TR Series Vibration Transmitter

User Manual

Installation, operation, maintenance

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TR-USR-E-B-12

Table of Content

TR4101 Proximity Loop-powered Transmitter for Shaft Vibration

Introduction

The TR4101 is a cost-effective solution for monitoring the radial vibration on the shaft of balance of plant machines. The TR4101 combines the proximity probe driver and the signal conditioning circuit into one package. It works with a proximity probe and extension cable as a system.

Features

- ✓ **Loop powered transmitter**
- ✓ **Does not require proximity probe driver**
- ✓ **Buffered output/ GAP**
- ✓ **Compatible with other manufacturers' proximity probes (5mm, 8mm and 11mm)**
- ✓ **Aluminum cast case (copper free) with epoxy potting for better environmental protection and reliability**
- ✓ **Same size as a proximity probe driver**

Specifications

Electrical

Power Supply:
16-30VDC
Frequency Response (±3dB):
2.0 - 3,000Hz
Probe and Cable:
5 meter or 9 meter proximity probe and extension cable
works with 5mm, 8mm, and 11mm probes
Proximity probe includes: TM0180, TM0105, TM0110, 3300, 7200 and 990 series
Sensor Linear Range (reference with AISI 4140 steel):
5mm, 8mm probe: 2.0 mm (80mil)
Approximately 0.25mm (10mil) to 2.25mm (90mil)
11mm probe: 4.0mm (160mil)
Approximately 0.4mm (15mil) to 4.4mm (175mil)
Overall Vibration:
4-20mA
2-wire, load
Buffered Output/ GAP:
Original vibration, un-filtered
Nominal: 2-18VDC
Impedance: 20 kΩ
Maximum cable distance: 3.0m (10ft)
Sensitivity: 8.0mV/um (200mV/mil) nominal
Maximum Load:
50×(Vs-16)

Electrical specifications continued

Where Vs is the system power supply
Isolation:
> 500Vrms; circuit to case
System OK:
System OK: output 4-20mA
System Not OK: output < 3.6mA

Physical

Height: 75mm (2.95")
Weight: 0.5 kg (1.0 lb)

Environmental

Temperature:
Operation: -40℃ to +70℃
Storage: -40℃ to +100℃
Humidity:
90% non-condensing

Order Information

* Factory default
Standard configuration:

TR4101-A00-E00-G00-S00
8mm probe:
TM0180-07-00-05-10-02
Extension cable:

TM0181-040-00

TR4101-AXX-EXX-GXX-SXX

AXX: Full Scale
A00*: 0 - 200um (8.0mil) pk-pk

A01: 0 - 500um (20mil) pk-pk
A02: 0 - 100um (4.0mil) pk-pk
A03: 0 - 250um (10mil) pk-pk
A04: 0 - 630um (25mil) pk-pk
A05: 0 - 125um (5.0mil) pk-pk

EXX: Probe and Cable (not included)

E00*: TM0180, 8mm Probe, 5m Cable
E01: TM0180, 8mm Probe, 9m Cable
E02: 3300, 8mm Probe, 5m Cable
E03: 3300, 8mm Probe, 9m Cable
E04: 7200, 8mm Probe, 5m Cable
E05: 7200, 8mm Probe, 9m Cable
E06: TM0105, 5mm Probe, 5m Cable
E07: TM0105, 5mm Probe, 9m Cable
E08: TM0110, 11mm Probe, 5m Cable
E09: TM0110, 11mm Probe, 9m Cable
E10: 3300, 11mm Probe, 5m Cable
E11: 3300, 11mm Probe, 9m Cable
E12: 7200, 11mm Probe, 5m Cable
E13: 7200, 11mm Probe, 9m Cable
E14: 3309 Probe, 5m Cable
E15: 3309 Probe, 7m Cable

GXX: Mount

G00*: DIN rail mount
G01: Plate mount

SXX: Hazardous Area

S00*: Without approval. CE
S01: Multiple approvals
ATEX: II 1 G EEx ia IIC T4
@Ta=-40℃ ~ +70℃
KEMA06ATEX0217X
CSA: Non-incendive, Class I, Div. 2,
Groups A, B, C, D & T4
CSA: Intrinsically safe, Class I, Div. I,
Groups A, B, C & D, T4
PCEC: Ex ia IIC T4
TR CU: 0Ex ia IIC T4 X
№ TC RU C-US.ГБ05.B.00477
NANIO CCVE
CE Mark

TR4101 Accessories

The TR4101 requires a proximity probe and extension cable to work as a system.

TM0180: 8mm probe
TM0105: 5mm probe
TM0110: 11mm probe
TM0181: Extension cable
TM0200: 3-1/2 digit display unit
BNC-2： BNC adaptor for portable data collector

Installation

Installation - Mounting the probe

There are two ways for probe's field installation:

1) Please mount the probe in axial direction for TR4101 Proximity Loop-powered Transmitter for Shaft Vibration monitoring system. Keep the distance between probe tip and shaft about 0.05" (1.25mm). In order to avoid wrong output, please make sure there is enough distance between probe tip and the other metal material which is monitored. The least distance is 0.63" (16mm), please refer to Figure 1. For exact gapping procedure see the section ***Set-up Procedure*** of chapter ***Operation.*** When mounting two probes adjacently, the two probes should keep 1" (25 mm) at least as shown in Figure 2.
2) Mount probe holder at the side of bearing as shown in figure 3. This method can easily adjust probe gap.

NOTE:
When inserting the probe through the machine case or bearing cap, the signal voltage may vary widely before the proper gap is obtained. Therefore, be sure the gap is within 0.07" (1.8mm) of the target before attempting to set the gap electrically.

Please refer to section ***Order information*** of chapter ***Maintenance***. Do not change the length of the extension cable or delete it, as such action will adversely affect the calibration and linearity.

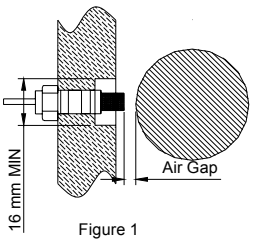


Figure 1

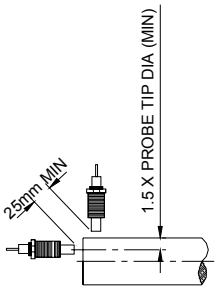


Figure 2

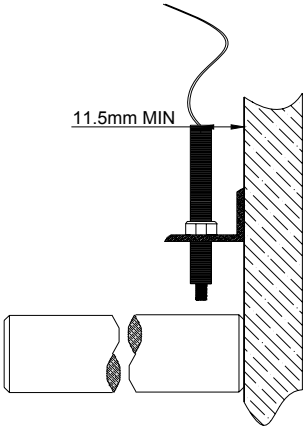
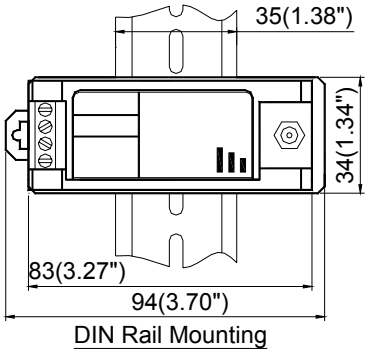


Figure 3



DIN Rail Mounting

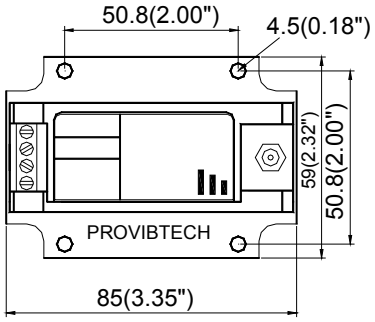


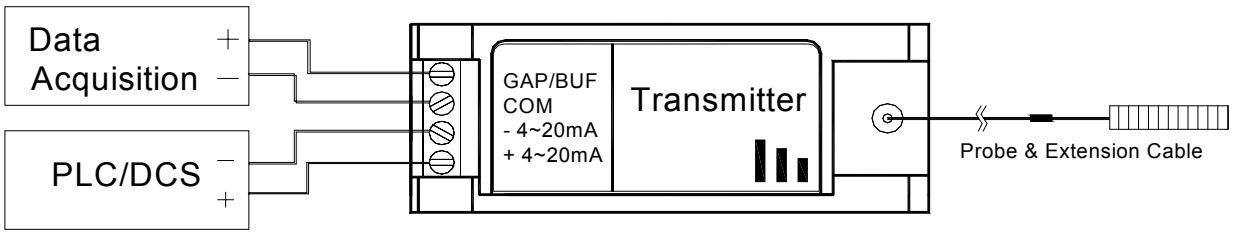
Plate Mounting

Figure 4

Installation - Mounting the transmitter

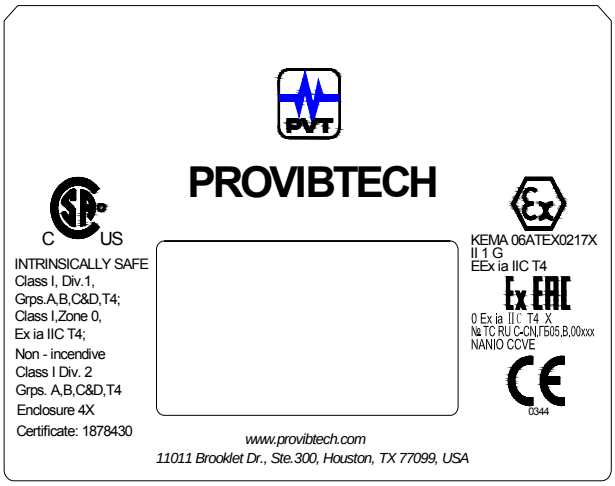
The Figure 4 shows the unit with the optional mounting plate and mounting rail.

Installation - Field Wiring



Installation - Intrinsically Safe Installation

Hazardous Area Marking

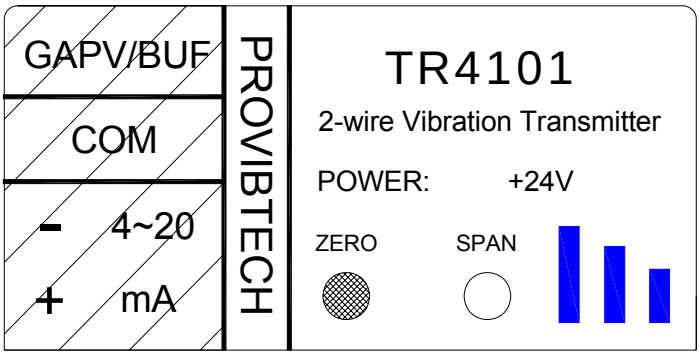


Explosion protection:

CSA: non-incendive, Class I, Div. 2, groups A/B/C/D T4
Intrinsically safe, Class I, Div. 1, groups A/B/C/D T4;
Class I, Zone 0, Ex ia IIC T4

ATEX: II 1 G, EEx ia IIC T4
@Ta=-40℃ ~ +70℃
KEMA06ATEX0217X
TR CU: 0Ex ia IIC T4 X

№ TC RU C-US.ГБ05.B.00477
NANIO CCVE



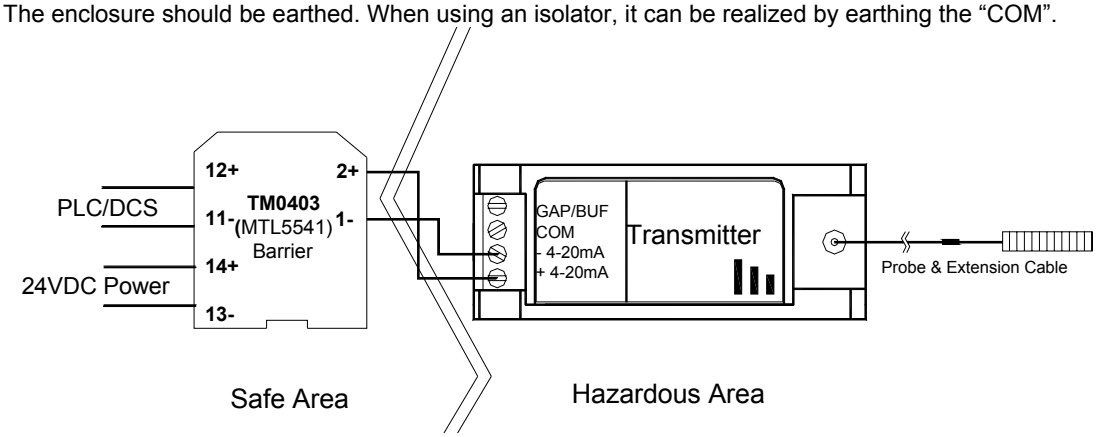
Input Parameters

U_i	28V
I_i	93mA
P_i	0.65W
C_i	4nF
L_i	0.7mH

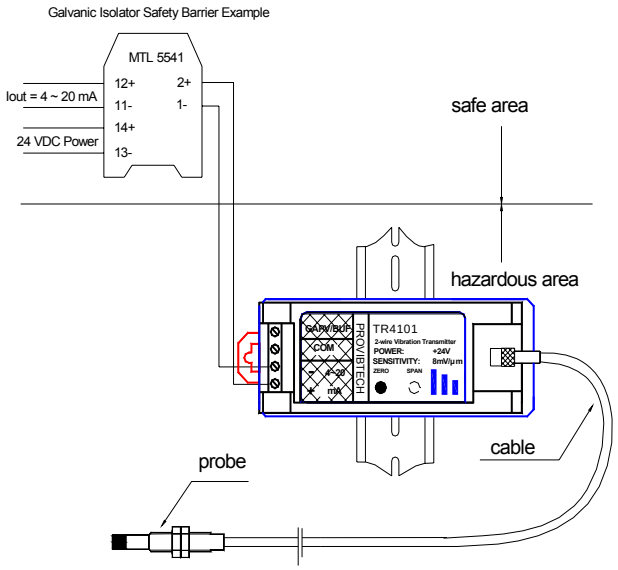
Special conditions

- The ambient temperature range is: -40℃≤Ta≤70℃
- Because the enclosure is made of aluminum alloy, an ignition source due to impact or friction between the enclosure and iron/steel must be avoided.

Because the mounting plate/din rail and probe cable outer jacket are made of non-metallic material, an ignition source due to electrostatic charging of the former must be avoided.
The barrier must fulfill the following requirements: $U_o<=U_i$, $L_o<=I_i$, $P_o<=P_i$, $C_o>C_i+C_{cable}$, $L_o>L_i+I_{cable}$
The enclosure should be earthed. When using an isolator, it can be realized by earthing the "COM".



Installation - TR4101 Field Wiring in Hazardous Area



Note:

1. Entity Installation:
   Transmitter entity parameters are:
   Ui=28V Ii=93mA Pi=0.65W Ci=4nF Li=0.7mH

   Choose a CSA certified barrier with entity parameters that satisfy the following conditions:
   Ui ≥ Uo Ii ≥ Io Pi ≥ Po Ci + Ccable ≤ Co Li + Lcable ≤ Lo

2. The associated apparatus must not be paralleled unless this is permitted by the associated apparatus approval.

3. Installation of the equipment shall be in accordance with the CEC section 18 and NEC ®Articles 504 and 505, and ISA RP 12.6 Recommend Practice for the Installation of Intrinsically Safe Circuits.

4. Intrinsically safe wiring in hazardous area used only in North America.

Operation

Power-up Inhibit

During power up, the vibration transmitter will be engaged in the self-test mode. The self-test will test the transducer OK, the vibration transmitter circuitry, and the system functionality. The total time is roughly 5 seconds. After the inhibit time, and the monitor tested OK, the output will be within the 4mA to 20mA range.

Set-up Procedure – Utilize Voltmeter

Mount the probe against the shaft.

Connect the probe, the extension cable, and TR4101.

1) Connect the voltmeter to “GAP V” and “COM” on TR4101.
2) Turn the power of TR4101 on.
3) Gap the probe against the shaft; read the voltmeter until it shows **8V +/- 0.5V**.
4) Tighten the probe.

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

Full-Scale Calibration Procedure (for certified Engineer only)

Calibration of full-scale can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Remove the top label.
3) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the shaker, gap the eddy-probe to until the gap voltage shows 8V+/-0.1V.
4) With the shaker standstill, turn the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
5) Turn the shaker to the full-scale vibration. Turn the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
6) Repeat procedure 4) and 5) four times.
7) Put the label and the seal back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

The Proximity Loop-powered Transmitter System measures the radial vibration of a shaft or other part of a machine in relation to the location of the probe tip. The following equation represents the relationship between the vibration and the loop current:

$$\text{Vibration} = \frac{(\text{Current(mA)} - 4)}{16} * (\text{Full Scale Range})$$

EXAMPLE:

Measured ma	Full Scale Vibration	Actual Vibration
<3.6	5.0 mils,pk-pk	Probe Fault
4.0	5.0 mils,pk-pk	0.0 mils,pk-pk
12.0	5.0 mils,pk-pk	2.5 mils,pk-pk
20.0	5.0 mils,pk-pk	5.0 mils,pk-pk

Buffered Output / GAP V

Buffered output will directly interface with any diagnostics or condition monitoring equipment. The buffered output will have the same unit as the overall vibration output.

CAUTION

1) **The buffered output can only drive 3 meters of cable from the TR transmitter to the data-collector. No more than 3 meters will be allowed.**
2) **It is not recommended that the diagnostics instrument been directly connected with the buffered output in the middle of the operation. This will likely been engaged in the ground loop problem and will possibly generate false vibration signal.**
3) **If you insist to connect the instrument to the buffered output during the machine operation, you must isolate the instrument from ground. In another word, you must make sure the diagnostics instrument and the Vibration transmitter only has one ground.**

Maintenance

TR4101 is a high integrated vibration transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Maintenance tools
4mA Calibration Procedure
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR4101 works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR4101 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK :The 4-20mA output will be less than 3.6mA if the following conditions meet:
   1) Probe failure.
   2) Extension cable failure.
   3) Probe and extension cable are not connected to TR transmitter.
   4) Transmitter failure.
   5) Probe is not gapped in its linear range.

TR4102 Proximity Loop-powered Transmitter for Thrust Position

Introduction

The TR4102 is a cost-effective solution for monitoring the axial position or phase reference on balance of plant machines. The TR4102 combines the proximity probe driver and the signal conditioning circuit into one package. It works with a proximity probe and extension cable as a system.

Features

- ✓ **Loop powered transmitter**
- ✓ **Does not require proximity probe driver**
- ✓ **Buffered output/ GAP**
- ✓ **Compatible with other manufacturers' proximity probes (5mm, 8mm and 11mm)**
- ✓ **Aluminum cast case (copper free) with epoxy potting for better environmental protection and reliability**
- ✓ **Same size as a proximity probe driver**

Specifications

Electrical

DCS or PLC Power Supply:
16-30VDC
Sensor Interface:
Special 95Ω coaxial cable with connector
Probe:
5mm, 8mm, and 11mm probes which includes: TM0180, TM0105, TM0110, 3300, and 7200 series
Sensor Linear Range (reference with AISI 4140 steel):
5mm, 8mm probe: 2.0 mm (80mil)
Approximately 0.25mm (10mil) to 2.25mm (90mil)
11mm probe: 4.0mm (160mil)
Approximately 0.4mm (15mil) to 4.4mm (175mil)
4-20mA Transmissions:
2-wire, load
Phase reference: frequency response: 0 - 10 KHz (G02 and G03)
Buffered Output (GAP V):
Raw position signal
Nominal: 2-18VDC
Impedance: 20 KΩ
Maximum cable distance: 3.0m (10ft)
Sensitivity: 8.0mV/um (200mV/mil) nominal
Frequency response: 0 - 10 KHz

Electrical specifications continued

Maximum Load:
50×(Vs-16)
Where Vs is the system power supply
System Self-test:
System OK: output 4-20mA
System Not OK: output < 3.6mA

Physical

Height: 75mm (2.95")
Weight: 1.0kg (2.0 lbs)

Environmental

Temperature:
Operation: -40℃ to +70℃
Storage: -40℃ to +100℃
Humidity:
90% non-condensing

Order Information

* Factory default
Standard configuration:
TR4102-E00-G00-S00
8mm probe:
TM0180-07-00-05-10-02
Extension cable:
TM0181-040-00
TR4102-EXX-GXX-SXX

EXX: Probe and Cable

E00*: TM0180, 8mm Probe, 5m Cable
E01: TM0180, 8mm Probe, 9m Cable
E02: 3300, 8mm Probe, 5m Cable
E03: 3300, 8mm Probe, 9m Cable
E04: 7200, 8mm Probe, 5m Cable
E05: 7200, 8mm Probe, 9m Cable
E06: TM0105, 5mm Probe, 5m Cable
E07: TM0105, 5mm Probe, 9m Cable
E08: TM0110, 11mm Probe, 5m Cable
E09: TM0110, 11mm Probe, 9m Cable
E10: 3300, 11mm Probe, 5m Cable
E11: 3300, 11mm Probe, 9m Cable
E12: 7200, 11mm Probe, 5m Cable
E13: 7200, 11mm Probe, 9m Cable
E14: 3309 Probe, 5m Cable
E15: 3309 Probe, 7m Cable

GXX: Mount/ Function

G00: DIN rail mount, measure position
G01: Plate mount, measure position
G02: DIN rail mount, measure phase
G03: Plate mount, measure phase

SXX: Hazardous Area

S00*: Without approval. CE
S01: Multiple approvals
ATEX: II 1 G EEx ia IIC T4
@Ta=-40℃ ~ +70℃
KEMA06ATEX0217X
CSA: Non-incendive, Class I, Div. 2,
Groups A, B, C, D & T4
CSA: Intrinsically safe, Class I, Div. I,
Groups A, B, C & D, T4
PCEC: Ex ia IIC T4
TR CU: 0Ex ia IIC T4 X
№ TC RU C-US.ГБ05.B.00477
NANIO CCVE
CE Mark

TR4102 Accessories

The TR4102 requires a proximity probe and extension cable to work as a system.

TM0180: 8mm probe
TM0105: 5mm probe
TM0110: 11mm probe
TM0181: Extension cable
TM0200: 3-1/2 digit display unit
BNC-2: BNC Adaptor for portable data collector

Installation

Installation - Mounting the probe

There are two ways for probe's field installation:

1) Please mount the probe in axial direction for TR4102 Proximity Loop-powered Transmitter for Thrust Position monitoring system. Keep the distance between probe tip and shaft about 0.05" (1.25mm). In order to avoid wrong output, please make sure there is enough distance between probe tip and the other metal material which is monitored. The least distance is 0.63" (16mm), please refer to Figure 1. For exact gapping procedure see the section ***Set-up Procedure*** of chapter ***Operation***. When mounting two probes adjacently, the two probes should keep 1" (25 mm) at least as shown in Figure 2.
2) Mount probe holder at the side of bearing as shown in figure 3. This method can easily adjust probe gap.

NOTE：
When inserting the probe through the machine case or bearing cap, the signal voltage may vary widely before the proper gap is obtained. Therefore, be sure the gap is within 0.07" (1.8mm) of the target before attempting to set the gap electrically.

Please refer to section ***Order information*** of chapter ***Maintenance***. Do not change the length of the extension cable or delete it, as such action will adversely affect the calibration and linearity.

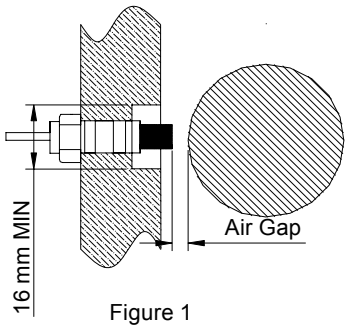


Figure 1

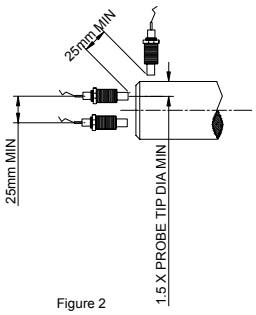


Figure 2

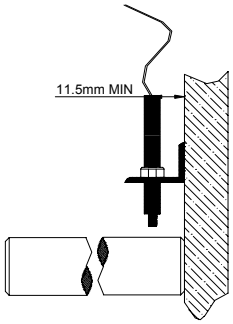
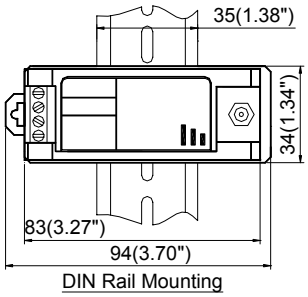


Figure 3

Installation - Mounting the transmitter

The below drawing shows the unit with the optional mounting plate and mounting rail.



DIN Rail Mounting

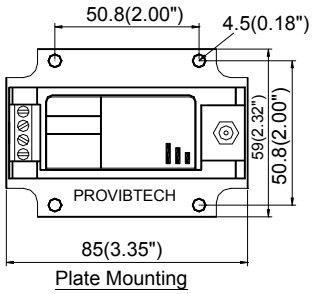
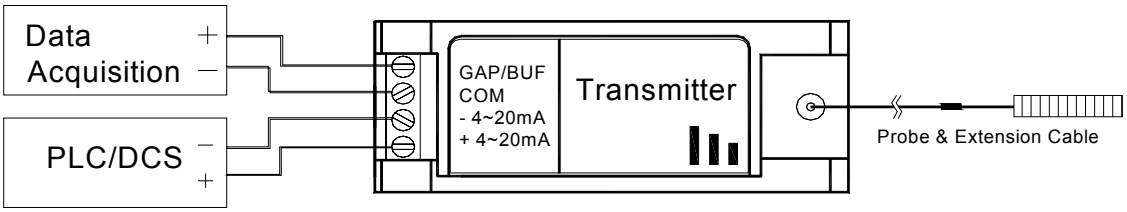


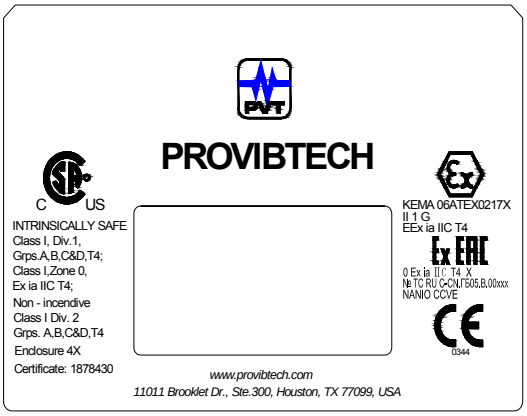
Plate Mounting

Installation - Field-wiring Diagram



Installation - Intrinsically Safe Installation

Hazardous Area Marking



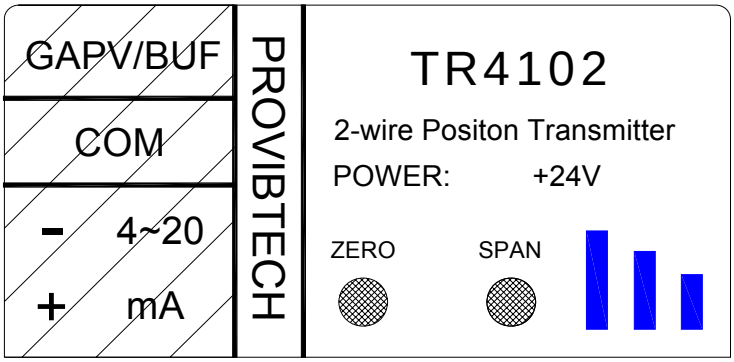
Explosion protection:

ATEX: II 1 G EEx ia IIC T4

KEMA 06ATEX0217X

CSA: non-incendive, Class I, Div. 2, groups A/B/C/D T4
Intrinsically safe, Class I, Div. 1, groups A/B/C/D T4; Class I, Zone 0, Ex ia IIC T4
TR CU: 0Ex ia IIC T4 X

№ ТС RU C-US.ГБ05.В.00477
NANIO CCVE



Input Parameters

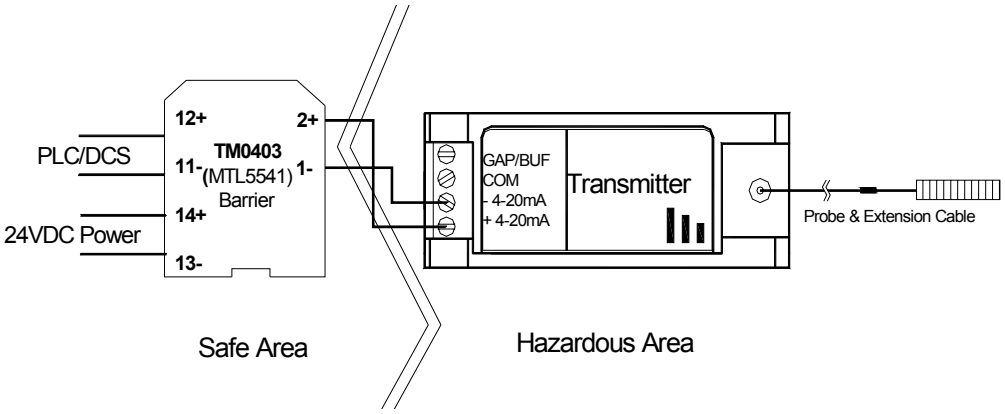
U_i	28V
I_i	93mA,
P_i	0.65W
C_i	4nF
L_i	0.2mH

Special conditions

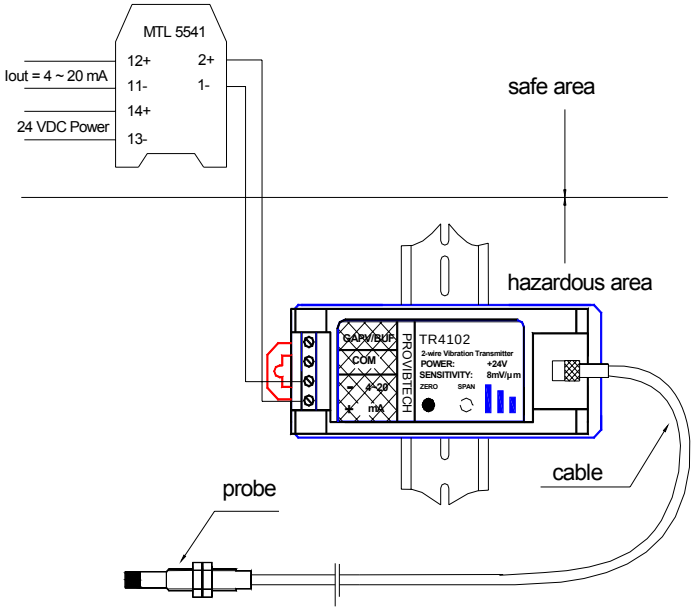
- The ambient temperature range is: -40℃≤Ta≤70℃
- Because the enclosure is made of aluminum alloy, an ignition source due to impact or friction between the enclosure and iron/steel must be avoided.

Because the mounting plate/din rail and probe cable outer jacket are made of non-metallic material, an ignition source due to electrostatic charging of the former must be avoided.
The barrier must fulfill the following requirements:
Uo<=Ui,Lo<=Ii,Po<=Pi, Co>Ci＋Ccable, Lo>Li+ Icable

The enclosure should be earthed. When using an isolator, it can be realized by earthing the “COM”.



Installation - Field Wiring in Hazardous Area



Note:

1. Entity Installation:
   Transmitter entity parameters are:
   Ui=28V Ii=93mA Pi=0.65W Ci=4nF Li=0.7mH

   Choose a CSA certified barrier with entity parameters that satisfy the following conditions:
   Ui ≥ Uo Ii ≥ Io Pi ≥ Po Ci + Ccable ≤ Co Li + Lcable ≤ Lo

2. The associated apparatus must not be paralleled unless this is permitted by the associated apparatus approval.
3. Installation of the equipment shall be in accordance with the CEC section 18 and NEC ®Articles 504 and 505, and ISA RP 12.6 Recommend Practice for the Installation of Intrinsically Safe Circuits.
4. Intrinsically safe wiring in hazardous area used only in North America.

Operation

Power-up Inhibit

During power up, the transmitter will be engaged in the self-test mode. The self-test will test the proximity probe system, the transmitter circuitry, and the system functionality. The total time is roughly 5 seconds. After the inhibit time, and the monitor tested OK, the output will be within the 4mA to 20mA range.

Set-up Procedure – Utilize Voltmeter

1) Mount the probe against the shaft.
2) Connect the probe, the extension cable, and the TR4102.
3) Connect the voltmeter to GAP V and COM on TR4102.
4) Turn the power of TR4102 on.
5) Gap the probe against the shaft; read the voltmeter until it shows **10V +/- 0.25V**.
6) Tighten the probe.

4-20mA Calibration Procedure (for certified Engineer only)

Calibration of 4-20mA can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” and “SPAN” from the top of the transmitter.
2) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the static calibrator, gap the eddy-probe to until the gap voltage shows 10V. This is the center of the linear range. Note this “central gap”.
3) Turn the static-calibrator 1.0mm toward the probe tip from the “central gap”. Adjust the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
4) Turn the static-calibrator 1.0mm away from the probe tip from the “central gap”. Adjust the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seals back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

The following equation represents the relationship between the target position and the loop current.

$$\text{Distance} = \frac{(\text{Current(mA)} - 12)}{8} * (\text{Full Scale Range})$$

Units: The transmitter current output is linearly proportional to the probe gap (Position) between 4 mA and 20 mA.

EXAMPLE:

Measured mA	Full Scale Vibration	Actual Vibration
<3.6	5.0 mils,pk-pk	Probe Fault
4.0	5.0 mils,pk-pk	-5.0 mils,pk-pk
12.0	5.0 mils,pk-pk	0 mils,pk-pk
20.0	5.0 mils,pk-pk	5.0 mils,pk-pk

Buffered Output / GAP V

Buffered output will directly interface with any diagnostics or condition monitoring equipment. The buffered output will have the same unit as the overall vibration output.

CAUTION

1. **The buffered output can only drive 3 meters of cable from the TR transmitter to the data-collector. No more than 3 meters will be allowed.**
2. **It is not recommended that the diagnostics instrument been directly connected with the buffered output in the middle of the operation. This will likely been engaged in the ground loop problem and will possibly generate false vibration signal.**
3. **If you insist to connect the instrument to the buffered output during the machine operation, you must isolate the instrument from ground. In another word, you must make sure the diagnostics instrument and the Vibration transmitter only has one ground.**

Maintenance

TR4102 is a high integrated Thrust Position transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Tool preparations
Current calibrating
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR4102 works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4-20mA Calibration Procedure (for certified Engineer only)

Calibration of 4-20mA can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” and “SPAN” from the top of the transmitter.
2) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the static calibrator, gap the eddy-probe to until the gap voltage shows 10V. This is the center of the linear range. Note this “central gap”.
3) Turn the static-calibrator 1.0mm toward the probe tip from the “central gap”. Adjust the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
4) Turn the static-calibrator 1.0mm away from the probe tip from the “central gap”. Adjust the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seals back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR4102 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK: The 4-20mA output will be less than 3.6mA if the following conditions meet:
   1) Probe failure.
   2) Extension cable failure.
   3) Probe and extension cable are not connected to TR transmitter.
   4) Transmitter failure.
   5) Probe is not gapped in its linear range.

TR5102 Proximity Speed and Phase Reference Transmitter

Introduction

TR5102 is a cost-effective solution for monitoring the speed on your balance of plant machines. TR5102 combines the proximity probe driver and the signal conditioning circuit into one package. It will work with proximity probe and extension cable as a system.

Features

- ✓ **Loop power transmitter**
- ✓ **Does not require proximity probe driver**
- ✓ **Buffered output/GAP available for portable vibration analyzer**
- ✓ **Work with other manufactures 5mm, 8mm and 11mm probes**
- ✓ **Aluminum cast case with epoxy potting for hazardous area and reliability**
- ✓ **Same size as a proximity driver**

Specifications

Electrical

Power Supply:

20-30VDC, 50mA.

Speed Response:

0 ~ 50,000 pulse per minute.

Sensor Interface:

Connection:

Special 95Ω coaxial cable with connector.

Probe:

5mm, 8mm, and 11mm probes that includes: TM0180, TM0105 ,TM0110, 3300, 7200 series.

Buffered Output:

TTL output for speed and phase.

Nominal 0~ 5VDC.

Impedance: 100Ω.

Maximum cable distance: 300m (1000ft).

Overall Speed Output:

4-20mA, source.

Driving load resistance up to 750Ω.

Physical

Dimension: Height: 75mm (2.95″), see figuration.

Weight: 1.0kg (2.0 lb).

Environmental

Temperature:

Operation: -35℃ ~ +70℃.

Storage: -40℃ ~ +100℃.

Humidity:

90% non-condensing.

Ordering Information

Standard configuration:

TR5102-A01-E00-F00-G00

8mm probe:

TM0180-A07-B00-C05-D10

Extension cable:

TM0181-A40-B00

TR5102-AXX-EXX-FXX-GXX

AXX: Full Scale.

A00: 0 ~ 1,000 rpm

A01*: 0 ~ 3,600 rpm

A02: 0 ~ 6,000 rpm

A03: 0 ~ 10,000 rpm

A04: 0 ~ 30,000 rpm

A05: 0 ~ 50,000 rpm

EXX: Probe and Cable.

E00*: TM0180, 5m Cable

E01: TM0180, 9m Cable

E02: 8mm Probe, 3300, 5m Cable

E03: 8mm Probe, 3300, 9m Cable

E04: 8mm Probe, 7200, 5m Cable

E05: 8mm Probe, 7200, 9m Cable

E06: TM0105, 5m Cable

E07: TM0105, 9m Cable

E08: TM0110, 5m Cable

E09: TM0110, 9m Cable

E10: 11mm Probe, 3300, 5m Cable
E11: 11mm Probe, 3300, 9m Cable
E12: 11mm Probe, 7200, 5m Cable
E13: 11mm Probe, 7200, 9m Cable

FXX: Teeth per Revolution.
F00*: 1
F02: Customer specify, number of teeth =XX

GXX: Mounting.
G00*: DIN rail mounting.
G01: Plate mounting.

* Denote factory default.

TR5102 Accessories

TR5102 must works with proximity probe transducer.

TM0180: 8mm probe.
TM0105: 5mm probe.
TM0181: Extension cable.

Installation

Installation - Mounting the probe

There are two ways for probe's field installation:

Please mount the probe in axial direction for TR5102 Proximity Speed and Phase Reference Transmitter monitoring system. Keep the distance between probe tip and shaft about 0.05" (1.25mm). In order to avoid wrong output, please make sure there is enough distance between probe tip and the other metal material which is monitored. For exact gapping procedure see the section ***Set-up Procedure*** of chapter ***Operation***. When mounting two probes adjacently, the two probes should keep 1" (25 mm) at least as shown in Figure 1.

NOTE：
When inserting the probe through the machine case or bearing cap, the signal voltage may vary widely before the proper gap is obtained. Therefore, be sure the gap is within 0.07" (1.8mm) of the target before attempting to set the gap electrically.

Please refer to section ***Order information*** of chapter ***Maintenance***. Do not change the length of the extension cable or delete it, as such action will adversely affect the calibration and linearity.

Installation Drawings

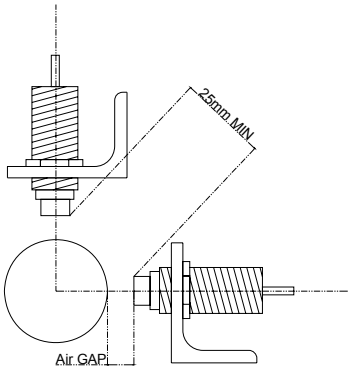


Figure 1

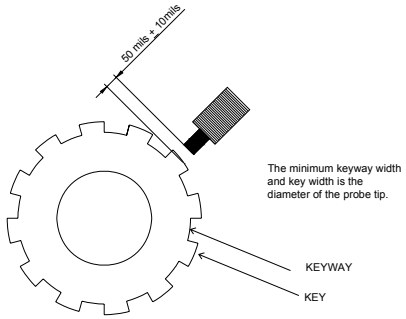
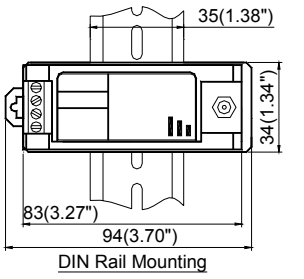
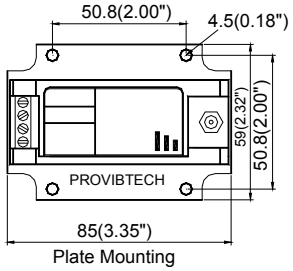


Figure 2

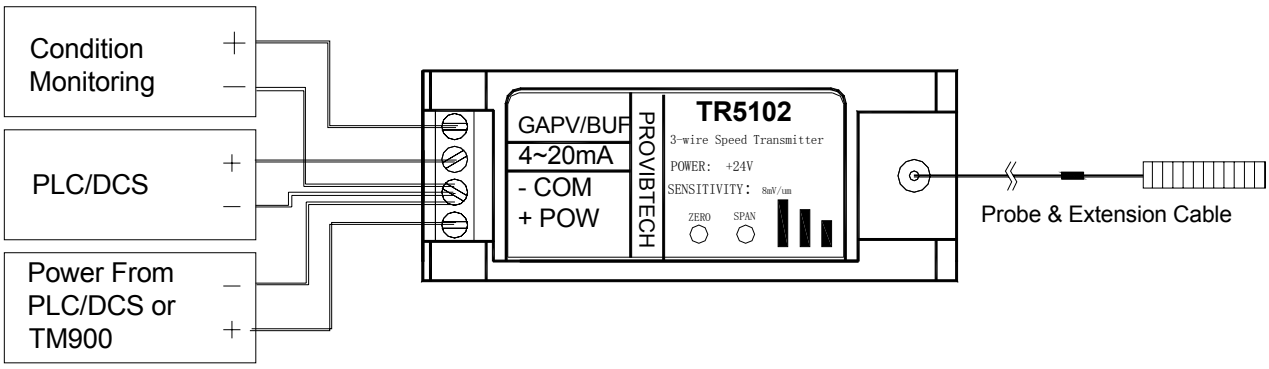
Installation - Mounting the transmitter

The below drawing shows the unit with the optional mounting plate and mounting rail.





Installation - Field-wiring Diagram



Operation

Power-up Inhibit

During power up, the Proximity Speed and Phase Reference transmitter will be engaged in the self-test mode. The self-test will test the transducer OK, the vibration transmitter circuitry, and the system functionality. The total time is roughly 5 seconds. After the inhibit time, and the monitor tested OK, the output will be within the 4mA to 20mA range.

Set-up Procedure – Utilize Voltmeter

1) Mount the probe against the shaft.
2) Connect the probe, the extension cable, and TR5102.
3) Connect the voltmeter to “GAP V” and “COM” on TR5102.
4) Turn the power of TR5102 on.
5) Gap the probe against the shaft; read the voltmeter until it shows **10V +/- 0.5V**.
6) Tighten the probe.

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

Full-Scale Calibration Procedure (for certified Engineer only)

Calibration of full-scale can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Remove the top label.
3) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the shaker, gap the eddy-probe to until the gap voltage shows 8V+/-0.1V.
4) With the shaker standstill, turn the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
5) Turn the shaker to the full-scale frequency (If the full scale is 0-6000RPM and teeth per cycle is 1, the frequency range is 0-100Hz). Turn the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
6) Repeat procedure 4) and 5) four times.
7) Put the label and the seal back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

The TR5102 Proximity Speed and Phase Reference Transmitter System measures the RPM of a shaft or other part of a machine in relation to the location of the probe tip. The following equation represents the relationship between the RPM and the loop current.

$$RPM = \frac{(Current(mA) - 4)}{16} * (Full\ Scale\ RPM)$$

During normal operation with RPM input, the transmitter current output is linearly proportional to the full scale RPM range between 4 mA and 20 mA.

EXAMPLE:

Measured ma	Full Scale RPM	Actual RPM
<3.6	100,000	Probe Fault
4.0	100,000	<100
12.0	100,000	50,000
20.0	100,000	100,000

Buffered Output / GAP V

Buffered output will directly interface with any diagnostics or condition monitoring equipment. The buffered output will have the same unit as the overall vibration output.

CAUTION

1) **It is not recommended that the diagnostics instrument been directly connected with the buffered output in the middle of the operation. This will likely been engaged in the ground loop problem and will possibly generate false vibration signal.**
2) **If you insist to connect the instrument to the buffered output during the machine operation, you must isolate the instrument from ground. In another word, you must make sure the diagnostics instrument and the Vibration transmitter only has one ground.**

Maintenance

TR5102 is a high integrated Proximity Speed and Phase Reference transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Maintenance tools
4mA Calibration Procedure
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR5102works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR5102 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK: The 4-20mA output will be less than 3.6mA if the following conditions meet:
   1) Probe failure.
   2) Extension cable failure.
   3) Probe and extension cable are not connected to TR transmitter.
   4) Transmitter failure.
   5) Probe is not gapped in its linear range.

TR1101 Vibration Transmitter with Acceleration, Velocity and Displacement

Introduction

Condition Monitoring

- ✓ Measuring any rotation machinery case vibration.
- ✓ System can be used in hazardous area.

Output

- ✓ 4-20mA, source.
- ✓ Acceleration, velocity or displacement
- ✓ Buffered Output for condition monitoring
- ✓ System powered by DCS/PLC or TM900

DCS/PLC Interface

Due to the fact that transmitter does not supply alarm function, the PLC or DCS should be configured with some recommendation for alarming and vibration monitoring as follows:

- ✓ **Bypass on start-up:** Some machine will have large vibration on start-up, especially while passing the machine harmonic speed, sometimes, it is recommended to have a bypass on alarm during start-up.
- ✓ **Alarm timed-defeat:** For reliable alarming of machine vibration, you must eliminate the interference due to radio, electric-static discharge etc. API670 normally requires a timed-defeat. The delay time is normally between 1 to 6 seconds that will be determined by field condition.
- ✓ **System self-test:** If there is a defect on probe, extension cable or the transmitter, the 4-20mA will give a current which less than 3.6mA. In this situation, alarm should be disabled.

Specifications

Electrical

Power Supply:
22-30VDC, 100mA (Non-isolated)
Frequency Response（±3dB):
Acceleration: 2.0 - 10 KHz
Velocity: 2 - 10 KHz (velocity sensor)
Velocity: 10 - 5 KHz (accelerometer)
Displacement: 10 - 3 KHz (velocity sensor)
Acceleration (low frequency): 1.0 - 100Hz
Velocity (low frequency): 1.0 - 100Hz (TM079VD)
Displacement (low frequency): 1.0 - 100Hz (TM079VD)
Sensor Interface:
Sensitivity:
100mV/g nominal for accelerometer or
4.0mV/mm/sec (100mV/in/sec) nominal for velocity sensor
40mV/mm/sec (1000mV/in/sec) nominal for velocity TM079VD or 4mV/um (100mV/mil) nominal for displacement TM079VD
Current Source:
Nominal 4mA@24VDC
Connectors:
GAP/Buf: gap and buffered output
SIG: sensor signal
COM: signal com
4-20mA: 4-20mA output
Buffered Output:
Original vibration, un-filtered
Impedance: 100Ω
Maximum cable distance: 300m (1,000ft)
Sensitivity: same as the sensor
Overall Vibration:
4-20mA, source
Driving load resistance up to 750Ω
System Self-test:
System OK: output 4-20mA
System Not OK: output < 3.0mA

Physical

Height: 75mm (2.95”)
Weight: 1.0kg (2.0 lbs)

Environmental

Temperature:
Operation: -40℃ to +70℃
Storage: -40℃ to +100℃
Humidity:
90% non-condensing

Order Information

*Factory Default

TR1101-AXX-EXX-GXX

AXX: Full Scale

A00*: 0 - 200um pk-pk
A01: 0 - 500um pk-pk
A02: 0 - 100um pk-pk
A03: 0 - 10mil pk-pk
A04: 0 - 25mil pk-pk
A05: 0 - 5.0mil pk-pk
A06: 0 - 50mm/s pk
A07: 0 - 100mm/s pk
A08: 0 - 20mm/s pk
A09: 0 - 2.0ips pk
A10: 0 - 4.0ips pk
A11: 0 - 1.0ips pk
A12: 0 - 5.0g pk
A13: 0 - 10g pk
A14: 0 - 5.0g pk (low frequency)
A15: 0 - 10g pk (low frequency)
A16: 0 - 50mm/s pk (low frequency, E01, E04)
A17: 0 - 100mm/s pk (low frequency, E01, E04)
A18: 0 - 500um pk-pk (low frequency, E04)
A19: 0 - 200um pk-pk (low frequency, E04)
A20: 0 - 2.0ips pk (low frequency, E04)
A21: 0 - 4.0ips pk (low frequency, E01, E04)
A22: 0 - 20mil pk-pk (low frequency, E04)
A23: 0 - 10mil pk-pk (low frequency, E04)

AXX: Full Scale continued

A24: 0 - 2.0ips (50 mm/s) rms
A25: 0 - 1.0ips (25 mm/s) rms
A26: 0 - 0.8ips (20 mm/s) rms
A27: 0 - 0.5ips (12.5 mm/s) rms

EXX: Sensor Type (not included)

E00*: Accelerometer TM0782A, TM0783A, TM0784A, TM0785A, TM0786A or any current mode accelerometer with 100mV/g
E01: Velocity sensor TM0793V, TM0796V or any current mode velocity sensor with 4mV/mm/sec
E02: 330500, 330525 velocity sensor
E03: 330750 velocity sensor
E04: TM079VD low frequency sensor

GXX: Mount

G00*: DIN rail mount
G01: Plate mount

TR1101 Accessories

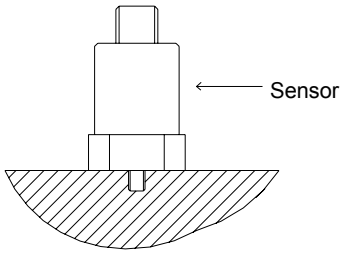
The TR1101 requires an external accelerometer or velocity sensor to work as a system.

TM0782A, TM0783A, TM0784A, TM0785A, TM0786A: Accelerometer
TM0793V, TM0796V: Velocity sensor
TM079VD: Low frequency velocity and displacement sensor
TM900: Power converter
TM0200: 3-1/2 digit display unit

Installation

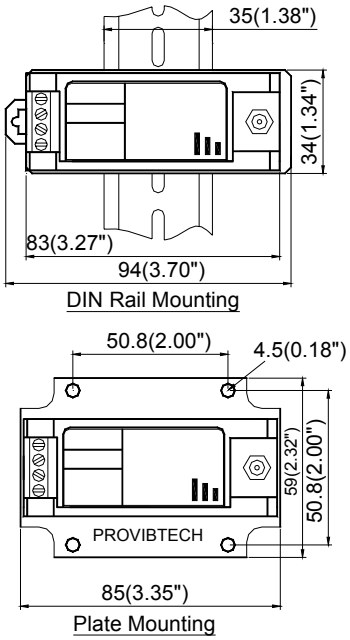
Installation - Sensor Installation

Only need to mill a flat base of 30mm in diameter, and drill a M6 hole in the middle to install the sensor. No need to do anything inside the machine.

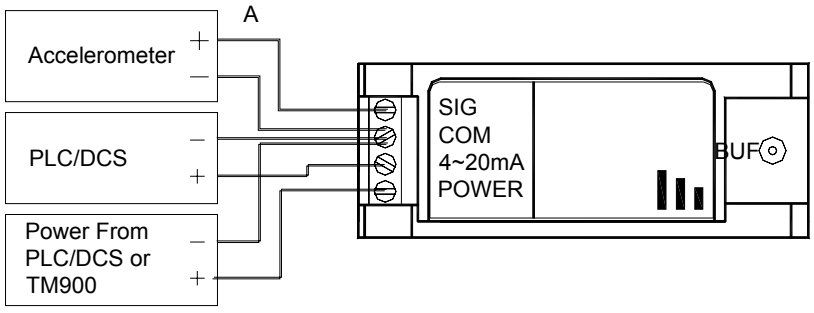


Installation - Mounting the transmitter

The below drawing shows the unit with the optional mounting plate and mounting rail.



Installation - Field-wiring Diagram



Operation

Power-up

During power- up, the Transmitter-Monitor will engage in the self-test mode. The self-test will test the transducer OK, the Transmitter-Monitor circuitry. The total time is roughly 6 seconds. After the inhibit time period, the green OK LED will be on

4-20mA Calibration Procedure (For Certified Engineer Only)

The main task for calibration is to adjust the "ZERO" and "SPAN" to conform to the output 4-20mA. This can only be done by experienced (certified) engineer with special tools. Please contact with ProvibTech for more details.

1) Remove the seal of "ZERO" and "SPAN" from the top of the transmitter.
2) Connect the driver, extension cable and Accelerometer to shaker.
3) With the shaker stand-still, turn the "ZERO" potential-meter till the 4-20mA output indicating 4.00mA.
4) Turn the shaker to the full-scale vibration. Turn the "SPAN" potential-meter on the side of right corner of the monitor, till the 4-20mA output indicating 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seal back to normal.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Buffer Output

Buffer output can directly interfere with any diagnoses or the condition of monitoring equipment. The Buffer output also has the same unit as the overall vibration output.

CAUTION

It is not recommended that the diagnostic instrument been directly connected with the Buffer output during the operation. This may be likely to lead the ground loop problem and may possibly generate false vibration signal.

If you insist on connecting the instrument to the Buffer output during the machine operation, you must isolate the instrument from ground. In other words, you must make sure the diagnostic instrument and the Transmitter-Monitor share one ground.

Maintenance

TR1101 is a high integrated vibration transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Maintenance tools
4mA Calibration Procedure
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR1101 works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4-20mA Calibration Procedure (For Certified Engineer Only)

The main task for calibration is to adjust the “ZERO” and “SPAN” to conform to the output 4-20mA. This can only be done by experienced (certified) engineer with special tools. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” and “SPAN” from the top of the transmitter.
2) Connect the driver, extension cable and Accelerometer to shaker.
3) With the shaker stand-still, turn the “ZERO” potential-meter till the 4-20mA output indicating 4.00mA.
4) Turn the shaker to the full-scale vibration. Turn the “SPAN” potential-meter on the side of right corner of the monitor, till the 4-20mA output indicating 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seal back to normal.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR1101 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK: The OK LED will remain on:
   1) Power supply failure.
   2) Transducer failure.
   3) Field wiring from the transducer to the Transmitter-Monitor shorted or opened.
   4) Transmitter-Monitor internal circuitry failure.

TR3101 Three-Wire Transmitter for Shaft Vibration

Introduction

Condition Monitoring

Measuring the rotation machinery shaft vibration. Monitoring the vibration increase due to shaft imbalance, misalignment, looseness etc.

Machine Type

All kinds of rotation machines with sleeve bearing. Such as blower, compressor, pump, gearbox, and power generators etc.

Output

- ✓ 4-20mA.
- ✓ Buffered Output, interface with portable or on-line data collector.
- ✓ System powered by DCS/PLC or TM900.

DCS/PLC Interface

Due to the fact that transmitter does not supply alarm function, the PLC or DCS should be configured with some recommendation for alarming and vibration monitoring as follows:

- ✓ **Bypass on start-up:** Some machine will have large vibration on start-up, especially while passing the machine harmonic speed, sometimes, it is recommended to have a bypass on alarm during start-up.
- ✓ **Alarm timed-defeat:** For reliable alarming of machine vibration, you must eliminate the interference due to radio, electric-static discharge etc. API670 normally requires a timed-defeat. The delay time is normally between 1 to 6 seconds that will be determined by field condition.
- ✓ **System self-test:** If there is a defect on probe, extension cable or the transmitter, the 4-20mA will give a current which less than 3.75mA. In this situation, alarm should be disabled.

Specifications

Electrical

Power Supply:
20-30VDC
Frequency Response（±3dB):
2.0 - 3,000Hz
Probe and cable:
5 meter or 9 meter proximity probe and extension cable works with 5mm, 8mm, and 11mm probes
Proximity probe includes: TM0180, TM0105, TM0110, 3300, 7200, 990 series
Sensor Linear Range (reference with ANSI 4140 steel):
5mm, 8mm probe: 2.0 mm (80mil)
Approximately 0.25mm (10mil) to 2.25mm (90mil)
11mm probe: 4.0mm (160mil)
Approximately 0.4mm (15mil) to 4.4mm (175mil)
Overall Vibration:
4-20mA; Source
Buffered Output/ GAP:
Original vibration, un-filtered
Nominal: 2-18VDC
Impedance: 100Ω
Maximum cable distance: 300m (1,000ft)
Sensitivity: 8.0mV/um (200mV/mil) nominal
Maximum Load:
500Ω
Isolation:
> 500Vrms; circuit to case
System OK:
System OK: output 4-20mA
System Not OK: output < 3.0mA

Physical

Height: 75mm (2.95”)
Weight: 0.5 kg (1.0 lb)

Environmental

Temperature:
Operation: -40℃ to +70℃
Storage: -40℃to +100℃
Humidity:
90% non-condensing

Order Information

* Factory default
Standard configuration:

TR3101-A00-E00-G00-S00

8mm probe:

TM0180-07-00-05-10-02

Extension cable:

TM0181-040-00

TR3101-AXX-EXX-GXX-SXX

AXX: Full Scale

A00*: 0 - 200um (8.0mil) pk-pk
A01: 0 - 500um (20mil) pk-pk
A02: 0 - 100um (4.0mil) pk-pk
A03: 0 - 250um (10mil) pk-pk
A04: 0 - 630um (25mil) pk-pk
A05: 0 - 125um (5.0mil) pk-pk

EXX: Probe and Cable (not included)

E00*: TM0180, 8mm Probe, 5m Cable
E01: TM0180, 8mm Probe, 9m Cable
E02: 3300, 8mm Probe, 5m Cable
E03: 3300, 8mm Probe, 9m Cable
E04: 7200, 8mm Probe, 5m Cable
E05: 7200, 8mm Probe, 9m Cable
E06: TM0105, 5mm Probe, 5m Cable
E07: TM0105, 5mm Probe, 9m Cable
E08: TM0110, 11mm Probe, 5m Cable
E09: TM0110, 11mm Probe, 9m Cable
E10: 3300, 11mm Probe, 5m Cable
E11: 3300, 11mm Probe, 9m Cable
E12: 7200, 11mm Probe, 5m Cable
E13: 7200, 11mm Probe, 9m Cable
E14: 3309 Probe, 5m Cable
E15: 3309 Probe, 7m Cable

GXX: Mount

G00*: DIN rail mount
G01: Plate mount

SXX: Approval

S00*: CE Mark
TR CU: № ТС RU C-US.ГБ05.В.00479

TR3101 Accessories

The TR3101 requires a proximity probe and extension cable to work as a system.

TM0180: 8mm probe
TM0105: 5mm probe
TM0110: 11mm probe
TM0181: Extension cable
TM900: Power converter
TM0200: 3-1/2 digit display unit
BNC-3： BNC adaptor for portable data collector

Installation

Installation -Mounting the probe

There are two ways for probe's field installation:

1) Please mount the probe in axial direction for TR3101 Three-Wire Transmitter for Shaft Vibration monitoring system. Keep the distance between probe tip and shaft about 0.05" (1.25mm). In order to avoid wrong output, please make sure there is enough distance between probe tip and the other metal material which is monitored. The least distance is 0.63" (16mm), please refer to Figure 1. For exact gapping procedure see the section ***Set-up Procedure*** of chapter ***Operation***. When mounting two probes adjacently, the two probes should keep 1" (25 mm) at least as shown in Figure 2.
2) Mount probe holder at the side of bearing as shown in figure 3. This method can easily adjust probe gap.

NOTE：
When inserting the probe through the machine case or bearing cap, the signal voltage may vary widely before the proper gap is obtained. Therefore, be sure the gap is within 0.07" (1.8mm) of the target before attempting to set the gap electrically.

Please refer to section ***Order information*** of chapter ***Maintenance***. Do not change the length of the extension cable or delete it, as such action will adversely affect the calibration and linearity.

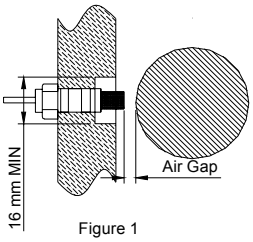


Figure 1

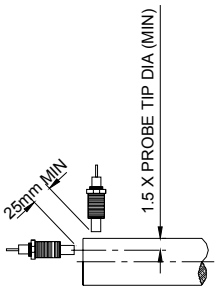


Figure 2

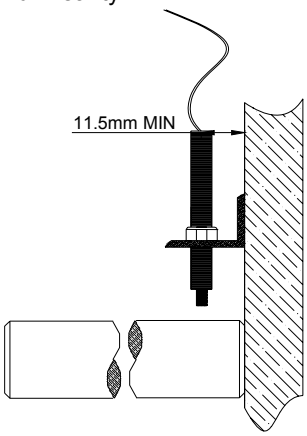
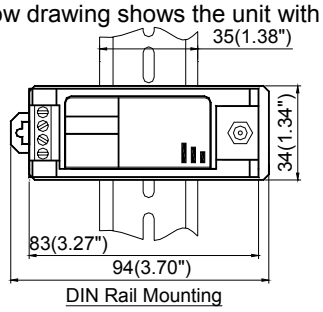


Figure 3

Mounting the transmitter

The below drawing shows the unit with the optional mounting plate and mounting rail.



DIN Rail Mounting

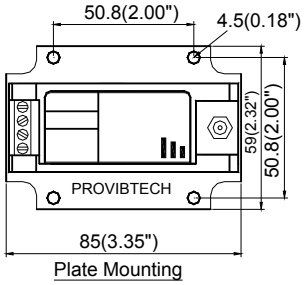
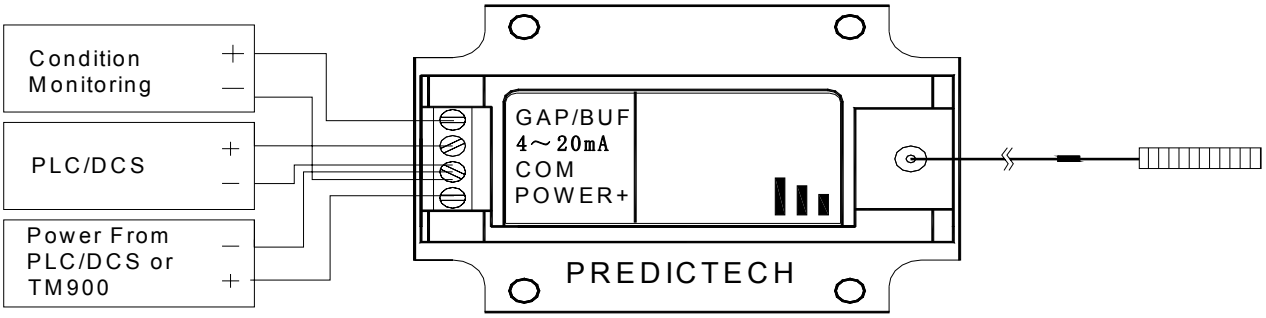


Plate Mounting

TR3101 Field-wiring Diagram



Operation

Set-up Procedure – Utilize Voltmeter

1) Mount the probe against the shaft.
2) Connect the probe, the extension cable, and TR3101.
3) Connect the voltmeter to “GAP V” and “COM” on TR3101.
4) Turn the power of TR3101 on.
5) Gap the probe against the shaft; read the voltmeter until it shows **8V +/- 0.5V**.
6) Tighten the probe.

Power-up Inhibit

During power up, the vibration transmitter will be engaged in the self-test mode. The self-test will test the transducer OK, the vibration transmitter circuitry, and the system functionality. The total time is roughly 5 seconds. After the inhibit time, and the monitor tested OK, the output will be within the 4mA to 20mA range.

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

Full-Scale Calibration Procedure (for certified Engineer only)

Calibration of full-scale can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Remove the top label.
3) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the shaker, gap the eddy-probe to until the gap voltage shows 8V+/-0.1V.
4) With the shaker standstill, turn the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
5) Turn the shaker to the full-scale vibration. Turn the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
6) Repeat procedure 4) and 5) four times.
7) Put the label and the seal back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Buffered Output / GAP V

Buffered output will directly interface with any diagnostics or condition monitoring equipment. The buffered output will have the same unit as the overall vibration output.

CAUTION

1) **It is not recommended that the diagnostics instrument been directly connected with the buffered output in the middle of the operation. This will likely been engaged in the ground loop problem and will possibly generate false vibration signal.**
2) **If you insist to connect the instrument to the buffered output during the machine operation, you must isolate the instrument from ground. In another word, you must make sure the diagnostics instrument and the Vibration transmitter only has one ground.**

Maintenance

TR3101 is a high integrated vibration transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Tool preparations
Current calibrating
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR3101 works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4mA Calibration Procedure

1) Remove the seal of “ZERO” from the top of the transmitter.
2) Connect the right probe and extension cable.
3) Gap the probe properly (see Field Set-up).
4) Connect the transmitter to power and the measuring unit. (Current meter, display unit, PLC/DCS etc.).
5) Adjust the potential-meter until the current meter indicates a 4.0mA or a “0” from PLC/DCS.
6) Put the seal back.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR3101 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK: The 4-20mA output will be less than 3.0mA if the following condition meet:
   1) Probe failure.
   2) Extension cable failure.
   3) Probe and extension cable are not connected to TR transmitter.
   4) Transmitter failure.
   5) Probe is not gapped in its linear range.

TR3102 Three-Wire Transmitter for Thrust Position

Introduction

Condition Monitoring

Measuring rotor thrust position.

Machine Type

All kinds of rotation machines with sleeve bearing. Such as blower, compressor, pump, gearbox, and power generators etc.

Output

- ✓ 4-20mA.
- ✓ Buffered Output, interface with portable/on-line data collector.
- ✓ System powered by DCS/PLC or TM900.

DCS/PLC Interface

Due to the fact that transmitter does not supply alarm function, the PLC or DCS should be configured with some recommendation for alarming and vibration monitoring as follows:

- ✓ **Bypass on start-up:** Some machine will have large vibration on start-up, especially while passing the machine harmonic speed, sometimes, it is recommended to have a bypass on alarm during start-up.
- ✓ **Alarm timed-defeat:** For reliable alarming of machine vibration, you must eliminate the interference due to radio, electric-static discharge etc. API670 normally requires a timed-defeat. The delay time is normally between 1 to 6 seconds that will be determined by field condition.
- ✓ **System self-test:** If there is a defect on probe, extension cable or the transmitter, the 4-20mA will give a current which less than 3.75mA. In this situation, alarm should be disabled.

Specifications

Electrical

DCS or PLC Power Supply:
20-30VDC
Sensor Interface:
Connection:
Special 95Ω coaxial cable with connector
Probe:
5 meter or 9 meter proximity probe and extension cable works with 5mm, 8mm, and 11mm probes

Proximity probe includes: TM0180, TM0105, TM0110, 3300, 7200, 990 series.
Sensor Linear Range (reference with AISI 4140 steel):
5mm, 8mm probe: 2.0 mm (80mil)
Approximately 0.25mm (10mil) to 2.25mm (90mil)
11mm probe: 4.0mm (160mil)
Approximately 0.4mm (15mil) to 4.4mm (175mil)
4-20mA Transmission:
2-wire, source
Buffered Output (GAP V):
Raw position signal
Nominal 2-18VDC
Impedance: 100Ω
Maximum cable distance: 300m (1,000ft)
Sensitivity: 8.0mV/um (200mV/mil) nominal
Frequency response: 0 - 10 KHz
Maximum Load:
500Ω
System Self-test:
System OK: output 4-20mA
System Not OK: output < 3.0mA

Physical

Height: 75mm (2.95”)
Weight: 1.0kg (2.0 lbs)

Environmental

Temperature:
Operation: -40℃ to +70℃
Storage: -40℃ to +100℃
Humidity:
90% non-condensing

Order Information

* Factory default
Standard configuration:
TR3102-E00-G00-S00

8mm probe:

TM0180-07-00-05-10-02

Extension cable:

TM0181-040-000

TR3102-EXX-GXX-SXX

EXX: Probe and Cable (not included)

E00*: TM0180, 8mm Probe, 5m Cable
E01: TM0180, 8mm Probe, 9m Cable
E02: 3300, 8mm Probe, 5m Cable
E03: 3300, 8mm Probe, 9m Cable
E04: 7200, 8mm Probe, 5m Cable
E05: 7200, 8mm Probe, 9m Cable
E06: TM0105, 5mm Probe, 5m Cable
E07: TM0105, 5mm Probe, 9m Cable
E08: TM0110, 11mm Probe, 5m Cable
E09: TM0110, 11mm Probe, 9m Cable
E10: 3300, 11mm Probe, 5m Cable
E11: 3300, 11mm Probe, 9m Cable
E12: 7200, 11mm Probe, 5m Cable
E13: 7200, 11mm Probe, 9m Cable
E14: 3309 Probe, 5m Cable
E15: 3309 Probe, 7m Cable

GXX: Mount/ Function

G00: DIN rail mount, measure position
G01: Plate mount, measure position

SXX: Approval

S00*: CE
TR CU: № ТС RU C-US.ГБ05.В.00479

TR3102 Accessories

The TR3102 works with a proximity probe and extension cable.

TM0180: 8mm probe
TM0105: 5mm probe
TM0110: 11mm probe
TM0181: Extension cable
TM900: Power converter
TM0200: 3-1/2 digit display unit
BNC-3: BNC adaptor for portable data collector

Installation

Installation - Mounting the probe

There are two ways for probe's field installation:

1) Please mount the probe in axial direction for TR3102 Three-Wire Transmitter for Thrust Position monitoring system. Keep the distance between probe tip and shaft about 0.05" (1.25mm). In order to avoid wrong output, please make sure there is enough distance between probe tip and the other metal material which is monitored. The least distance is 0.63" (16mm), please refer to Figure 1. For exact gapping procedure see the section ***Set-up Procedure*** of chapter ***Operation***. When mounting two probes adjacently, the two probes should keep 1" (25 mm) at least as shown in Figure 2.
2) Mount probe holder at the side of bearing as shown in figure 3. This method can easily adjust probe gap.

NOTE:
When inserting the probe through the machine case or bearing cap, the signal voltage may vary widely before the proper gap is obtained. Therefore, be sure the gap is within .07" (1.8mm) of the target before attempting to set the gap electrically.

Please refer to section ***Order information*** of chapter ***Maintenance***. Do not change the length of the extension cable or delete it, as such action will adversely affect the calibration and linearity.

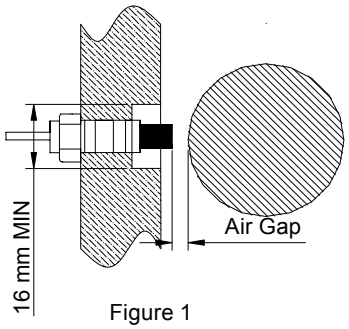


Figure 1

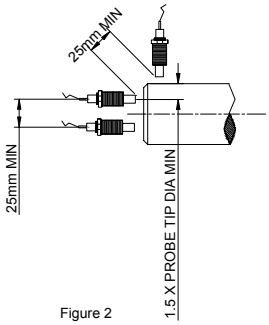


Figure 2

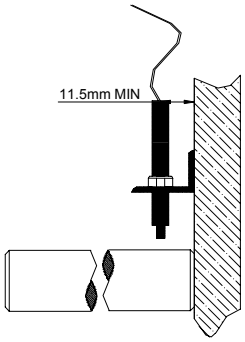
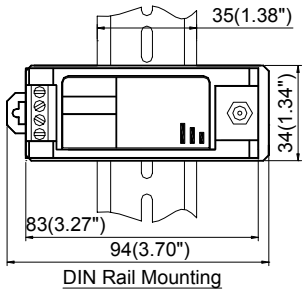


Figure 3

Installation - Mounting the transmitter

The below drawing shows the unit with the optional mounting plate and mounting rail.



DIN Rail Mounting

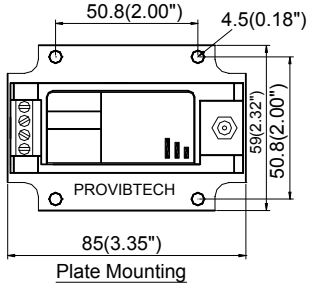
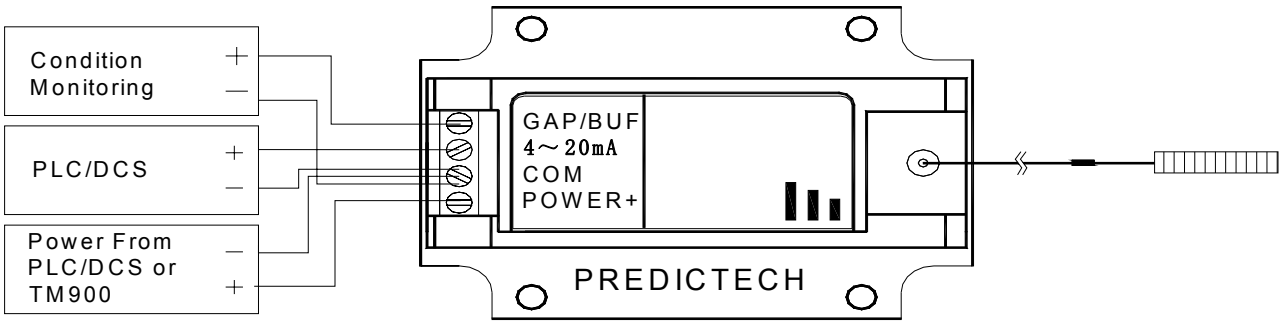


Plate Mounting

Installation - TR3102 Field-wiring Diagram



Operation

Power-up Inhibit

During power up, the transmitter will be engaged in the self-test mode. The self-test will test the proximity probe system, the transmitter circuitry, and the system functionality. The total time is roughly 5 seconds. After the inhibit time, and the monitor tested OK, the output will be within the 4mA to 20mA range

Set-up Procedure – Utilize Voltmeter

1) Mount the probe against the shaft.
2) Connect the probe, the extension cable, and the TR3102.
3) Connect the voltmeter to GAP V and COM on TR3102.
4) Turn the power of TR3102 on.
5) Gap the probe against the shaft; read the voltmeter until it shows **10V +/- 0.25V**.
6) Tighten the probe.

4-20mA Calibration Procedure (for certified Engineer only)

Calibration of 4-20mA can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” and “SPAN” from the top of the transmitter.
2) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the static calibrator, gap the eddy-probe to until the gap voltage shows 10V. This is the center of the linear range. Note this “central gap”.
3) Turn the static-calibrator 1.0mm toward the probe tip from the “central gap”. Adjust the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
4) Turn the static-calibrator 1.0mm away from the probe tip from the “central gap”. Adjust the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seals back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Buffered Output / GAP V

Buffered output will directly interface with any diagnostics or condition monitoring equipment. The buffered output will have the same unit as the overall vibration output.

CAUTION

1) **It is not recommended that the diagnostics instrument been directly connected with the buffered output in the middle of the operation. This will likely been engaged in the ground loop problem and will possibly generate false vibration signal.**
2) **If you insist to connect the instrument to the buffered output during the machine operation, you must isolate the instrument from ground. In another word, you must make sure the diagnostics instrument and the Vibration transmitter only has one ground.**

Maintenance

TR3102 is a high integrated Thrust Position transmitter. The maintenance described here covers the test of the module and check whether it works properly and primary setting for measuring value.

This part describes vortex probe system monitoring and output current calibration.
Periodic maintenance
Tool preparations
Current calibrating
Exceptional module treatment

Periodic Maintenance

This maintenance interval is very important for the module maintenance. Usually, a yearly maintenance is sufficient. If TR3102 works in extraordinary circumstance, user should shorten the interval according to the actual situation.

Extraordinary circumstance

Used to monitor some critical equipment
High temperature, high humidity, and corrosive environment

Maintenance tools

Multimeter
Screw driver

4-20mA Calibration Procedure (for certified Engineer only)

Calibration of 4-20mA can only be done by experienced (certified) engineer. Special equipments are needed. Please contact with ProvibTech for more details.

1) Remove the seal of “ZERO” and “SPAN” from the top of the transmitter.
2) Connect the TR transmitter, extension cable and eddy probe. Mounting the probe to the static calibrator, gap the eddy-probe to until the gap voltage shows 10V. This is the center of the linear range. Note this “central gap”.
3) Turn the static-calibrator 1.0mm toward the probe tip from the “central gap”. Adjust the “ZERO” potential-meter until the 4-20mA output indicates 4.0mA.
4) Turn the static-calibrator 1.0mm away from the probe tip from the “central gap”. Adjust the “SPAN” potential-meter until the 4-20mA output indicates 20.0mA.
5) Repeat procedure 3) and 4) four times.
6) Put the seals back to the transmitter.

CAUTION

The 4-20mA output has been factory calibrated before the shipment. Unless you are sure you understand the conversion factor, and you have the special tools, otherwise, please do not try to calibrate it.

Exceptional Module Treatment

In case of finding some exceptions after the test, except the linearity problem which can be solved by calibrating, users should not repair it by themselves. Users could substitute it with a spare TR3102 transmitter and contact with a ProvibTech local office.

Trouble shooting

1. NOT OK: The 4-20mA output will be less than 3.0mA if the following condition meet:
    1) Probe failure.
    2) Extension cable failure.
    3) Probe and extension cable are not connected to TR transmitter.
    4) Transmitter failure.
    5) Probe is not gapped in its linear range.