

Relative vibration measuring system with 4-20mA output type RVC10 / MDS10

Application

The non-contacting displacement probe-transmitter system is a gap to current and voltage device that measure dynamic distance between the probe tip and the observed target both in dynamic and static mode. It uses the eddy current technology. The RVC10/MDS10 system is intended for shaft relative vibration measurement in centrifugal compressors, pumps, motors and other machines with slide bearings that use PLC or DCS as machinery information system. This allows the operator to monitor machine trends and to alarm in case of excessive rotor relative vibration to avoid serious problems. Probe/transmitter system shows shaft dynamic motion relative to bearing housing.

Description

One measuring system consists of MDS10 probe and RVC10 transmitter. The transmitter radio frequency oscillator generates a radio frequency signal, that is radiated through the probe into the observed metal surface. The transmitter detects in the return signal the strength loss for the eddy-currents generated in the observed surface and conditions the signal to linear current output 4-20mA proportional to the relative vibration peak-to-peak value .

Additionally the transmitter provides the 4-20V signal proportional to the gap (the distance between probe head front side and shaft surface) instantaneous value. This information is helpful when probe is mounted to fix it's starting gap(1,5mm or 2,5mm, that corresponds voltage of 12V) and , during machine work, for diagnostic analysis made by portable equipment(spectrum analysis, shaft centre trajectory shape).

The probe tip is constructed of polyphenylene sulfide, a high performance plastic, impervious to oil, water and many different chemical liquids. The probe housing is made of stainless steel in two shapes(Fig.1,2). The probe cable is concentric with PTFE/FEP isolation, can be provided with steel protective armour.

The probe is connected with the transmitter by concentric cable of total length 5m or 9m. This length correspond to the probe integral cable or this length is composed of integral cable length and extension cable length(Fig.4).



Possible combinations of those both lengths are described in Ordering Information (point.7 in User Manual).

The total cable length 5m or 9m is a distinguishing feature of RVC10 transmitter execution what is also described in Ordering Information.

The probe in execution with miniature coaxial connector is equipped with one part of the rubber protective shield. The second part of the protective shield is supplied with probe extension cable.

The connector protective shield is made of impervious to oil and high temperature rubber. The protective shield is a sealing and galvanic isolating part for miniature connector. As both parts of rubber protection shield are closed together by groove-flange method and are tightly matched to the connector body the shield is an additional protection of unwanted connector disconnecting.

Probe marked as MDS10P (Fig.1) has axial cable output and two nuts, the probe MDS10PO (Fig.2) has an integral with the casing hexagon for wrench and is mounted in a holder from opposite position(to the holder a probe cable goes the first). The MDS10PO probe execution is applied in cases, when a probe outrigger is used for probe mounting because of relatively big distance between measuring shaft surface and holder mounting place. An example of such application, showing probe mounting from the outer side of machine through the hole $\frac{3}{4}$ "-14NPT in bearing housing wall is presented at Fig.6

The RVC10 transmitter circuit is placed in aluminium enclosure(IP65) painted in RAL 7032 colour, with two cable glands. Can be mounted on a flat surface by two screws M4x16.The mounting holes spacing (52x110mm) is showed at the Fig.4 The electronics is silicon-resin encapsulated .

The transmitter requires 24VDC supply voltage. The output signals are galvanic isolated from the supply voltage. In case of probe damage or probe

disconnecting from transmitter the output current 4-20mA goes down to value less than 0,1mA.

The cable type required for distance connection with PLC/DCS is two twisted pairs, screened of 0,5 to 1,5 mm² cross-section. The terminal strip under the transmitter casing cover have seven screw terminals: probe cable hot wire, probe cable screen, supply voltage 24VDC negative and positive terminals, output current positive terminal, output voltage positive terminal and common negative output current and voltage terminal. The probe-transmitter system is factory calibrated according to ordered range from 100 to 1000µm p-p (see Ordering Information below).

The probe working gap 0,5 to 2,5 mm(or 0,5 to 4,5mm) corresponds to output voltage 4-20VDC accessible at BNC socket and screw terminals.

The probes, probe extension cables and transmitters are changeable for the same total cable length.

Specifications

METROLOGICAL

Measured value:

- relative vibration in µm as peak-to-peak value
- gap instantaneous value (diagnostic output)

Measuring ranges

- vibration: 100,150, 200, 300, 400, 500 µm pp
- gap: 0,5 to 2,5mm
- or
- vibration: 1000 µm pp
- gap: 0,5 to 4,5mm

Output signal:

- vibration:4-20mA DC
- gap: 4V to 20V DC

Frequency response:

- vibration: 5Hz ÷ 5 kHz or 1Hz ÷ 600Hz
- gap: 0Hz do 5kHz

Maximum vibration measuring error of FS:

±1,5% in +22 °C(±2,0% for range 1000 µm pp)

Maximum temperature error of FS (in full range of temperature change):

Probe ±3%

Transmitter ±1%

Max. linearity error of FS including additional error of interchangeability of probe, extension cable and transmitter in temperature range 0°C to + 50 °C: ±5%

Not OK information : Output current goes down to less than 0,1mA in case of break or shorting in probe circuit

Minimum target size :

Flat surface: diameter 26mm

Shaft: diameter 40mm for singular probe, diameter 75mm for two probes of X,Y arrangement

ELECTRICAL

Supply voltage: 18 to 36 VDC

Current consumption: < 40mA(at 24V)

Output load:

- **current output:** maximum 500Ω

- **voltage output:** minimum 10KΩ

Galvanic isolation between outputs and supply source: 1,5kV

ENVIRONMENTAL

Operating temperature:

Probe: -35 °C to +180°C

Transmitter: -35 °C to +70°C

Relative humidity:

Probe: 95%, no condensation

Transmitter: 100%, not submerged

MECHANICAL

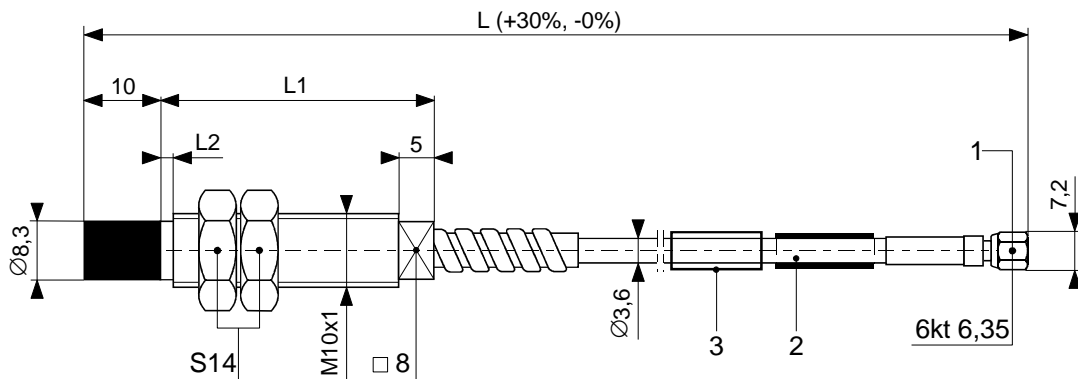
Mass(typical):

Probe with 1m cable, without armour : 100g

Cable: 32g/m

Armour: 50g/m

Transmitter: 600g



- 1 – Miniature female coaxial connector
 2 – Part number and serial number
 3 – Heat shrinkable jacket for user's design

- Cable diameter 3,6mm , FEP isolation
- Stainless steel armour, outer diameter 7.0mm
- Stainless steel armour diameter with additional PVDF outer jacket: 7.5mm

Fig.1 MDS10P - probe in basic shape

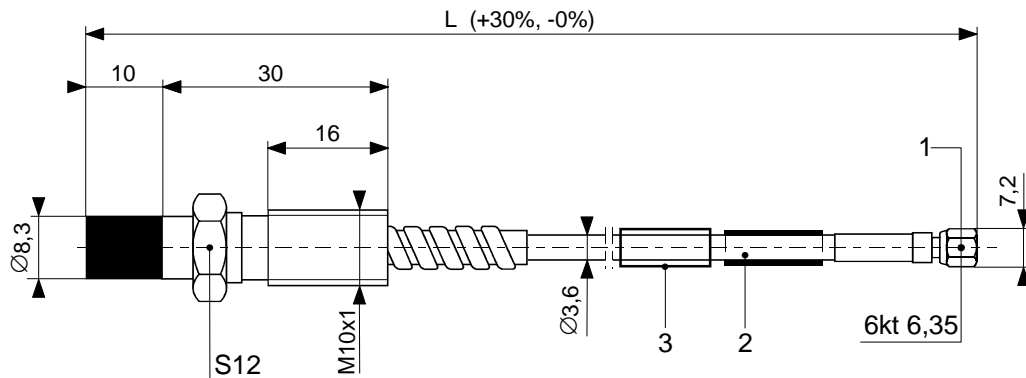
Ordering information for probe of basic shape

A B C D E

MDS10P -□□□-□□□-□□-□□-□□

Options description

- A** □□□ Overall case length L1 in mm, range from 030 to 200 with 10mm step
- B** □□□ Unthreaded length L2 in mm, range from 002, 010 and further to 160 with 10mm step
- C** □□ Total probe integral cable length L
- 05** cable length 0.5m
 - 10** cable length 1.0m
 - 20** cable length 2.0m
 - 50** cable length 5.0m
 - 90** cable length 9.0m
- D** □□ Cable stainless steel armour protection
- 00** without armour
 - 01** with armour
 - 02** with armour having additional PVDF outer jacket
- E** □□ Probe cable with miniature connector to connect with extension cable
- 00** without connector(cable wire and screen ended with kneaded sleeves)
 - 01** with connector (apply to probe with L=0.5m, 1.0m, 2.0m)



- 1 – Miniature female coaxial connector
 2 – Part number and serial number
 3 – Heat shrinkable jacket for user's designation

- Cable diameter 3,6mm , FEP isolation
- Stainless steel armour, outer diameter 7.0mm
- Stainless steel armour diameter with additional PVDF outer jacket: 7.5mm

Fig.2 MDS10PO – probe shape for reverse mount.

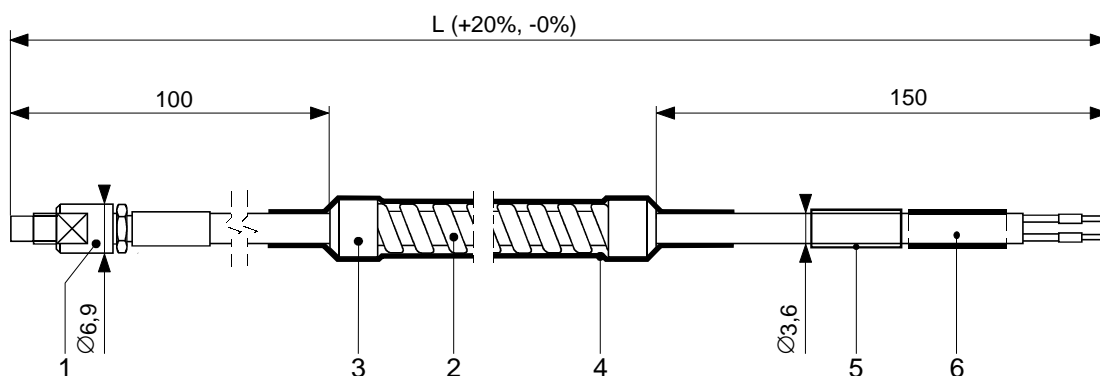
Ordering information for probe of reverse mount shape

A B C

MDS10PO - □□-□□-□□

Options description

- A** □□ Total probe integral cable length L
- 05** cable length 0.5m
 - 10** cable length 1.0m
 - 20** cable length 2.0m
 - 50** cable length 5.0m
 - 90** cable length 9.0m
- B** □□ Cable stainless steel armour protection
- 00** without armour
 - 01** with armour
 - 02** with armour having additional PVDF outer jacket
- C** □□ Probe cable with miniature connector to connect with extension cable
- 00** without connector(cable wire and screen ended with kneaded sleeves)
 - 01** with connector (apply to probe with L=0.5m, 1.0m, 2.0m)



- 1 – Miniature male coaxial connector
- 2 – Stainless steel armour, outer diameter 7.0mm
- 3 – Stainless steel ferrules, 8.0mm diameter
- 4 – PVDF jacket, outer diameter 7.5mm
- 5 – Heat shrinkable jacket for user's designation
- 6 – Part number and serial number

- cable diameter 3,6mm , FEP isolation
- armour length is app.300mm shorter than true extension cable length

Fig. 3 MDS10C – Extension cable for MDS10... probes

Ordering information for extension cable

A B

MDS10C- □□-□□

Note: the probe cable total length (a sum of probe integral cable length and extension cable length) must equal one of two nominal total lengths: 5m or 9m

Options description

A □□ Cable length L

- 3 0** 3.0m
- 4 0** 4.0m
- 4 5** 4.5m
- 7 0** 7.0m
- 8 0** 8.0m
- 8 5** 8.5m

B □□ Cable stainless steel armour protection

- 0 0** without armour
- 0 1** with armour
- 0 2** with armour having additional PVDF outer jacket



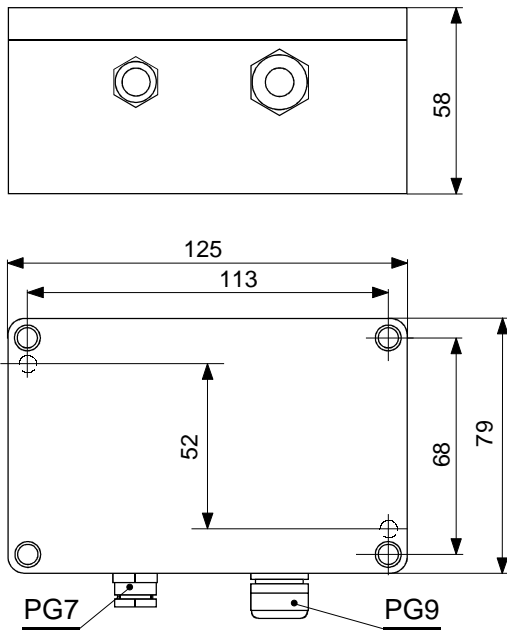


Fig.4 RVC10 Transmitter. Dimensions.

Ordering information for transmitter

A B C
RVC10 - □□-□□-□□

Options description

A □□ Probe cable total length (a sum of probe integral cable length and extension cable length)

5 0 cable total length 5.0m

9 0 cable total length 9.0m

B □□ Relative vibration measuring range

0 1 0-100µm p-p

0 2 0-150µm p-p

0 3 0-200µm p-p

0 4 0-300µm p-p

0 5 0-400µm p-p

0 6 0-500µm p-p

0 7 0-1000µm p-p

C □□ Frequency response

0 1 5Hz - 5kHz

0 2 1Hz - 600Hz

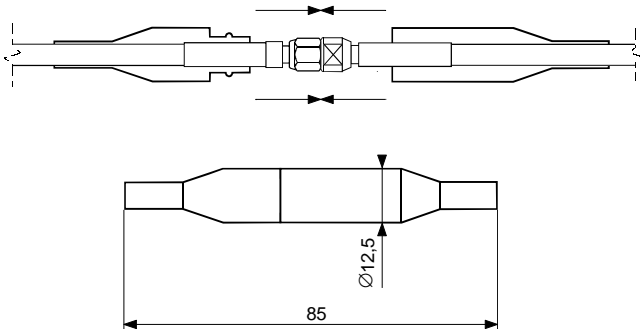


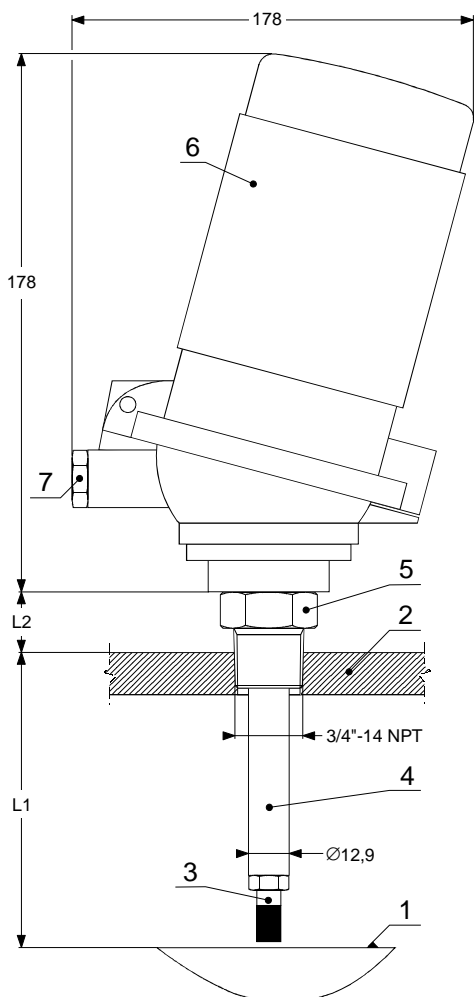
Fig.5 Connector protective shield.

Ordering information for connector protective shield

CP – rubber protective shield

Note: Probe and extension cable are supplied with protective shield.





- 1 - shaft measuring surface (measuring path)
- 2 – bearing cap wall
- 3 – relative vibration probe MDS10PO...
- 4 – probe outrigger (distance pipe)
- 5 – connector pipe 3/4"-14NPT
- 6 - aluminium shield (it protects the probe to extension cable miniature coaxial connector)
- 7 – output seat with M16x1,5 thread for probe extension cable output . The extension cable can be protected by Anaconda hose 3/8" with connection end M16x1,5

L1 – the distance required in mounting kit ordering – the length between the bearing cap outer surface and the shaft measuring surface

L2 – the hexagon 32 (pos.5) height, as a distance between the bearing cap outer surface and the aluminium shield basis. The increase of L2 distance will result in rise of the shield, pos.6, mounting level.

Fig.6 MK - Relative vibration probe mounting kit.

Ordering information for relative vibration probe mounting kit

A B
MK - □□□-□□□

Option description

A □□□ L1 distance(Fig.5) in mm

B □□□ L2 distance(Fig.5) in mm in the range from 012mm(minimum distance), 020mm and further each 10mm

Ordering information for Anaconda protective hose

A B
Anaconda - □□-□□□

Option description

A □□ Anaconda protective hose size

0 1 3/8" (matched to MK mounting kit or FT1- one-way feed-through)

0 2 3/4" (matched to FT4 – four-way feed-through)

B □□□ Anaconda protective hose length in metres, for instance 030 means 30 metres

Ordering information for wall-mounted protective box for RVC10 transmitters mounting

PB – Steel protective box, RAL 7035 powder coated, wall mounted, dimensions: 300mm(width) x 300mm(height) x 210mm(deep). One box contains maximum four transmitters.

