



Model Number

AVS78E

Features

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

Description

This absolute rotary encoder returns a position value corresponding to the shaft position via the SSI interface.

In order to obtain the position data, the controller sends a start sequence to the absolute rotary encoder. The encoder then responds synchronously to the pulses from the controller with the position data.

The modular design enables you to order the absolute rotary encoder so that it fulfills your requirements. A listing of the part options can be found in the ordering information.

You can select the counting direction via 2 functional inputs and set the zero position.

Technical Data

General specifications

| | |
|----------------|-----------------------------|
| Detection type | photoelectric sampling |
| Device type | Singleturn absolute encoder |

Functional safety related parameters

| | |
|--------------------------------|---------------------|
| MTTF _d | 40 a |
| Mission Time (T _M) | 20 a |
| L ₁₀ | 7.7 E+9 at 3000 rpm |
| Diagnostic Coverage (DC) | 0 % |

Electrical specifications

| | |
|---------------------------------------|---|
| Operating voltage U _B | 10 ... 30 V DC |
| No-load supply current I ₀ | max. 90 mA |
| Linearity | ± 2 LSB at 16 Bit, ± 1 LSB at 13 Bit, ± 0,5 LSB at 12 Bit |
| Output code | Gray code, binary code |
| Code course (counting direction) | see input 1 |

Interface

| | |
|---------------------|------------------|
| Interface type | SSI |
| Monoflop time | 20 ± 10 µs |
| Resolution | |
| Single turn | up to 16 Bit |
| Transfer rate | 0.1 ... 2 MBit/s |
| Standard conformity | RS 422 |

Input 1

| | |
|-----------------|---|
| Input type | Selection of counting direction (cw/ccw) |
| Signal voltage | |
| High | 10 ... 30 V or open input cw descending (clockwise rotation, code course descending) |
| Low | 0 ... 2 V cw ascending (clockwise rotation, code course ascending) |
| Input current | < 6 mA |
| Switch-on delay | < 10 ms |

Input 2

| | |
|-----------------|-------------------|
| Input type | zero-set (PRESET) |
| Signal voltage | |
| High | 10 ... 30 V |
| Low | 0 ... 2 V |
| Input current | < 6 mA |
| Signal duration | ≥ 100 ms |
| Switch-on delay | < 10 ms |

Connection

| | |
|----------------------|--|
| Cable | Ø 10.2 mm, Radox 9 x 0.5 mm ² |
| Terminal compartment | see ordering information |

Standard conformity

| | |
|----------------------|--|
| Degree of protection | DIN EN 60529, IP66 |
| Climatic testing | DIN EN 60068-2-3, no moisture condensation |
| Emitted interference | EN 61000-6-4:2007 |
| Noise immunity | EN 61000-6-2:2005 |
| Shock resistance | DIN EN 60068-2-27, 100 g, 3 ms |
| Vibration resistance | DIN EN 60068-2-6, 10 g, 10 ... 2000 Hz |

Ambient conditions

| | |
|-----------------------|--------------------------------|
| Operating temperature | -40 ... 70 °C (-40 ... 158 °F) |
| Storage temperature | -40 ... 85 °C (-40 ... 185 °F) |

Mechanical specifications

| | |
|----------------------|---|
| Material | |
| Combination 1 | housing: anodized aluminum flange: anodized aluminum shaft: Stainless steel 1.4401 / 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 |
| Mass | approx. 2600 g (combination 1) approx. 3900 g (combination 2) |
| Rotational speed | max. 3000 min ⁻¹ |
| Moment of inertia | 180 gcm ² |
| Starting torque | ≤ 4 Ncm |
| Shaft load | |
| Axial | 60 N |
| Radial | 80 N |

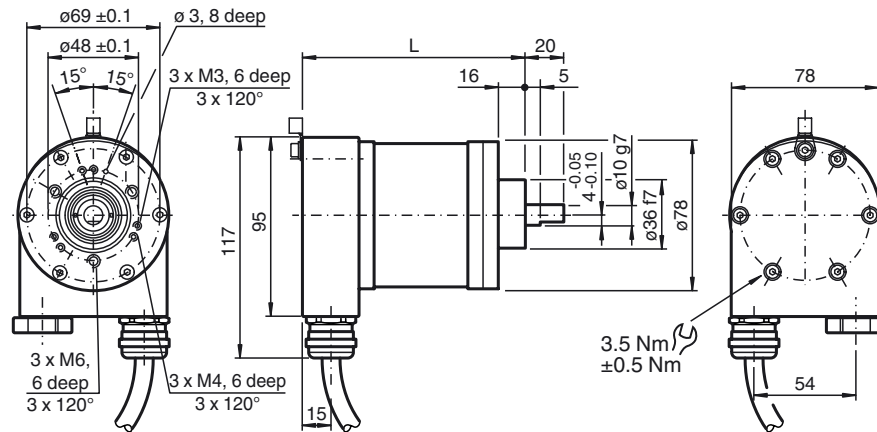
Data for application in connection with hazardous areas

| | |
|---------------------------------|--|
| EU-type examination certificate | ITS 15 ATEX 18372X IECEx ITS 15.0061X |
| Marking | ⊕ II 2G Ex d IIC T5 Gb ⊕ II 2D Ex tb IIIC T100°C Db |
| Directive conformity | |
| Directive 2014/34/EU | IEC 60079-0:2011, EN 60079-0:2012+A11:2013, IEC 60079-1:2014, EN 60079-1:2014, IEC 60079-31:2013, EN 60079-31:2014 |

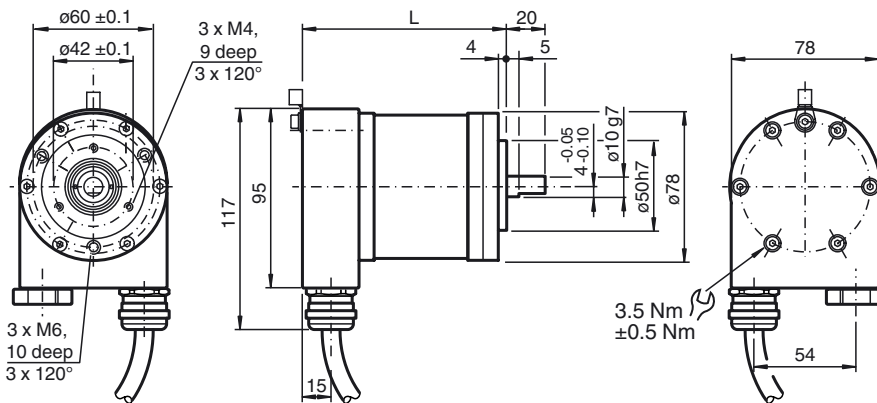
Dimensions

Encoder length L

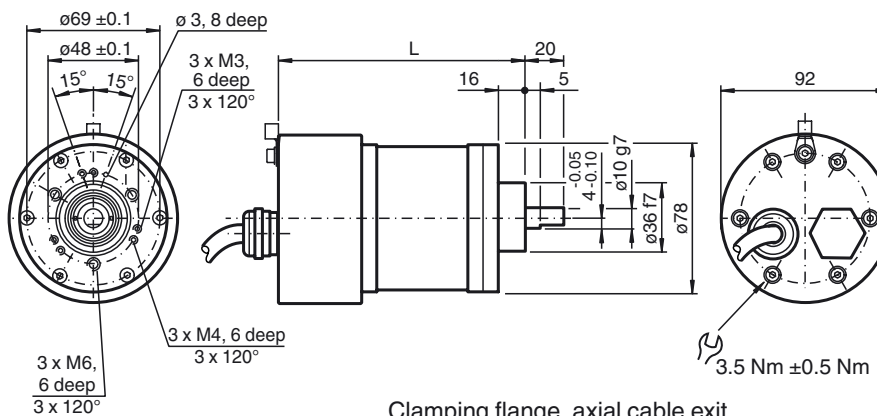
| Version | | Length L |
|-------------------|-----------------|----------|
| Radial cable exit | Clamping flange | 118 mm |
| | Servo flange | 118 mm |
| Axial cable exit | Clamping flange | 134 mm |
| | Servo flange | 134 mm |



Clamping flange, cable exit radial

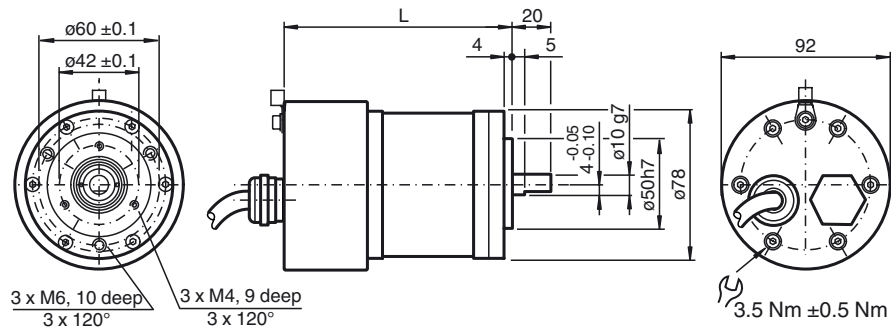


Servo flange, radial cable exit



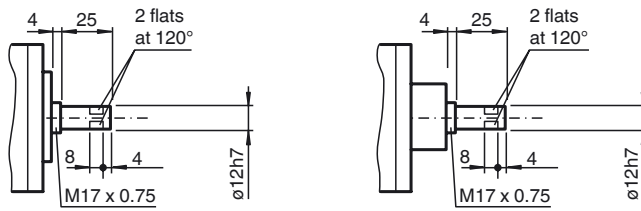
Clamping flange, axial cable exit

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Servo flange, axial cable exit

Shaft 12 mm



Electrical connection

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

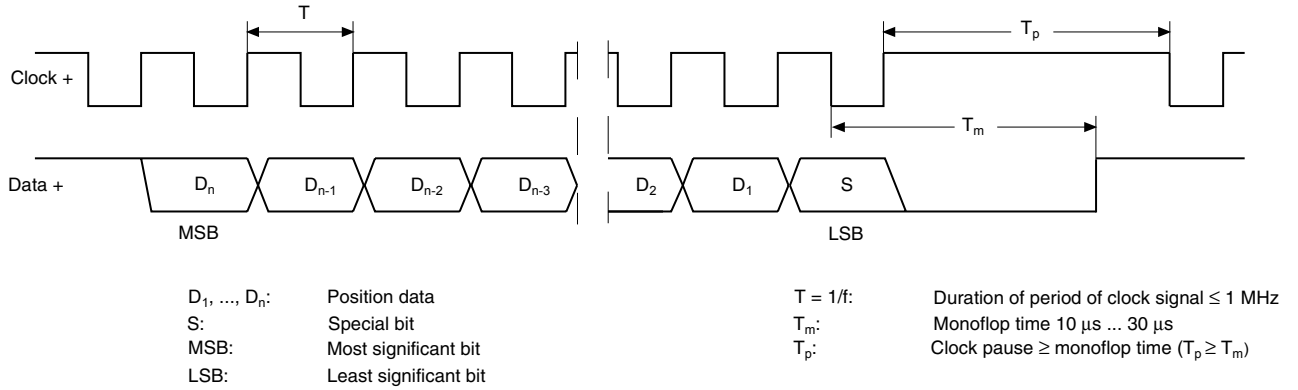
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Description

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

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

SSI signal course Standard



SSI output format Standard

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

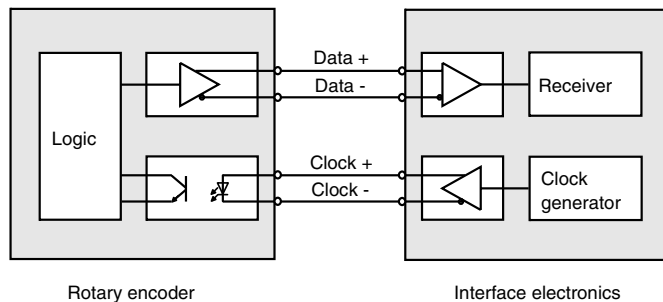
SSI output format ring slide operation (multiple transmission)

- In ring slide operation, multiple transmission of the same data word over the SSI interface makes it possible to offer the possibility of detecting transmission errors.
- In multiple transmission, 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

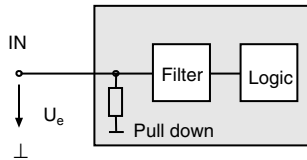
| Line length in m | Baudrate in kHz |
|------------------|-----------------|
| < 50 | < 400 |
| < 100 | < 300 |
| < 200 | < 200 |
| < 400 | < 100 |

Inputs

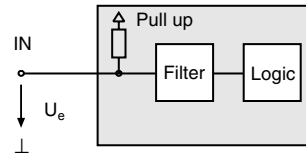
The selection of the counting direction input (cw/ccw) is activated with 0-level. The zero-set input (PRESET 1) is activated with 1-level.

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zero-set input (PRESET 1)



Input for selection of counting direction (cw/ccw)



Ordering information

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|--|--|--|--|--|---|--|--|--|---|---|---|--|--|
| A | V | S | 7 | 8 | E | - | 0 | | | | | | 0 | | | | - | 0 | 0 | | |
|---|---|---|---|---|---|---|---|--|--|--|--|--|---|--|--|--|---|---|---|--|--|

| | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | Number of singleturn bits |
| | | | | | | | | | | | | | | | | | | 12 4096 |
| | | | | | | | | | | | | | | | | | | 16 65536 |
| | | | | | | | | | | | | | | | | | | Number of multiturn bits |
| | | | | | | | | | | | | | | | | | | 00 Singleturn rotary encoder |
| | | | | | | | | | | | | | | | | | | Housing material |
| | | | | | | | | | | | | | | | | | | N Aluminum |
| | | | | | | | | | | | | | | | | | | I Stainless steel 1.4404 (AISI 316L) |
| | | | | | | | | | | | | | | | | | | Output code |
| | | | | | | | | | | | | | | | | | | B Binary |
| | | | | | | | | | | | | | | | | | | G Gray |
| | | | | | | | | | | | | | | | | | | Option 2 |
| | | | | | | | | | | | | | | | | | | 0 Zeroing (preset) and counting direction (F/R) |
| | | | | | | | | | | | | | | | | | | Exit position |
| | | | | | | | | | | | | | | | | | | A axial |
| | | | | | | | | | | | | | | | | | | R radial |
| | | | | | | | | | | | | | | | | | | Connection type |
| | | | | | | | | | | | | | | | | | | K2 Cable, 9 strands, 2 m |
| | | | | | | | | | | | | | | | | | | K5 Cable, 9 strands, 5 m |
| | | | | | | | | | | | | | | | | | | KR Terminal compartment, 1 cable gland, 1 stopping plug |
| | | | | | | | | | | | | | | | | | | Flange version |
| | | | | | | | | | | | | | | | | | | 1 Clamping flange |
| | | | | | | | | | | | | | | | | | | 2 Servo flange |
| | | | | | | | | | | | | | | | | | | Shaft dimension |
| | | | | | | | | | | | | | | | | | | 01 Shaft Ø10 mm x 20 mm |
| | | | | | | | | | | | | | | | | | | 02 Shaft Ø12 mm x 25 mm |
| | | | | | | | | | | | | | | | | | | Option 1 |
| | | | | | | | | | | | | | | | | | | E Explosion-proof, standard IP66 |
| | | | | | | | | | | | | | | | | | | Functional principle |
| | | | | | | | | | | | | | | | | | | S Singleturn |
| | | | | | | | | | | | | | | | | | | Type of shaft |
| | | | | | | | | | | | | | | | | | | V Solid shaft |
| | | | | | | | | | | | | | | | | | | Data format |
| | | | | | | | | | | | | | | | | | | A SSI interface |

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