

P100/200 Series Pressure Transducer

Installation & Operation Manual



TABLE OF CONTENTS

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A. PRESSURE TRANSDUCERS – GENERAL DESCRIPTION	1
B. MODEL NUMBER DESIGNATION	1
C. STATIC ERROR BAND	2
D. CIRCUIT TYPE	2
1) CIRCUIT TYPE A AND B	2
2) CIRCUIT TYPE C AND D	2
3) CIRCUIT TYPE L	2
4) CIRCUIT TYPE M.....	2
5) CIRCUIT TYPE T.....	2
E. WARM-UP TIME	2
F. REVERSE POLARITY PROTECTION	3
G. PRESSURE CONNECTION	3
1) LETTER DESIGNATION / DESCRIPTION	3
H. ELECTRICAL CONNECTIONS	4
1) LETTER DESIGNATION / DESCRIPTION	4
2) CIRCUIT TYPE A , B, AND M.....	4
3) CIRCUIT TYPE C, D, L	5
4) CIRCUIT TYPE T.....	5
I. CALIBRATION	5
1) TO RE-CALIBRATE A TRANSDUCER	6
2) RECOMMENDED CALIBRATION INTERVAL.....	6
3) SHUNT CALIBRATION.....	6
4) SPECIAL COMMENTS ABOUT P100 WITH HIGH PRESSURE OPTION	6
J. CERTIFICATE OF CONFORMANCE	7
K. PRESSURE REFERENCE	7
1) GAGE.....	7
2) SEALED GAGE.....	7
3) ABSOLUTE.....	7
L. PROOF PRESSURE	7
M. SURGE AND HAMMER PROTECTION	7
N. WARRANTY (NEW ITEMS)	8
O. REPAIRS AND RE-CALIBRATION	8
P. RETURNS AND CANCELLATIONS	8

P100/P200 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. Detailed specification sheets for the P100 and P200 series can be found by visiting our web site www.transmetrics.com or calling (888) 782-2229 and requesting literature for mail or fax.

Pressure transducers are able to convert applied pressure to an electric signal through various technologies. The technology used in all Trans Metrics P100 and P200 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 transducer's output.

B. Model Number Designation

Each P100/P200 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 P100 series is constructed of a single diaphragm and can be ordered in ranges from 50 through 10000 psi. The P200 is constructed of a beam/diaphragm to enhance low-pressure range operation and may be ordered in ranges from 10 psi through 49.9 psi.

The P100 and P200 use the same electronic board assemblies; however, the mechanical assemblies are different. A typical part number might be P115TIA291 1000 psig. The 291 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>P115TIA291 1000 psig</i>
Location	<i>12345678910</i>
Modification	<i>291 represents oxygen cleaning</i>

The type of series is defined in location 1 and 2 of the part number, location 3 and 4 define the static error band, 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: **P115TIAXXX 1000 psig:**

P1:	denotes the P100 series
15:	denotes a .15% SEB BSL (static error band, best straight line)
T:	denotes a 4-20 mA output
I:	denotes a ¼-18 NPT male pressure port
A:	denotes a 6 pin bayonet (similar to PTIH-10-6P)
XXX:	denotes a modification number (assigned if nonstandard)
1000:	denotes the pressure range
psi:	denotes the units of measure
g:	denotes gage reference

A P200 might look like P215TIAXXX 1000 psig. Same circuit, different mechanical design. 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 a request to sales@trans-metrics.com or access our website at www.trans-metrics.com.

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 6 circuit types offered with the P100 and P200 series. They are designated by A, B, C, D, L, and T.

1) Circuit type A and B

Description: 4 wire, amplified, differential output. The A circuit has an excitation range of 15-32 VDC and the B circuit has an excitation range of 9-28 VDC. There are two lines for excitation (+exc/-exc) and two lines for signal (+/-). Do not connect power supply common to -signal. Operation above 160F will limit the upper end of the excitation range. At 250F, the excitation is limited to 18VDC or the transducer will shut off.

2) Circuit type C and D

Description: 3 wire, amplified, single ended output. The output signal is referenced to power supply common. The C circuit gives a true zero output when there is zero pressure applied. For example, 0-5 VDC. The D circuit is also referenced to power supply common; however, the D circuit provides an elevated zero balance at zero psi. For example: 1-5 VDC. Operation above 160F will limit the upper end of the excitation range. At 250F, the excitation is limited to 18VDC or the transducer will shut off.

3) Circuit type L

Description: 3 wire, amplified, single ended output. The output signal is referenced to power supply common. The letter L signifies low power. Ideal for applications that requires battery operation. In addition, this circuit has a capability to operate with 4 VDC excitation and still put out a 5 VDC output signal. Operation above 160F will limit the upper end of the excitation range. At 250F, the excitation is limited to 18VDC or the transducer will shut off.

4) Circuit type M

Description: 4 wire, unamplified, differential output. The excitation may vary between 5 to 18 VDC. The output is a nominal 1.0 mV/V to 2.0 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. In addition, the certificate of calibration will state a shunt value. It is an external shunt and user supplied. In most cases, the certificate will state a shunt value when a 56 kohm resistor is placed between the -OUT(-signal) and -IN(-excitation). Please note the certificate of calibration for the exact shunt calibration resistor.

5) Circuit type T

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

E. Warm-up Time

In general, P100 warm-up times are defined in minutes. The P100 uses a 1000 ohm impedance gage to reduce warm-up time. The P200 uses a 350 ohm impedance gage and its warm-up time is approximately 15 minutes. A special case is a P100 with the L type circuit. This particular model uses a 5000 ohm gage and the warm-up time is typically immediate.

F. Reverse Polarity Protection

All P100 and P200 pressure transducers are protected from reverse polarity.

G. Pressure Connection

A wide variety of pressure fitting connections are available. Please consult factory for special requirements.

The P100/P200 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
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)
L	3/8" high pressure female port(Autoclave style)
M	1/4" high pressure female port(Autoclave style)
N	1/8-27 NPT female
S	Special pressure port per customer request
S (mod number 552)....	3/4" sanitary flange
S (mod number 556)....	1 1/2" sanitary flange
S (mod number 511)....	2" sanitary flange
S (mod number 583)....	BVCO 1/4" female
S (mod number 584)....	BVCO 1/4" male
S (mod number 143)....	1/4" weldable tube stub, 4" length
S (mod number 539)....	1/4" weldable tube stub, 1" length
S (mod number 670)....	1/4" weldable tube stub, 2" length
T	Flo-thru sensor 1/4-28 NPT threads
V	1/4 in VCR® fitting (female) TM Swagelok Company
W	1/4 in VCR® fitting (male) TM Swagelok Company

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.
- 7-10 RA finish available with certain fittings.
- Oxygen cleaning available.
- 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 over-tighten 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).

The VCR® fittings require a metal face seal.

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 these mating connector to option J.
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, *case* is a hard wired connection from the case of the transducer to a pin on the connector, *cal* stands for shunt calibration. 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.

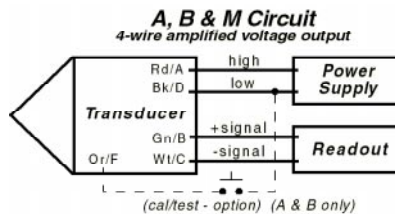
2) Circuit type A , B, and M

Standard pin out configurations

connector option (see letter description on page 3)

Connector Option	→	A	B	C	D	F	I
In (excitation)		A	A	Rd	Rd	Rd	Pin1
+ Out (+Signal)		B	B	Gn	Gn	Gn	Pin2
- Out (-Signal)		C	C	Wt	Wt	Wt	Pin4
Comm (common)		D	D	Bk	Bk	Bk	Pin3
Case		E	E	Or	Bl	Bn	
Cal (shunt calibration)		F, D	F, D	N/A	Or,Bk	Or,Bk	

Cal is not standard and needs to be requested when order is placed. Your unit may not have it. The designation F, D means pin F must be shorted to Pin D to engage shunt. If your circuit type is M, please refer to Page 2 under section titled Circuit type M for a discussion about shunt calibration .

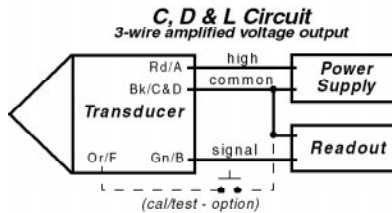


Color varies per cable option selected/E connected to case. Exc. (+/-In), Signal (+/-Out)

3) Circuit type C, D, L

Standard pin out configurations connector option (see letter description on page 3)

Connector option	A	B	C	D	F	I
In(excitation)	A	A	Rd	Rd	Rd	Pin1
Out (+Signal)	B	B	Gn	Gn	Gn	Pin3
Comm (common)	C, D	C, D	Bk	Bk	Bk	Pin2
Case	E	E	Wt	Wt	Wt	Pin4*
Cal (shunt calibration)	F,D	F,D	Or,Bk	Or,Bk	Or,Bk	Pin4*



Wt/E connected to case, Exc. (+/-In), Signal (Out)

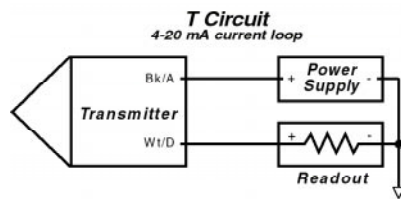
If the shunt modification has been ordered, pin4 will not be connected to the case, but used for the shunt calibration.

Cal is not standard and needs to be requested when order is placed. Your unit may not have it. The designation F, D means pin F must be shorted to Pin D to engage shunt.

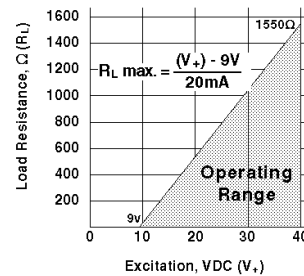
4) Circuit type T

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



Gn/E connected to case
Exc. (+In/-In)



Load vs. Excitation curve

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

**** Note**** The label attached to the transducer is marked zero and fso. The zero is for adjusting the zero balance and the fso (full scale output) is used to adjust the span. (Reference 3 and 4 below)

1. Allow the pressure transducer to warm-up for 15 minutes with the appropriate calibration voltage applied to the excitation inputs. See calibration sheet for this value.
2. Remove plug from housing.
3. With zero pressure applied (vent to local atmosphere for psig, vacuum for psia, 14.696 psia for psis), calibrate the zero output of the transducer by rotating the zero potentiometer.

**** Important** Step 4 should only be performed with a NIST traceable pressure source.

4. With full scale pressure applied, calibrate the span of the transducer by rotating the fso (full scale output) potentiometer.

Pressure transducer 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 P100 and P200 do not come standard with a shunt calibration. They must be requested at time of order. If your transducer has a -004 or -005 modification number, you have a shunt calibration. The shunt calibration actually consists of a relay and resistor. The shunt resistor is isolated from the circuit when not in use to avoid noise pickup.

The shunt calibration is useful for checking operation or for calibrating systems without applying pressure to the transducer. The shunt is engaged when the cal pin or cable wire is shorted to circuit common. The change in output is usually a nominal 80% of FSO. The exact value is indicated on your certificate of calibration.

4) Special comments about P100 with high pressure option

The P100 with high pressure option can exhibit a 2% shift in zero after the pressure fitting has been installed. When you receive the pressure transducer, the zero maybe out of tolerance due to the stress of high pressure fitting. Trans Metrics does not rezero the output after we remove our test fitting. Once you install your fitting, the zero should be very close. Due to different torque ratings of various fittings, we recommend the following steps prior to calibration. (Our 3 page p100 with high pressure option specification sheet recommends several adapters and the companies that provide them. Available on our web site www.trans-metrics.com).

- 1) Install the high pressure fitting that will be used. Know your torque ratings.
- 2) Apply excitation voltage to the transducer for several minutes.
- 3) Apply 2 to 3 rated pressure excursions to the pressure transducer. This is commonly referred to as a wake-up cycle and it will allow the sensor to adjust to the stress of the newly installed fitting.
- 4) With no pressure applied to the pressure transducer, rezero the output by using the zero adjust pot located behind the rubber plug.

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 P100/P200 series pressure transducers measure pressure using a gage, sealed gage, absolute, or vacuum pressure.

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

1) Gage

Gage pressure measurement reference applied pressure relative to local atmospheric pressure. To be a true gage pressure transducer, the case must be vented in order to track atmospheric pressure changes. (Venting must be done to a clean, dry, non-corrosive gas). On models with ranges 0-500 psig or lower, venting is done through a pinhole in one of the plugs covering the potentiometers (The pinhole is made at the factory). Models with ranges above 0-500 psig do not require venting (changes in atmospheric pressure have a negligible effect on the output of high range transducers).

2) Sealed gage

Sealed gage pressure measurements reference applied pressure to standard atmospheric pressure at sea level. No venting is required.

3) Absolute

Absolute pressure measurement 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:

- P100 series 3x rated range or 20,000 psi whichever is less.
- P200 series 2x rated range or 100 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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