CARLEN

Magnetostrictive Linear Position Sensors
Model series CHM/CPM with CANopen - interface

CANopen®

- ■ **Model CPM: Profile version**
- ■ **Model CHM: Rod version**
- ■ **Measuring strokes from 25 to 7600 mm**
- ■ **Contactless, robust system**
- ■ **Resolution up to 1 µm**
- ■ **Linearity better than 0.01 %**
- ■ **4 positions measurable simultaneously**

- ■ **CANopen interface according to encoder profile DS-406/3.1**
- ■ **Transmission rate up to 1 MBaud**
- ■ **Parameterisable via the bus**
- ■ **Protection types up to IP 68**
- ■ **Operating temperature range -40 °C ... +85 °C**
- ■ **Rod version pressure stability up to 350 bar**

Structure and operation

The displacement transducers operate according to the principle of run time measurement between two points of a magnetostrictive waveguide. One point is determined by a moveable position magnet, whose distance from the null point corresponds to the section to be measured. The run time of an emitted impulse is directly proportionate to this section. Conversion to a measuring signal takes place in the downstream electronics.

The waveguide is housed in a pressure-resistant stainless steel tube or extruded profile. To the rear of this is a die-cast aluminium housing containing the electronics in SMD technology.

In the rod version, the position magnet is located in a ring, which is guided over the rod without contact. In the profile version, it is located either in a slider, which is linked to the moving part of the machine via a ball joint, or it moves as a liftable position magnet, without wear, over the profile.

Standard measuring strokes

- □ Up to 1000 mm in 50 mm steps
- □ Up to 5000 mm in 250 mm steps (profile version: CPM)
- □ Up to 7600 mm in 250 mm steps (rod version: CHM)

Characteristics of CANopen

The CXM magnetostrictive displacement transducers correspond to encoder profile DS-406/3.1 (CANopen standard DS-301/3.0) and can be connected directly to the field bus. Their measured data are converted to displacement-proportionate, bus-capable output signals in the sensor and are transmitted directly to the CANopen master.

Properties from CANopen

The CAN interface is designed for serial data transmission of max. 1 MBaud according to CAN standard ISO 11898. In addition to useful data transmission via PDO (Process Data Object), the CANopen protocol supports extensive monitoring and diagnostic functions via SDO (Service Data Object), which can be configured via the EDS file on installation.

Displacement transducer output data

The displacement transducer supplies a freely-configurable data block (PDO) of max. 8 bytes. This provides the following data as default:

- Position (32-bit integer value)
- Speed (16-bit integer value)
- Status of the 4 limit values (1 byte)

Each displacement transducer provides four PDOs. PDO1 to PDO4 correspond to magnets 1 to 4.

Selectable parameters per magnet

- Preset
- Operating range
- 4 limit values

Operating modes

Like programming the parameters, the operating modes are selected via the SDOs. The following settings are possible:

Asynchronous: Independent data transfer in a selectable cycle from 1 - 65535 ms

Synchronous: Data transfer following request (SYNC message) by the control system

Node address and baud rate setting

Each CARLEN sensors with CANopen interface has an LMT address, via which clear assignment in the CAN network is guaranteed. This is comprised of the CARLEN manufacturer ID, the product ID and the serial number. The node address and baud rate are set via the LMT service. The default settings are:

- Baud rate: 125 kBaud
- Node address: 127

EDS file

The EDS file - for integrating the sensor into CANopen project planning software - and the CANopen manual in PDF format are contained on the enclosed diskette.

Diagnosis

The LEDs (green/red) in the sensor head are used for adjustment and additionally provide information on the sensor status.

Green	Red	Meaning
On	Off	Normal function
On	On	Magnet not detected or incorrect number of magnets
Off	On	Initialisation error
Flashing	Flashing	Operating voltage not in the specified range

Blockdiagram
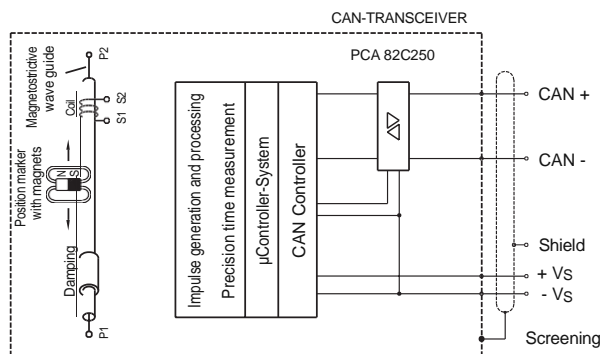
Technical data

- Supply voltage range V_S: 24 VDC (+20 / -15%) Polarity reversal protection
- Supply current I_S: 90 mA (typical)
- Resolution:

Displacement in µm	2	5
Speed in mm/s	0.2	0.5

- Linearity 0.01% (min. 40 µm)
- Repeatability: < 0.001% (min. 1.0 µm)
- Hysteresis: < 4 µm
- Temperature drift: < 15 ppm / °C
- Meas. cycle time (appr.): 1 ms to 2400 mm
  2 ms to 4800 mm
  4 ms to 7600 mm
  meas. length

- Op. temperature range: - 40 °C to + 85 °C
- Dew point, humidity: 90% rel. humidity, no condensation
- Shock test: 100 g to IEC Standard 68-2-27
- Vibration test: 15 g / 10 to 2000 Hz to IEC Standard 68-2-6
- Protection type
  □ Profile IP 65
  □ Rod IP 67, IP 68 with cable outlet
- Op. pressure for rod: Max. 350 bar
- EMC test: EN 50081-1, EN 50082-2, EN 61000-4-2/3/4/6

- **Output:**
- Interface: CAN to ISO-DIS 11898
- Protocol: CANopen (encoder profile)
- Signal transmission: Differential signal as per RS485
- Transmission rate: Max. 1 MBit/s
- Default address: 127
- Default baud rate: 125 kBaud
- **Mating connector:**
- Connection type: 6-pin connector M16
- Housing: Nickel-plated die-cast zinc (straight or angled 90°)
- Contacts: Socket, Ag
- Wire connection: Soldering
- Wire cross-section: Max. 0.75 mm²
- Cable strain relief: Pg 7 or Pg 9
- Max. cable diameter: 6 mm (Pg 7), 8 mm (Pg 9)
- Protection type: IP 67

Multi-magnet measurement

CANopen sensor MXN enables 4 positions to be measured simultaneously. Please note that the distance between the individual magnets must be at least 75 mm in this case.
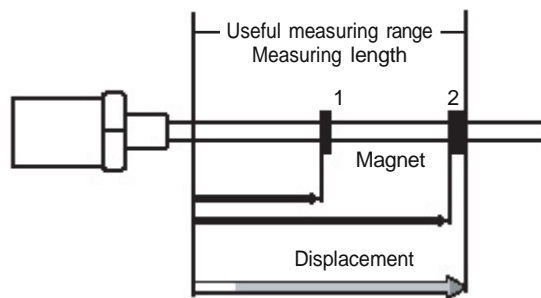
Electrical connections

Socket

Mating connector on soldered connection side

Pin	Wire	Signal
1	gray	CAN -
2	pink	CAN +
3		not connected
4		not connected
5	brown	+ V_S (+ 24 VDC)
6	white	- V_S (0 VDC)

Baud rates and cable lengths

Baud rate [kBaud]	10	20	50	125	250
Cable length max. [m]	5000	2500	1000	500	250

Baud rate [kBaud]	500	800	1000
Cable length max. [m]	100	50	25

Order code format

■ Displacement transducer

CHM M /1000 S 002 - 1 60 01

Electrical and
mechanical variants*

60 = Connector M16

No. of poss. magnets**

Displacement resolution in µm***

Signal curve:
S = positively ascending on
movement from the flange
towards rod end
(With CANopen always S)

Measuring stroke in mm CHM

Design

CHM (rod):

M = With threaded connection
M 18 x 1.5
S = With threaded connection
16 UNF ¾ "

CPM (profile):

1 = Position slider
Central ball joint
2 = Position slider
Front ball joint
3 = Liftable position
magnet

Model

CPM = Profile version
CHM = Rod version

* The basic versions according to the data sheet bear the number
01. Deviations are identified with a variant number and are
documented in the factory.

** CARLEN sensors with CANopen interface are basically designed
for measuring 4 positions. However, they may also be operated with
one magnet.

*** The displacement and speed resolutions cannot be set via
CANopen. The resolution desired for displacement must
be specified on ordering and therefore also determines the
resolution for speed.

Cable outlet and version with two M16 connectors or 2 x 5 pin
M12 + 4 pin M8 - connectors on request.

Scope of delivery:

Rod: Sensor, nut (order magnet separately)
Profile: Sensor, 1 position magnet, 2 mounting clamps up
to 1250 mm + 1 clamp for each additional 500 mm.

The scope of delivery includes a CD with the EDS file and a
CANopen manual in PDF format.

Accessories

■ Position magnets for MSN

CPR02   Standard position ring (ø 33 mm)
CPR03   Liftable position magnet

■ Position magnets for MPN

CPS01   Position slider, central ball joint
CPS02   Position slider, front ball joint
CPR03   Liftable position magnet

■ Straight mating connector, order separately

CSTK6GS42   Pg 7
CSTK6GS47   Pg 9

■ 90° angled mating connector, order separately

CSTK6WS43   Pg 7
CSTK6WS51   Pg 9

■ Installation material

CMB-MP-01   Mounting clamps for profile version
CNT-MP-01   M5 sliding block for profile version
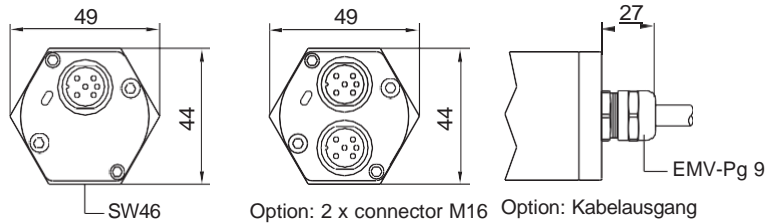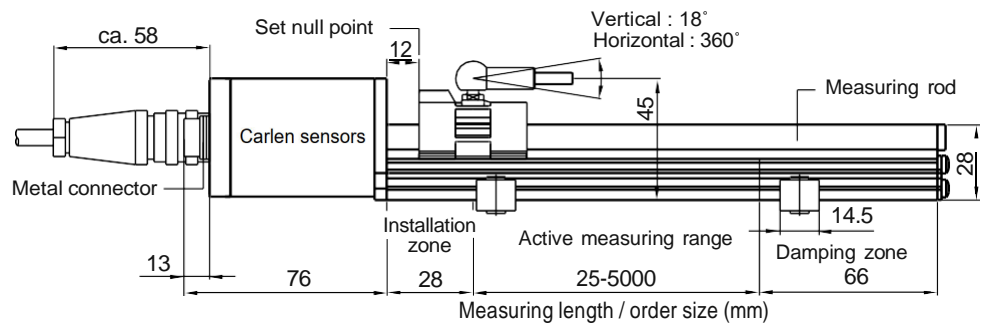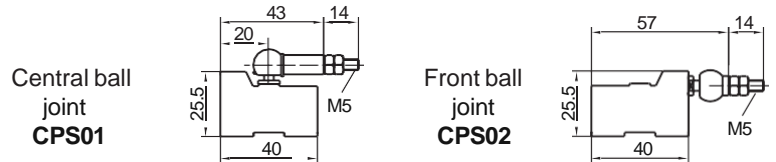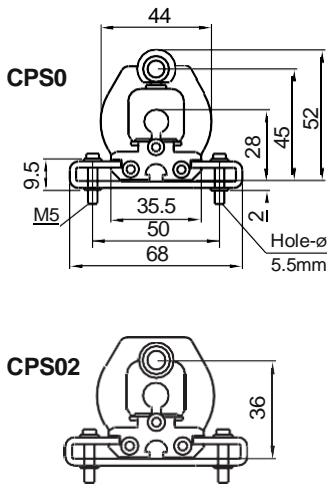
Dimensions in mm

Modell: CHM (rod version)
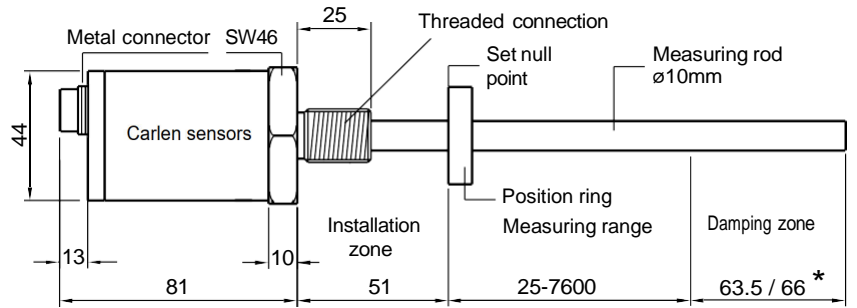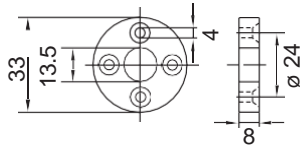
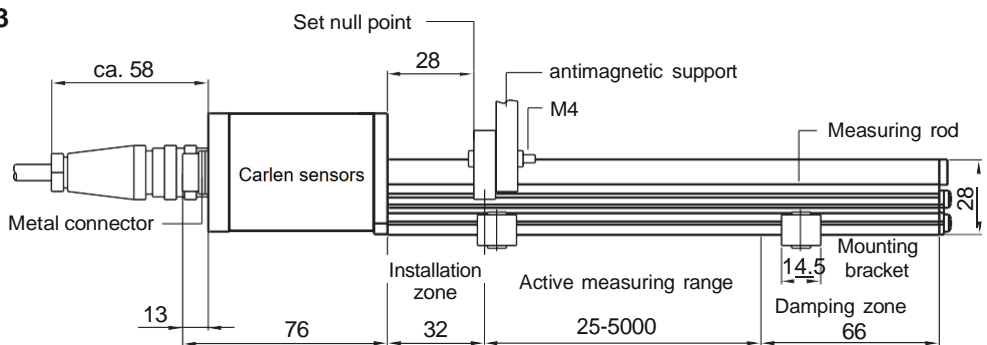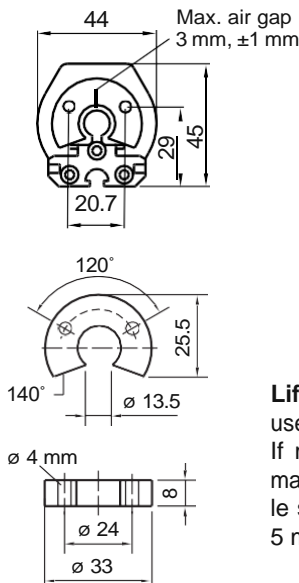With measuring strokes of 1000 mm and over, mechanical rod support is recommended.

The sensor's fastening should be manufactured from non-magnetic materials (e.g.: brass, plastic). Note installation instruction **MWA22318** on installation in magnetisable materials.

Metal connector SW46 — 25 — Threaded connection
Set null point
Measuring rod ø10mm
44
Carlen sensors
13 — 10 — Position ring
81 — 51 — Installation zone — Measuring range — Damping zone
Measuring range 25-7600
Damping zone 63.5 / 66 *

* Measuring lenght > 5000 mm

49 — 44 — SW46
49 — 44 — Option: 2 x connector M16
27 — EMV-Pg 9 — Option: Kabelausgang

Modell: CPM (profile version)

CPS0
44
52
45
28
9.5
M5
35.5
50
68
2
Hole-ø 5.5mm

CPS02
36

Central ball joint **CPS01**
43 — 14 — 20 — 25.5 — M5 — 40

Front ball joint **CPS02**
57 — 14 — 25.5 — M5 — 40

ca. 58
Set null point
Vertical : 18°
Horizontal : 360°
Measuring rod
12
45
28
Carlen sensors
Metal connector
13 — 76 — 28 — 25-5000 — 14.5 — 66
Installation zone — Active measuring range — Damping zone
Measuring length / order size (mm)

Liftable position magnet CPR03

44
Max. air gap 3 mm, ±1 mm
45
29
20.7

120°
25.5
140°
ø 13.5

ø 4 mm
8
ø 24
ø 33

ca. 58
Set null point
28
antimagnetic support
M4
Measuring rod
28
Carlen sensors
Metal connector
13 — 76 — 32 — 25-5000 — 14.5 — Mounting bracket
Installation zone — Active measuring range — Damping zone 66

Liftable position magnet: Wherever possible, use non-magnetisable material for fastening this. If magnetisable material is used, the position magnet must be mounted via a non-magnetisable spacer washer with a minimum thickness of 5 mm using non-magnetisable bolts.
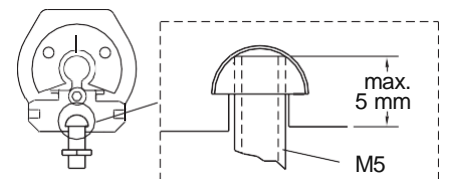
max. 5 mm
M5
Sliding block: Studded nut in T slot

Note: On installation of the CARLEN SENSORS, careful shielding from magnetic and electromagnetic fields must be ensured. The cable shield must be mounted on the connector and connected to ground at the evaluation electronics. All data sheets and manuals are also available in the Internet under **carlen-sensors.de**