

# Data Sheet

## C-Series M1-Sensor Analog

Magnetostrictive Linear Position Sensors

Document Part No.  
551401 Revision B

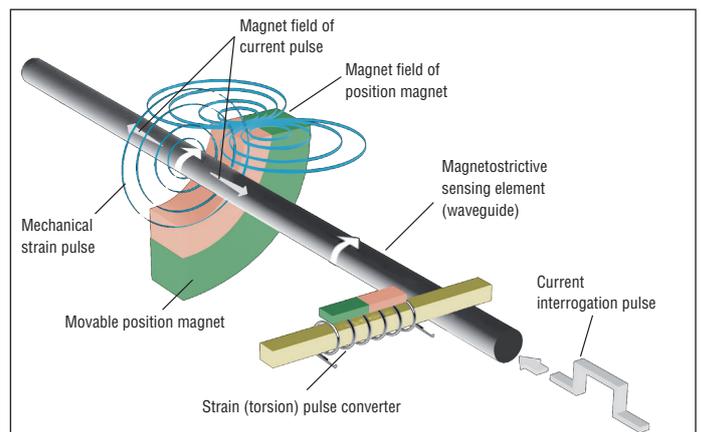


- Contactless measurement – entirely wear-free
- Low weight – ideal for small portable OEM products
- Cost-efficient
- Space-saving
- Low energy requirement – can be operated from 5 VDC or 12 VDC supply
- No need for periodic re-adjustment
- Available with various position magnets
- Optional: direct or inverse analog output signal
- Optional: assignment of output signal to measuring length

**The sensor is a function of the customer requirements according to the application, and considering the environment, environmental influences, including EMC protection effects.**

### Measuring technology

The absolute Temposonics linear position sensors are based on the proprietary magnetostrictive measuring principle. This combines various magneto-mechanical effects and uses the physically exact velocity measurement of an ultrasonic wave (torsion pulse in its sensor element) for position detection. The sensor-integrated signal processing converts the measured values directly into commercially available outputs. The non-contact principle - an external moving magnet marks the position - eliminates the problems of wear, noise and false signals and guarantees best durability without recalibration.



### Technical data

#### Input

Measured value:	Position
Stroke length:	72, 109, 128, 148, 162, 186, 194, 217, 250 mm

#### Ausgang

Voltage:	0.1 - 4.9 VDC
Resolution:	analog output signal
Signal without magnet:	not specified
Features:	At 5 VDC operating voltage output is ratiometric to operating voltage

#### Accuracy

Linearity:	±0.15 mm by means of magnet 401842, between 5 % and 95 % of stroke length
Zero tolerance:	±1 mm
Hysteresis:	±25 µm
Repeatability:	±25 µm
Temperature coefficient:	±0.005 % per °C
Update time:	500 Hz (2 ms)

#### Operation conditions

Operating temperature:	-40 °C...+75 °C (+105 °C after consulting Temposonics)
Storage temperature:	-40 °C...+85 °C

#### Pressure

up to 2500 m altitude  
 Operating pressure: Ø 8 mm rod  
 Pn: 250 bar, Pmax: 325 bar

#### IP Protection

IP69K (plugged)  
 6 - DIN 40 050 Part 9 – Protection against foreign bodies: Dustproof, complete protection against contact  
 9K - DIN 40 050 Part 9 – Protection against water: At high pressure / steam cleaning, connected condition

#### Environmental testing

Shock test:	IEC-68-2-27 100 g (11 ms) → Single hit 50 g (11 ms) 1000 Shocks per axis
Vibration test:	IEC 68-2-6 (10...2000 Hz) 15 g Sinus (resonance frequencies excluded)
EMC-test:	Electromagnetic emission EN 61000-6-4 CISPR 16-2-3 – Disturbance field strength (measuring distance 3 m) CISPR 16-2-1 – Disturbance current (DC voltage supply) Electromagnetic immunity EN 61000-6-2 EN 61000-4-2 – Electrostatic discharge (ESD) EN 61000-4-3 – Radiated electrosolenoidic radio frequency, free radiated EN 61000-4-4 – Electrical fast transient (Burst) EN 61000-4-5 – Surge EN 61000-4-6 – Conducted radio-frequency, line guided EN 61000-4-8 – Power frequency solenoidic field

**The sensor is a function of the customer requirements according to the application, and considering the environment, environmental influences, including EMC protection effects.**

#### Form factor, material

Housing:	Stainless steel 1.4305 (AISI 303)
Protective tube:	Stainless steel 1.4306 (AISI 304L)

#### Electrical connection

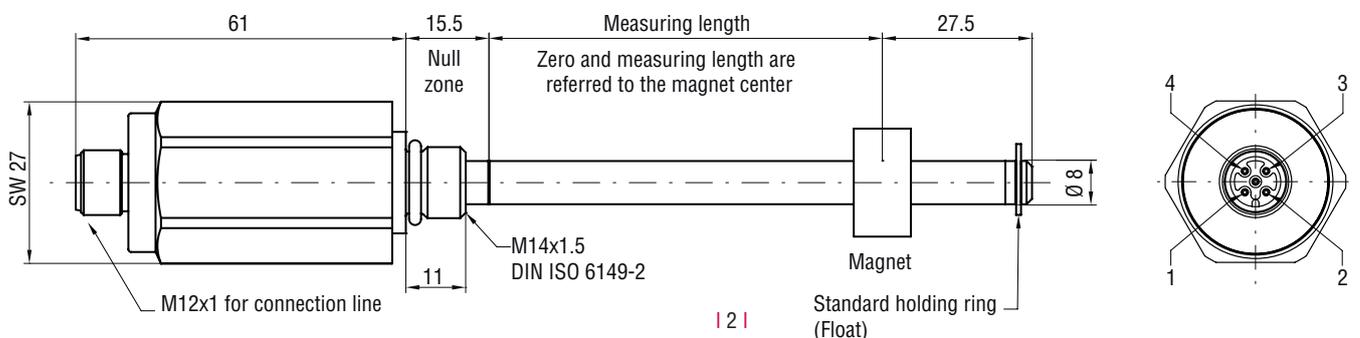
Supply voltage:	CS: 5 VDC (tolerance range 4.75 - 5.5 VDC), CM: 12 VDC (tolerance range 9 - 15 VDC)
Max. power consumption:	max. 40 mA
Output load:	analog: > = 10 kΩ
Overvoltage protection:	CS: up to 19 VDC short term CM: up to 29 VDC short term
Polarity protection:	VDC - GND

Pin	Signal
1	Supply voltage
2	Output voltage
3	DC Ground
4	

Operating voltage quality:	CS: 5 VDC	CM: 12 VDC
Load control:	±0.1 %	±0.15 %
Grid control:	±0.05 %	±0.05 %
Ripple:	< 50 mVpp	< 100 mVpp

for Ua at Ia 0 - 100 %  
 for Ua at Uemin - Uemax

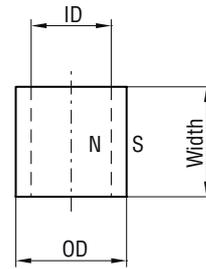
#### Mechanical connection



**Accessories**

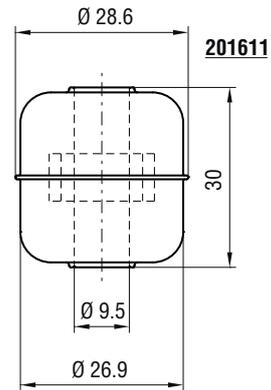
**Ring magnet**

Description	Article No.	Inside Ø	Outside Ø	Width
Ring magnet 19.3 mm	400 424	19.3 mm	28 mm	4.9 mm
Ring magnet 13.5 mm	254 012	13.5 mm	20 mm	10.5 mm

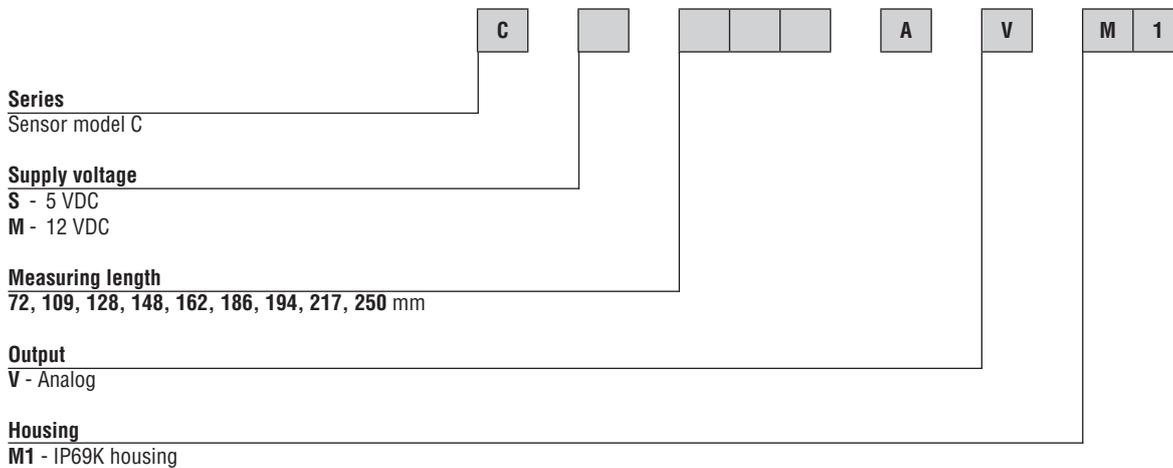


**Float**

Description	Article No.	Inside Ø	Outside Ø	Width
Float 1	201 611	9.5 mm	28.6 mm	30 mm



**Temposonics® order code**



**Example:**  
CM186AVM1

Sensor model C - Supply voltage 12 VDC - Measuring length 186 mm - Output analog - IP69K housing

**Magnet and float options (An additional quantity of 1 unit per sensor should be ordered)**

Description	Function	Article No.
Ring magnet 19.3 mm	optional after approval for applications requiring a magnet with more clearance	400 424
Ring magnet 13.5 mm	optional after approval for applications requiring a magnet with more clearance	254 012
Float 1 with magnet	optional after approval for applications	201 611

## Application examples:

The target in customer solutions is a high degree of efficiency and synergy to the product. During the design phase measurements need to be taken which enable the product to meet customer requirements suitable for the application.

In this respect, close cooperative partnership between the customer and Temposonics is desirable.

All constructive measures relating to operating parameters (vibration, temperature and ESD) require consultation with Temposonics. This also includes the CE marking of components used for installation.



### Level measurement in medical technology

An analyser for immunodiagnostics applications uses magnetostrictive level sensors in containers to monitor the levels of consumables and of the collected waste products of the analysis. Through continuous measurement, it is always known how much fluid is in the containers. This enables continuous reloading without interruption of the analysis and anticipatory planning.



### Increased dosing accuracy, reduced consumption

The dosing accuracy during preparation of damping solution and precise control of the IPA concentration are of considerable importance for the production and process stability in printing systems. The continuous discussion relating to the toxic load of the ambient air at work places and the need for cost reduction in printing companies also requires further reduction of isopropyl alcohol in the damping solution. The Temposonics® OEM-sensor plays an important part for dosing of damping solutions and thus for decreasing the overall costs.



### Position feedback in process measurement and control systems

The valve position feedback combines well-proven sensor technology and state-of-the-art design for optimized applications. Our development activity focused on the requirements and wishes expressed by our customers in the liquid processing industry.

In addition to safe control and monitoring of all functions of process valves in breweries, dairies, facilities for production of fruit juice and production plants in the pharmaceutical industry, the C-Series provides a high degree of efficiency.



### Position feedback in steering systems

The customer-specific sensors are used to monitor the steering position of rear drives and to provide position feedback. Based on the linear C-series position sensor, these sensors are equipped with a special housing, which was developed by the end user and realized by Temposonics. The sensors measure the stroke of steering cylinders on the port side and the bow side. Typically installed in multi-engine boats, the boat control system uses the sensor signal to permit control of the boat movement using a joystick: A solution termed "Steer-By-Wire".



### Cabin suspension

To reduce the human vibration, directive 2002/44/EC (human vibration directive) of the European Union has been implemented into national law in March 2007. This directive defines binding limit values (reference period of 8 hours < value 0.5 m/s<sup>2</sup>) for the hand-and-arm area as well as whole-body vibration values, which must not be exceeded.

These limit values are met by effectively reducing the induced vehicle vibration using C-series position sensors in a cabin suspension system. The cabin suspension system permits reduction of the accelerations mainly in the Z axis. Due to this reduction, the vibration load acting on the driver is alleviated considerably, without affecting driving experience and operability.

Document Number: 551401 Rev. B (EN) 09/2013

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## UNITED STATES

Temposonics, LLC

Americas & APAC Region

3001 Sheldon Drive

Cary, N.C. 27513

Phone: +1 919 677-0100

E-mail: [info.us@temposonics.com](mailto:info.us@temposonics.com)

## GERMANY

Temposonics GmbH & Co. KG

EMEA Region & India

Auf dem Schüffel 9

58513 Lüdenscheid

Phone: +49 2351 9587-0

E-mail: [info.de@temposonics.com](mailto:info.de@temposonics.com)