



## Angle Sensor

### HAT 1400

CANopen Safety  
Two-chamber design  
Enhanced functional safety

Magnetic

Absolute

Singleturn, 14 bit

**CANopen**  
safety easy to use



**Functional Safety**  
PL d  
SIL 2

#### Features

- Contactless, magnetic measurement method
- Robust design
- IP 6K9K (two-chamber design)
- Functional safety acc. to EN 61508 SIL 2  
ISO 13849 PL d

#### Description

HAT 1400 is an absolute measuring singleturn angle sensor.

Due to its two-chamber design, the electronic unit is completely encapsulated which means it meets IP 6K9K if the electrical connection is carried out accordingly.

The sensors meet the safety requirements according to SIL2 (EN 61508) and PL d (ISO 13849).

The measured value is digitized and made available to the CAN field bus system via the CANopen protocol. The instrument parameters can be viewed and configured by the user via the CANopen object directory using standard CAN software.

#### Application fields

Thanks to its non-contact magnetic measuring method and its robust design, the HAT 1400 is ideally suited for the measurement of the rotational angle in mobile machines.

The sensor is therefore particularly suitable for a large variety of applications in the automobile industry and in mobile work machines, especially for applications with increased safety requirements.

Especially for the use in public traffic vehicles, HAT 1400 is approved for road vehicles according ECE type approval via the E13 approval.

## Technical Data

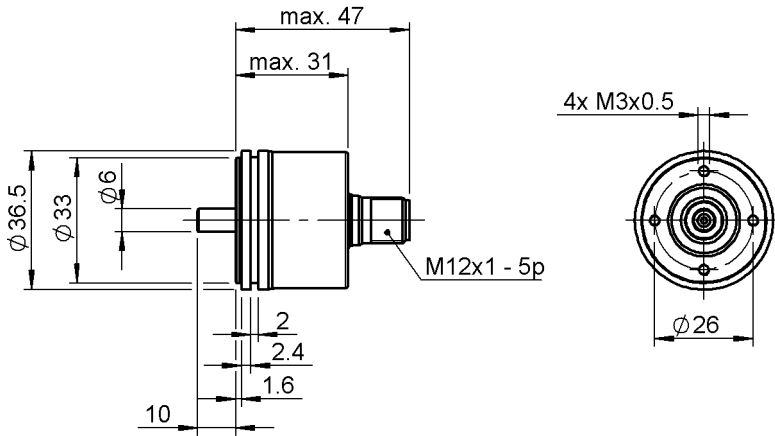
| Input data   |  |                         |
|--|--|-------------------------|
| Measurement range                                      | 0 .. 360 °   |                         |
| Direction of rotation                                  | No orientation restrictions                              |                         |
| Max. axial load  | 60 N   |                         |
| Max. radial load                                       | 100 N  |                         |
| Material, housing                                      | Stainless steel  |                         |
| Material, shaft  | Stainless steel  |                         |
| Output data  |  |                         |
| Output signal  | CANopen Safety   |                         |
| Resolution   | 14 bit   |                         |
| Accuracy<br>(at room temperature)                      | ± 0.1° typ.<br>± 0.2° max.                               |                         |
| Accuracy<br>(over the temperature range)               | ± 0.05 ° / 10 K typ.<br>± 0.1° / 10 K max.               |                         |
| Repeatability  | ≤ ± 0.05 °   |                         |
| Angle increase   | cw / ccw (factory-set)                                   |                         |
| Environmental conditions                               |  |                         |
| Operating temperature range                            | -40 .. +85 °C  |                         |
| Storage temperature range                              | -40 .. +85 °C  |                         |
| CE mark  | EN 61000-6-1 / -2 / -3 / -4                              |                         |
| E <sup>3</sup> mark                                    | E13*10R00*10R05*14136*00                                 |                         |
| Vibration resistance acc. to<br>DIN EN 60068-2-6: 2008 | 7.5 mm (5 Hz ≤ f < 8.2 Hz)<br>2 g (8.2 Hz ≤ f < 2000 Hz) |                         |
| Shock resistance acc. to<br>DIN EN 60068-2-27: 2010    | 20 g (11 ms in 3 axes)                                   |                         |
| Protection type to DIN EN 60529 <sup>1)</sup>          | IP 67, IP 6K9K (electronics)                             |                         |
| Protocol data for CANopen Safety                       |  |                         |
| Communication profile                                  | CiA DS 301 V4.2.0 / DS 304 V1.0.1                        |                         |
| NMT-Services   | CiA DSP 302 V4.1   |                         |
| Layer setting services and protocol                    | CiA DSP 305 V2.2   |                         |
| Encoder Device Profile                                 | CiA DS 406 V3.2  |                         |
| Baud rates   | 10 kbit/s to 1 Mbit/s according to DS305 V2.2            |                         |
| Transmission services                                  |  |                         |
| - SRDO / PDO   | Measured value as 32 bit                                 |                         |
| - Transfer   | synchronous, asynchronous, cyclical                      |                         |
| Node ID/ Baud rate                                     | Adjustable via LSS                                       |                         |
| Safety-related data                                    |  |                         |
| <b>Performance Level</b>                               | Based on PL  | DIN EN ISO 13849-1:2008 |
|  | PL   | d                       |
|  | Architecture   | Category 2              |
| <b>Safety Integrity Level</b>                          | Based on SIL   | DIN EN 61508:2010       |
|  | SIL  | 2                       |
|  | Architecture   | 1oo1 / 1oo2             |
| Other data   |  |                         |
| Supply voltage   | 9 .. 36 V DC   |                         |
| Residual ripple of supply voltage                      | ≤ 5 %  |                         |
| Power consumption                                      | < 1.4 W  |                         |
| Weight   | ~ 186 g  |                         |

**Note:** Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

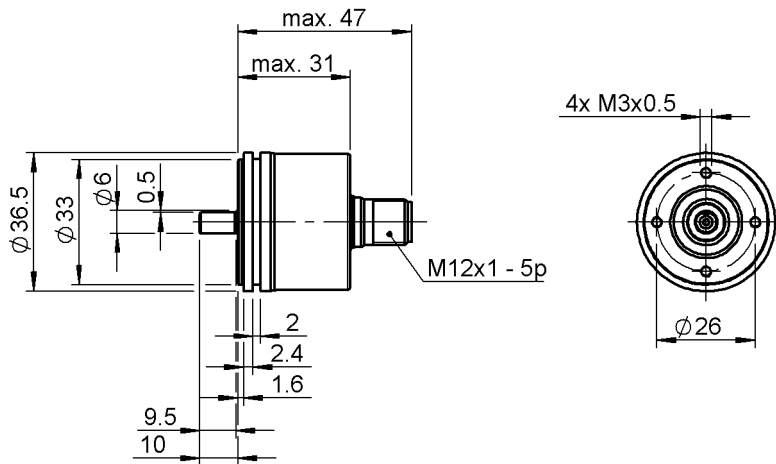
<sup>1)</sup>With mating connector of corresponding protection type fitted

## Dimensions

### Mechanical connection: solid shaft



### Mechanical connection: D-shape:



## Pin connections

| M12x1, 5 pole | Pin | Output signal: F1X |                        |
|---------------|-----|--------------------|------------------------|
|               |     | Signal             | Description            |
|               | 1   | CAN_SHLD           | Shield/housing         |
|               | 2   | CAN_V+             | External supply +      |
|               | 3   | CAN_GND            | Ground / 0 V / V -     |
|               | 4   | CAN_H              | Bus line dominant high |
|               | 5   | CAN_L              | Bus line dominant low  |

## Model code

HAT 1 436 - F13 - XXXX - P01 - XXXX - M01 - S2PD - 000

### Resolution

4 = 14 Bit

### Housing diameter

36 = 36 mm

### Output signal

F13 = CANopen Safety

### Measuring range in ° and rotational direction <sup>1)</sup>

360R = 360°, clockwise rotation

360L = 360°, anti-clockwise

### Electrical connection

P01 = Installation plug M12x1; 5 pole, axial

### Mechanical connection

V106 = Solid shaft, length 10 mm, diameter 6 mm

D106 = D-shape, length 10 mm, diameter 6 mm

### Fixing type

M01 = Synchro flange with 4 threaded bores

### Functional Safety

S2PD = SIL2 to IEC 61508 and PLd to DIN EN 13849-1

### Modification number

000 = Standard

### Accessories:

Appropriate accessories, such as mating connectors, can be found in the Accessories brochure.

### Note:

Special models on request

<sup>1)</sup> Viewed from the side of the shaft

## Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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