CM SERIES | EDDY CURRENT SENSOR

Ultra-compact sensors for monitoring dynamic machine components under high pressure and temperature conditions.

- contactless distance measuring under high pressure and temperature conditions

- shielded sensor for universal usability on limted space

- ceramic housing ensures high resistance even under high temperature

- ultra compact sensors for a best application compatibility

- pressure up to 200 bar

- monitoring of combustion engines

eddylab

The CM Series are eddy current sensors, excellent for use in harsh industrial environments under high pressure and temperature conditions. The ceramic housing can be used as the pressurised component, there is no extra housing needed. All CM sensors are shielded. The combination of shielded coil and ceramic housing guarentees an universal use in limited space of machine parts. Measuring of lubrication gap of crankshafts is a typical application for the CM series.

THE BASIC PRINCIPLE

The principle of measurement bases on a DSP-driven oscillating circuit made up of the probe (inductance) and a interconnect capacitance. This circuitry is attenuated in the presence of metallic objects. The oscillating circuit generates magnetic field lines - these induce eddy currents on the surface of conductive objects. The eddy currents counteract their cause and attenuate the amplitude of the oscillating circuit. This effect is decoupled from the oscillating circuit and fed towards further signal processing.

APPLICATIONS

The new miniature ceramic sensors are especially developed for monitoring high dynamic movement of mechanical machine components, motors and other technical facilities. The installation is the greatest challenge for the use of minimized sensors. For the CM series it is not necessary to remove disturbing conductive material in the area of the sensor head. The installation hole can be a simple bore. This is a big advantage of CM series compared to other eddy current sensors. Due to high strength of the housing material, the CM sensor are optimised for use under high pressure and temperature conditions.
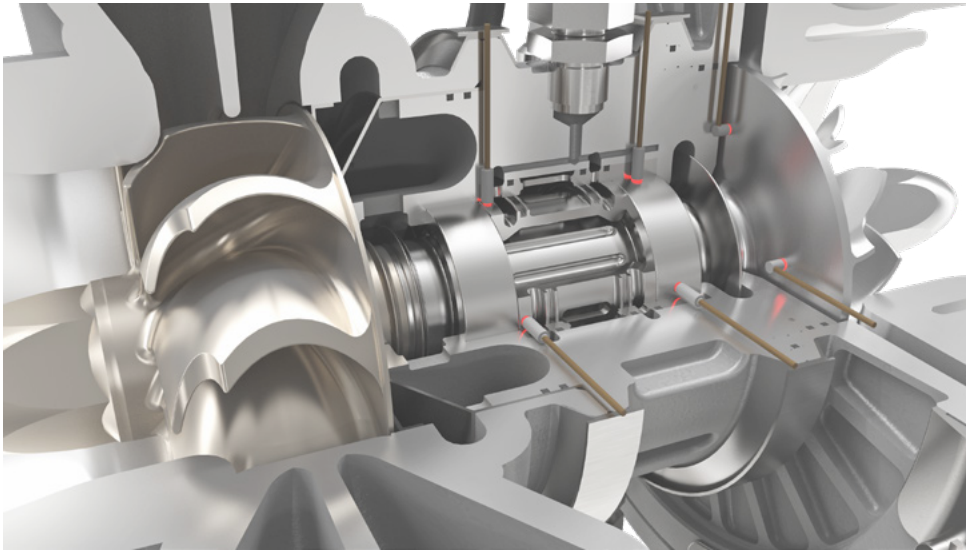
Inside the turbocharger, the eddylab sensors detect the exact position of the compressor wheel under real conditions, in order to optimise the complete system.
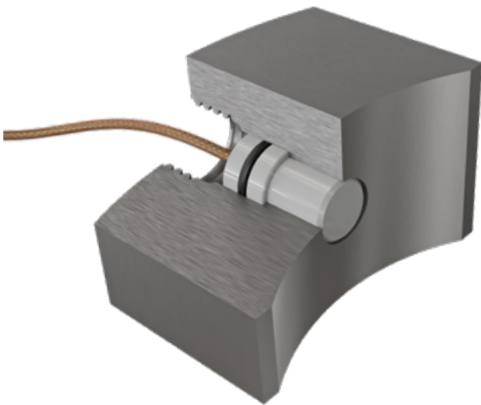
The mini ceramic sensors of the CM series – No need of extra space at the installation point!

Miniature model from ø 3.2 mm

TECHNICAL DATA − SENSORS

PROBE	CM03	CM05	CM1	CM2
range [mm]	0...0,3	0...0,5	0...1	0...2
pressure resistant front side	200 bar	100 bar	100 bar	70 bar
housing size [mm]	ø4	ø6	ø7,5	ø8,6
offset gap (blind range)		~ 0.01 mm		
linearity		± 0,15 % of range		
resolution reg. corner frequency [% FS]*10 Hz		dependent on the distance, valid for middle of range		
100 Hz	0,02	0,006	0,01	
1 kHz	0,04	0,008	0,015	
10 kHz	0,2	0,021	0,035	
35 kHz	0,3	0,075	0,061	
	0,35	0,101	0,088	
temperature range sensor		-60...185°C		
temperature coefficient sensor		dependent on distance		
sensor cable PTFE-COAX	ø0,8 mm	ø1,8 mm		
cable length		3 m / customised length on request		
min. bend radius static/dynamic	3/8 mm	6/18 mm		
temperature range cable		-55...+200 °C		
connection		BNC connector / optional SMB connector		
protection class sensor		IP68		
vibration		20 g, DIN EN 60068-2-6		
shock		100 g / 6 ms, DIN EN 60068-2-27		
check resistance [Ω]		n.a.		
housing material		sensor head ceramics		

* 98,5 % 98.5% confidence interval (confidence limit), middle of range as % of range. Resolution dependent on the distance.

# CABLE CONFIGURATION

By default the probes have a BNC plug for the connection at the TX-Driver. Optionally the probes are equipped with a SMB connector. The SMB connection is either performed as BNC-SMB adapter (Version 1).

Please note:
The SMB connectors have beryllium copper contacts. The connector housing is gold plated and has an outer diameter of 6.5 mm. This facilitates the installation in particular with narrow conditions (Version 1).

It is recommended to avoid unnecessary connections within the cable as it increases the probability of failure due to environmental influences such as wetness, dirt, aggressive media, massive vibration or shock.
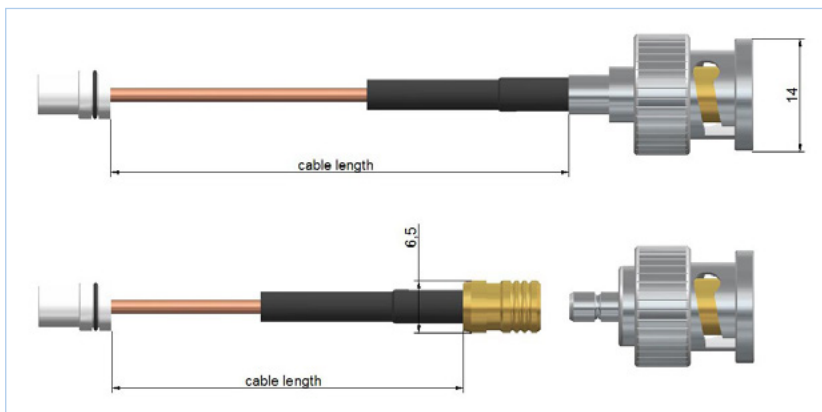
STANDARD VERSION
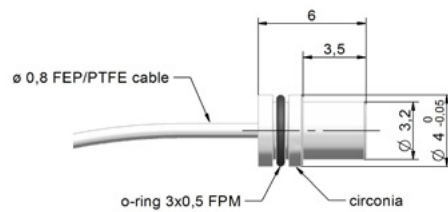- probe with BNC connector
- cable length 3 m (standard)*

VERSION 1
- probe with SMB connector
- cable length 3 m (standard)*
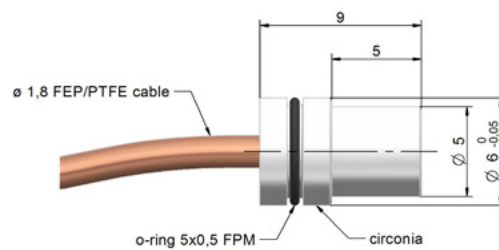- BNC-SMB adapter for eddy current basic module

* For further information about the eddy current basic module TX please refer to the datasheet „TX Series - eddy current probes".

TECHNICAL DRAWINGS – SENSORS

■ TYPE CM03

ø 0,8 FEP/PTFE cable
6
3,5
Ø 3,2
Ø 4 0 -0,05
o-ring 3x0,5 FPM
circonia

■ TYPE CM05

ø 1,8 FEP/PTFE cable
9
5
Ø 5
Ø 6 0 -0,05
o-ring 5x0,5 FPM
circonia

■ TYPE CM1

ø 1,8 FEP/PTFE cable
9
5
Ø 6,4
Ø 7,5 0 -0,05
o-ring 6x1 FPM
circonia

■ TYPE CM2

ø 1,8 FEP/PTFE cable
9
5
Ø 7,6
Ø 8,6 0 -0,05
o-ring 7x1 FPM
circonia
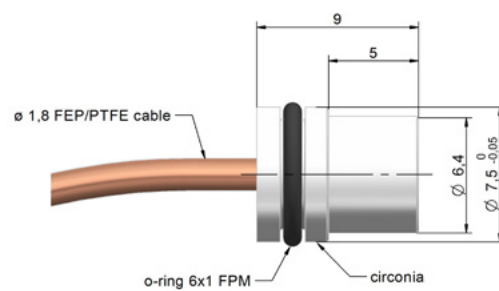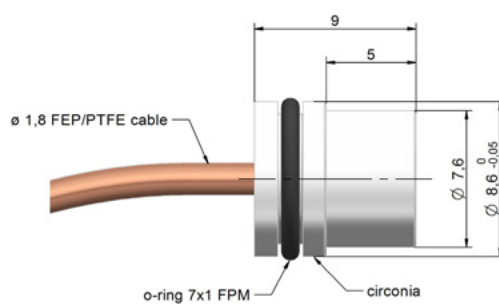
INSTALLATION

◼ ELECTRICAL INSTALLATION

Choose a dry location, preferably with a stable temperature for the electrical installation (TX-Driver) such as electrical cabinets,terminal boxes, housing, etc.
Connect the supply line, probe lines and output lines. Please ensure that all supply and signal lines are laid separately from energy-carrying lines such as supply and discharge lines from converters and drives, lines from ovens and synchronised appliances or generator lines, etc., in order to avoid malfunctions in the signal behaviour.
Please use shielded supply lines only and apply the shield to one side to avoid ground loops.
Please observe the correct assignment of the probes to the respective basic modules and channels. Each individual channel is aligned by the probe as a pair.

◼ PROBE INSTALLATION

Firstly, install the probe at the relevant installation location and affix the probe using jam nuts or clamp mechanisms. After you have installed the probe, lay the cable. Ensure that the cable is laid without dents and is not placed under stress. After you have laid the cable into place, do not turn the probe out of the thread, so as to prevent cable damage arising from stress. Secure excess probe cable as far away from temperature influences as possible, i.e. close to electronics. Never shorten the probe cable!

◼ OBJECT SIZE AND THE EDDY CURRENT MEASUREMENT FIELD

The sensing electromagnetic field (illustrated in red) is emitted elliptically from the probe and is greater than the probe head in terms of its spatial expansion. For standard-calibrated probes a surface with a target diameter 2-3 times greater than the probe head diameter is necessary for measurement. If the object is too small, only a part of the measurement field enters the material, and the output signal becomes larger. If the diameter is too small, the object appears to be further away from the sensor. A similar effect takes place in the case of round objects.

However, if other conductive objects collide with the sensing electromagnetic field the output signal is reduced due to pre-attenuation. The actual object appears to be closer to the probe. If this signal alteration is not desired, we provide a customer-specific linearisation for such applications. In this case, the probe is calibrated withinthe pre-attenuating environment. The measuring system will fulfill the standard specification. The object (shape, material) is documented in the calibration document.

PRECAUTIONS ⚠️

- ◼ **Never shorten the probe's coaxial cable. The probe, cable and electronic system form a coordinated oscillating circuit.**

- ◼ **Lay the cable so that it is protected and avoid running it along objects with sharp edges. A cable that has been squashed or damaged in another manner can tamper with the signal or render the probe unusable.**

- ◼ **Please note that the sensors have been aligned with the electronic system. The alignment can be found in the calibration record or on the label on the unit, identified by the serial number. Do not switch the channels.**

- ◼ **Avoid placing the cable under tensile or torsional stress. Never turn the probes in the holders inwards or outwards without first loosening the fastenings.**

- ◼ **Protect the plug connections in the coaxial line against humidity and wetness.**

- ◼ **The sensors may not be used in strong radioactive environment (nuclear power plant).**

ORDER CODE

◼ SENSORS

probe type			X	X	X
CM **a**		–	**b**	**c**	**d**

a **Measuring range**
03	=	0,3 mm
05	=	0,5 mm
1	=	1 mm
2	=	2 mm

b **cable length**
1	=	3M: 3 m

c **cable output**
1	=	BNC connector (standard)
2	=	SMB connector

d **others**
1	=	- (standard)

eddylab GmbH
Ludwig-Ganghofer-Str. 40, 83624 Otterfing

Telefon: +49 (0)8024 46772 - 0
FAX: +49 (0)8024 46772 - 100

E-mail: info@eddylab.de
Internet: www.eddylab.de