

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

EPRO

CON021

EDDY-CURRENT SIGNAL CONVERTER

Used with the applicable PR642x eddy-current measuring chains configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Emerson official manufacturer documentation

Machinery Health™ Sensor

CON 021 and CON 031, Converter for PR 642x Eddy Current Sensors



1 General

1.1 Using this manual

This manual contains information concerning the use of the device.

Read the operating manual completely prior to starting installation and operating the device. Comply with all safety instructions.

This operating manual applies for CON 021, CON 031, CON 021/..., and CON 031/... Converters with serial number 20xx/07-xxxxxx (hardware revision 07). See type plate for serial number.

Include the operating manual when transferring the device to third parties.

Note

When requesting technical support, please indicate type and serial number from the type plate.

Table 1-1 shows a list of documents that are referred to in this operating manual.

Table 1-1: Referenced documents

MHM-97866	Installation Guide PR642x, Eddy Current Sensors
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1.2 Symbols

Note

This symbol marks passages that contain important information.

⚠ CAUTION

This symbol marks operations that can lead to malfunctions or faulty measurements, but will not damage the device.

⚠ DANGER

A danger indicates actions that can lead to property damage or personal injury.

	According to IEC 61010, this symbol means that this device must be operated with DC voltage.
	According to IEC 61010, this symbol means that the documentation of the device must completely be read and understood before installing and commissioning of the device. Observe all safety related instructions in this document.

3 Application and design

3.1 Application

The CON 021 or CON 031 Signal Converters in combination with sensors of type PR 6422 to PR 6426 form eddy current measuring chains to be used for static and dynamic distance measurements at all kinds of rotating machinery. This means that slow axial displacements as well as fast radial vibrations of rotating machines can be measured. By using pulse wheels or key marks stuck on the shaft, the speed of the machine can be measured and key pulses generated.

Sensors and signal converters are adjusted together and are delivered as complete measuring chains in order to achieve a maximum accuracy. For this reason it is important to always operate sensors and converters together. The type of the sensor and its serial number are marked on the type plate of the converter.

The characteristics of the measuring chain are adapted to the material mainly used for turbo machinery (reference material: 42 Cr Mo 4, according to SAE 4140). The standard adjustment of the measuring chains is generally related to this material – if necessary, other materials can be used for the adjustment (see installation guide PR 642x, Eddy Current Sensors). During installation at the machine only the distance between the head of the sensor and the measuring target are to be adjusted. Criterion for the adjustment of the sensor is the output signal of the converter.

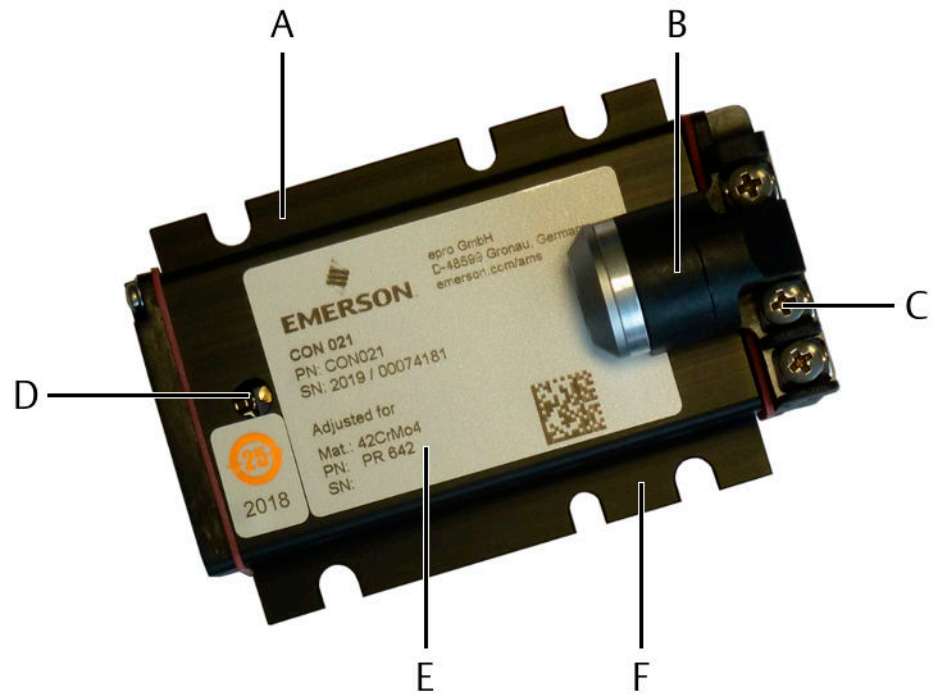
Supply circuits for the eddy current sensor and the measuring electronic are contained in the converter. The nominal supply voltage for the converter is -24 V DC, the nominal range of the output signal, proportional to the nominal measuring range of the sensor, may be set to either -4 to -20 V or -2 to -18 V. The output voltage of converters for special measuring ranges (CON 021 / 91x-xxx or CON 031 / 91x-xxx) have a firmly adjusted range of -4 to -20V.

Five eddy current probes are at disposal. The actual type to be used depends on the measuring range, on the available space for measuring and on the environmental temperature.

3.2 Design

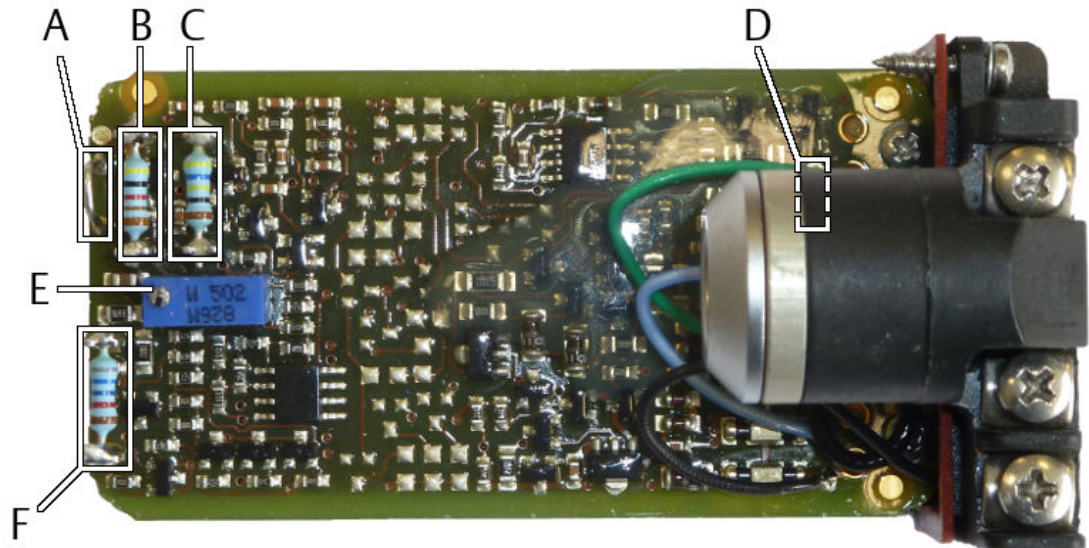
The CON 021 and CON 031 signal converters are accommodated in a simple housing prepared for the installation in a mounting box. Connection of the eddy current probe to the CON 021 is made with a LEMO connector at the front of the converter (see [Figure 3-1](#)), the CON 031 is provided with screw terminals for transducers without connector (see [Figure 3-2](#)). See [Figure 3-3](#) for details of an open CON 021. The component layout of CON 031 is identical to the layout of the CON 021.

Figure 3-1: CON 021 Converter



- A. Mounting plate
- B. Sensor connector (LEMO socket)
- C. Screw terminals for voltage supply (-24 V DC) and signal output.
- D. Calibration element: Potentiometer for fine tuning.
- E. Label
- F. Mounting plate

Figure 3-3: Open CON 021 Converter



- A. Wire bridge for change of voltage output range (-2 to -18 V or -4 to -20 V). Not available for CON 021/91x-xxx and CON 031/91x-xxx converters.
- B. Calibration element: Soldering point R24
- C. Calibration element: Soldering point R22 (gain)
- D. Wire bridge for change of oscillator frequency. Under the LEMO connector.
- E. Calibration element: Potentiometer for fine tuning
- F. Calibration element: Soldering point R23 (zero point)

3.3 CSA - Conditions of acceptability

- Converter shall be powered by 24 V DC supply double or reinforced from isolated from mains and with a maximum available current of 8 A.
- The converter is evaluated for a maximum ambient temperature of -30°C to +85°C. This is only valid for non-hazardous areas.

6 Installation and commissioning

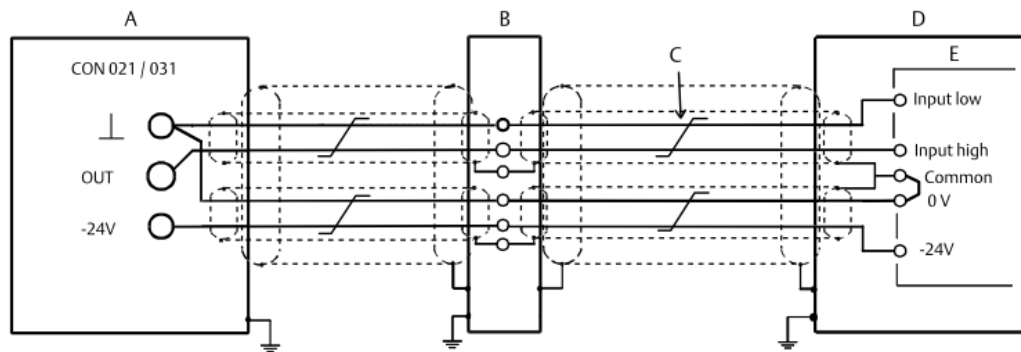
6.1 Hints for installation and connection

To ensure the electromagnetic compatibility of the eddy current measuring chain, Emerson recommends using a double screened twisted pair cable for connecting the signal converter to the measuring amplifier. For direct connections to the converter, preferably use cables of type LiYCY-CY 2x2x0.25 mm². Master connection cable may be any multicore cable with a corresponding cable structure. Emerson recommends to connect the outer cable shield to protective earth/measuring ground close to the measuring amplifier directly at the cable inlet of the control cubicle. Moreover, connect the outer cable shield to protective earth as often as possible, for example, at every intermediate distribution frame or cable gland.

If only cables of type LiYCY-CY 2x2x0.25mm² are used, the maximum cable length is 400 m. If longer cables are used set an intermediate distributor close to the converter and use cables with a higher cross section for connection to the measuring amplifier (for example LiYCY-CY n x2x1.5 mm²).

- Install measuring cables according to general standards for measuring and control cables. If possible, install cables in metallic cable channels or tubes. Observe that the measuring cables are arranged orthogonally.
- Use preferably cable protection tubes of type MPT 064 for the measuring cable from the transducer. They can be fitted directly to the cable glands of the mounting box.

Figure 6-1: Connection example



- A. CON 021 or CON 031 converter
- B. Junction box
- C. Twisted wires
- D. Control cubicle / Cabinet
- E. Measuring amplifier (for example: protection card)

6.2 Adjustment of measuring chains at the machine

6.2.1 General connection

Procedure

1. Connect the converter supply -24 V DC (+24 V to $\perp$).
2. Fit connector of sensor to converter input.
3. Measure output level at pins OUT and $\perp$.

6.2.2 Sensors PR 6422, PR 6423, PR 6424, and PR 6425

Procedure

1. Loosen the lock nut from the sensor.
2. Remove the sensor cable to avoid twisting of the cable during mounting and turning the sensor.
3. Turn the sensor in the holder as long as the nominal distance between sensor head and measuring target is reached and the connected voltmeter indicates the desired point on the characteristic curve.
 - For measuring shaft vibrations it is sufficient to adjust the sensor to an output value of $-10\text{V} \pm 1\text{ V}$ (output range -2 V to -18 V) or $-12\text{ V} \pm 1\text{ V}$ (output range -4 V to -20 V). See [Figure 6-2](#).
 - For static measurements a precise adjustment to one output value is required, the sensor is preferably set to one of the three output levels of the converter:
For symmetrical displacements around the center point (see [Figure 6-3, F](#)) to -12 V (-4 V to -20 V) or -10 V (-2 V to -18 V) $\pm 0.05\text{ V}$ (recommended procedure) for the measuring range minimum (= minimum distance) to -4 V (-4 V to -20 V) or -2 V (-2 V to -18 V) $\pm 0.05\text{ V}$ for single-sided movements to greater distances ([Figure 6-3, E](#))
for the measuring range maximum (= maximum distance) to -20 V (-4 V to -20 V) or -18 V (-2 V to -18 V) $\pm 0.05\text{ V}$ for single sided movements to smaller distances. ([Figure 6-3, G](#))
or to any other value within the measuring range when different distances in both directions must be measured.

8 Technical data

Only specifications with indicated tolerances or limit values are required. Data without tolerances or without error limits are informative data and not guaranteed. Technology is under constant development, and specifications are subject to change without notice. If not stated otherwise, the specifications are valid for the nominal supply voltage of -24V.

8.1 Input

Connection for eddy current sensors. Self locking LEMO socket (CON 021) or screw terminals (CON 031) for connection of Emerson sensors PR 6422/xxx-xxx, PR 6423/xxx-xxx, PR 6424/xxx-xxx, PR6424/xxx-xxx, and PR 6426/xxx-xxx.

8.2 Supply

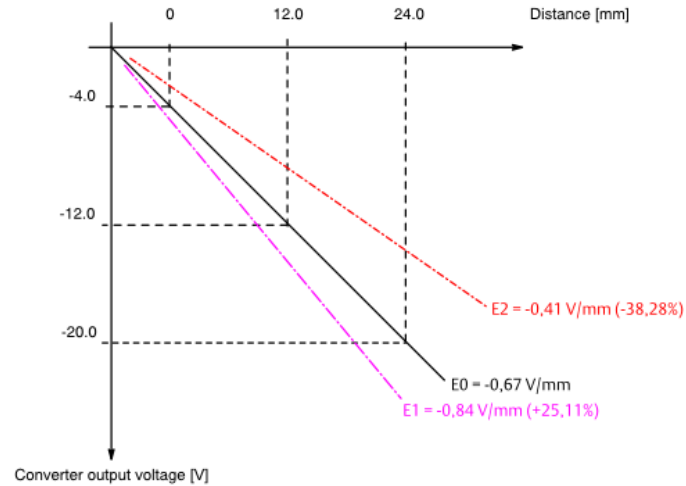
Supply voltage range	-23 to -28 V for output voltage range -4 to -20 V
	-21 to -28 V for output voltage range -2 to -18 V
	-18 to -21 V with reduced output voltage range
Nominal supply current	<15 mA, with 10 kΩ load resistance
Reverse connect protection	Reverse connect protection of all 3 terminals (GND, Output, and -24 V)
Nominal operating frequency	approximately 1.25 MHz
De-adjustment of oscillator for adjacent arrangement of sensors	open wire bridge D in Figure 3-3 (delivery state: closed)

8.3 Output

DC voltage with superimposed AC signal corresponding to vibration or displacement of the shaft. Open-circuit and short-circuit proof.

Output voltage range	Wire bridge A in Figure 3-3 closed: -2 to -18 V (factory setting)
	Wire bridge A in Figure 3-3 open: -4 to -20 V
	adjusted with 100kΩ load resistance
Limit range	-1 to -22 V (at -24 V supply voltage)
Nominal frequency range	0 to 20 kHz (-3 dB) with C - load = 10 nF
	0 to 15 kHz (-3 dB) with C - load = 20 nF
Rise time	<15 μs, with C - load = 1 nF
Output impedance	approximately 100 Ω
Load resistance	nominal value 100 kΩ (for R = 10 kΩ, error <1%)

Figure 8-1: Temperature influence on the sensitivity - PR 6426 with 0 to 24 mm measuring range



E0: Sensitivity at +23°C environmental temperature.

E1: Sensitivity at +100°C environmental temperature.

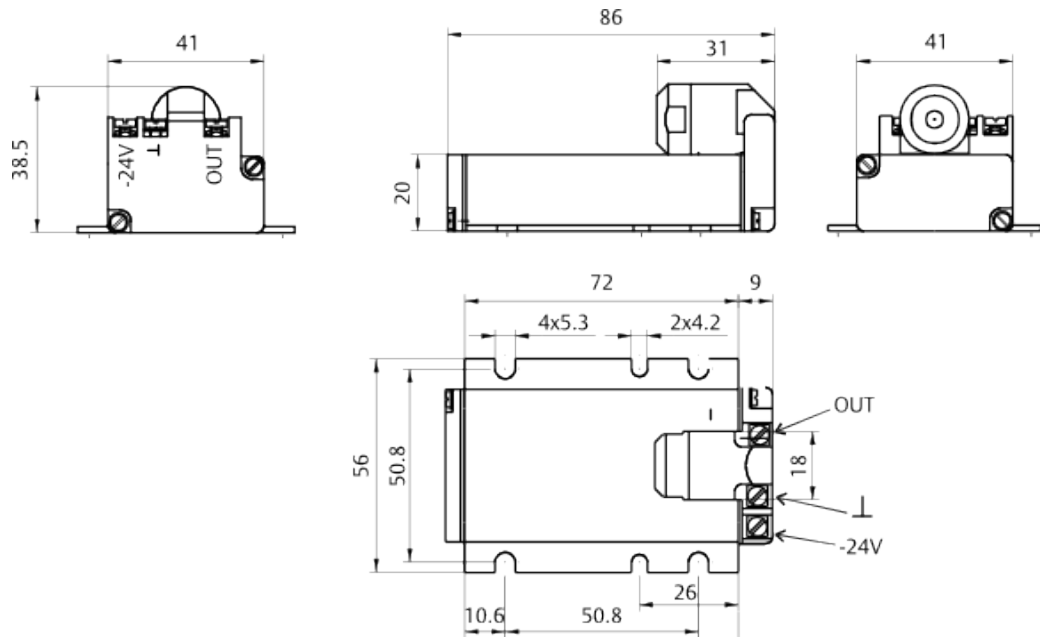
E2: Sensitivity at -35°C environmental temperature.

8.5 Environmental conditions

Temperatures	Reference value	+23°C
	Nominal operating range	-30 to +100°C
	Limit range for operating	-40 to +105°C only for non-Ex-i applications (see Technical data, explosion - proof) except CSA (see CSA - Conditions of acceptability)
	Storage and transport	-40 to +105°C
Relative humidity		0 to 95%, non condensing
Protection class		IP 20
Vibration according to IEC 68-2-6		10 to 60 Hz with $a = 0.35 \text{ mm}$
		60 to 150 Hz with 5 g constant
Shock		40 g for 6 ms according to IEC 68-2-29

CE – compatibility		Test according to: EN 55011(1998) & A1(1999) & A2(2001) (emitted interference) EN 61362(1997) & A1(1998) & A2(2001) & A3(2003) IEC 61326–1:2005 including EN 61000–4–5:2006 (interference resistance). The converter CON 021/... and CON 031/... meets the specifications mentioned above. The test specifications as setup, test levels, pass criteria, and so on, are described in the document “CON0x1_EMV –Testspezifikationen”. For copies of this document contact Emerson.	
Housing	Dimensions	see Figure 8-2 or Figure 8-3	
	Material	AlMgSi0,5F22	
Weight		net weight	CON 021: 95 g and CON 031: 85 g
		with packing	CON 021: 0.56 kg and CON 031: 0.55 kg

Figure 8-2: Dimensions CON 021



All dimensions in mm.