the first clock change is generated again.
- After the first transmission, the 26th pulse controls data repetition. If the 26th pulse follows after an amount of time greater than the monoflop time T_m, a new current data word will be transmitted with the following pulses.

If the pulse line is exchanged, the data word is generated offset.
Ring slide operation is possible up to max. 13 bits.

Block diagram



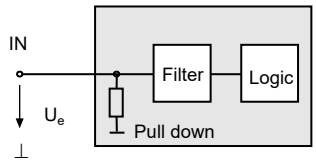
Line length

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

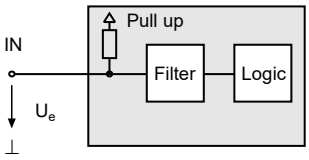
Inputs

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

zero-set input (PRESET 1)



Input for selection of counting direction (cw/ccw)



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Order code

A	V	S	4	2	H	–	0	1	R	B	E	A	0		N	–	0	0		

Data format
A SSI (Synchronous Serial Interface)

Shaft version
V Solid shaft

Principle of operation
S Singleturn

Version
H Heavy duty

Shaft dimension/flange version
01R Shaft Ø10 mm x 21 mm with 42 mm servo flange

Connection type
BE Connector, M12 x 1, 8 pin

Exit position
A Axial

Option
0 cw/ccw and preset

Output code
B Binary
G Gray

Temperature
N Normal

Number of bits singleturn
12 4096 (standard)
13 8192 (max.)

Installation

Anti-interference measures

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

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

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

- Termination of the serial line with a 120 Ω resistor (between Receive/Transmit and Receive/Transmit) at the beginning and end of the serial line (e. g. the control and the last encoder).
- The wiring of the encoder should be laid at a large distance to energy lines which could cause interferences.
- Cable cross-section of the screen at least 4 mm^2.
- Cable cross-section at least 0,14 mm^2.
- The wiring of the screen and 0 V should be arranged radially, if and when possible.
- Do not kink or jam the cables.
- Adhere to the minimum bending radius as given in the data sheet and avoid tensile as well as shearing load.

Operating instructions

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

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

Notes on connecting the electric screening

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

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

The following instructions have to be observed:

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

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

Safety instructions

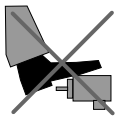
Please observe the national safety and accident prevention regulations as well as the subsequent safety instructions in these operating instructions when working on encoders.

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

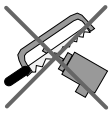
Repairs may be carried out only by the manufacturer. Entry into and modifications of the device are not permissible.

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

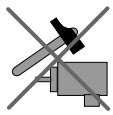
Tighten all screws and plug connectors prior to operating the encoder.



Do not stand on the encoder!



Do not remachine the drive shaft!



Avoid impact!

Do not remachine the housing!

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