



Model 730

Operating Instructions

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1.0 Introduction

Setra's Model 730 capacitance manometer is a temperature compensated, absolute pressure transducer designed for accurate and repeatable vacuum measurements. Various full scale ranges are available from 10 Torr up to 1000 Torr. The units of measurement may be specified in Torr (mmHg), mBar, kPa, or PSIA.

The Model 730 operates from a 12-30 VDC power supply and provides a 0-10 VDC signal output that is linear with pressure and independent of gas composition. It can also be supplied with a 0-5 VDC output, which operates from 9-30 VDC power supply. The Model 730 is pin for pin compatible with competitive capacitance manometers. Superior EMI/RFI performance is achieved by the use of a metal case in conjunction with surge and ESD suppression components and RFI filtering on the inputs and outputs. The Model 730 has easy access to multi-turn potentiometers for fine zero adjustments. Inconel is used for all wetted materials for compatibility with corrosive gases. A wide range of process connections are available.

The high accuracy pressure sensing element used in the Model 730 is Setra's variable capacitance sensor. A centrally located feedthrough assembly supports a circular electrode in close proximity to the back surface of the diaphragm. Together, the electrode and diaphragm form a variable capacitor within a small reference vacuum chamber. As the pressure increases, the diaphragm deflects and the gap between the electrode and diaphragm reduces, causing an increase in the capacitance. This change in capacitance is detected and converted to a highly accurate linear DC electronic signal by Setra's high frequency precision diode bridge circuit.

Excellent zero stability and barometric insensitivity is achieved through the patented sensor design. The Model 730 sensor contains no fragile or complex parts as found in ceramic based capacitance manometers. The all welded construction eliminates stability issues inherent in other designs due to frictional contact between dissimilar materials.

2.0 Mechanical installation

Remove all packaging material and the protective flange cover and visually check the Model 730. If the Model 730 appears damaged, notify Setra Systems or your supplier immediately. Retain packaging materials for inspection. Do not use if damaged. If the Model 730 is not going to be used immediately, then replace the protective flange cover and store in an area where the temperature range is controlled between -20 to +85°C.

The Model 730 can be mounted in any orientation on the vacuum system. To avoid the buildup of debris or condensable material in the measurement cavity of the Model 730 (which may cause measurement errors), we recommend that you install the Model 730 vertically with the tube facing down. Outline drawings showing the external dimensions are shown in Figure 1.

To connect the Model 730 to your system use the appropriate hardware for the type of fitting:

- Use a Swagelock® Ultra Torr vacuum fitting to connect to the 0.5" or 0.25" OD tube.
- Use an O-ring/centering ring and clamp to connect to the NW16 or 25 flange options.

NOTE: A stepped O-ring carrier may be used to connect the NW16 flange to an NW10 flange on the system.

- Use a Male 4 VCR™ or 8 VCR™ Face Seal Fitting and sealing gasket to connect to the female swivel 4 VCR™ or 8 VCR™ Style Face Seal Fitting.

NOTE: Tighten fittings in accordance with the manufacturer's specifications.

Figure 1: Outline drawing of Model 730 with 9-pin D-sub and 0.5" and 0.25" OD Tube.

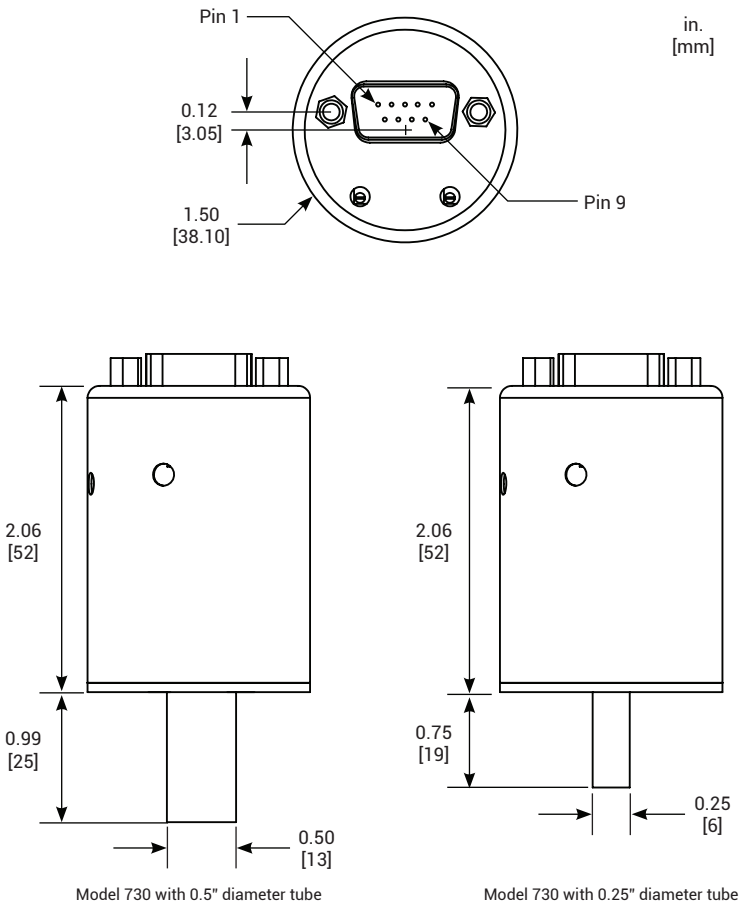


Figure 2: Outline drawing of Model 730 with 5-pin terminal strip and 0.5" and 0.25" OD Tube.

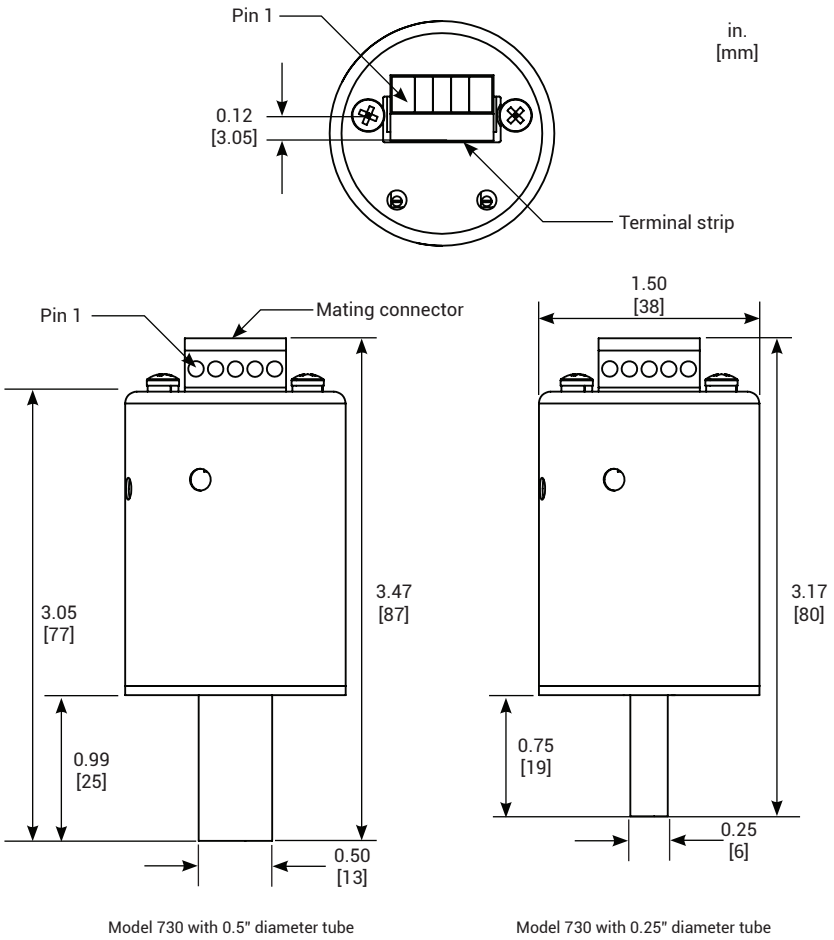
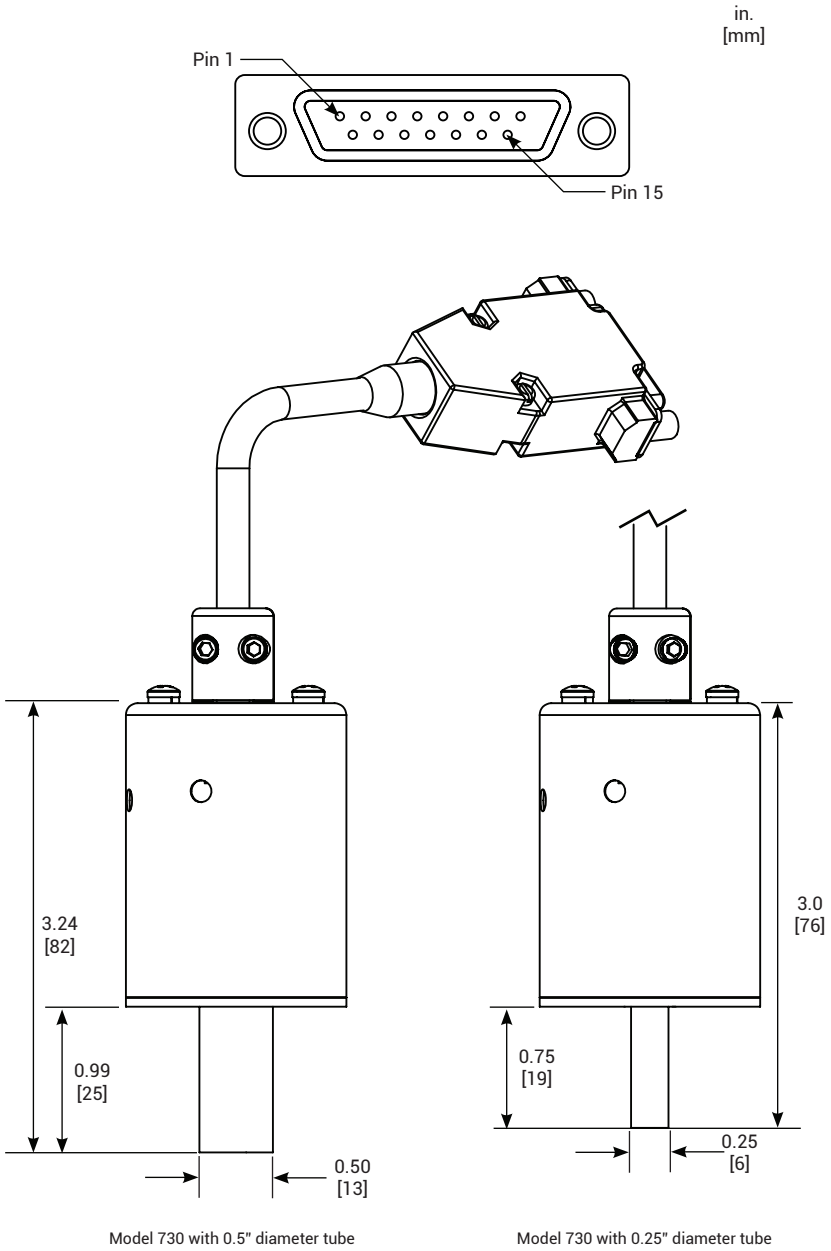


Figure 3: Outline drawing of Model 730 with 6" cable and 15-pin D-sub and 0.5" and 0.25" OD Tube.



3.0 Electrical installation

The model 730 operates from a 12-30 VDC regulated power supply for the 0-10 VDC output version or from a 9-30 VDC regulated power supply for the 0-5 VDC output version. Either version can be specified with a 5 Pin terminal strip, 9 Pin D-sub, or 15 Pin D-sub on a 6 inch pigtail. Mating connectors are provided with the terminal strip version. The pinouts for each option are shown in figures 4, 5, and 6, Page 6.

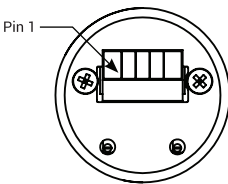
The ground of any external power supply and readout system should be the same as the transducer ground (chassis ground) to minimize any possible ground loops, which may effect the performance and stability of the system.

3.1 Wiring guidelines

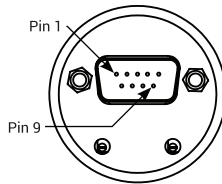
The Model 730 is compliant with the Electro Magnetic Compatibility Directive 2004/108 EC, which tests for radio frequency emissions and immunity, provided the following wiring guidelines are adhered to:

1. All interconnecting cables must have overall metal braid and foil shields covering all wires and be properly grounded at each end.
2. The cable connectors must have a metal case and it must be in direct contact with the cable braided shield for the entire circumference of the cable. A single wire from the shield to the connector case will not be effective.
3. The connectors must make good contact, about 0.01 ohms, to the transducer's case (chassis).
4. Versions with the 5 pin terminal strip connector option must be used with a suitable clamp on ferrite such as the Fair-rite part number 0461164281 which is included with each unit. The ferrite should be assembled as close to the connector as possible to meet CE EMI requirements.

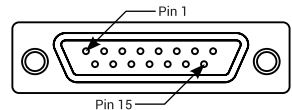
WARNING: Class A equipment is intended for use in an industrial environment. Operation of the equipment in other locations may cause harmful interference do to conducted as well as radiated disturbances.



**Fig. 4:
Pin out of
5-pin terminal strip**



**Fig. 5:
Pin out of 9-pin
D-sub connector**



**Fig. 6:
Pin out of 15-pin
D-sub connector**

| Pin | Function |
|-----|----------------------|
| 1 | Power supply common |
| 2 | Signal output common |
| 3 | + Signal output |
| 4 | Case ground |
| 5 | Power supply |

| Pin | Function |
|------------------|----------------------|
| 1 | + Signal output |
| 9 | Power supply common |
| 4 | Power supply + VDC |
| 8 | Signal output common |
| 2, 3, 4, 5, 6, 7 | Not used |

| Pin | Function |
|----------------------------------|-----------------------|
| 2 | + Signal output |
| 5 | Power supply common |
| 7 | Power supply + 15 VDC |
| 12 | Signal output common |
| 15 | Chassis |
| 1, 3, 4, 6, 8, 9, 10, 11, 13, 14 | Not used |

4.0 Operation

For most accurate pressure measurement, allow the Model 730 to warm up for at least 15 minutes. After installation, periodically check the zero output reading to verify correct output. Adjust the zero potentiometer if incorrect (See Section 5 for zero adjustment instructions). The signal output of the Model 730 is linear with pressure; e.g., for a 10 VDC FS Model 730, 10 VDC equals 100% FS output; 1 VDC equals 10% FS output.

Table 1 indicates the lowest pressures recommended for reading and pressure control for each range of the Model 730. The lowest suggested pressure for reading is limited by the resolution and the accuracy of the Model 730. This is directly related to the electrical noise on the signal output and can be significantly effected by incorrect electrical ground connection, or connection to an electronically noisy power supply or readout instrument. Improved results may be obtained if the transducer is operated in an environment with stable temperature and air flow. The lowest recommended pressure used for control applications, such as a closed loop downstream pressure control system, is based on a minimal signal output of 50 mV.

NOTE: if the unit has been exposed to sudden environmental changes, allow at least 2 hours before making any adjustments.

Table 1: Recommended Lowest Pressures

Available for reading and pressure control

| Full scale range | Lowest recommended pressure reading | Recommended lowest pressure for control |
|-------------------------|--|--|
| 10 Torr | 0.005 Torr | 0.05 Torr |
| 20 Torr | 0.010 Torr | 0.10 Torr |
| 100 Torr | 0.050 Torr | 0.50 Torr |
| 200 Torr | 0.100 Torr | 1.00 Torr |
| 1000 Torr | 0.500 Torr | 5.00 Torr |
| 10 mbar | 0.005 mbar | 0.05 mbar |
| 20 mbar | 0.010 mbar | 0.10 mbar |
| 100 mbar | 0.050 mbar | 0.50 mbar |
| 1000 mbar | 0.500 mbar | 5.00 mbar |
| 1 kPa | 0.0005 kPa | 0.005 kPa |
| 2 kPa | 0.0010 kPa | 0.010 kPa |
| 10 kPa | 0.0050 kPa | 0.050 kPa |
| 100 kPa | 0.0500 kPa | 0.50 kPa |

5.0 Calibration & adjustment

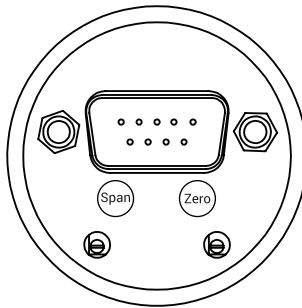
5.1 Checking & zero adjustment

After installation on a system, the Model 730 should be zeroed. Figure 7 shows the location of the zero adjustment potentiometer.

NOTE: Before making adjustments be sure to allow the Model 730 to warm up and pump down sufficiently to the system base pressure. This time will vary depending on range and system conductance. A minimum of 15 minutes is suggested.

Use a digital voltmeter to view the signal output of the Model 730. Adjust the signal output of the model 730 to be 0.001 to -0.001 V. Make this adjustment at a pressure at least 1/2 decade below the Model 730's resolution; e.g., for a 10 Torr FS unit the zero pressure should be less than $5E-5$ Torr. For a 1000 Torr unit, a pressure less than 0.050 Torr is acceptable.

Figure 7: Location of calibration adjustment potentiometers



5.2 Span (full scale) adjustment and calibration

The Zero adjustment is the only adjustment that should be made in the field. Span (Full Scale) adjustments require a calibrated and certified reference standard and should only be attempted by qualified personnel. Return the Model 730 to Setra Systems for periodic calibration, Span (Full Scale) Adjustment and Calibration adjustments and servicing.

6.0 Maintenance & Troubleshooting

There are no general maintenance requirements for the Model 730 other than periodic zero adjustment. If the unit fails to operate when received or if the unit appears damaged, notify Setra Systems or your supplier immediately. Retain packaging materials for inspection. Do not use if damaged. If the Model 730 is not going to be used immediately then replace the protective flange cover and store in suitable conditions described in Section 2.

If no obvious damage has occurred, a few simple checks can be made to verify proper installation. Table 2 shows the solution to common problems with the installation. If none of these problems/solutions are applicable, then please contact a Setra Systems applications engineer for further assistance.

Table 2: Common Installation Problems & Solutions

| Problem | Cause | Solution |
|---------------------------------|---|--|
| No signal output | Incorrect or no supply voltage | Ensure power supply is used as specified in Section 3. |
| | Readout display short circuit or incorrect impedance | Ensure impedance of readout unit is >10k |
| Signal output reads over range | Incorrect wiring | Ensure wiring conforms to diagrams in Section 3.0 |
| | Potential difference between chassis ground of unit, power supply and readout/display | Ensure common chassis ground between unit, power supply, and display |
| Signal output reads under range | Incorrect zero adjustment | Adjust zero per section 5.1 |
| | Readout display incorrect impedance | Ensure impedance of readout unit is > 10k |
| | Incorrect wiring polarity to readout display | Ensure wiring conforms to diagrams in Section 3.0 |
| Unstable signal supply | Chassis ground not connected | Ensure common chassis ground between unit, power supply, and display |
| | Unstable or unregulated power supply | Use a regulated power supply as specified in Section 3.0 |
| | Electrical noise on chassis ground | Ensure common chassis ground between unit, power supply, and display |

7.0 Specifications

Performance data

| | |
|---------------|---|
| Accuracy | ±0.5% of reading; ±0.25% of reading (Opt) |
| Response time | <20 ms |
| Resolution | Infinite, limited only by output noise level ($\leq 0.005\%$ FS) |

Thermal effects

| | |
|---------------------|---|
| Compensated range | 0° to +50°C |
| Zero shift | ±0.25% FS/50°C |
| Span shift | ±1.35% Rdg/ 50°C |
| Long term stability | 0.5% FS/1 YR, excluding environmental effects |
| Proof pressure | 45 PSIA |

Electrical data (voltage)

| | |
|--------------------------------|--|
| Excitation/Output ⁴ | 12 to 30 VDC for 0-10 VDC; 9 to 30 VDC for 0-5 VDC |
| Current consumption | <10 mA max |
| Output load | >10 kΩ Load |
| Output impedance | <1 ohm |
| Circuit | 3-Wire |
| EMC performance | Complies with EMC Directive 2004/108EC |

Physical description

| | |
|-----------------------|--|
| Pressure fittings | See data sheet |
| Wetted material | Inconel® |
| Electrical connection | 5-Pin Screw terminal, 9-Pin D-Sub, or 15-Pin D-Sub on 6" pigtail |
| Case | Stainless steel |
| Cavity volume | <6.0 cc |
| Weight (approx.) | <250 g |

Pressure media

Gases or liquids compatible with Inconel®. Inconel® wetted material is for 0.5" tube option only. Other fitting options will add stainless steel.

Environmental data

| | |
|-----------------------|--------------|
| Operating temperature | 0° to 80°C |
| Storage temperature | -20° to 85°C |

Approvals

CE, RoHS

¹Includes non-linearity, non-repeatability and hysteresis

²Units calibrated at nominal 66°F. Maximum thermal error computed from this datum.

³±1.0% FS/yr for ranges <100 Torr full scale when operated at 80°C

⁴Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater

Specifications subject to change without notice.

8.0 Returning products for repair

Please contact a Setra application engineer (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 ensure prompt handling, please supply the following information and include it inside the package or returned material:

- Name and phone number of person to contact.
- Shipping and billing instructions.
- Full description of the malfunctions.
- Identify any hazardous material used with the 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 chargers.

Calibration Services

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

9.0 Limited warranty & limitation of repair

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 date 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.

For all CE technical questions, contact Setra Systems, USA. EU customers may contact our EU representative Hengstler GmbH, Uhlandstr 49, 78554 Aldingen, Germany (Tel: +49-7424-890; Fax: +49-7424-89500).



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