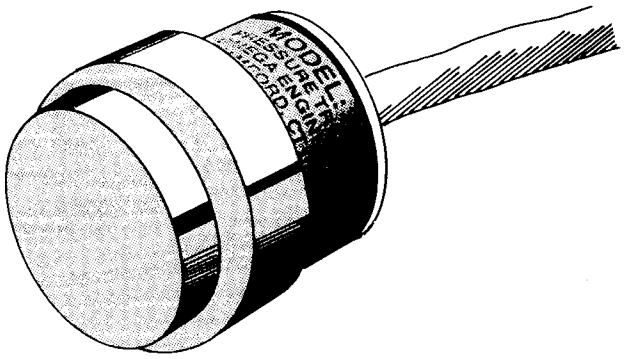
OMEGA®
An OMEGA Technologies Company

PX102 Series
Pressure Transducers
Operator's Manual: M0209/0695



PHYSICAL

TYPE	PSIG—Units 100 PSI and above have cases sealed from the surrounding atmosphere, providing maximum reliability in humid or corrosive environment (psis). Ranges below 100 PSI are vented to the atmosphere and read gage pressure independently of barometric pressure changes (psig).
RANGES	0-6, 15, 25, 50, 100, 200, 500, 1000, 2000, 3000, 5000, 10,000, 15,000 and 20,000
OVERLOAD	2 times rated pressure without damage; 5 times rated pressure without bursting
CASE MATERIAL	316L stainless steel for ranges 50 PSI and under 15-5PH stainless steel for ranges 100 PSI and over
SHOCK & VIBRATION RESISTANCE	Undamaged by 50 G's. Meets MIL-STD-810 B,

ELECTRICAL

SIGNAL OUTPUT	100 millivolts at rated pressure, ± 1%, open circuit
ZERO BALANCE	Within ± 5 mV at 70°F *(21.1°C)*
SENSITIVITY	20 mV/V
EXCITATION VOLTAGE	5 Vdc or ac rms recommended; 6 V maximum
BRIDGE RESISTANCE	Input, 150 ohms ± 50 ohms Output, 115 ohms ± 25 ohms
ELECTRICAL CONNECTION	4 conductor shielded cable, 3 feet *(0.9m)* long.

PERFORMANCE

ACCURACY	100 to 5000 PSIG = 0.25% BFSL All other ranges = 1% BFSL
RESOLUTION	Infinite
OPERATING TEMPERATURE RANGE	– 65° to 200°F *(– 53.9°C to 93.3°C)*
COMPENSATED TEMPERATURE RANGE	100 to 5000 PSIG = 30°F to 160°F All other ranges = 30°F to 130°F
THERMAL EFFECT ON ZERO	100 to 5000 PSIG = Less than ± 1% of Span over any 100°F (55°C) range within compensated range. All other ranges = Less than ± 5% within compensated range
THERMAL EFFECT ON SPAN	100 to 5000 PSIG = Less than ± 1% of Span over any 100°F (55°C) range within compensated range. All other ranges = Less than ± 2% Span within compensated range

General

The PX102 pressure transducer is a rugged, accurate and small pressure measuring instrument designed for industrial service. Its construction features simplicity, ruggedness, and absence of moving parts. Semiconductor strain gages mounted on a unique sensor measure the deflection of the diaphragm at its center. The strain gages are wired into a Wheatstone Bridge which is balanced at no-load conditions. Pressure on the diaphragm causes it to deflect, straining the gages, and changing their electrical resistance. When an excitation voltage is applied across two corners of the bridge, a signal voltage proportional to pressure is produced across the other two corners. The high sensitivity of the strain gage/sensor combination allows the diaphragm deflection to be as low as 0.002 inches. Thus, the diaphragm stresses are minimized insuring long life.

OMEGA ENGINEERING, INC. offers a wide range of signal conditioners, controllers and meter indicators for both bench and panel mount; and a calibrator for the Model PX102.

These units supply the 5 volt excitation and signal amplification. Refer to catalog for details.

Application Information

The PX102 is particularly well suited for making measurements where shock and vibration are present. Because of low operating stresses, they may be used up to rated pressure range without any reduction in life expectancy.

All transducers measure gage pressure. On ranges of 100 psi and up, venting to atmospheric pressure is not necessary since normal barometric pressure changes will have negligible effect on accuracy. These units have been sealed to provide maximum reliability in the presence of moisture and corrosive atmospheres.

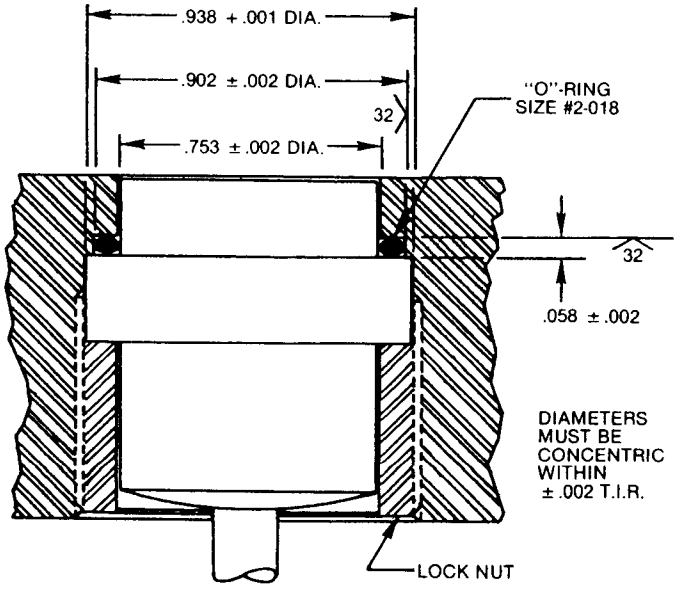
The 50 psi and lower range units have the internal cavity of the transducer vented to atmosphere. This is accomplished by means of a short tube which extends into the cable. Reference to atmospheric pressure is thus provided thru the cable jacket. It is important then not to pot the end of the cable nor to pinch it very tightly if clamping is required. The cable jacket should not be punctured, particularly in corrosive environments, and should be terminated in a clean, dry, environment.

PX102 pressure transducers may also be supplied to measure absolute pressures. These models in ranges of 15, 25, and 50 psia are evacuated and hermetically sealed. Their electrical balance is set to give minimum output at 0 psia.

Installation

The PX102 transducer may be easily mounted in the wall of a pressure vessel, pump housing, machine, etc. or it may be provided with an adapter to standard piping or tubing systems. Adapters for many different types of plumbing connections are available.

The suggested mounting method shown below may be used for all pressure ranges. When using the suggested pressure mounting, care must be exercised not to damage the "O" ring during installation. Use of a lubricant is recommended. Hand tightening is usually sufficient to seal liquids up to 20,000 psi provided the "O" ring mounting surface finish is adequate (32 microinches or better).



Suggested Mounting for All Pressure Ranges

Although the PX102 transducers are rugged, they should not be handled carelessly. Care should be taken to avoid undue force on the cable or bending it sharply where it is attached to the transducer. Avoid striking, scratching, or denting the diaphragm particularly on low range units. Also note that it is possible to apply enough pressure to the diaphragm with the thumb to overload low range units.

Protective Cap

Each transducer is shipped with a protective cap which should be removed before installation.

Maintenance

No maintenance is required with these transducers. The absence of moving parts and the solid state sensors make them trouble-free and reliable. Some precaution in handling the transducers is necessary, particularly in the low pressure ranges. Do not press on the diaphragm unless the unit is connected to a pressure readout to make sure the full scale rating is not exceeded. The diaphragm area should, of course, be protected from nicks, scratches and dents. The protective cap should remain on the unit until it is ready for installation.

It is important that the insulation resistance of the electrical circuit be maintained. Moisture, dirt or contaminated oils at the solder connections may be a source of trouble. It is important that the cable remains free from punctures and that it be protected from chemical attack. (Carefully read the installation section.) The cable supplied with the transducer has a tough PVC jacket. If the environmental conditions are severe, a protective sleeve may be inserted over the cable.

If malfunction of the transducer is suspected, the following electrical checks are recommended:

1. Input resistance (RED to BLACK) should be 150 ± 50 ohms.
2. Output resistance (GREEN to WHITE) should be 115 ± 25 ohms.
3. Resistance to ground between any lead and transducer case should be 500 megohms minimum. When making this measurement make sure that the megohmeter is limited to 50 volts DC. Do not connect an insulation tester between two leads. The transducer will be permanently damaged.

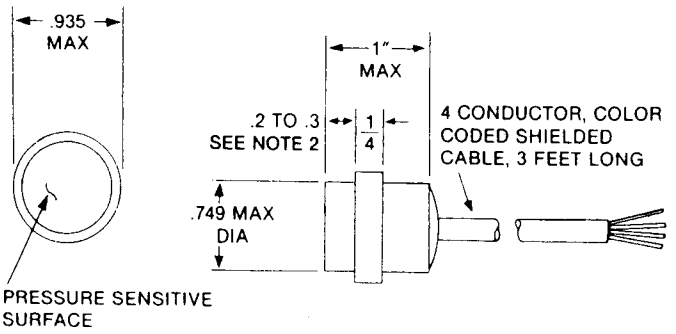
CAUTION: 6 volts is the maximum voltage which can be safely applied to the transducer input or output terminals. If 6 volts is applied from the green to either the red or black terminals the unit may be permanently damaged.

If the transducer has been accidently overloaded, a permanent zero shift may occur. The transducer may still function properly however and a re-balancing with an external resistor as described in Section IV should be performed to verify the proper functioning of the unit.

Instrumentation and Operation Theory

The instrumentation for use with the PX102 transducers is very simple. Only a regulated constant voltage source and a meter recorder, oscilloscope or other readout instrument is required.

The PX102 transducer may be excited with either ac or dc voltage. For many temporary or test applications, a battery may be a suitable source. The recommended excitation is 5 Vdc or ac rms. Do not exceed 6 V. The supply should be able to deliver a current of at least 50 mA at 5 V. Connect the excitation across the red and black leads. The green and white leads should be connected to the readout instrument.

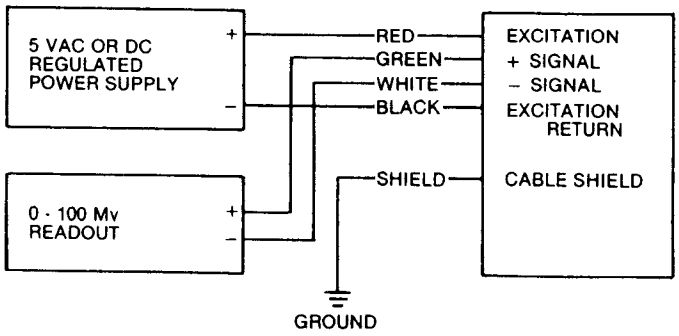


NOTES:

1. RECOMMENDED EXCITATION VOLTAGE: 5 VOLTS AC OR DC; 6 VOLTS MAXIMUM.

COLOR CODE:
RED (+)EXCITATION
GREEN (+)SIGNAL
WHITE (−)SIGNAL
BLACK (−)EXCITATION

2. DIMENSION LOCATING FLANGE VARIES DEPENDING ON RANGE.

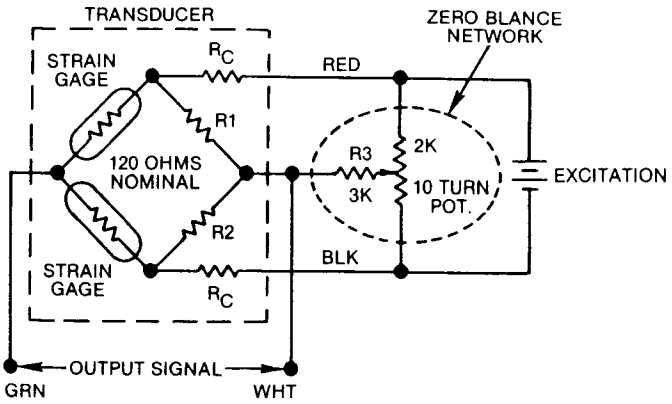


Circuit Diagram

Caution: Some power supplies exhibit an inductive kick or do not regulate properly the instant they are turned on. With such supplies a large transient voltage may be applied to the transducer resulting in possible electrical failure. With supplies of this type it is recommended that the transducer be energized only after the power supply has begun to regulate.

The bridge impedance of the PX102 transducers ranges from about 100 to about 200 ohms. This impedance increases approximately 6% per 100°F temperature rise. As a consequence, if series resistors are used to drop the excitation voltage to the recommended 5 volts, the voltage appearing at the transducer will increase with increasing temperature, thus producing a calibration or span error. This effect can easily be calculated. The maximum calibration error introduced by series input dropping resistors is +6% per 100°F and occurs when the resistance becomes infinite. (Constant current supply.)

The signal voltage appearing across the output leads of the transducer is both a function of the applied pressure and the excitation voltage. The transducers have been calibrated to 100 mV ± 1% full scale output with exactly 5.0 volts excitation. If, for example, 2.5 volts excitation is used, the output at full scale will be proportionally lower or 50 mV. At no load, a small residual output voltage will be present. This voltage (within 5% of the transducer's full scale output) can easily be nulled out by most read-out instruments. Nulling can also be achieved by placing a shunt resistor from the white lead to either red or black depending upon the polarity of the unbalance.



NOTES:

1. CIRCUIT PROVIDES APPROX. 50% FULL SCALE ZERO BALANCE RANGE.
2. "R_C" ARE CALIBRATION ADJUSTMENT RESISTORS INSIDE TRANSDUCER.

External Zero Balance Circuit

Circuitry used with the transducer can cause adverse changes in its temperature compensation. This problem can be avoided with a PX102 transducer by shunting only across the inactive resistors on the " White side" of the bridge. If for any reason the user feels he must shunt an active gage, the shunt should be kept as large as possible (20K Ω minimum) and an equal shunt on the other active gage will nullify the effect on temperature compensation. Shunting the active gages will also reduce the output signal somewhat: 20K Ω shunts will reduce the sensitivity by about 0.6%.

A wide variety of readily available meters make suitable readout devices for the PX102 transducers. When excited with about 5.6 V, the PX102 will drive a 100 microamp 1000 ohm meter full scale. It also has sufficient sensitivity for use with most digital panel meters.

Shunt calibration is a technique used with strain gage transducers to simulate the effect of applied pressure to produce an output signal. Shunting 1400 ohms across the black and white leads of the PX102 transducer produces a signal approximately equal to the transducer full scale. Similarly a 3000 ohm shunt will simulate a 50% output signal. These values are approximate and will vary from unit to unit. If shunt calibration is to be used, it is recommended that the actual transducer shunt output be determined by test and recorded.

Pressure Overloads

The PX102 transducers will withstand high overloads. See Over load Specification on page 1.

If this overload rating is exceeded, electrical failure may occur. As a safety feature they have been designed to withstand much higher burst pressures than the pressure which will cause permanent damage.

Important: Both static and dynamic overloads must be considered when selecting a pressure transducer. In most systems, pressure fluctuations exist. These fluctuations can have very large and very fast peak pressures as in water hammer effects. If the transducer is connected to a slow responding instrument such pressure peaks may not be observed. Where pressure pulses are expected, the transducer rating should be high enough to prevent overload by the peak pressure. The life of the transducer will be reduced if the transducer is repeatedly operated in the overload range, particularly under dynamic conditions. An oscilloscope is a convenient tool for determining if high pressure transients exist in a system.

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WARRANTY/DISCLAIMER

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this warranty is VOID, if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. Nevertheless, OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.

OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY / DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS OR **CALIBRATION**, consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.