

Absolute Encoder Multiturn



Features

- Resolution: Singleturn: up to 4,096 (**12 Bit**) steps per revolution
Multiturn: up to 16,777,216 (**24 Bit**) revolutions
- Interface: **SSI** (synchron serial interface) or **BiSS**® (bidirectional serial synchron)
- Output: RS 422 transceiver
- Maximum shaft diameter: **6,35 mm**
- Rotation speed: up to **8.000 rpm**
- Preset (for zero position)
- Rotation direction selectable



Description

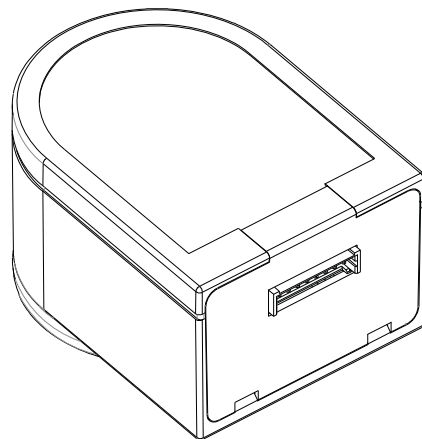
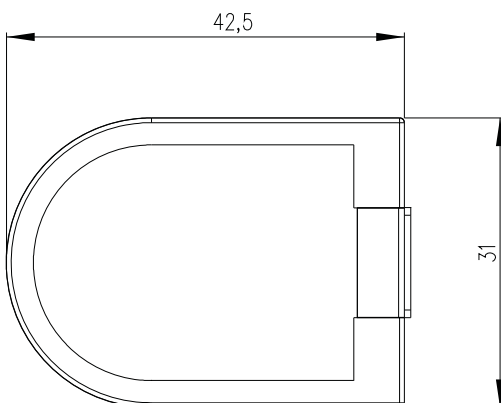
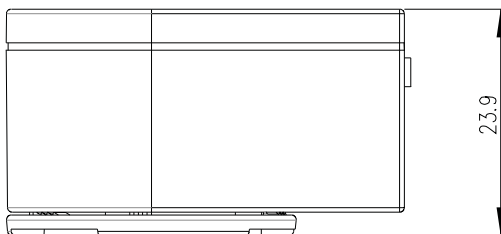
The AEM30 is an absolute magnetic multiturn encoder. It is a reliable low cost hollow shaft encoder which can be fixed quickly and easily onto different sizes of motor shafts. The encoder is developed for absolute positioning, for brushless motors of servo motors and steppers. The AEM30 is a real time system for high speed applications and rough environments.

The encoder is available with to different interfaces: SSI or BiSS ®. Power supply and signals are provided by a 8 pin Molex connector.

Main characteristics

- Absolute rotary encoder
- Magnetic sensing
- Multiturn by electronic gear
- Hollow shaft encoder
- High performance in compact size
- Robust plastic housing
- Quick and easy assembly
- Several shaft diameter options
- Operating temperature range -40 °C to +85 °C
- Compliant EU-directive 2011/65/EU (RoHS)

Dimensions



Recommended operating conditions

Typical values at 25 °C.

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|-----------------------------|------------------|------|----------|-------|----------------------------------|--|
| Supply voltage | U _B | 4.5 | 5.0 | 5.5 | V _{DC} | |
| | U _B | 8.0 | 12.0 | 24.0 | V _{DC} | |
| Supply current | I _{UB} | 40 | 60 | 80 | mA | no load |
| Reverse polarity protection | U _B | -36 | | 0 | V _{DC} | 8-30V version |
| | | -6 | | 0 | V _{DC} | 5V version |
| Start up time | t _T | | | 2 | ms | |
| Absolute accuracy | | | +/- 0.8 | | ° | |
| Relative accuracy | | | +/- 1,5 | | LSB | (repeatability) |
| Rotation speed | RPM | | | 8,000 | U/min | |
| Acceleration | α _{max} | | | 40 | 10 ³ °/s ² | |
| ESD voltage | U _{ESD} | | | 2 | kV | discharged over 1,5kΩ |
| SSI / BiSS | | | | | | |
| Clock frequency | f | 80 | | 5000 | kHz | |
| Scan ratio of T | | 40 | 50 | 60 | % | |
| Monoflop time | t _m | | 20 + T/2 | | µs | adaptive Encoder Timeout |
| High level output voltage | V _{oH} | 2.0 | 3.0 | 5.5 | V _{DC} | R _L = 120Ω |
| Low level output voltage | V _{oL} | | | 0.8 | V _{DC} | R _L = 120Ω |
| High level input voltage | V _{iH} | 2.0 | | 5.5 | V _{DC} | |
| Low level input voltage | V _{iL} | | | 0.8 | V _{DC} | |
| Output current per channel | I _{out} | -1.0 | 30 | 50 | mA | overload protection |
| BiSS | | | | | | |
| CRC Polynomial | | | 0x43 | | hex | x ⁶ + x ¹ + x ⁰ |
| CRC Start Value | | | 0x0000 | | hex | |
| CRC Bits | | | 6 | | | |
| CDM | | | | | | inverted |
| Environment | | | | | | |
| Operating temperature | T _A | -40 | 25 | 85 | °C | optional 100°C |
| Storage temperature | T _S | -40 | | 85 | °C | |
| Humidity exposure | | | | 90 | %RH | not condensing |
| Vibration | | | | 2000 | Hz | 20 g |

Mechanical characteristics and drawings

| Parameter | Value | Tolerance | Unit |
|---|--|------------|------|
| Dimensions | 42.5 x 31.0 x 23.9 (refer to Page 2) | | mm |
| Weight | 37 | | g |
| Shaft diameters \varnothing | 4.0 / 5.0 / 6.0 / 6.35 ** (see Fig.2 below) | ± 0.01 | mm |
| Motor shaft length L | 10.5 (see Fig.2 below) | + 1.5 | mm |
| Max. motor mounting boss diameter D | 13.0 (see Fig.2 below) | | mm |
| Max. motor mounting boss height H | 2.0 (see Fig.2 below) | | mm |
| Max. motor axial shaft play | | ± 0.2 | mm |
| Max. motor shaft eccentricity + radial play | 0.1 | | mm |
| Screws for fixing | 2 X M3 (DIN 965) 3 X M2 (DIN 7985) | | |
| Tightening torque of the screws | 15 | -5 | Ncm |
| Flange print | Refer to Fig.3 below | | |
| Protection class | IP50 (according to DIN 40500)* | | |

Note: * When the encoder is properly assembled

** Further shaft diameters on request

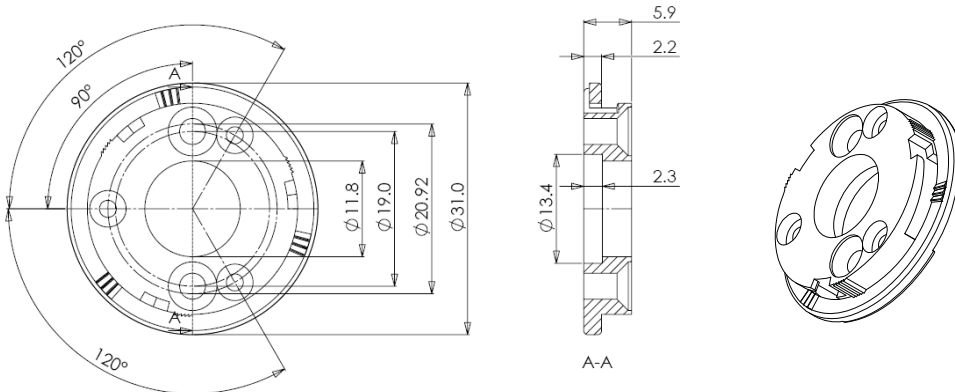


Fig. 1 Flange dimension

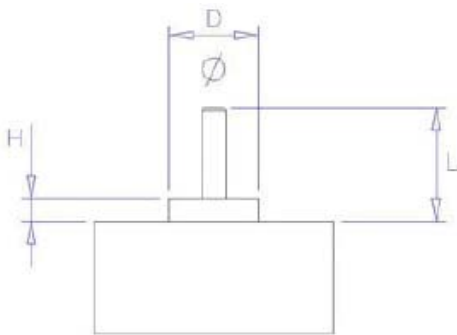


Fig. 2 Motor shaft tip

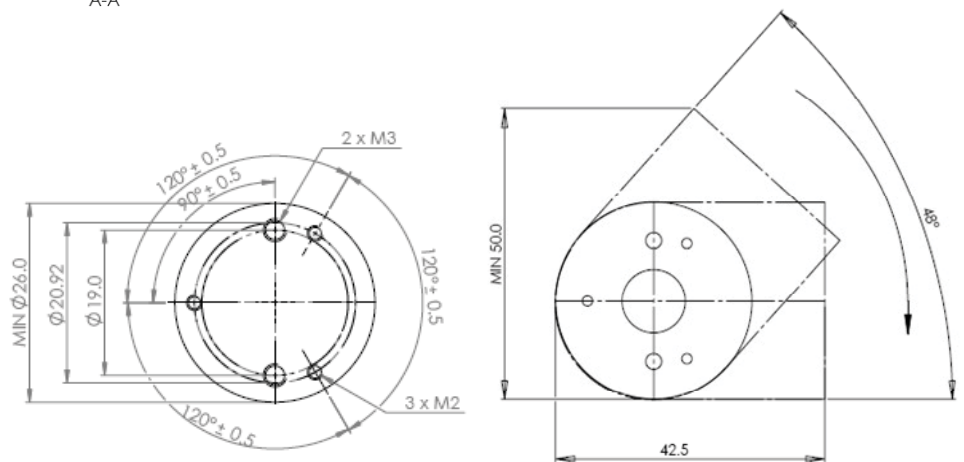
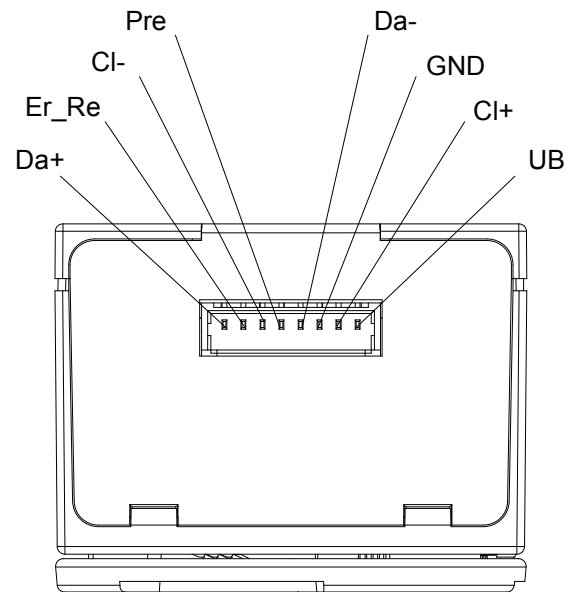


Fig. 3 Flange print

Pin out description

| Pin | Output pin | Description | Wire colors (UL 1061) |
|-----|------------|--------------|-----------------------|
| 1 | UB | Power supply | red |
| 2 | Cl+ | Clock + | green |
| 3 | GND | Ground | blue |
| 4 | Da- | Data - | purple |
| 5 | Pre | Preset | brown |
| 6 | Cl- | Clock - | yellow |
| 7 | Er_Re | Error Reset | orange |
| 8 | Da+ | Data + | black |



Encoder header connector: Molex 53048-0810

Description:

The encoder AEM30 is a kit system, consisting a magnetic hub and a housing unit including the PCB. After assembly by the customer (see page 10/11) and after power on, the encoder can indicate the error „magnet lost“. This is caused by missing the magnet during the shipment and the assembly.

For erasing the error, set the Pin „Error Reset“ high by a unique impulse (5VDC, $\geq 100\text{ms}$). Then reboot the encoder by interrupting the power supply.

Error Reset can also executed by command using BiSS interface

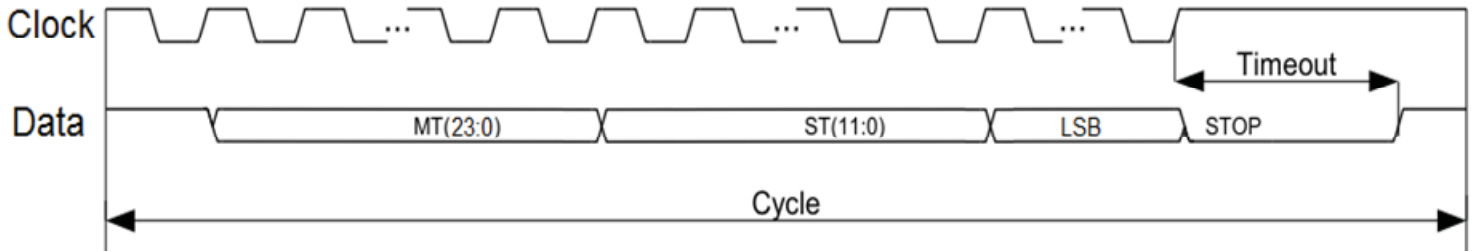
To reset the position data to zero, set the Pin „Preset“ high by a unique impulse (5VDC, $\geq 100\text{ms}$).

To suppress interferences in operation, set the Pin „Error Reset“ and „Preset“ to GND. Avoid an open wire on this both pins (influence like an antenna).

Preset and rotation direction are programmable by a BiSS command.

Interface:

Data transfer: SSI Gray-Code



LSB:

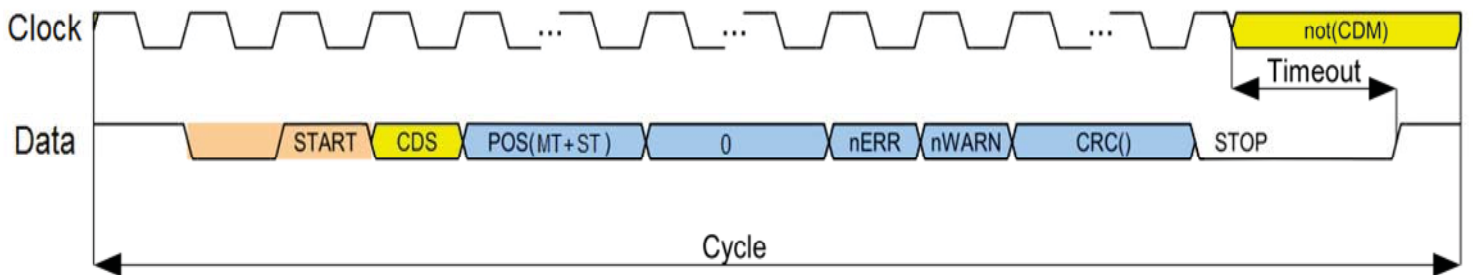
These are additional bits to refill the singleturn bit length to 13 Bit. The number of LSB-bits is depended of the Ordering code (see below).

The LSB-Bits have the same value like the last bit of the singleturn data word [ST (0) = LSB]

Example:

| | | | |
|----------------|--------------------------|----|--|
| Ordering code: | AEM30 - S 09 / 12 - | => | 21 Position bits + 4 x LSB bits + STOP bit |
| | AEM30 - S 10 / 12 - | => | 22 Position bits + 3 x LSB bits + STOP bit |
| | AEM30 - S 11 / 12 - | => | 23 Position bits + 2 x LSB bits + STOP bit |
| | AEM30 - S 12 / 12 - | => | 24 Position bits + 1 x LSB bits + STOP bit |

Data transfer: BiSS (C-Mode) Binary-Code



0:

These are additional bits to refill the singleturn bit length to 12 bit. The number of Zero-bits is depended of the Ordering code (see below). The value of these bits is low.

Example:

| | | | |
|----------------|--------------------------|----|---|
| Ordering code: | AEM30 - B 09 / 12 - | => | ... + 21 Position bits + 3 x 0 bits + ... |
| | AEM30 - B 10 / 12 - | => | ... + 22 Position bits + 2 x 0 bits + ... |
| | AEM30 - B 11 / 12 - | => | ... + 23 Position bits + 1 x 0 bits + ... |
| | AEM30 - B 12 / 12 - | => | ... + 24 Position bits + ... |

For a detailed description of the protocol, see separate interface specification.