



204, 228-1, 239 Series

PRESSURE TRANSDUCERS AND TRANSMITTERS

Pressure Transducers (0 to 5 VDC Output)

Model 204	Gage, Absolute, and Vacuum Pressure
Model 204D	Wet/Dry Differential Pressure
Model 228-1	Wet/Wet Differential Pressure
Model 239	Differential Pressure

Pressure Transmitters (4 to 20 mA) Output

Model C204	Gage, Absolute and Vacuum Pressure
Model C228-1	Wet/Wet Differential Pressure
Model C239	Differential Pressure

TABLE OF CONTENTS

General Information and Installation 2

Electrical Information for Standard 24 VDC 4

Excitation Pressure Transducers (nominal) 4

Electrical Information for Optional ± 15 VDC (± 24 VDC) 5

Excitation Pressure Transducers (Option #621 and 622) 5

Electrical Information for 4 to 20 mA Pressure transmitters 6

Adjustments for Pressure Transducers and Transmitters 6

Zero and Sensitivity 6-7

Remote Control Instructions for Pressure Transducers 7

Installation Instructions for Multiple Hook-Up of 4-Wire 8-9

Pressure Transducers (24 VDC Excitation Units Only) 10

Returning Products for Repair 10

Calibration Services 10

Limited Warranty 11

204, 228-1, 239 Series Pressure Transducer and Transmitters

General Information and Installation

Your Setra transducer/transmitter has been carefully calibrated before shipment to you, and it should be handled with the same care given any precision instrument. Pressure range and dimensions are reported on the applicable specifications bulletin.

Ambient Conditions

Do not submerge in liquids, use in ambient conditions corrosive to anodized aluminum, subject to spray or dripping, or use in a high vibration environment. The transducer/transmitter is very slightly sensitive to acceleration in the pressure fitting axis (see applicable specifications bulletin for acceleration response specifications). Installation is recommended in the vertical position, with the pressure port downward. This position minimizes damage from drippage of pressure system piping (for wet/wet differential models when bleeding air from the system, liquid will flow down away from the electrical section).

Installation of Pressure Fittings

Your transducer is designed for most accurate operation when subjected to pressures within the designated pressure range. Refer to the catalog bulletin specifications for proof pressure limits. Subjection to excessive pressure voids the warranty. **Do Not Overpressure.**

Installation with FM approved Explosionproof/Weatherproof enclosure:

1. Conduit seals shall be placed no more than 18' from the enclosure.
2. Cables with gas/vapor tight continuous sheath, capable of transmitting gas or vapor through the cable core, shall be sealed per National Electric Code (NEC) for Class 1, Division 1 (most current revision).
3. Caution: Do Not open cover while circuits are live.

Standard sealants such as Teflon pipe tape generally are satisfactory. For the most sensitive pressure ranges, excessive high torquing of a metal pressure fitting may cause slight zero shift which may be trimmed out using the zero adjustment. Use of a plastic fitting often shows no noticeable zero shift. The torquing effect does not appreciably affect linearity or sensitivity. The wrench flat on the 204 and 239 series should be used when installing the positive pressure fitting.

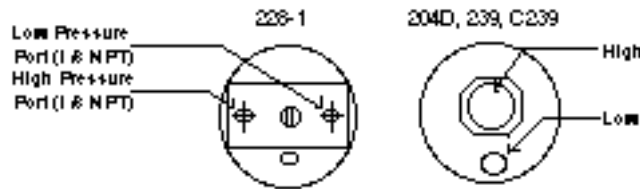
A. Positive Pressure Fitting and Media Compatibility

- | | |
|------------------------|--|
| Model 204, C204, 204D: | 1/4"-18 NPT internal fitting
For use with gases or liquids compatible with 17-4 PH stainless steel. (316 stainless steel optional) |
| Model 228-1, C228-1: | 1/8"-27 NPT internal fitting
For use with gases or liquids compatible with 300 series and 17-4 PH stainless steel, Viton "O" ring and bleed screw seals. |
| Model 239, C239: | 1/8"-27 NPT internal fitting
For use with gases compatible with stainless steel, hard anodized 6061 aluminum, Buna N "O" ring. (Stainless steel in place of aluminum optional.) |

B. Reference Pressure Fitting and Media Compatibility (Differential pressure measurements only.)

Model 204D: 1/8"-27 NPT internal fitting
For use with clean dry air, non-corrosive or non-conductive gases.
Maximum line pressure 1000 psig.

Model 228-1, C228-1: 1/8"-27 NPT internal fitting
For use with gases or liquids compatible with 300 series and 17-4 PH stainless steel, Viton "O" ring and bleed screw seals.
Maximum line pressure 1000 psig.



Model 239, C239: 1/8"-27 NPT internal fitting
For use with non-corrosive, non-condensing clean dry air or other gases. Maximum line pressure 250 psig.

Notes:

- (1) Differential pressure Models can be used to measure gage pressure by leaving the reference port open to atmosphere.
- (2) Line Pressure refers to pressure applied to both high and low sides of the sensing device simultaneously. Refer to the product data sheet to determine maximum differential pressure and over-pressure limits.

Model 228-1, C228-1 Purging Procedure

The Model 228-1 differential pressure transducer and Model C228-1 pressure transmitter must be purged as much as possible of air when used with liquids. This is necessary to prevent inaccuracy of the unit resulting from surface tension effects created at the liquid/air sensing diaphragm interface.

This process is similar to the bleeding of air from brake hydraulic lines. A slotted head seal screw is provided to enable bleeding of the air from the high and low pressure port cavities independently. The procedure involves opening up the bleed port screws, then pressurizing the applicable pressure port with the fluid whose pressure is to be measured. While pressurizing, trapped air will be pushed out of the pressure cavities. The unit must be oriented so that the bleed port screw is at the highest point relative to the rest of the unit when the bleeding operation is being performed. An alternative to using pressurized fluid is to place the unit below the fill fluid reservoir so that the weight of the fluid column will force out any air.

Electrical Information for Standard 24 VDC Excitation Pressure Transducers (nominal)

Connections (Model 204, 239 and 228-1 w/Remote Control Option)

<u>Cable Lead</u>	<u>Function</u>
White	Positive Excitation
Yellow	Positive Output
Brown	Negative Output
Black	Negative Excitation - (to circuit ground)
Case	Shield

Note: Other leads in the cable are not used with the standard pressure transducer unless the transducer has been wired for Remote Control (see Remote Control Instructions).

Connections (Model 228-1 Transducer)

<u>Cable Lead</u>	<u>Function</u>
Red	Positive Excitation
Green	Positive Output
White	Negative Output
Black	Negative Excitation - (to circuit ground)
Shield	Case

Note: If the "Remote Control" option was ordered, a 9 conductor cable, color coded as above, is supplied and the remote control instructions should be followed.

Electrical - The electrical circuit is equivalent to a 4 terminal network, which can be grounded at only one point, either at the -excitation or the -signal output lead, but must not be commoned or grounded at more than one point.

The pressure transducer must be operated with the case connected either to the negative excitation terminal or to the negative output terminal. Failure to do this may result in damage to or unsatisfactory operation of the unit. This connection may be made by connecting shield and black (-excitation) leads or alternately by connecting the shield and brown (-output) leads together. Best shielding against noise will be obtained by connecting the shield and -excitation (black) leads.

The circuit has internal protection:

- Reversed excitation voltage for at least 5 minutes.
- Short-circuit or signal output leads.
- Short duration power line transients up to 150 volts.

Note on long cable use:

In some instances, use of long cables (several hundred feet length) may introduce enough cable capacitance into the circuit to cause output oscillations. If encountered, this oscillation may be eliminated by connecting a 100 ohm resistor (1/8th watt or larger) in series to each of the output leads at the end of the 2 foot transducer cable. These series resistors, of course, add to the output resistance.

Atmospheric Reference (Gage Pressure Transducers only)

Lower range units are subject to excessive thermal zero shift unless vented to atmosphere. The electrical cable provides this equalization vent. Do not seal the electrical cable when installing.

Electrical Information for Optional ± 15 VDC (Option 622) and ± 24 VDC (Option 621)

Excitation Pressure Transducers

Note: Any figures in parentheses () pertain to the ± 24 VDC excitation units only.

Connections

<u>Cable Lead</u>	<u>Function</u>
White	+15 (+24) Positive Excitation
Black	Power Supply Ground -15 (-24)
Violet	+15 (+24) Negative Excitation Positive
Yellow	Positive Output
Brown	Negative Output
Shield	Case

Note: Other leads in the cable are not used for electrical Option 621 and 622 unless the transducer has been wired for Remote Control (see Remote Control Instructions).

Electrical - Electrical Option 622 permits operation from a ± 15 VDC and electrical Option 621 permits operation from a ± 24 VDC supply (common return grounded), and provides you with the negative signal output lead also at the common ground potential. Thus many transducers can be operated from one power supply into single-ended loads. Circuit is reversed voltage protected for at least 5 minutes. Internal transient suppression network is provided for short duration transients to 150 volts.

Grounding - For general usage and best results (lowest noise) grounding of the shield/case to the black lead is recommended.

Power Supply Advice - This transducer has been designed to operate from a dual ± 15 VDC (± 24 VDC) source. Stated another way, the supply is a 30V (48V) center tapped supply. The ± 15 V (± 24 V) is 15 V (24 V) above the common power return-lead, and the -15 V (-24 V) is 15 V (24 V) below the common power return lead.

All three power leads must be connected. The transducer will not function if just the +15 V (+24 V) and -15 V (-24 V) leads are connected to the power source.

To avoid circuit damage due to excessive voltage, the positive supply voltage should be held within the range of +15 V to +20 V (+22 V to +30 V), and the negative supply voltage should be held within the range of -10 V to -20 V (-10 V to -24 V).

Note on long cable use:

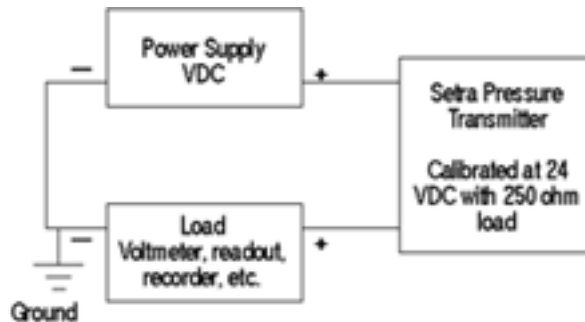
In some instances, use of long cables (several hundred feet length) may introduce enough cable capacitance into the circuit to cause output oscillations. If encountered, this oscillation may be eliminated by connecting a 100 ohm resistor (1/8th watt or larger) in series to each of the output leads at the end of the 2 foot transducer cable. These series resistors, of course, add to the output resistance.

Electrical Information for 4 to 20 mA Pressure Transmitters

Electrical - The circuit is designed to operate as a true 2-wire 4 to 20 mA pressure transmitter.

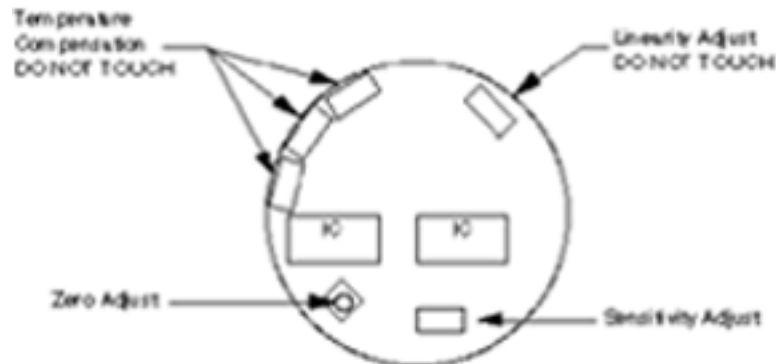
Connection

The Setra transmitter has two electrical leads. These may be connected for current flow in either direction, without change in performance or damage.



We suggest that the electrical cable shield be connected to the system loop circuit's ground, thereby improving electrical noise rejection.

Adjustments for Zero and Sensitivity Adjustments for Voltage Output Pressure Transducers (cover must be removed)



Caution: TURN OFF EXCITATION POWER DURING COVER REMOVAL OR REPLACEMENT

Zero Pressure Output - Can be adjusted to zero by potentiometer as shown in diagram. Unit factory adjusted to zero output (± 10 mV).

Sensitivity (span) - Can be adjusted by potentiometer as shown on outline diagram. Unit factory adjusted to order specifications.

Linearity - DO NOT TOUCH

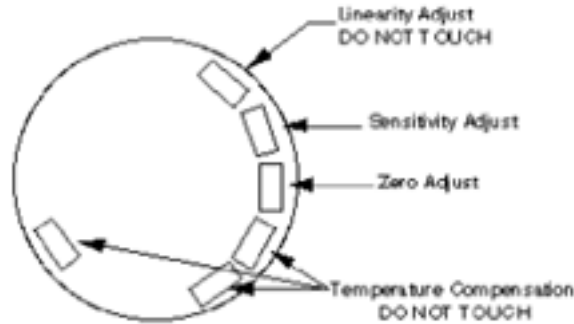
Factory adjusted for best linearity. Touching any adjustments other than zero output or sensitivity may necessitate recalibration.

Note: Sensitivity (span) adjustment is not recommended unless a primary pressure standard (dead weight tester, etc.) is available for use as a reference.

Adjustments for Current Output Pressure Transmitters (cover must be removed)

Zero Pressure Output - Zero output can be adjusted ± 0.2 mA about the nominal 4 mA. The zero adjustment is the potentiometer shown in the diagram. Changing zero will not change span.

Sensitivity (span) - Sensitivity can be adjusted approximately ± 5 mA from the nominal 16 mA full



scale span. The sensitivity adjustment potentiometer is located as shown in the diagram and may be adjusted without affecting linearity calibration.

Linearity - DO NOT TOUCH

Factory adjusted for best linearity. Touching any adjustments other than zero output or sensitivity may necessitate recalibration.

Note: Sensitivity (span) adjustment is not recommended unless a primary pressure standard (dead weight tester, etc.) is available for use as a reference.

Remote Control Instructions for Pressure Transducers

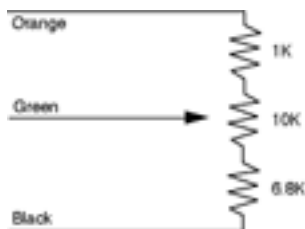
Cable leads indicated below are connected into the transducer circuitry on this transducer as ordered.

Connection of the remote control leads extends the internal zero and sensitivity adjustments. The transducer was factory calibrated with the remote control wiring disconnected.

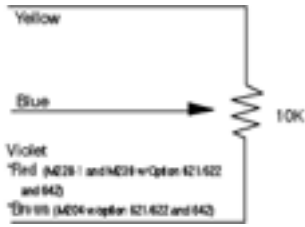
Caution: The remote control leads directly access active circuit elements. Inadvertent short-circuiting to each other, to ground, or other miswiring may cause immediate circuit damage. Keep remote control wiring either free of other contact or else keep the leads properly wired as shown below.

Note: All resistance elements are 0.1 watt or greater. All remote circuits have voltages less than 10 volts and currents less than 1 mA.

Remote Zero Adjustment (standard)



The transducer has been preset with the regular internal zero adjustment potentiometer. If remote zero control is desired, connect the orange, green and black leads as shown with external resistors and potentiometers.



Remote Sensitivity Adjustment (optional)

The transducer has been preset with the regular internal sensitivity adjustment potentiometer. If remote sensitivity control is desired (Option 642), connect the yellow, blue and violet* leads and adjustable resistance as shown.

*For Models 228-1, 239 and 204 w/options 621/622 and 642, replace violet lead as shown.

Fixed

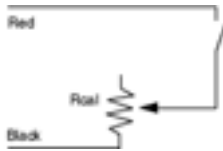


Remote Calibration Signal (optional)

Two types of calibration signal zero offset are offered:

Fixed calibration signal, closing red to black leads.

Adjustable



Adjustable calibration signal, on closing circuit with an adjustable resistance between red and black leads. Suggest use of a 100K potentiometer.

Installation Instructions for Multiple Hook-Up of 4-Wire Pressure Transducers (24 VDC Units Only)

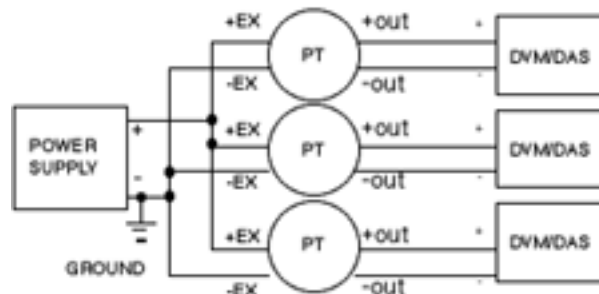
PS - Power Supply (nominal 24 VDC)

PT- Pressure Transducer (4-Wire Circuit)

DVM/DAS - Digital Voltmeter or Data Acquisition System

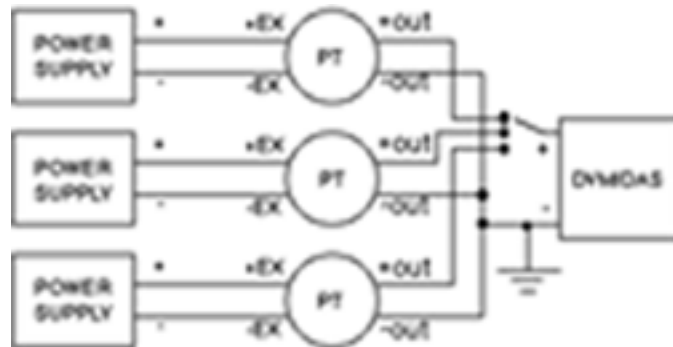
Option #1

Uses a single, ground referenced power supply for excitation and separate, isolated differential input (not ground referenced) readout or data acquisition system for each pressure transducer output.



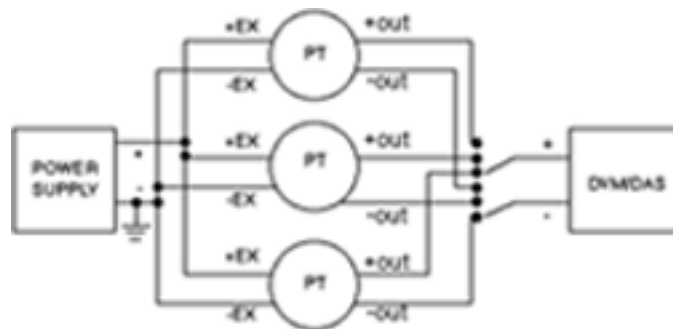
Option #2

Uses a separate, isolated power supply for each pressure transducer's excitation and a single, ground reference (single ended input) readout or data acquisition system for all of the outputs.



Option #3

Uses a single, ground referenced power supply for excitation and either a single, isolated readout with a bipolar switch that "breaks before makes" both the +output and the -output of each pressure transducer, or a single data acquisition system with a multiplexer (MUX).



Note: The shield is internally commoned to the case and pressure port of the transducer. When the shield is connected to ground, the case and pressure port of the transducer will also be commoned to that ground.

RETURNING PRODUCTS FOR REPAIR

Please contact Setra (1-800-257-3872, 978-263-1400) before returning unit for repair to review information relative to your application. Many times, only minor field adjustments may be necessary. When returning a product to Setra, the material should be carefully packaged and shipped prepaid to:

Setra Systems, Inc.
159 Swanson Road
Boxborough, MA 01719-1304
Attn: Repair Department

To assure prompt handling, please supply the following information and include it inside the package of returned material:

1. Name and phone number of person to contact.
2. Shipping and billing instructions.
3. Full description of the malfunction.
4. Identify any hazardous material used with product.

Notes: Please remove any pressure fittings and plumbing that you have installed and enclose any required mating electrical connectors and wiring diagrams.

Allow approximately 3 weeks after receipt at Setra for the repair and return of the unit.

Non-warranty repairs will not be made without customer approval and a purchase order to cover repair charges.

Calibration Services

Setra maintains a complete calibration facility that is traceable to the National Institute of Standards & Technology (NIST). If you would like to recalibrate or recertify your Setra pressure transducers or transmitters, please call our Repair Department at 1-800-257-3872 (978-263-1400) for scheduling, cost and turnaround estimates.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

SETRA warrants its products to be free from defects in materials and workmanship, subject to the following terms and conditions:

Without charge, SETRA will repair or replace products found to be defective in materials or workmanship within the warranty period; provided that:

- a) the product has not been subjected to abuse, neglect, accident, incorrect wiring not our own, improper installation or servicing, or use in violation of instructions furnished by SETRA;
- b) the product has not been repaired or altered by anyone except SETRA or its authorized service agencies;
- c) the serial number or product code has not been removed, defaced, or otherwise changed; and
- d) examination discloses, in the judgment of SETRA, the defect in materials or workmanship developed under normal installation, use and service;
- e) SETRA is notified in advance of and the product is returned to SETRA transportation prepaid.

Unless otherwise specified in a manual or warranty card, or agreed to in a writing signed by a SETRA officer, SETRA pressure and acceleration products shall be warranted for one year from date of sale.

The foregoing warranty is in lieu of all warranties, express, implied or statutory, including but not limited to, any implied warranty of merchantability for a particular purpose.

SETRA's liability for breach of warranty is limited to repair or replacement, or if the goods cannot be repaired or replaced, to a refund of the purchase price. SETRA's liability for all other breaches is limited to a refund of the purchase price. In no instance shall SETRA be liable for incidental or consequential damages arising from a breach of warranty, or from the use or installation of its products.

No representative or person is authorized to give any warranty other than as set out above or to assume for SETRA any other liability in connection with the sale of its products.

159 Swanson Road, Boxborough, MA 01719-1304; 800-257-3872;
(978) 263-1400; Fax. 978-264-0292; WEB; www.setra.com;
E-mail: transducer.sales@setra.com



SSO461REV.D 10/03/97