TXR5521 TRENDSETTER

Installation Manual

OVERVIEW

The TXR5521 RPM Transmitter System consists of three parts: a proximity probe, a matched extension cable, and a loop-powered transmitter. The system provides a 4 to 20 mA output signal that is proportional to the RPM of a rotating shaft. Rotative speed is sensed by the number of times a discontinuity passes under the probe tip with each shaft rotation, and the transmitter is configured at the factory for the specific number of events per revolution, such as a 60-tooth wheel, or a once-per-turn keyway. This setting cannot be changed in the field and must be specificed at time of ordering. The following equation represents the relationship between the RPM and the loop current:

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

CAUTION: Metrix RPM transmitters are designed for speed indication only. Use as part of a speed control and/or overspeed protection circuit. Represents a misuse of the product; it does not provide the necessary. Response times and other attributes required for such applications.

1003407 • REV F (July 2017)

In addition to the 4-20mA output signal, the transmitter provides a voltage proportional to the distance between the target and the probe tip. This voltage is available as a buffered output on the BNC connector; it is used when gapping the probe and for diagnostic purposes. You may apply this voltage to any battery-powered or ground-isolated instrumentation with a 1 MΩ or larger input impedance.

The amplitude of the output signal is +200 mV/ mil.

The Dynamic Output signal is buffered however, due to the limited current available on the loop; the DYNAMIC OUTPUT reading will be attenuated by instrumentation with an input Impedance of less than 1 MΩ, see Graph 1.

RECEIVING, INSPECTING, AND HANDLING THE SYSTEM

The probe, extension cable, and transmitter are shipped as separate units and must be interconnected at the installation site by the user. Carefully remove all equipment from the shipping containers and inspect the equipment for shipping damage. If shipping damage is apparent, file a claim with the carrier and submit a copy to Metrix Instrument Co. Include part numbers and serial numbers on all correspondence. If no damage is apparent and the equipment is not going to be used immediately, return the equipment to the shipping containers and reseal until ready for use. Store the equipment in an environment free from potentially damaging conditions such as extreme temperature, excessive humidity, or a corrosive atmosphere.

INSTALLATION

1. For RPM measurements, mount the probe with its axis radial to the shaft with its tip approximately .050" (1.25 mm) from the outermost surface of the shaft. The probe tip must be provided with sufficient clearance from surrounding metal to prevent an erroneous output. As a minimum, the clearance diameter should be .63" (16 mm) for the full length of the probe tip, as shown in Figure 1. For exact gapping procedure see the section concerning calibration. To prevent cross-feed between two probes mounted in the same vicinity, at least 1" (25 mm) spacing between the probe tips should be maintained, as shown in Figure 2 & 3.

2. The minimum keyway depth is .060" (1.5mm). The minimum keyway width and key width is the diameter of the probe tip. This will ensure that the transmitter responds properly to the keyway at all RPMs. Some experimentation may be required such as adjusting the probe gap or modifying the keyway dimensions.

3. The probe can be mounted in a simple bracket, such as the Metrix model 7646, in a tapped hole in the bearing cap or by means of a Metrix model 5499 Probe Housing. The latter arrangement provides an easy way to adjust the probe air gap, especially where the target is some distance from the outside surface of the machine.

4. 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" (1.8 mm) of the target before attempting to set the gap electrically. If possible, set the probe gap while the machine is shut down, to avoid the danger of damaging the probe in the event that it touches the shaft.

5. Connect the probe to the transmitter using the proper extension cable such that the combined system length of probe + cable matches the transmitter configuration (refer to datasheet 1028003, Ordering Option B). Do not change the length of the extension cable from the system, as such action will adversely affect the calibration and linearity. If a connector must be replaced, the overall length of the cable can be reduced by 2" without harm. Insulate the probe connector/extension cable connector junction with the Metrix model 8973 connector insulator.

INSTALLATION DRAWINGS

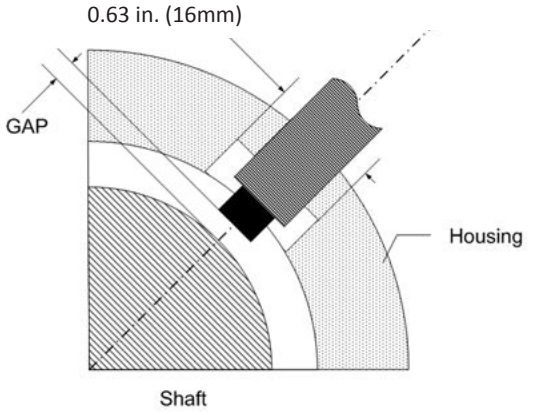


Figure 1

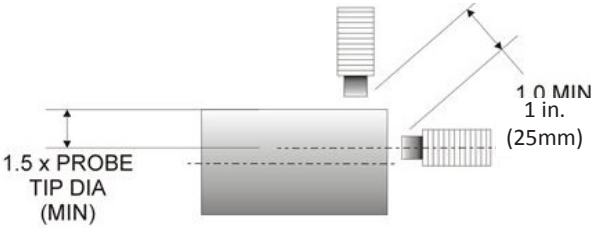


Figure 2

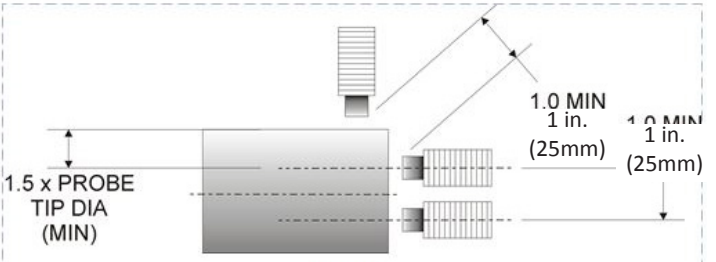


Figure 3

INSTALLATION DRAWINGS

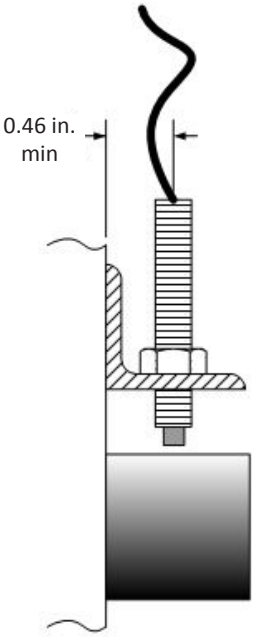


Figure 4

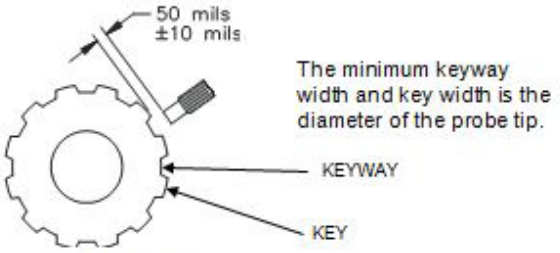
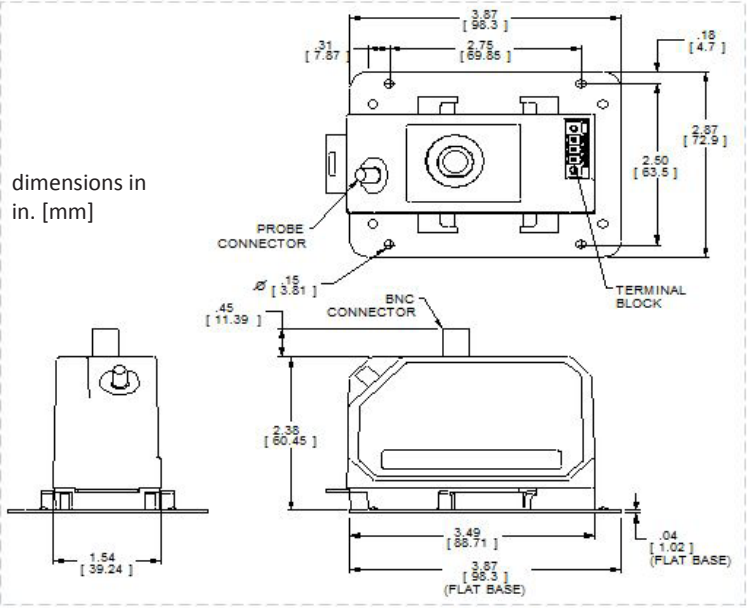


Figure 5

MOUNTING

Mount the transmitter in a suitable enclosure in a location that is compatible with its environmental specifications. Refer to Metrix datasheet 1028003 for environmental and other specifications for the transmitter. The transmitter comes standard with a DIN rail mount. The below drawing shows the unit with the optional flat base mounting plate, part number 9647, ordered separately.



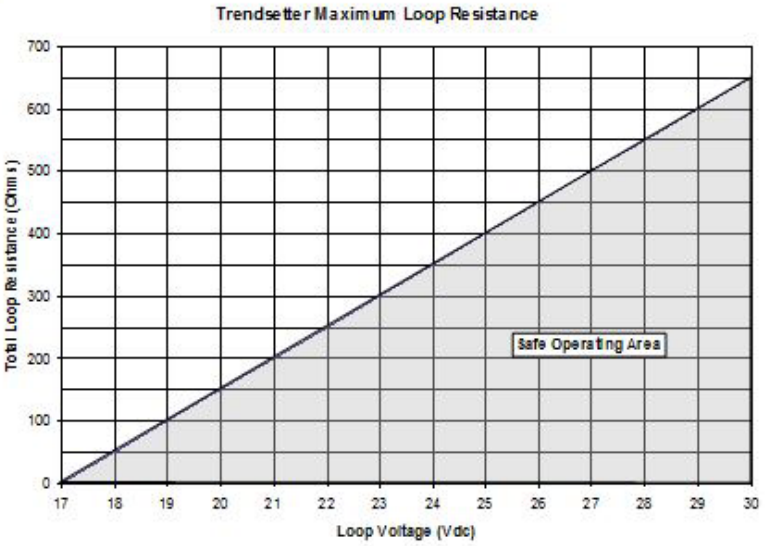
Routing the Extension Cable and Field Wiring

Route the extension cable using the following guidelines:

- Check that the Transmitter, extension cable, and probe belong to the same system.
- Secure the extension cable to supporting surfaces or place in conduit. Make certain the cable is not kinked, scraped, nor bent beyond the minimum recommended radius of 1".
- Secure coaxial connectors between the extension cable and the proximity probe. Connection should be "finger tight" with an additional quarter turn using an open ended 9/32" wrench or equivalent.
- Insulate the connection between the probe lead and the extension cable by wrapping the connector with Teflon tape.

Connect the field wiring in accordance with the appropriate diagrams shown in Figure 6 & 7. The minimum power supply voltage is 17 V plus 1 V for each 50 Ω of loop resistance, see Graph 1.

Graph 1



INTRINSICALLY SAFE INSTALLATION IN HAZARDOUS LOCATIONS

C US

Intrinsically Safe
Class I, Div. 1, Groups A, B, C, D
Temp Code T4 (–40°C ≤ Ta ≤ +85°C)

Connect the field wiring in accordance with Metrix drawing 9688 (page 1) for CSA Class I, Div 1 installations. The transmitter requires a minimum of 17 VDC for proper operation. The voltage drop across the specified zener barriers on the installation drawings with a 20 mA loop current is 8.1 VDC. The minimum loop power supply voltage required is 25.1 VDC plus 1 volt for each 50 ohms of loop resistance. The maximum loop power supply voltage that may be applied to the safety barrier is 26 VDC. Therefore, the maximum loop resistance with a 26 VDC supply is 45 ohms.

Example: Single wire resistance = 5 ohms
Resistance of receiver = 50 ohms
Total loop resistance = 55 ohms
Minimum supply voltage = 55 (1V/50 ohms) + 25.1 V = 26.2 VDC

REVISIONS				
REV	ENG	BY	DATE	APPROVED
*	9383 RELEASE	AW	5-18-06	

NOTES:

1. SAFE AREA APPARATUS IS NOT SPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN IN NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250 VRMS OR 250 VDC.

2. THE TRANSMITTER ENTITY PARAMETERS ARE:

   Vmax = 28V
   Imax = 93mA
   Ci = 18nF
   Li = 0uH
   Pi = 0.66W

   CHOOSE A CSA CERTIFIED BARRIER WITH ENTITY PARAMETERS THAT SATISIFY THE FOLLOWING CONDITIONS:

   Vmax ≥ Voc
   Imax ≥ Isc
   Ci + C cable ≤ Ca
   Li + L cable ≤ La
   Pi ≥ Po

   SUITABLE BARRIERS INCLUDE:

   MTL 7087+

   SUITABLE GALVANIC ISOLATION SAFETY BARRIERS INCLUDE:

   STAHL 9303/11-22-11.

3. INSTALL IN ACCORDANCE WITH THE APPROPRIATE NATIONAL ELECTRICAL REQUIREMENTS AND PER THE BARRIER INSTRUCTIONS.

4. THE TRANSMITTER MUST BE INSTALLED IN A SUITABLE ENCLOSURE ACCEPTABLE TO THE LOCAL INSPECTION AUTHORITY HAVING JURISDICTION.

⑤ THE TRANSMITTER PROBE ENTITY PARAMETERS ARE:

   Voc = 5.36V
   Isc = 3.61mA
   Ca = 512uF
   La = 1000uH
   Po = 19.4mW

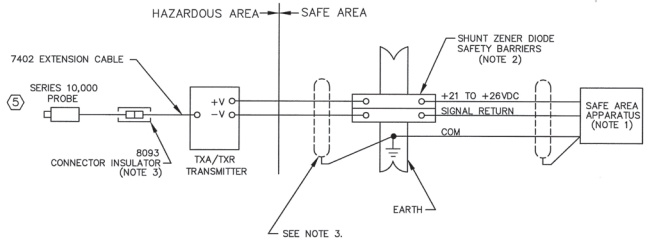
   THE SERIES 10,000 PROBE TOGETHER WITH ITS 7402 EXTENSION CABLE AND 8093 CONNECTOR INSULATOR MAY BE REPLACED BY ANY CSA CERTIFIED INTRINSICALLY SAFE PROBE THAT SATIFIES THE FOLLOWING CONDITIONS:

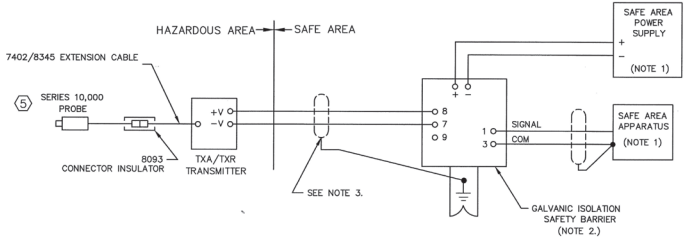
   Vmax ≥ Voc
   Imax ≥ Isc
   Ci + C cable ≤ Ca
   Li + L cable ≤ La
   Pi ≥ Po

AGENCY APPROVED PRODUCT

DO NOT DEVIATE FROM DOCUMENTED CONSTRUCTION OR LISTED PARTS

INTRINSICALLY SAFE INSTALLATION
CSA





MATERIAL:	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. ALL CORNERS BROKEN TO .010 MIN RADIUS AND TOLERANCES ARE:		APPROVALS	DATE	HOUSTON TEXAS METRIX INSTRUMENT CO. U.S.A.
FINISH:	FRACTIONS: ±1/64 DECIMALS: .XX ±.01 .XXX ±.005 ANGLES: ±1° SURFACE FINISH 64		DRAWN BY A. Wilson	11-29-05	INSTALLATION (CSA) TXA/TXR TRANSMITTER
THIS DOCUMENT AND ALL INFORMATION HEREON IS THE PROPERTY OF METRIX INSTRUMENT CO. APPROVAL MUST BE OBTAINED BEFORE IT IS REPRODUCED OR INFORMATION HEREON IS ISSUED TO A THIRD PARTY. THIS DOCUMENT MUST BE RETURNED UPON REQUEST.		TXR TXA NEXT ASSY	CHECKED BY	5-18-06	SIZE C DRAWING NO. 9688 REV *
		TXR TXA USED ON	APPROVED BY	5/18/06	SCALE: 1:1 SHEET: 1 of 2
		APPLICATION	DO NOT SCALE DRAWING		

NOTES:

1. THE MAXIMUM OUTPUT VOLTAGE FROM THE SAFE AREA APPARATUS MUST NOT EXCEED THE RATED VOLTAGE OF THE TRANSMITTER: 30VDC.
2. CIRCUIT IN HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING A VOLTAGE TEST OF 500 VRMS TO EARTH OR TO THE FRAME OF THE APPARATUS. USE 8093 INSULATOR ON CONNECTOR BETWEEN PROBE AND EXTENSION CABLE.
3. THE INSTALLATION MUST COMPLY WITH THE APPROPRIATE NATIONAL INSTALLATION REQUIREMENTS.
4. THE TRANSMITTER MUST BE INSTALLED IN A SUITABLE ENCLOSURE ACCEPTABLE TO THE LOCAL INSPECTION AUTHORITY HAVING JURISDICTION.

⑤ THE TRANSMITTER PROBE ENTITY PARAMETERS ARE:

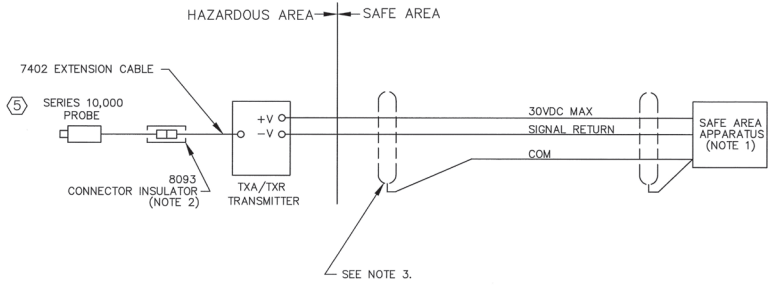
Voc	=	5.36V
Isc	=	3.61mA
Ca	=	512uF
La	=	1000uH
Po	=	19.4mW

THE SERIES 10,000 PROBE TOGETHER WITH ITS 7402 EXTENSION CABLE AND 8093 CONNECTOR INSULATOR MAY BE REPLACED BY ANY CSA CERTIFIED INTRINSICALLY SAFE OR NON-INCENDIVE PROBE THAT SATISFIES THE FOLLOWING CONDITIONS:

Vmax	≥	Voc
Imax	≥	Isc
Ci + C cable	≤	Ca
Li + L cable	≤	La
Pi	≥	Po

THE TRANSMITTER PROVIDES A NON-INCENDIVE CIRCUIT TO THE PROBE.

DIVISION 2 INSTALLATION
CANADIAN STANDARDS



METRIX PMC/BETA INSTRUMENT CO. HOUSTON, TEXAS U.S.A.

INSTALLATION (CSA)
TXA/TXR TRANSMITTER

SIZE B | DRAWING NO. 9688 | REV. *

SCALE: 1:1 | SHEET: 2 of 2

METRIX

WIRING DIAGRAMS

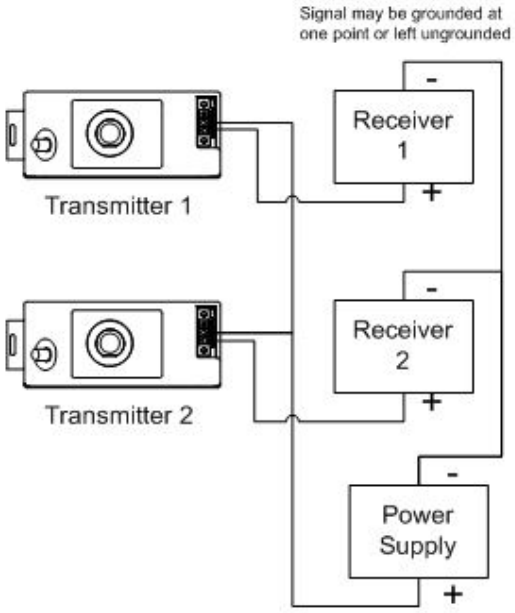


FIGURE 6

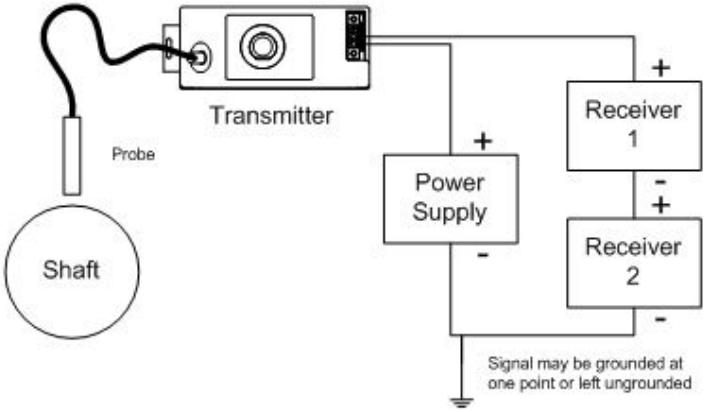


FIGURE 7

Permanent wiring connection to the Dynamic Signal BNC connector is not allowed under the intrinsic safety certification requirements.

SPECIAL CONDITIONS OF SAFE USE (INTRINSICALLY SAFE)

Transmitter is certified as a component only and must be installed in a suitable enclosure acceptable to local authorities.

Field wiring from the safe area to the transmitter must conform with the local electrical code. The transmitter provides a non-sparking circuit to probe and extension cable, which therefore require no further electrical protection.

Do not use Dynamic Signal BNC connector unless area is known to be non-hazardous.
The transmitter is not capable of withstanding the insulator test required by Clause 6.4.12 of EN50020:2002. This must be taken into account when installing the transmitter.

INPUT/OUTPUT PARAMETERS (INTRINSICALLY SAFE)

Terminals marked "POWER"

U_i	= 28V
I_i	= 93mA
P_i	= 0.66W
C_i	= 18nF
L_i	= 0uH

External Probe Connector, J1 marked "PROBE"

CSA Parameters	
V_{oc}	= 5.36V
Disc	= 3.61mA
C_a	= 512uF
L_a	= 1000uH
P_o	= 19.4mW

NON-INCENDIVE INSTALLATION IN HAZARDOUS LOCATIONS

Non-Incendive
Class I, Div. 2, Groups A, B, C, D
Temp Code T4 (–40°C ≤ Ta ≤ +85°C)

Connect the field wiring in accordance with Metrix drawing 9688 (page 2) for CSA Class I, Div 2 installations. Transmitter is certified as a component only and must be installed in a suitable enclosure acceptable to local authorities. Field wiring from the safe area to the transmitter must conform with the local electrical code. The transmitter provides a non-incendive circuit to probe and extension cable, which therefore require no further electrical protection. Do not use Dynamic Signal BNC Connector unless area is known to be non-hazardous.

CALIBRATION AND SIGNAL ANALYSIS

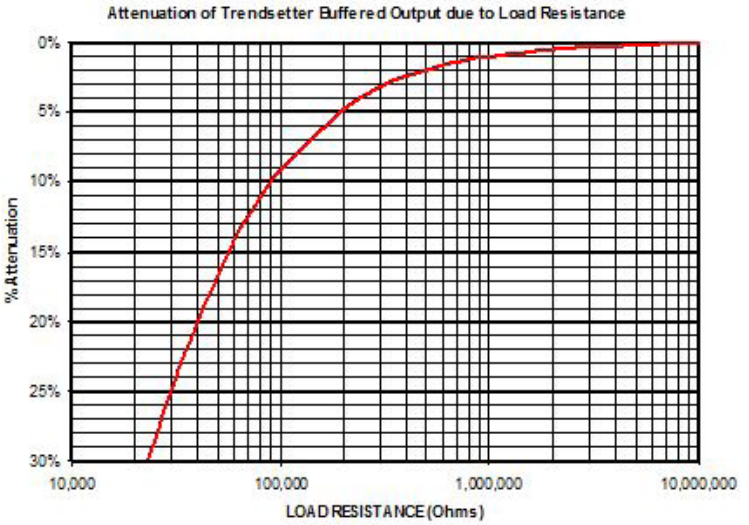
1. Each transmitter has been factory calibrated for use with the probe type and extension cable specified using a 4140 steel target material. The full scale 20 mA output (SPAN) is factory set to the full scale value indicated on the nameplate. Probes and extension cables of the same type may be exchanged with a maximum error of ± 12% without recalibration of the transmitter. For maximum accuracy, calibrate the transmitter with the probe and cable to be used.

CAUTION: Do not connect test equipment or cables to the transmitter unless the area has been determined to be non-hazardous.

2. The Dynamic Output jack (BNC) is a buffered output from the transmitter. The probe gap can be set “electrically” to the center of its measurement range by observing the DC output voltage at the BNC connector with an isolated meter. Adjust the probe gap to obtain 10 VDC, which corresponds to a gap of approximately .050” (1.25 mm). The preferred static gap range for TXR5521 units is .040” to .060”. This corresponds to a gap voltage of 8.0 VDC to 12 VDC.

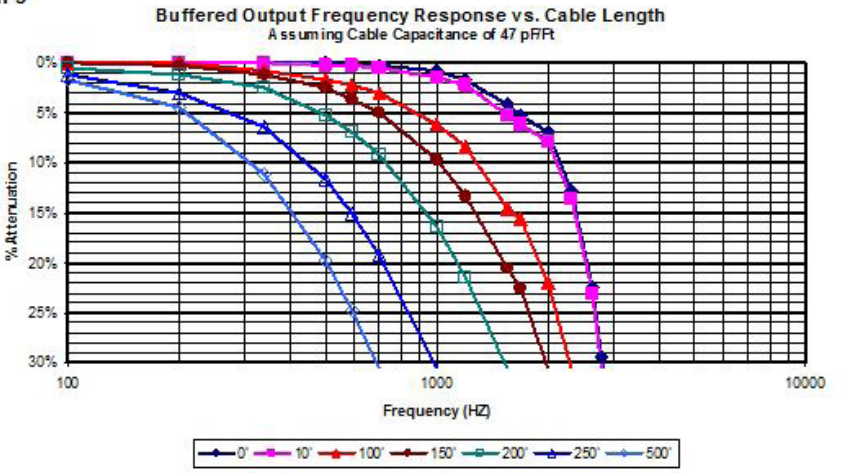
The use of a ground, isolated instrument or signal isolator is highly recommended. The meter, oscilloscope or analyzer used to measure the gap voltage or to observe the vibration signal (DYNAMIC OUTPUT) must have an input impedance of one MΩ or greater. The output impedance of the DYNAMIC OUTPUT is 10,000 Ω. Use of a measuring instrument with an input impedance of less than one MΩ will introduce a measurement error. See Graph 2.

Graph 2



The length of the shielded cable, which temporarily may be attached to the DYNAMIC OUTPUT BNC, is limited to 3 meters (10 ft.). Use of a longer cable length is possible, but will attenuate the higher frequency content of the vibration signal, and cause the reading on the instrument to be lower than the actual amplitude. See Graph 3.

Graph 3



The full scale RPM and number of keyways is configured during factory calibration. They are not field adjustable.

3. 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. Please note that the transmitter will provide a current of 4 mA for an RPM less than the greater of either 0.9 RPM

or 0.1% of full scale. For a full scale of 100,000 RPM, the minimum reading is 100 RPM. For a 5 RPM full scale, the minimum reading is 0.9 RPM.

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

NOTE: Check points are 10 mils inside of specified range end points. Tolerance is + 0.15 mA. It is recommended that an out-of-tolerance transmitter be returned to the factory for recalibration.

4. The transmitter cannot be repaired in the field and must be replaced by an equivalent unit. The transmitter is not to be exposed to dust conditions.

5. The transmitter should not be installed where it may be subjected to mechanical and excessive thermal stresses or where it may be attacked by existing or foreseeable aggressive substances.

6. The transmitter must be installed such that its terminals are protected to at least IP20.

7. The apparatus enclosure is made from plastic which must be protected from impact and friction.

8. Installer must perform a risk assessment in accordance with Clause 10 of EN60079-25 and install lightning protection arresters as deemed necessary.

SPECIFICATIONS AND ORDERING INFORMATION

Refer to datasheet 1028003.

ENVIRONMENTAL SPECIFICATIONS

Unless otherwise noted, all specifications are specified at 21°C (70°F), +24 VDC power supply, gap set to 1.27 mm (50 mils) and using Metrix AISI 4140 steel target.

Operating Temperature Range:
-40°C to 85°C (-40°F to 185°F)
Operating Humidity Range:
95% non-condensing, external environmental protection is required.
Power Requirements:
• 17 to 30 VDC with a maximum start up current of 20 mA (-40°C to 85°C)
• Maximum loop resistance is determined by $R_L = 50 (V_s - 17)$ ohms

Frequency Response:
• 5 Hz to 5 kHz +0, -3 dB pk-pk vibration (TXR)
• 0 Hz to 20 Hz +0, -3 dB position (TXA)

Linear Range:
• 0.5 to 2.0 mm (20 to 80 mils); (8 mm probe)
• 0.5 to 4.0 mm (20 to 160 mils); (11 mm probe)

Buffered Output:
• 7.87 V/mm (200 mV/mil) +/- 5% when calibrated as a system, +/- 12% including interchangeability error when measured in 0.25 mm (10 mils) increments over the linear range.
• 3.94 V/mm (100 mV/mil) +/- 5% for 11 mm probes when calibrated as a system, +/- 12% including interchangeability error when measured in 0.25 mm (10 mils) increments over the linear range.
• 0 Hz to 3 kHz +0, -3 dB

NOTE: This must be taken into account when installing the transmitter.

4-20 mA Output:
4 mA +/- 0.1 mA with no input vibration
4 mA +/- 0.2 mA @ -40°C to 85°C with no input vibration
20 mA +/- 0.5 mA @ -40°C to 85°C with full scale input vibration
< 3.6 mA indicates “Not OK” condition

Hazardous Area Ratings
- CSA Certified
  Intrinsically Safe, Class I. Div. 1, Groups A, B, C & D, Temp Code T4
  Non-Incendive, Class I. Div. 2, Groups A, B, C & D

ENVIRONMENTAL INFORMATION

This electronic equipment was manufactured according to high quality standards to ensure safe and reliable operation when used as intended. Due to its nature, this equipment may contain small quantities of substances known to be hazardous to the environment or to human health if released into the environment. For this reason, Waste Electrical and Electronic Equipment (commonly known as WEEE) should never be disposed of in the public waste stream. The “Crossed-Out Waste Bin” label affixed to this product is a reminder to dispose of this product in accordance with local WEEE regulations. If you have questions about the disposal process, please contact Metrix Customer Services.

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