

P027 Series Pressure Transducer

Installation & Operation Manual



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P027 Installation & Operation Manual

A. Pressure Transducers – General Description

A transducer is a device, which provides a useable output in response to a specified physical condition. In the case of a pressure transducer, the useable output is an electric signal and the specified physical condition is an application of pressure.

Pressure transducers are able to convert applied pressure to an electric signal through various technologies. The technology used in all Trans Metrics P027 series of pressure transducer is bonded foil strain gage. The bonded foil strain gage transducer measures pressure by introducing a fluid into a simple low volume chamber (port) where it acts against a diaphragm. Proportional to the applied pressure, the resistance change is conditioned by integrated circuit devices to produce the transducers output.

B. Model Number Designation

Each P027 pressure transducer is designated by a model number, pressure range, units of measure, reference type, and serial number. This information is printed on the certificate of calibration and on the front of the transducer.

The model number in its basic form, designates the mechanical configuration of the transducer. The P027 series is constructed of a single diaphragm and can be ordered in ranges from 25 through 10,000 psi.

A typical part number could be a P027TIC184 1000 psig. The 184 is considered a modification and alters the standard transducer in some way. For ease of discussion, we will call this modification number XXX. Over the past 20 plus years of business, Trans Metrics has assigned over 600 modification numbers.

A breakdown of the part number is as follows:

Part Number	<i>P027TIC184 1000 psig</i>
Location	<i>12345678910</i>
Modification	<i>184 represents 10 feet of cable</i>

The type of series is defined in location 1, 2, 3, and 4 location 5, 6, and 7 designate the circuit type, pressure connection, and electrical connection respectively by way of letters, locations 8, 9, and 10 designate a three digit modification number (transducer has been altered from the standard part, the three digit number is our method of documenting this alteration), blank space, pressure range, blank space, units, reference.

Lets go through a typical part number in detail:

Example: **P027TIC184 1000 psig:**

- P027:** denotes the P027 series, the static error band varies with range <100 psi +/- 1% max, >=100 and < = 2000 +/- .5% max, and >2000 +/- .25%).
- T:** denotes a 4-20 mA output.
- I:** denotes a ¼-18 NPT male pressure port.
- C:** denotes a 1 meter length of PVC jacketed cable AWG #24.
- 184:** denotes a modification number and changes the 1 meter cable length to 10 feet cable length.
- 1000:** denotes the pressure range.
- psi:** denotes the units of measure.
- g:** denotes gage reference.

The specification sheet details performance specifications, common connections, dimensional details, and available options. Reference options/pricing to derive a complete part number. Any questions, please call the factory.

A specification sheet is sent with your order. You may call the factory to request a copy, email your request to sales@trans-metrics.com, or access our web site at www.trans-metrics.com. If you would like email notices of new products, please let us know.

C. Static Error Band

Trans Metrics uses Best Straight-Line approach when determining nonlinearity. Static Error Band is the combined effects of nonlinearity, hysteresis, and repeatability.

D. Circuit Type

At present, there are 4 circuit types offered with the P027 series. They are designated by E, S, M, and T.

1) Circuit type E and S

Description: 4 wire, amplified, differential output. The E circuit has an excitation range of 10.5-28 VDC and the S circuit has an excitation range of 8-28 VDC. There are two lines for excitation (+exc/-exc) and two lines for signal (+/-). Do not connect -exc to -signal. The typical signal output for the E circuit is 0-5 VDC and the signal output for the S circuit is 0-100 mV. The E circuit can be ordered with a 1-5 VDC or 1-6 VDC signal output. Due to the elevated zero balance, the E circuit is altered to a three wire type with single ended output. The -signal and -exc are the same.

2) Circuit type M

Description: 4 wire, unamplified, differential output. The excitation may vary between 5 to 18 VDC. The output is a nominal 3 mV/V. In order to calculate the full scale output, measure the excitation voltage at the transducer and multiply it by the mV/V rating as noted on the certificate of calibration. Please note that below 500 psi, the mV/V rating may be substantially less than 3 mV/V.

3) Circuit type T

Description: 2 wire, current loop, 4-20 mA signal output.

E. Warm-up Time

In general, P027 warm-up times are 15 minutes. The P027 uses a 350 ohm impedance strain gage. The P027T uses a 3500 ohm gage and the warm-up time is typically immediate.

F. Reverse Polarity Protection

The P027E is not protected from reverse polarity. The P027S and P027T are protected from reverse polarity.

G. Pressure Connection

A wide variety of pressure fitting connections are available. Please consult factory for special requirements. The P027 series have an integral hex-headed boss to ease the installation process. A 3/4" or 19 mm wrench will suffice for most fittings.

1) Letter Designation	Description	Torque Rating
B	7/16-20 37 degree male (for 1/4" tube) MS 33656-4	
C	7/16-20 female MS33649-4	
G	7/16-20 SAE female (for 1/4" tube) MS16142(SH)	
H	1/4-18 NPT female	
I	1/4-18 NPT male	
J	1/8-27 NPT male	
K	1/2-20 UNF male (with o-ring seal)	
N	1/8-27 NPT female	
S	Special pressure port per customer request	
	(S592) 10-32 thread by 3/8" length (with o-ring)	finger tight (20 in lbs max)
	(S675) 10-32 thread by 3/8" length (with viton o-ring)	finger tight (20 in lbs max)
T	Flo-thru sensor 1/4-28 NPT threads	

Some options have additional expense.

Standard wetted material is 15-5 VAC CE. This material is a precipitation hardened stainless steel that offers good corrosion resistance. Detailed specifications are on file at factory.

- * The housing material is 300 series stainless steel.
- * Optional wetted material is 316L stainless steel.
- * Male fittings can be ordered with an integral snubber. Female fittings must use an adapter.
- * Please call factory regarding questions, availability, and current pricing.

Extreme caution should be taken not to overtighten the pressure fitting connection when option H is used and the pressure range is less than 150 psi. Also, for transducers with optional pipe threads or pipe thread adapters, Teflon® tape is recommended to seal the connection (apply to male thread only).

H. Electrical Connections

1) Letter Designation Description

A.....	PTIH-10-6P (6 pin bayonet) (mate required, sold separately)
B.....	PTIH-10-6P (6 pin threaded) (mate required, sold separately)
C.....	Cable 1 meter PVC jacket #24 AWG
D.....	1 meter Teflon® jacketed #24 AWG
F.....	Flying leads 1 meter #24 AWG Teflon® wires (individual)
I.....	Mini-Hirschman (DIN 43650-C) (mate required, included)
J.....	PTIH-8-4P (4 pin bayonet) (mate required, sold separately)
	Trans Metrics does not offer this mating connector.
M.....	EM-12 (mate required, sold separately)
S.....	Special connector per customer request

- * Options A, C, F, and I are standard, no additional cost.
- * Options B, D, and J incur additional cost.
- * The S represents special requests. For example, a connector not listed above.
- * Options C, D, and F can be ordered with additional lengths.
- * Mates to option A and B are 80002 and 80001 respectively. 80001 may have a substantial lead time and cost.
- * Trans Metrics offers pre-wired cable assemblies for options A and B. They are 3000050.10 and 3000085.10 respectively. The standard pre-wired connector assembly has 10 feet of cable length. Additional lengths are available.
- * Please call our factory regarding any questions and current pricing. (440) 248-2229.

Please note that wiring pinouts are printed on each transducer. The word *IN* stands for excitation and *Out* stands for signal, *Comm* stands for common, and *Case* is a hard wired connection from the case of the transducer to a pin on the connector. These words were chosen due to space limitations on the label. The bar code on the label is code 39 and represents the serial number.

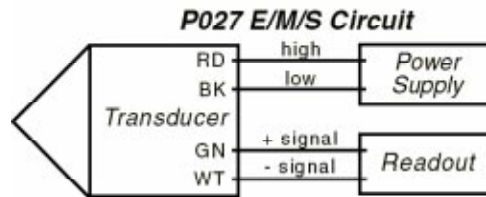
2) Circuit type E, M, and S

Standard pin out configurations

connector option (see letter description on page 3)

Connector option	A	B	C, D, F	G	I
In(excitation)	A	A	Rd	Rd	Pin1
Out (+Signal)	B	B	Gn	Yl	Pin2
Out (-Signal)	C	C	Wt	Wt	Pin4
Comm(common)	D	D	Bk	Bk	Pin3

There is no shunt cal option with the P027 series.



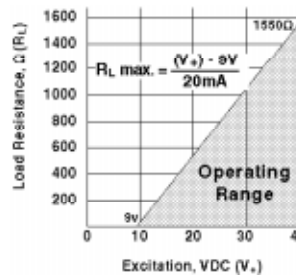
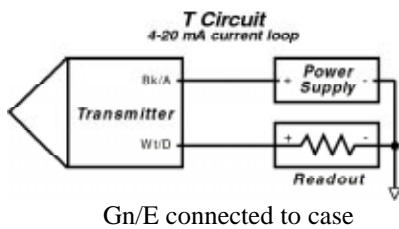
Connections shown for connector type C, D, and F.

3) Circuit type T

Standard pin out configurations

connector option (see letter description on page 3)

Connector option →	A	B	C	D	F	I
In(excitation)	A+/D-	A+/D-	Bk+/Wt-	Bk+/Wt-	Bk+/Wt-	Pin1+/Pin2-
Out (+Signal)						
Case	E	E	Gn	Gn	Gn	Pin 4



Load vs. Excitation curve

The T circuit must be supplied with the appropriate excitation voltage. Reference the load versus excitation curve to select the appropriate excitation voltage.

I. Calibration

All Trans Metrics pressure transducers are calibrated in direct comparison to pressure and voltage standards traceable to the National Institute of Standards and Technology. Each transducer is supplied with a certificate of calibration verifying its compliance.

1) To re-calibrate a transducer

1. Allow the pressure transducer to warm-up for 30 minutes with the appropriate calibration voltage applied to the excitation inputs. See calibration sheet for this value.

**** Important** Step 2 and 3 should only be performed with a NIST traceable pressure source.

2. With zero pressure applied (vent to local atmosphere for psig, vacuum for psia, 14.696 psia for psis), observe the zero output of the transducer.
3. With full scale pressure applied, observe the span of the transducer.

The P027 has no accessible zero or span adjustment. Please return to factory if the transducer needs adjustment.

Pressure transducers can be returned to Trans Metrics for a re-calibration.

2) Recommended calibration interval

A commonly asked question is how often should I calibrate this pressure transducer? Each pressure transducer is aged to minimize drift. If your transducer is being used as a primary standard, a quarterly calibration is recommended. If your transducer is being used as a secondary standard, a semi annual to annual calibration is recommended.

3) Shunt calibration

The shunt calibration feature is not available with the P027 series.

J. Certificate of Conformance

At present, a calibration certificate is sent with each transducer. If a certificate of conformance is required, please specify at time of order. After May of 1998, all record information will be stored electronically; therefore, we can provide a five-point certificate of conformance after the unit is shipped. (the five points are 0%, 50%, 100% increasing and 50%, 0% decreasing)

An eleven-point certificate of conformance can be requested at time of order. Please specify number 199904 at \$75.00. (The eleven points are 0%, 20%, 40%, 60%, 80%, 100% increasing and 80%, 60%, 40%, 20%, and 0% decreasing).

K. Pressure Reference

The P027 series pressure transducer is available with gage, sealed gage, or absolute reference.

A sealed reference type is recommended where wet, humid, or corrosive conditions may be present.

1) Gage

Gage pressure measurements reference applied pressure relative to local atmospheric pressure.

2) Sealed gage

Sealed gage pressure measurements reference applied pressure to standard atmospheric pressure at sea level.

3) Absolute

Absolute pressure measurements reference applied pressure to a vacuum. Because an absolute transducer's zero is set with a vacuum, the output will equal local atmospheric pressure if the pressure source is disconnected from the transducer.

L. Proof Pressure

Proof pressure is the maximum pressure that can be applied to a transducer without changing specified tolerances. The proof pressure ratings are listed below:

P027 series 1.5x rated range 15,000 psi whichever is less.

Continued application of pressures higher than the rated pressure may reduce the life of the transducer.

M. Surge and Hammer Protection

Surges (when fluid is suddenly introduced into the pressure port) and hammers (when fluid is suddenly removed from the pressure port) should always be avoided. Surges in excess of the proof pressure can cause the transducer to operate out of tolerance, and surges in excess of the burst pressure can completely destroy it.

To avoid surges and hammers, keep fluid lines full at all times (if possible), bring pumps up to power and down to rest slowly, and open and close valves slowly. As further precautions, install a surge chamber on the system and install a pressure snubber on each transducer. Snubbers are available from Trans Metrics.

N. Warranty (New Items)

All products manufactured by Trans Metrics are warranted by Trans Metrics to be free from defects in materials and workmanship under normal use for a period of one year, provided however, that Trans Metrics liability will be limited to the repair or replacement of such products returned to Trans Metrics, transportation prepaid. There is no liability for consequential or incidental damages. Any claims with respect to products will be waived by customer unless Trans Metrics is notified within one year after shipment. If inspection of the product by Trans Metrics does not disclose any defect of workmanship or materials, our regular repair charges will apply.

O. Repairs and Re-calibration

Repairs and re-calibrations are performed by Trans Metrics at a minimum cost of \$80 per unit (unless under warranty). The \$80 charge covers evaluation and re-calibration only. All units returned for service, whether for repair or re-calibration only, are evaluated for possible problems. All repair work is quoted on a flat rate. Trans Metrics offers a 10% discount toward the purchase of a new transducer if a unit is deemed 'non-repairable'. The \$80 evaluation and re-calibration fee still applies to scrapped units.

All products repaired by Trans Metrics are warranted by Trans Metrics to be free from defects in materials and workmanship under normal use for a period of 90 days, provided however, that Trans Metrics liability will be limited to the repair or replacement of such products returned to Trans Metrics, transportation prepaid. There is no liability for consequential or incidental damages. Any claims with respect to products will be waived by customer unless Trans Metrics is notified within 90 days after shipment. If inspection of the product by Trans Metrics does not disclose any defect of workmanship or materials, our regular repair charges will apply.

Send units to: Trans Metrics, Division of United Electric Controls,
5325 Naiman Pkwy. Solon, Ohio 44139.
ATTN: Repair department. (No RMA Number required)

P. Returns and Cancellations

Trans Metrics will consider the return of new, unused and standard items if notified within 30 days after shipment. Standard items are defined as the products listed in our product catalog and specification sheets with no options and modifications (listed on page 3 of all specification sheets). A 20% restocking fee will be applied to all returned items. Orders canceled (due to customer error) during production and before shipment are also subject to a 20% restocking fee. Orders for non standard items, as defined above, are not cancelable.

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