# DATASHEET
# ABSOLUTE MAGNETIC ROTARY ENCODER CANOPEN

High-resolution absolute encoder based on magnetical technology. Singleturn encoding based on 360° Hall technology. Multiturn encoding based on magnetic pulse counter. No batteries used.

**Main Features**

- Compact industrial model
- Interface: CANopen (DS406)
  CANopen Lift (DSP417)
- Housing: 36.5 mm ∅
- Solid Shaft: 6 or 10 mm ∅
- Blind hollow shaft: 6 mm ∅
- EMC: EN 61000-6-2, EN 61000-6-4
- Max. revolution not limited (typical 15 bit)
- Velocity and Acceleration Output
- LSS services

**Programmable Parameters**

- Baud rate and CAN-Identifier
- Resolution per revolution
- Total resolution
- Direction of rotation (complement)
- Preset value
- Two limit switches
- Transmission mode: Polled mode, cyclic mode, sync mode

**Mechanical Structure**

- Aluminum flange
- Nickel-plated steel housing
- Stainless steel shaft
- Precision ball bearings

**Electrical Features**

- Polarity inversion protection
- Over-voltage-peak protection
- Galvanic Isolation

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## Technical data

### Electrical data

| | |
|---|---|
| Interface | Transceiver according ISO 11898,<br>galvanically isolated by opto-couplers |
| Transmission rate | max. 1 MBaud |
| Device addressing | Adjustable by SDO telegrams or Layer Setting Services |
| Supply voltage | 10-30 V DC ( absolute maximum ratings ) * |
| Current consumption | max. 100 mA with 10 V DC, max. 50 mA with 24 V DC |
| Power consumption | max 1,2 Watts |
| Electrical lifetime | > $10^5$ h |
| EMC | Emitted interference: EN 61000-6-4<br>Noise immunity: EN 61000-6-2 |

* Supply voltage according to EN 50 178 (safety extra-low voltage)

### Sensor data

| | |
|---|---|
| Singleturn technology | magnetic 2 axis Hall sensor |
| Singleturn resolution | up to 4096 steps / revolution ( 12 Bit ) |
| Singleturn accuracy | ± 0.35° |
| Internal cycle time Singleturn | < 1 ms |
| Multiturn technology | self supplied magnetic pulse counter ( Wiegand Sensor ) |
| Multiturn resolution | Can measure up to 200 Billion revolutions |

### Environmental Conditions

| | |
|---|---|
| Operating temperature sensor (*) | - 30 ... + 85 °C ( -22 …+185 °F ) |
| Storage temperature (*) | - 30 ... + 85 °C ( -22 …+185 °F ) |
| Humidity | 98 % ( without liquid state ) |
| Protection Class (EN 60529) | Casing side: IP 54 ( moulded : SCM-…-CAW )<br>Casing side: IP 64 ( other types : SCM-…-PAM and SCM-…-GAW ) |
| | Shaft side: IP 64 |

(*) Please also refer temperature range of cable

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**Mechanical data**

| | |
|---|---|
| Housing | nickel-plated steel housing |
| Flange | Aluminum |
| Shaft | stainless steel |
| Lifetime | Dependent on shaft version and shaft loading – refer to table |
| Max. shaft loading | axial 40 N, radial 110 N |
| Inertia of rotor | ≤ 30 gcm$^2$ ( 0.11 oz-in$^2$ ) |
| Friction torque at + 25°C | ≤ 3 Ncm ( 2.8 oz-in ) |
| RPM (continuous operation) | max. 12.000 RPM |
| Shock (EN 60068-2-27) | ≤ 100 g ( half sine, 6 ms ) |
| Permanent shock (EN 60028-2-29) | ≤ 10 g ( half sine, 16 ms ) |
| Vibration (EN 60068-2-6) | ≤ 10 g (10 Hz ... 1,000 Hz) |
| Weight (standard version) | ≈ 150 g ( 0.33 lbs ) including cable |

**Minimum (mechanical) lifetime**

| Flange | | Lifetime in $10^8$ revolutions with ( $F_a/F_r$ ) | | | | | |
|---|---|---|---|---|---|---|---|
| S6 Synchro flange | (SCM-…-S060-…) | 224 | ( 20N/20N ) | 28 | ( 20N/40N ) | 3 | ( 20N/80N ) |
| C100 flange | (SCM-…-C100-…) | 247 | ( 40N/60N ) | 104 | ( 40N/80N ) | 40 | ( 40N/110N ) |

**Cable (*)**

| | |
|---|---|
| Operating temperature cable | flexing -5°C to +70°C ( +23 ... +158 °F )<br>static -30°C to +70°C ( -22 ... +158 °F ) |
| Minimum bend radius | flexing 10x cable diameter<br>static 5x cable diameter |
| Cable | approx 6 mm (~0.236 in) ∅ / type : LIYCY 4x2x0.14 |

(*) Valid for types: SCM-…-CAW and SCM-…-GAW

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## Interface

### Configuration

The standard configuration of the encoder is: node number 32 and baud rate 20 KBaud. For adapting the encoder for a respective application the customer could use SDO telegrams. Valid baud rate range is 20 kBaud up to 1MBaud and node numbers from 0 to 127.
**Remark: The encoder adds internal 1 to the adjusted node number.**

### Electrical interface

The standard connection is a cable with a RJ45 connector. 5 pin circular plug M12 and cable exit are available too (For pin assignment see table below).

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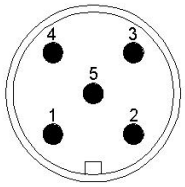
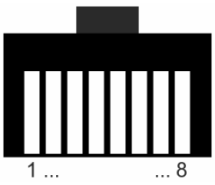
### Connection plan

| Function | Wire end | Connector Pin RJ45 | Connector Pin M12 |
|---|---|---|---|
| Can High | white | 1 | 4 |
| Can Low | brown | 2 | 5 |
| Can-GND | green | 3 | 1 |
| GND | yellow | 4 | 3 |
| + $U_b$= 10-30 V | red | 8 | 2 |

### Connectors (front view)

| **M12 Connector**<br>SCM-XXXX-XXXX-XXXX-PAM | **Axial Cable Exit (*)**<br>SCM-XXXX-XXXX-XXXX-CAW |
|---|---|
|  |  |
| 5 pin M12 connector male | RJ45 Connector |

(*) A RJ45 Connector is mounted on the cable end for the CAW version. This connector can be used for test purposes also for custom installation. Do not connect to any Ethernet network, devices may be damaged!

**Programmable Encoder - Parameter**

| | |
|---|---|
| Operating Parameters | This parameter determines the counting direction, in which the output code increases or decreases. As an important operating parameter the code sequence (complement) can be programmed. |
| Resolution per Revolution | The parameter resolution per revolution is used to program the desired number of steps per revolution. |
| Total Resolution | This parameter is used to program the desired number of measuring units over the total measuring range. This value may not exceed the total resolution of the absolute rotary encoder. If the encoder is used in a continuous measuring application, certain rules for the setting of this parameter must be followed. These rules are outlined in the manual. |
| Preset Value | The preset value is the desired position value, which should be reached at a certain physical position of the axis. The position value is set to the desired process value by the parameter pre-set. |
| Limit Switch,<br>Min. and Max. | Two position values can be programmed as limit switches. By reaching these values one bit of the 32-bit process value is set to high. |
| Cam | Eight position values can be programmed as cams. By reaching these values bits in object 6300h Cam state register are set. |

**Programmable CAN Transmission Modes**

| | |
|---|---|
| Polled Mode | By a remote-transmission-request telegram the connected host calls for the current process value. The absolute rotary encoder reads the current position value, calculates eventually set-parameters and sends back the obtained process value by the same identifier. |
| Cyclic Mode | The absolute rotary encoder transmits cyclically - without being called by the host - the current process value. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms. |
| Sync Mode | After receiving a sync telegram by the host, the absolute rotary encoder answers with the current process value. If more than one node number (encoder) shall answer after receiving a sync telegram, the answer telegrams of the nodes will be received by the host in order of their node numbers. The programming of an offset-time is not necessary. If a node should not answer after each sync telegram on the CAN network, the parameter sync counter can be programmed to skip a certain number of sync telegrams before answering again. |

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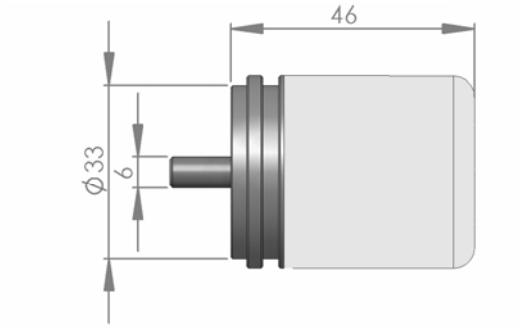
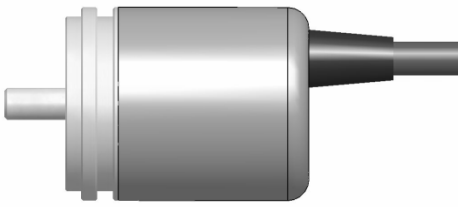
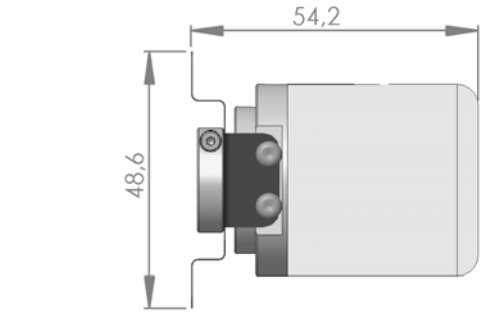
## Mechanical Models

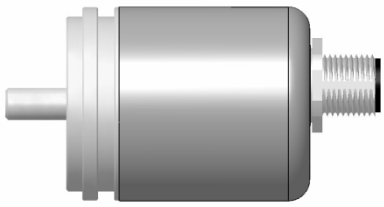
For more detailed mechanical drawing contact us

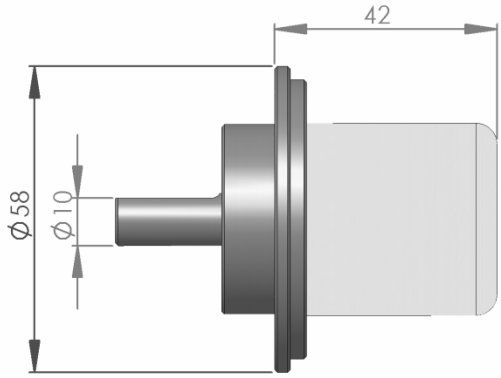
| Flange Types | Housing and Connector Types |
|---|---|
| Synchro Flange<br>SCM-XXXX-XXXX-S060-XXX | Axial Cable Exit<br>SCM-XXXX-XXXX-XXXX-CAW |
| Blind Hollow Shaft<br>SCM-XXXX-XXXX-B060-XXX | M12 Connector<br>SCM-XXXX-XXXX-XXXX-PAM |
| Clamp Flange<br>SCM-XXXX-XXXX-C100-XXX | Axial Cable Exit with Gland<br>SCM-XXXX-XXXX-XXXX-GAW |








All units measured in [mm]

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## Models / Ordering Description

**Description**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Magnetocode | **SCM-** | _ _ | **00** | **B** - | _ _ | _ _ - | _ | _ _ | 0- | _ _ _ |
| Interface and Version | CANopen | **CA** | | | | | | | | |
| | CANopen lift (DSP417) | CL | | | | | | | | |
| Current Version | CA | | **00** | | | | | | | |
| | CL | | 00 | | | | | | | |
| Code | Binary | | | | | | | | | |
| Bits for Revolutions | Single turn | | | | 00 | | | | | |
| | Multi turn (4096 turns) | | | | 12 | | | | | |
| | Multi turn (32768 turns) | | | | **15** | | | | | |
| Steps per revolution | 4096 | | | | | **12** | | | | |
| Flange | Synchro flange (6mm shaft diameter) | | | | | | **S** | **06** | | |
| | Blind hollow shaft (6mm shaft diameter) | | | | | | B | 06 | | |
| | 58mm Clamping Flange (10mm shaft diameter) | | | | | | C | 10 | | |
| Shaft diameter | 06 mm (Flange S and B) | | | | | | | | | |
| | 10 mm (Flange C) | | | | | | | | | |
| Mechanical options | Without | | | | | | | | **0** | |
| | Customized | | | | | | | | C | |
| Connection | Cable exit, axial 1m, moulded | | | | | | | | | **CAW** |
| | Cable exit, axial 1m, with cable gland | | | | | | | | | GAW |
| | Connector 5pol M12 | | | | | | | | | PAM |

**Standard = bold**, further models on request

**Ordering example:**

SCM-CA00B-1512-S060-CAW

**Accessories**

| Article No | Article | Description |
|---|---|---|
| 34050515 | PAM5 | Female cable connector M12x1 5pin A-coded for SCM-…-PAM |
| 10001978 | PAM5 2m | Connecting cable PAM5 2m shielded for SCM-…-PAM |

**Disclaimer**

## APPENDIX

**Same Encoder Series also available with SSI.**

**… or combined with a draw wire adapter to perform linear measurements.**