



MODEL 820 Capacitance Manometer

Return Policy

Returns are accepted on stock items up to 30 days from date of order. You must contact our Returns Department for a Return Authorization (RA) number. Return the goods - freight prepaid - in the original container and include original packing slip. C. O. D. returns are not accepted. Gems reserves the right to apply restocking charges.

Gems Sensors cannot accept a Model 820 for repair unless the Form 720ERN is completed. Contact Gems Sensors for an ERN Number or the Form 720ERN. Form 720ERN is included in this guide on page 7.

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Important Points

- Gems products must be maintained and installed in strict accordance with the National Electrical Code and the applicable Gems Product Instruction Bulletin that covers installation, operating and proper maintenance. Failure to observe this information may result in serious injury or damages.
- Please adhere to the pressure and temperature limitations shown throughout this bulletin. These limitations must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.
- Selection of materials for compatibility with the media is critical to the life and operation of Gems products. Take care in the proper selection of materials of construction, testing is required.
- Our sensors have been designed to resist shock and vibration. However, shock and vibration should be minimized.
- Our sensors must not be field-repaired.
- Physical damage sustained by product may render it unserviceable.



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1.0 Introduction

Gems Model 820 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 (hPa), kPa or psia.

The Model 820 operates from a 14-30 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 820 is pin for pin compatible with other 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 820 has easy access to multi-turn potentiometers for fine zero and span adjustments. Inconel is used for all wetted materials for compatibility with corrosive gases. A wide range of pressure/vacuum fittings are available.

The high accuracy pressure sensing element used in the Model 820 is a 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 Gems's unique custom integrated circuit utilizing a patented charge balance principle.

Excellent zero stability and barometric insensitivity is achieved through the patented sensor design. The Model 820 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 820. If the Model 820 appears damaged, notify Gems Sensors or your supplier immediately. Retain packaging materials for inspection. Do not use if damaged. If the Model 820 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 -50 to +125°C.

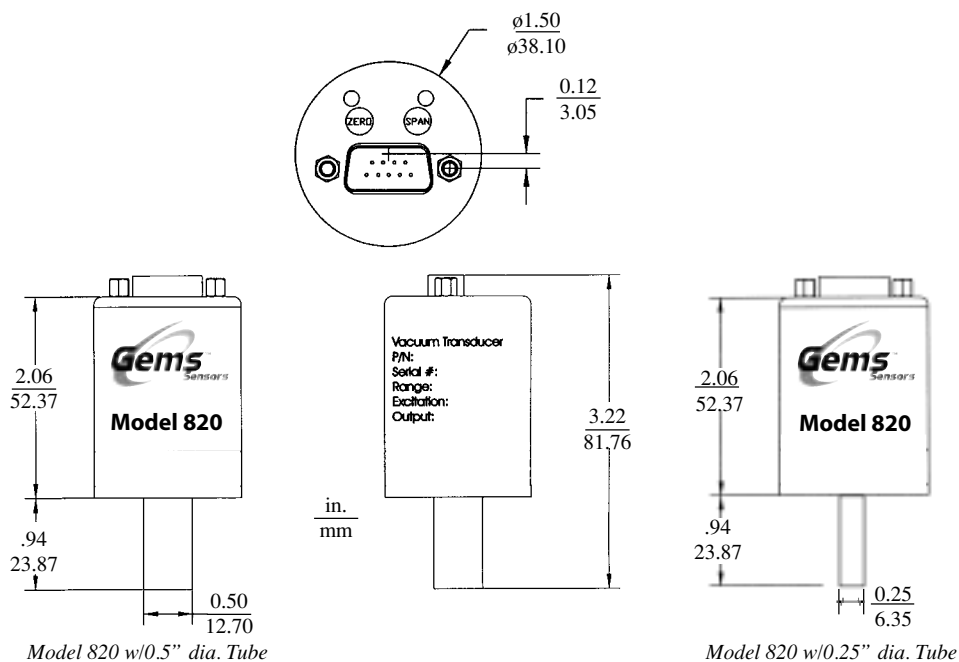
The Model 820 can be mounted in any orientation on the vacuum system. To avoid the buildup of debris or condensable material in the measurement cavity of the Model 820 (which may cause measurement errors), we recommend that you install the Model 820 vertically with the tube facing down. Outline drawings showing the external dimensions are shown in Figure 1.

To connect the Model 820 to your system use the appropriate hardware for the type of fitting:

- Use a Cajon® Ultra Torr type of compression coupling to connect to the 0.5" or 0.25" OD tube.
- Use an O-ring/centering ring and clamp to connect to the NW16, 25 and 40 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™ Style Face Seal Fitting and sealing washer to connect to the female swivel 4 VCR™ or 8 VCR™ Style Face Seal Fitting.

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

Figure 1: Outline drawing of 9-pin D connector, 0.25" and 0.5" OD tube.



8.0 RETURN OF GEMS SENSORS PRODUCT-DECLARATION (Form 820ERN)

EXPECTED RETURN NUMBER _____

You must:

- Know about all of the substances which have been used and produced in the product before you complete this Declaration.
- Contact your supplier if you have any questions and for an ERN Number.
- Send this form to your supplier with the return of the product.

SECTION 1: Product

A. Model Number _____

B. Serial Number _____

C. Has the product been used, tested or operated?

Yes - Go to Section 2

No - Go to Section 4

SECTION 2: Substances in Contact with the Product

A. Radioactive* Yes No

B. Biologically Active Yes No

C. Dangerous to Human Health and Safety? Yes No

* Note: Your supplier will not accept delivery of any products that are contaminated with radioactive substances, unless you:

- Decontaminate the products
- Provide proof of decontamination

YOU MUST CONTACT YOUR SUPPLIER FOR ADVICE BEFORE YOU RETURN SUCH PRODUCTS

Substance Name	Chemical Symbol	Precautions Required (e.g., use protective gloves, etc.)	Actions Required After Spillage or Human Contact
1.			
2.			
3.			
4.			
5.			
6.			

If you have answered "no" to all of these questions, go to Section 4.

SECTION 3: List of Substances in Contact with the Product

SECTION 4: Return Information

Reason for return and symptoms of malfunction: _____

If you have a warranty claim:

• Who did you buy the product from?: _____

• Give the supplier's invoice number or your purchase order number: _____

SECTION 5: Declaration

Print your Name: _____ Print Your Job Title: _____

Print Your Company Name: _____

Print Your Address: _____

Telephone Number: _____ Date of Product Return: _____

I have made reasonable inquiry and I have supplied accurate information in this Declaration. I have not withheld any information. I have followed the Return of Gems Sensors Product Procedure.

Signed: _____ Date: _____

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 2.
	Readout display short circuit or incorrect impedance	Ensure impedance of readout unit is > 10 kΩ
Signal output reads over-range	Incorrect wiring	Ensure wiring conforms to diagrams in Section 4.2
	Potential difference between chassis ground of unit , power supply and readout / display	Ensure common chassis ground between unit, power supply and display.
	Incorrect zero adjustment	Adjust zero per section 5.1
Signal output reads under-range	Readout display incorrect impedance	Ensure impedance of readout unit is > 10 kΩ .
	Incorrect wiring polarity to readout display	Ensure wiring conforms to diagrams in Section 4.2
	Chassis ground not connected	Ensure common chassis ground between unit, power supply and display.
Unstable signal	Unstable or unregulated supply	Use a regulated power supply power supply as specified in Section 2.
	Electrical noise on chassis ground	Ensure common chassis ground between unit, power supply and display.

7.0 Specifications

Performance Data:

Accuracy (RSS) ¹ :	< ± 0.5% of Reading
Optional	< ± 0.25% of Reading
Resolution:	0.01% FS
Thermal effects	
Compensated Range:	0 to +50°C
Zero Shift:	< ± 0.005% FS / °C
Span Shift:	< ± 0.027% Rdg / °C
Proof Pressure:	45 psia
Operating Temperature:	-20 to +80°C
Storage Temperature:	-40 to +125°C

Electrical Data:

Connector:	9 pin D sub
Excitation/Output:	14-30 VDC for 0-10 VDC output 9-30 VDC for 0-5 VDC output
Output Maximum Load:	< 10 KΩ load
Power Consumption:	< 200 mW
Time Constant:	< 20 ms
EMC Performance:	Complies with EMC Directive 89/336/EEC

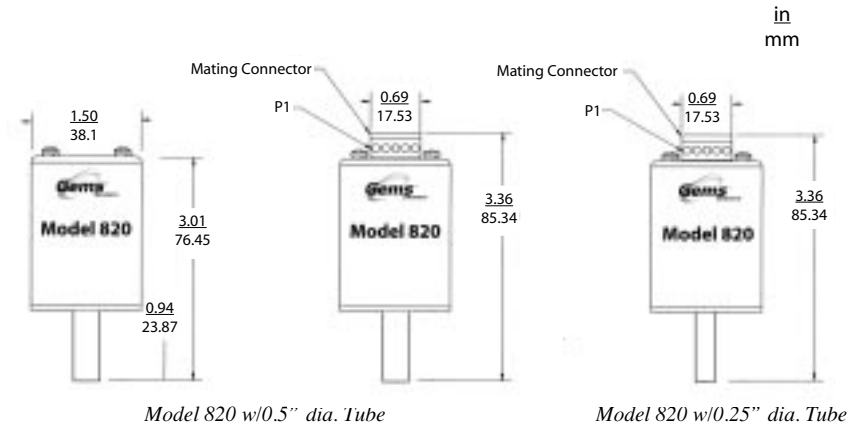
Physical Description:

Case:	Stainless steel
Vacuum Fittings:	0.25" or 0.5" OD Tube; other fittings available; specification sheet
Wetted Materials ² :	Inconel®
Measurement cavity volume ³ :	<6.2 cc
Weight:	137 g

Notes:

1. Root sum of the squares (RSS) of linearity, hysteresis and non-repeatability. Accuracy is expressed as % of reading. However, near Zero, the accuracy is limited by the resolution of the ±0.1% instrument. So, the accuracy is more correctly stated as the greater of ±0.5% reading. (For the optional accuracy, this becomes the greater of ±0.25% reading or ±0.01% FS).
2. Wetted material is for 0.5" tube option only. Other flange options will add stainless steel.
3. Maximum cavity volume including the 0.5" OD tube volume of 0.26 in³ (4.28 cm³).

Figure 2: Outline drawing of 5-pin terminal strip, 0.25" and 0.5" O.D. tube



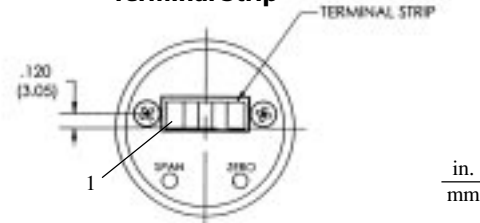
3.0 Electrical Installation

The model 820 operates from a 14-30 VDC regulated power supply for the 0-10 VDC output, or a 9-30 VDC regulated power supply for the 0-5 VDC output. The pin outs for the 5 Pin terminal strip and D-sub 9 Pin connector are shown in Figures 3 and 4 below.

Note 1: 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 transducer.

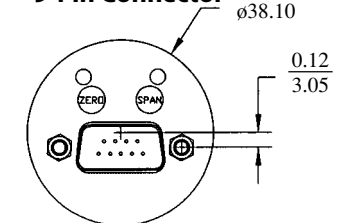
Note 2: The Model 820 meets CE mark requirements and complies with EMC Directive 89/336/EEC. To ensure compliance when installed, an overall metal braided shielded cable (and metal shielded connectors for the D sub connector option) connected to chassis ground at both ends is required.

Fig. 3: Pin out of 5-Pin Terminal Strip



Pin Location	Function
1	Power Supply Common
2	Signal Output Common
3	+Signal Output
4	Case Ground
5	Power Supply +VDC

Fig. 4: Pin out of D-sub 9-Pin Connector



Pin Location	Function
1	+Signal Output
9	Power Supply Common
4	Power Supply +VDC
8	Signal Output Common
2,3,5,6,7	Not Used

4.0 OPERATION

For most accurate pressure measurement, allow the Model 820 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 820 is linear with pressure; e.g., for a 10 VDC FS Model 820, 10 VDC equals 100% FS output; 1 VDC equals 10% FS output.

Table 1 indicates the lowest pressures available for reading and pressure control for each range of the Model 820. The lowest suggested pressure available for reading is limited by the resolution and the accuracy of the Model 820. 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 signal output of 50 mV.

Table 1: Recommended Lowest Pressures Available for Reading & Pressure Control

Full Scale Range	Recommended Lowest Pressure Reading	Recommended Lowest Pressure for Control
10 Torr	0.005 Torr	0.05 Torr
20 Torr	0.010 Torr	0.10 Torr
50 Torr	0.025 Torr	0.25 Torr
100 Torr	0.050 Torr	0.50 Torr
200 Torr	0.100 Torr	1.00 Torr
500 Torr	0.250 Torr	2.50 Torr
1000 Torr	0.500 Torr	5.00 Torr
10 mbar / hPa	0.005 mbar / hPa	0.05 mbar / hPa
100 mbar / hPa	0.05 mbar / hPa	0.5 mbar / hPa
1000 mbar / hPa	0.5 mbar / hPa	5 mbar / hPa
1 psia	0.0005 psia	0.005 psia
2 psia	0.0010 psia	0.010 psia
5 psia	0.0025 psia	0.025 psia
10 psia	0.0050 psia	0.050 psia
20 psia	0.0100 psia	0.100 psia

5.0 Calibration & Adjustment

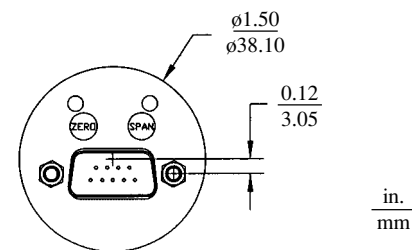
5.1 Checking & Zero Adjustment

After installation on a system, the Model 820 may require initial zero adjustment. Figure 5 shows the location of the zero adjustment potentiometer.

Use a digital voltmeter to view the signal output of the Model 820. Adjust the signal output of the Model 820 to be 0.001 to -0.001 mV. Make this adjustment at a pressure at least 1/2 decade below the Model 820's resolution; e.g., for a 10 Torr FS unit the zero pressure should be less than 5E-4 Torr. For a 1000 Torr unit, a pressure less than 0.050 Torr is sufficient.

The Zero potentiometer is a multi-turn potentiometer providing very fine adjustment of the zero over a +/- 250 mV range.

Figure 5 : 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 820 to Gems Sensors 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 820 other than periodic zero adjustment. If the unit fails to operate when received or if the unit appears damaged, notify Gems Sensors or your supplier immediately. Retain packaging materials for inspection. Do not use if damaged. If the Model 820 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 Gems Sensors applications engineer for further assistance.