Pirani Gauge Enhanced

PGE500

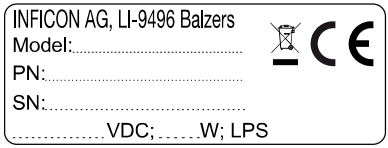
With DeviceNet

Operating Manual

Incl. EU Declaration of Conformity

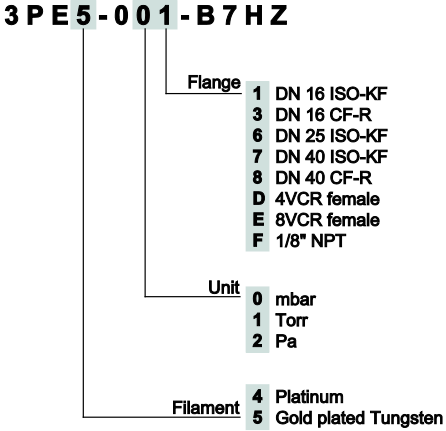
Product Identification

In all communications with INFICON, please specify the information given on the product nameplate. For convenient reference copy that information into the space provided below.



Validity

This document applies to products with part numbers:



The part number (PN) can be taken from the product nameplate.

This User Manual is applicable to the INFICON® model PGE500 product with Device Net interface manufactured with firmware number FW 2998-101 and higher (last three digits of 101 or higher). See STATUS menu described in section 4.6.4 of this manual to determine the firmware version of your PGE500

We reserve the right to make technical changes without prior notice.

Important User Information

There are operational characteristic differences between solid state equipment and electromechanical equipment. Because of these differences, and because there are a variety of uses for solid state equipment, all persons that apply this equipment must take every precaution and satisfy themselves that the intended application of this equipment is safe and used in an acceptable manner.

In no event will INFICON be responsible or liable for indirect or consequential damages that result from the use or application of this equipment.

Any examples or diagrams included in this manual are provided solely for illustrative purposes. Because of the many variables and requirements imposed on any particular installation, INFICON cannot assume responsibility or liability for any actual use based on the examples and diagrams.

No patent liability is assumed by INFICON with respect to use of information circuits, equipment, or software described in this manual.

Throughout this manual we use notes, notices and apply internationally recognized symbols and safety messages to make you aware of safety considerations.

Identifies information about practices or circumstances that can cause electrical or physical hazards which, if precautions are not taken, could result in death or serious injury, property damage, or economic loss.

Identifies information about practices or circumstances that can cause electrical or physical hazards which, if precautions are not taken, could result in minor or moderate injury, property damage, or economic loss.

Identifies information that is critical for successful application and understanding of the product.

Labels may be located on or inside the device to alert people that dangerous voltages may be present.

General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.

  Consider possible reactions with the product materials.

  Consider possible reactions (e.g. explosion) of the process media due to the heat generated by the product.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

Liability and Warranty

INFICON assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the product documentation.

The end-user assumes the responsibility in conjunction with the process media used.

Gauge failures due to contamination or wear and tear, as well as expendable parts (e.g. Pirani filament), are not covered by the warranty.

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used.

1 Introduction / General Information

1.1 Description

Thermal conductivity gauges measure pressure indirectly by sensing the loss of heat from a sensor to the surrounding gases. The higher the pressure of the surrounding gas, the more heat is conducted away from the sensor. Pirani thermal conductivity gauges maintain a sensor (usually a wire) at some constant temperature, and measure the current or power required to maintain that temperature. A standard Pirani gauge has a useful measuring range of about 10^{-4} Torr to 10 Torr. By taking advantage of convection currents that are generated above 1 Torr, convection-enhanced Pirani gauges increase the measuring range to just above atmosphere.

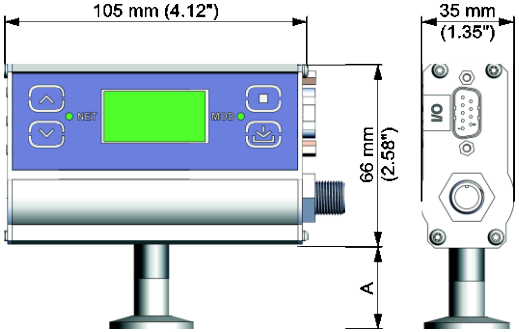
The INFICON® PGE500 module provides the basic signal conditioning required to turn a convection vacuum gauge into a complete measuring instrument. This version of the PGE500 provides a DeviceNet interface as well as two process control setpoint relays. Additionally a built-in OLED digital display provides the measured pressure values and provides for a convenient user interface for setup and operation of the vacuum gauge. The INFICON PGE500 module will also directly replace the DeviceNet version of the Granville-Phillips® / MKS Mini-Convectron® vacuum gauge as the electrical connector pin-out and DeviceNet commands are identical to the corresponding Mini-Convectron®.

1.2 Specifications

Measurement range	1.3×10^{-4} … 1333 mbar 1×10^{-4} … 1000 Torr 1.3×10^{-2} Pa … 133 kPa
Accuracy - N_2 (typical)	
1×10^{-4} … 1×10^{-3} Torr	0.1 mTorr resolution
1×10^{-3} … 400 Torr	±10% of reading
400 … 1000 Torr	±2.5% of reading
Repeatability - N_2 (typical)	±2% of reading
Display	bright OLED
Scientific notation: 3 digits plus 2 digit exponent for user selectable units in Torr, mbar or Pa. Engineering notation is also user selectable for Torr/mTorr only.	
Materials exposed to vacuum	gold-plated tungsten, 304 & 316 stainless steel, glass, nickel, Teflon®
Housing (electronics)	aluminum extrusion
Internal volume	26 cm^3 (1.589 in^3)
Internal surface area	59.7 cm^2 (9.25 in^2)
Weight	340 g (12 oz.)
Permissible temperature	
Operating	0 … +40 °C
Storage	–40 … +70 °C
Bakeout temperature	≤150 °C (gauge only - electronics removed)

Relative humidity	0 … 95%, non-condensing
Use	
Operating	altitude up to 2500 m (8200 ft.)
Storage	altitude up to 12500 m (41000 ft.)
Mounting orientation	horizontal recommended (orientation has no effect on measurements below 1.3 mbar (1 Torr))
DeviceNet Interface	
Device type	vacuum gauge/pressure gauge device
Adjustable parameters	setpoints, engineering units of measure, vacuum and atmosphere calibration
Messaging	polled I/O and explicit
Baud rates	125K, 250K, or 500K, adjustable via rotary switch
Supply voltage	12 … 26 V (dc), 0.22 A, 2.4 W protected against power reversal and transient over-voltages
Setpoint relays	two, single-pole double-throw relays (SPDT), 1 A at 30 V (dc) resistive, or V (ac) non-inductive
Electrical connection	9-pin D-sub male used for setpoint relays 5-pin Micro for power and DeviceNet interface

1.3 Dimensions



Fitting	Dimension A	
	mm	(inch)
DN 16 ISO-KF	29.5	(1.16)
DN 25 ISO-KF	29.5	(1.16)
DN 40 ISO-KF	29.5	(1.16)
DN 16 CF-R	34	(1.34)
DN 40 CF-R	34	(1.34)
4 VCR female	43.7	(1.72)
8 VCR female	40.9	(1.61)
1/8" NPT male	21.8	(0.86)

2 Important Safety Information

INFICON has designed and tested this product to provide safe and reliable service, provided it is installed and operated within the strict safety guidelines provided in this manual. **Please read and follow all warnings and instructions.**

WARNING

To avoid serious injury or death, follow the safety information in this document. Failure to comply with these safety procedures could result in serious bodily harm, including death, and or property damage.

Failure to comply with these warnings violates the safety standards of installation and intended use of this instrument. INFICON disclaims all liability for the customer's failure to comply with these instructions.

Although every attempt has been made to consider most possible installations, INFICON cannot anticipate every contingency that arises from various installations, operation, or maintenance of the module. If you have any questions about the safe installation and use of this product, please contact INFICON.

2.1 Safety Precautions - General

The product should never be operated with the enclosure removed.

WARNING! There are no operator serviceable parts or adjustments inside the product enclosure. However, the sensor inside the product enclosure is replaceable. Refer servicing to service trained personnel.

Do not modify this product or substitute any parts without authorization of qualified INFICON service trained personnel. Return the product to an INFICON qualified service and repair center to ensure that all safety features are maintained. Do not use this product if unauthorized modifications have been made.

WARNING! Source power must be removed from the product prior to performing any servicing.

After servicing this product, ensure that all safety checks are made by a qualified service person. When replacement parts are required, ensure that the parts are specified by INFICON Substitutions of non-qualified parts may result in fire, electric shock or other hazards. Use of unauthorized parts or modifications made to this product will void the warranty.

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. These products are not waterproof and careful attention must be paid to not spill any type of liquid onto these products. Do not use these products if they have been damaged. Immediately contact INFICON to arrange return of the product if it is damaged.

Due to the possibility of corrosion when used in certain environmental conditions, it is possible that the product's safety could be compromised over time. It is important that the product be periodically inspected for sound electrical connections and equipment grounding. Do not use if the equipment grounding or electrical insulation has been compromised.

2.2 Safety Precautions - Service and Operation

Ensure that the vacuum port on which the PGE500 vacuum gauge is mounted is electrically grounded.

Use an appropriate power source of 12 … 26 V (dc), 0.22 A, 2.4 W.

Turn off power to the unit before attempting to service the module.

Turn off power to the unit if a cable or plug is damaged or the product is not operating normally according to this operating manual. Contact qualified INFICON service personnel for any service or troubleshooting condition that may not be covered by this operating manual.

It is important that the product be periodically inspected for sound electrical connections and equipment grounding. Do not use if the equipment grounding or electrical insulation has been compromised.

Do not use if the unit has been dropped or the enclosure has been damaged. Contact INFICON for return authorization and instructions for returning the product to INFICON for evaluation.

2.3 Electrical Conditions

WARNING! When high voltage is present in any vacuum system, a life threatening electrical shock hazard may exist unless all exposed electrical conductors are maintained at earth ground potential. This applies to all products that come in contact with the gas contained in vacuum chambers. An electrical discharge within a gaseous environment may couple dangerous high voltage directly to any ungrounded conductor of electricity. A person could be seriously injured or killed by coming in contact with an exposed, ungrounded electrical conductor at high voltage potential. This condition applies to all products that may come in contact with the gas inside the vacuum chamber (vacuum / pressure containment vessel).

2.3.1 Proper Equipment Grounding

WARNING! Hazardous voltages that could seriously injure or cause death are present in many vacuum processes. Verify that the vacuum port on which the PGE500 vacuum gauge module is mounted is electrically grounded. Consult a qualified Electrician if you are in doubt about your equipment grounding. Proper grounding of your equipment is essential for safety as well as intended operation of the equipment. The PGE500 module vacuum gauge must be connected directly to a good quality earth ground. Use a ground lug on the PGE500 gauge vacuum connection / flange if necessary.

WARNING! In order to protect personnel from electric shock and bodily harm, shield all conductors which are subject to potential high voltage electrical discharges in or around the vacuum system.

2.3.2 Electrical Interface and Control

It is the user's responsibility to ensure that the electrical signals from this product and any connections made to external devices, for example, relays and solenoids, are used in a safe manner. Always double check the system set-up before using any signals to automate your process. Perform a hazardous operation analysis of your system design and ensure safeguards and personnel safety measures are taken to prevent injury and property damage.

2.4 Overpressure and use with hazardous gases

WARNING! Install suitable protective devices that will limit the level of pressure inside your vacuum chamber to less than what the vacuum chamber system components are capable of withstanding. INFICON gauges should not be used at pressures exceeding 1000 Torr absolute pressure.

In cases where an equipment failure could cause a hazardous condition, always implement fail-safe system operation. For example, use a pressure relief device in an automatic backfill operation where a malfunction could result in high internal pressures if the pressure relief device was not installed on the chamber.

The PGE500 vacuum gauge module is not intended for use at pressures above 20 psia (1000 Torr); DO NOT exceed 35 psig (<2½ bars) pressure inside the sensor. If your chamber goes to higher pressures, you should install an isolation valve or pressure relief device to protect the gauge tube from overpressure conditions. With some fittings, actual safe overpressure conditions may be lower; for example, a quick-connect, O-ring compression fitting may forcibly release the gauge tube from the vacuum chamber fitting with only a few psi over local uncorrected barometric (atmospheric) pressure.

CAUTION! If the internal pressure of a vacuum gauge device is allowed to increase above local uncorrected barometric pressure (atmospheric pressure side), vacuum fittings may release and possible overpressure conditions may cause leaks that would allow the gas inside the gauge tube to release into the atmosphere of the surrounding environment. Toxic, pyrophoric and flammable gases are examples of hazardous gases that if allowed to leak out of the vacuum/pressure containment vessel into the atmospheric environment, could cause bodily injury and possible damage to equipment. Never expose the gauge tube internal volume to pressure above local atmospheric pressure when using hazardous gases.

2.5 Gases other than Nitrogen / air

WARNING! Do not attempt to use with gases other than nitrogen (N_2) or air without referring to correction factor data tables.

INFICON gauges and modules are calibrated for direct readout of nitrogen or air. Do not attempt to use with other gases such as argon (Ar) or carbon dioxide (CO_2) unless accurate conversion data for N_2 to other gas is properly used. Refer to sections titled "Using the gauge with different gases", "Display" and "Analog Output" for a more complete discussion.

WARNING! Do not use this device in an explosive atmosphere or in the presence of flammable gases, vapors or fumes. Do not use this device to measure the pressure of explosive or combustible gases or gas mixtures. The sensor wire in the gauge normally operates at 125 °C, but if malfunction should occur, the wire temperature could exceed the ignition temperature of certain combustible gases and gas mixture. This could cause an explosion which could result in serious injury or death.

3 Installation

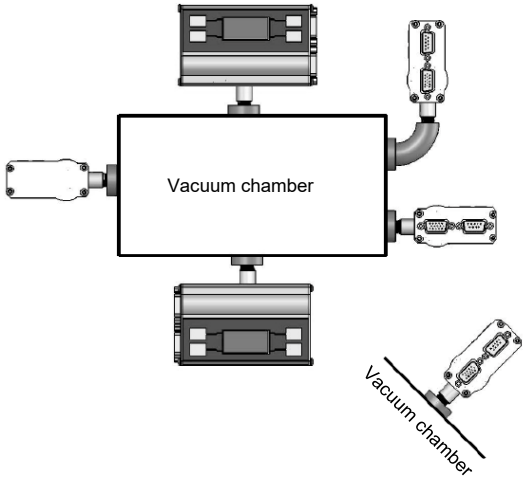
3.1 Mechanical Installation

Mount the PGE500 as close as possible to the pressure you want to measure. Long or restricted, small diameter tubing will create a pressure difference between your process chamber and the gauge. This may cause a delay in response to pressure changes.

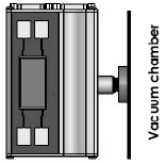
Mounting the PGE500 too close to a gas source inlet may also cause measurement and control instability. Do not mount the PGE500 near a source of heating or cooling, such as heaters or air conditioning vents.

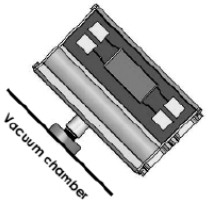
Mount the PGE500 with its main (long) axis horizontal (see diagram below). Pressure reading errors may occur above 1 Torr if the unit is not mounted horizontally. Below 1 Torr, mounting position has little to no effect.

For accurate measurements above 1 Torr, mount the gauge axis horizontally as shown below:



Incorrect Orientation:





Mount the PGE500 with port down, if possible, to help minimize the effect of any particles or condensation from collecting in the gauge.

Do not mount the PGE500 where it will be subjected to excessive vibration. Vibrations may cause unstable readings, measurement errors and possible mechanical stress to components in the PGE500.

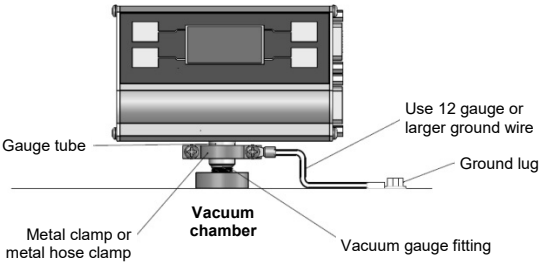
Flanges/ Fittings - follow the manufacturer's recommendations and note the following:

- NPT fittings: When connecting the device using a NPT fitting, apply a thread sealant or wrap the threaded portion of the tubing with one-and-a-half to two wraps of pipe thread seal tape such as PTFE (Teflon®) tape and hand tighten the gauge into the gauge port. Do not use a wrench or other tool which may damage the gauge.

3.2 Electrical Installation

3.2.1 Grounding

Be sure the vacuum gauge and the rest of your vacuum system are properly grounded for safety as well as intended operation of the equipment. When using KF flanges, metal clamps must be used to ensure proper grounding. Be aware that some vacuum fittings such as NPT connections installed using Teflon tape may not allow for metal-to-metal contact between the vacuum gauge and the vacuum chamber. If such is the case, use a 12 gauge or larger copper wire to connect the vacuum gauge to a ground lug on your vacuum chamber as shown below.



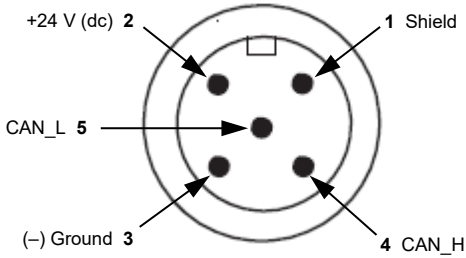
3.2.2 Electrical Connections

A good recommended practice is to remove power from any cable prior to connecting or disconnecting it.

9-pin D-sub Connector pinout

Pin no.	Pin description
1	Relay 2 Normally Open
2	Relay 2 Common
3	Relay 2 Normally Closed
4	No Connection
5	Relay 1 Common
6	Relay 1 Normally Closed
7	Relay 1 Normally Open
8	No Connection
9	No Connection

5-pin DeviceNet Micro Connector

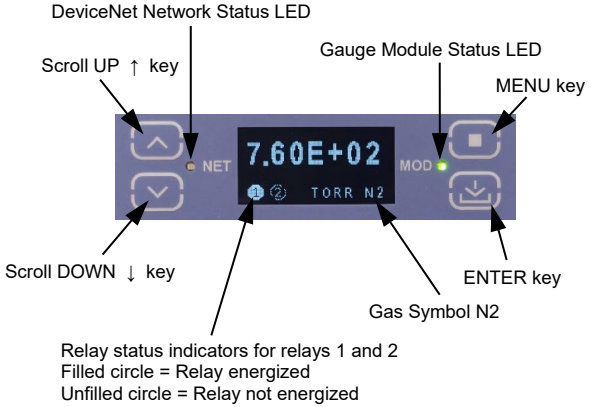


4 Setup and Operation

4.1 User Interface Basics

The setup and programming is done via the four programming-keys located on the front panel of the PGE500. During programming of the gauge, the display will identify what function each key represents.

To begin programming, press the MENU key. Press the UP and DOWN key to select the desired menu or change values. Press the ENTER key to access the parameters and save the new settings. Press the MENU Key to return to the previous menu or press repeatedly to return to the main pressure measurement display screen. To continue setting additional parameters, scroll with the UP { ↑ } and DOWN { ↓ } keys until you reach the desired parameter then press ENTER.



4.2 DeviceNet and Module Status LEDs

In addition to a built-in display the PGE500 is provided with two status LED indictors as shown below. The LED indicator marked NET represents the DeviceNet network status. The LED indicator marked MOD represents the gauge module (PGE500) status.

MOD Status LED:

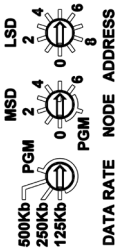
LED	Meaning
off	no power to the gauge
red	an error condition/fault exits with the gauge
flashing red-green	gauge is in self test. Review Identity Object in ODVA DeviceNet specifications
green	gauge is functioning normally

NET Status LED:

LED	Meaning
off	no power to the gauge gauge is not connected to the network duplicate MAC ID check is not complete
red	gauge not able to communicate on the DeviceNet network check for duplicate MAC ID or network off
flashing red	I/O connection(s) in the timed out state
flashing green	gauge is on the network, has completed the duplicate MAC ID check but connection to other nodes does not exist
	gauge is on the network but connection to the DeviceNet network has not been completed
	gauge not allocated to a network master
green	gauge is functioning normally

4.3 DeviceNet Setup Switches

Three switches (on the side of the gauge) as shown below are used to select the Data Rate (Baud Rate) and Node Address settings.



4.3.1 Data Rate Switch Setting

The Data Rate Switch setting is used to set the Baud Rate to 500 Kb (default), 250 Kb or 125 Kb. If the Date Rate is set to PGM, the gauge uses the Baud Rate setting that is sent from the network master. The new Buad Rate setting is stored in the non-volatile memory of the PGE500 after a reset message has been sent from the network master or power to the gauge is reset.

The following table shows the Baud Rate switch setting based on the maximum cable length between the PGE500 and the DeviceNet network master.

Baud Rate Switch Setting

Cable length (max)	Baud Rate Switch Setting
1640 ft. (500 m)	500 Kb
820 ft. (250 m)	250 Kb
328 ft. (100 m)	125 Kb

4.3.2 Node Address Switch Setting

The Node Address switches are used to set the MAC ID. The network master uses the MAC ID to identify the specific PGE500 on the network. The address can range from 0 to 63. The Switch marked "MSD" represents the most significant digit of the address (first digit) and it can be set to any number from 0 to 6. The Switch marked "LSD" represents the least significant digit of the address (second digit) and it can be set to any number from 0 to 9. If the Node Address switch is set to PGM, the PGE500 uses the MAC ID setting that is sent from the network master. The new MAC ID setting is stored in the non-volatile memory of the PGE500 after a reset message has been sent from the network master or power to the gauge is reset.

When the PGE500 is connected to DeviceNet network it checks to see whether there is a duplicate MAC ID on the network. If another gauge or instrument has the same MAC ID the gauge will not connect to the network until the duplicate MAC ID issue is resolved. When the PGE500 is able to connect to the network the net status LED will blink green until the connection to the

network master is achieved. The NET status LED will then become solid green indicating the connection is complete.

4.4 Initial Setup

Two of the most important steps for the initial setup of the gauge are to set atmosphere (SET ATM) set zero (SET VAC) and as described in the Programming section 4.6.4 below. This will ensure proper operation of the gauge and accurate pressure measurements. The gauge is calibrated at the factory using nitrogen. Furthermore, the gauge is also installed in a certain orientation when calibrated at the factory. Without setting zero and atmosphere after the gauge is installed in your system, the gauge may not display the expected and correct pressures. This could be caused by the fact that you may be using a different gas than Nitrogen such as air to setup and calibrate the gauge (most commonly the case) and the gauge orientation is different than the orientation used at the factory. As such, it is very important to perform your own initial setup and calibration by setting zero and atmosphere with the gauge installed in your actual system. Please note the following:

Setting Atmosphere (SET ATM)

Setting atmosphere is the most important step for a newly installed gauge. If you prefer to use air to set atmosphere, vent your vacuum system chamber to expose the gauge to the local atmospheric pressure (air) and set atmosphere to match your known local uncorrected barometric pressure (air). This is the reading of ambient air pressure you will expect if you were to vent and open your vacuum chamber to the atmosphere surrounding the outside of your chamber. At sea level, this pressure is usually near 760 Torr. At elevations above sea level, the pressure decreases. Check your local aviation authority or airport web sites or your current local weather conditions online to help find your local uncorrected barometric pressure if you do not have this information. See "SET ATM" in section 4.6.4.

Setting zero (SET VAC)

Setting zero optimizes performance of the gauge when operating at a low pressure range of 1.00×10^{-4} Torr to 1.00×10^{-3} Torr. If your minimum operating pressure is higher than 1.00×10^{-3} Torr, it is not normally necessary to set zero and thus setting atmosphere should be adequate. If you are able to evacuate your system to below 1.00×10^{-4} Torr, it is always a good practice to check and set zero if necessary. See "SET VAC" in section 4.6.4.

Note - Setting zero and atmosphere is normally required only once during the initial setup and maybe checked by the user periodically. After power has been applied to the gauge during the initial setup, allow five minutes for the gauge to stabilize (warm-up) before setting zero and atmosphere. If you set factory defaults you would need to repeat the initial setup procedure including setting ATM and VAC and reprogram other parameters as required.

4.5 Factory-Set Default Parameters

The following is a summary of all factory-set default values in the PGE500 display menu.

DISPLAY

- UNITS: [Factory default = TORR]
- CNTRAST: [Factory default = 6]
- SCRN SVR: [Factory default = ON
- FLIP SCR: [Factory default = OFF]
- NOTATN: [Factory default = SCI]

STATUS

- STATUS: [Factory default = OK]

- GAUGE INFO [Factory default
  MSN: Actual Module Serial Number
  GSN: Actual Gauge Serial Number
  FW: Firmware version of device

CALIBRATION

- SET ATM [Factory default = SET TO 760]
- SET VAC [Factory default = SET TO ZERO]

DFAULTS

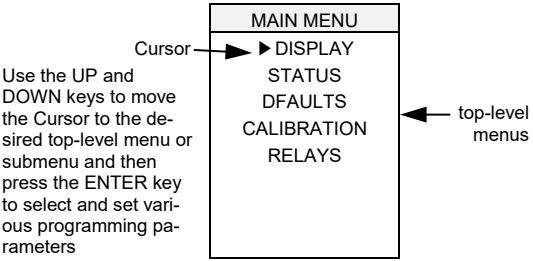
- DEFAULTS [Factory default = NO]
  (Gauge shipped with factory defaults but user must select YES to set factory defaults again)

RELAYS

- RELAY 1
  RLY: [Factory default = DISABLED]
  LO TRIP [Factory default = 7.00 E+02 TORR]
  HI TRIP [Factory default = 7.50 E+02 TORR]
- RELAY 2
  RLY: [Factory default = DISABLED]
  LO TRIP [Factory default = 7.00 E+02 TORR]
  HI TRIP [Factory default = 7.50 E+02 TORR]
- TEST RELAYS
  ①: [Factory default = OFF]
  ②: TRIP [Factory default = OFF]

4.6 Programming

This section provides detailed information on programming and configuration of various menus and submenus of the device. To begin programming, press the MENU key to access the top-level menus shown below:



Press the MENU key to return to the previous menu or press repeatedly to return to the main pressure display screen. To continue setting additional parameters, scroll with the UP and DOWN keys until you reach the desired parameter.

4.6.1 DISPLAY

The following menu choices allows the user to select the display format. Scroll to the menu of choice by using either the ↑ or ↓ keys and then press the ENTER key to access the desired menu.

UNITS [Factory default = TORR]

This should be the first parameter that is set. This will be the units-of-measure (TORR, mBAR, Pa) that are used for all other settings.

CNTRAST [Factory default = 6]

This function sets the display contrast. Access the CNTRST menu and use select a number between 1 and 10. The contrast setting of 10 provides the highest contrast (brightest) and 1 the lowest. **Note -** Factory default setting of 6 optimizes display life.

SCRN SVR [Factory default = ON]

The PGE500 uses an OLED type display which over an extended period of time can start to show divergence between pixels that are on at all times verses pixels that are not. This could result in pixels exhibiting a burned-in effect. To minimize the burned-in effect, a screen saver function can be activated by programming the SCRN SVR menu selection to ON. With the screen saver function turned on, the display appearance changes every 12 hours. The display will appear in the normal mode with a dark background color for the first 12 hours and will then switch to a back-lit background color for the next 12 hours. If you like to have the 12 hour period for the normal display mode to start at a specific time of the day, simply access the SCRN SVR menu and change setting to OFF and then ON again. This initiates the screen saver function immediately.

FLIP SCREEN [Factory default = OFF]

This allows the user to select a normal display or have the displayed data inverted. When the gauge is mounted in an inverted position, this selection is used to invert the displayed date 180 degrees for user convenience.

NOTATN [Factory default = SCI]

This allows the user to select the pressure measurement display format. Select SCI for scientific notation (Torr, mBAR and Pa) and ENG for engineering notation (Torr only). For example, when scientific notation (SCI) is selected, the pressure measurement format will be displayed as 7.60E+02 Torr while the same pressure value will be displayed as 760 Torr when the engineering notation (ENG) is selected. ENG notation is only available when units of measure is Torr. With ENG notation selected any

measured pressure value from 1000 to 1 Torr will be displayed in units of measure in Torr and any pressure values below 1 Torr will be displayed in mTorr.

4.6.2 STATUS

The following menu choices allows the user to see any pending error conditions as well as gauge identification information.

STATUS [Factory default = OK]

Access this menu to determine whether the gauge is functioning normally or an error condition(s) exists.

GAUGE INFO

Factory default = MSN: Actual Module Serial Number
GSN: Actual Gauge Serial Number
FW: Firmware version of device

4.6.3 DEFAULTS

The following menu allows the user to return all values to the original factory default setting.

DEFAULTS [Factory default = NO]

Gauge shipped with factory defaults but user must select YES to set factory defaults again.

If desired, you can reset all values to the original factory default settings. Access the DEFAULTS menu, then press YES or NO to set factory defaults. If YES is selected the FAC SET. submenu will be displayed indicating the device has been returned to the original factory default setting. Press the menu key to return to the previous menu(s). Note that if you set factory defaults you would need to repeat the initial setup procedure including setting ATM and VAC and reprogram other parameters as required.

4.6.4 CALIBRATION

As described in section 4.4 above, two of the most important steps for the initial setup of the gauge is to set atmosphere (SET ATM) and set zero (SET VAC) as described below:

SET ATM

Select SET ATM to set atmosphere and the following two sub-menu choices will appear:

- SET TO 760
- ENTER VALUE

1) To set the atmospheric pressure reading (also known as the "spa" adjustment), flow nitrogen gas or air into your closed vacuum chamber to allow the pressure to rise to a known value above 400 Torr. Alternatively, if your local uncorrected barometric pressure (air) is known, simply vent your vacuum system chamber to expose the gauge to the local atmospheric pressure.
2) If you are at sea level you may simply select "SET TO 760" if the units of measure selected is in Torr (SET TO 1.01E+03 if using mbar or SET TO 1.01E+05 if using Pa). PGE500 responds with message ATM SET confirming atmosphere has been successfully set. Press the menu key to return to the previous menu(s). If you are at an elevation other than sea level you may select "ENTER VALUE" to enter your actual known local uncorrected barometric pressure. Minimum ATM value that can be set is 400 Torr.

SET VAC

Select SET VAC to set zero and the following two submenu choices will appear:

- SET TO VAC
- ENTER VALUE

INFICON advises that you first determine if the "span" (SET ATM) adjustment of your measurement device is set properly before setting the "zero" (SET VAC) adjustment. It is good practice to perform the sequence of checking and adjusting ATM (span) then VAC (zero) and then, finally re-checking the ATM setting to ensure the instrument has been properly set.

1) To properly set the vacuum reading ("zero" point), with the gauge installed on your vacuum system, the gauge should be evacuated to a pressure below 1.00×10-4 Torr.
2) When the known vacuum system pressure is below 1.00×10-4 Torr, press SET TO ZERO and the number 0.00E+0 Torr will be displayed. PGE500 responds with message VAC SET confirming zero has been successfully set. Press the menu key to return to the previous menu(s).

   If for a specific reason you want to set the "zero" pressure reading to a number higher than 0.00E+0, then select the "ENTER VALUE" menu instead of "SET TO VAC" to enter the value. Maximum VAC value that can be set is 1.00E-01 Torr.

   Due to the nature of circuit operation and transducer electrical control that cover a full range of measurement by a convection gauge, it is advised that one first check and adjust, if necessary, the "span" and "zero" to ensure that all measurements made between these two, adjusted settings are as accurate as possible.

4.6.5 RELAYS

Select RELAYS to access the following relay menus for configuring the setpoint relays:

RELAY 1

Select RELAY 1 to configure setpoints for relay 1 and the following submenus will appear:

RLY: [Factory default = DISABLED]

The factory default setting for the relay 1 is disabled. Select this menu to change the state of relay 1 to ENABLED.

LO TRIP [Factory default = 7.00 E+02 TORR]

This setpoint corresponds to the turn on point for Relay 1. Relay 1 will turn on when the pressure drops below this setting. If you are unable to increase the value of LO TRIP (PGE500 responding with message "LO MORE THAN HI"), you must first access the HI TRIP menu below and increase that value to a number higher than the value of the LO TRIP you are trying to set. Note that at the bottom of the screen the HI TRIP value is also displayed (but cannot be changed) while in this menu selection.

HI TRIP [Factory default = 7.50 E+02 TORR]

This setpoint corresponds to the turn off point for Relay 1. Relay 1 will turn off when the pressure rises above this setting. If you are unable to decrease the value of HI TRIP (PGE500 responding with message "LO MORE THAN HI"), you must first access the LO TRIP menu above and decrease that value to a number lower than the value of the HI TRIP you are trying to set. Note that at the bottom of the screen the LO TRIP value is also displayed (but cannot be changed) while in this menu selection.

RELAY 2

Select RELAY 2 to configure setpoints for relay 2 and the following submenus will appear:

RLY: [Factory default = DISABLED]

Same instructions as relay 1 RLY above.

LO TRIP [Factory default = 7.00 E+02 TORR]

Same instructions as relay 1 LO TRIP above.

HI TRIP [Factory default = 7.50 E+02 TORR]

Same instructions as relay 1 HI TRIP above.

TEST RELAYS

This allows the user to manually toggle the relays on and off to test for correct external circuit wiring and ensure polarity is as desired. Select the TEST RELAYS menu and the following two submenus will appear:

①: [Factory default = OFF]

Press the ENTER key to turn on and energize relay 1. Press the ENTER key again to turn off and deenergize relay 1.

②: [Factory default = OFF]

Press the ENTER key to turn on and energize relay 2. Press the ENTER key again to turn off and deenergize relay 2.

Relays will return to the previous state after exiting the TEST RELAYS menu.

5 Using the gauge with different gases

A thermal conductivity gauge senses heat loss which depends on the thermal conductivity of the gas surrounding the sensor. Since different gases, and mixtures, have different thermal conductivities, the indicated pressure readings and outputs will also be different. INFICON convection gauges (and most other thermal conductivity gauges) are calibrated using nitrogen (N_2). When a gas other than N_2 / air is used, correction must be made for the difference in thermal conductivity between nitrogen (N_2) and the gas in use. The charts and tables on the following pages indicate how different gases affect the display and output from an INFICON convection gauge.

WARNING! Using a thermal conductivity gauge with gases other than that for which it is calibrated could result in death or serious injury. Be sure to use gas correction data in this manual when measuring pressures of gases other than N_2 / air.

For N_2 the calibration shows excellent agreement between indicated and true pressure throughout the range from 10^{-4} to 1000 Torr. At pressures below 1 Torr, the calibration curves for the different gases are similar. The difference in readings at these low pressures is a constant, a function of the difference between thermal conductivities of the gases.

At pressures above 1 Torr, indicated pressure readings may diverge significantly. At these higher pressures convection currents in the gauge become the predominant cause of heat loss from the sensor and calibration depends on gauge tube geometry and mounting position as well as gas properties.

Generally, air and N_2 are considered the same with respect to thermal conductivity, but even N_2 and air will exhibit slight differences in readings at higher pressures. For example, when venting a system to atmosphere using N_2, you may see readings change by 30 to 40 Torr after the chamber is opened and air gradually displaces the N_2 in the gauge. For most other gases the effect is much more significant and may result in a hazardous condition as described below.

Other considerations when using gases other than N2 / air

Flammable or explosive gases

WARNING! INFICON convection gauges are neither intrinsically safe nor explosion proof and are not intended for use in the presence of flammable or explosive gases or vapors.

Under normal conditions the voltages and currents in INFICON convection gauges are too low to cause ignition of flammable gases. However, under certain failure conditions, sufficient energy could be generated to cause flammable vapors or gases to ignite or explode. Thermal conductivity gauges like the INFICON convection gauges are not recommended for use with flammable or explosive gases.

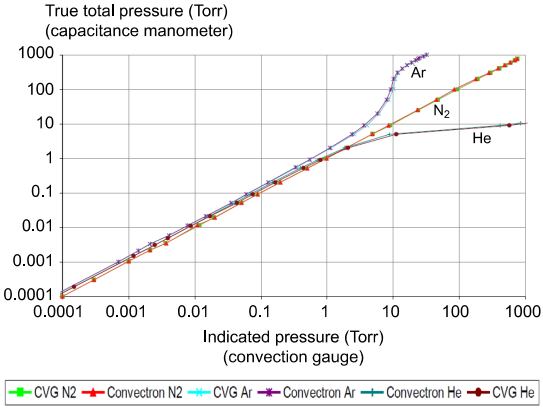
Moisture / water vapor

In some processes (lyophilization, for example) the gas composition may not change significantly, except for moisture content. Water vapor can significantly change the response of a thermal gauge and correction should be made, as you would for any other gas.

Other contaminants

If your gases condense, coat, or corrode the sensor, the gauge calibration and response to different gases will change. Generally, if the gauge can be "calibrated" ("zero" and "span" settings), these changes are small enough to be ignored. If you can’t set zero and span, the gauge should be replaced or return to factory for evaluation and possible cleaning.

Indicated vs. true total pressure (test gases N_2, Ar, He)



Gas Correction Chart

The Y- axis of the above chart is actual pressure as measured by a capacitance manometer, a diaphragm gauge that measures true total pressure independent of gas composition. The X-axis is the pressure reading indicated by the convection gauge under test. This chart shows readings for an INFICON convection gauge (CVG) and Granville-Phillips® Convectron® gauge to illustrate that the difference in the response for both of these types of gauges is virtually indistinguishable.

CAUTION! Do not assume this data applies to other convection gauges which may or may not be the same. Refer to the table in section 6.1 and note the following examples:

Example A: If the gas is nitrogen (N_2), when the true total pressure is 500 Torr, the gauge will read 500 Torr.

Example B: If the gas is argon (Ar), when the true pressure is 100 Torr, the gauge will read about 9 Torr.
If you are backfilling your vacuum system with Ar, when your system reaches a pressure of 760 Torr true pressure your gauge will be reading about 23 Torr. Continuing to backfill your system,

attempting to increase the reading up to 760 Torr, you will over pressurize your chamber which may present a hazard.

Example C: If the gas is helium (He), the gauge will over pressure (OP) when pressure reaches about 10 Torr true pressure and opening the chamber to atmosphere prematurely may present other hazards for both people and product.

CAUTION! What these examples illustrate is that using gases other than nitrogen (N_2) without using accurate gas conversion data and other proper precautions could result in injury to personnel and/or damage to equipment.

Suggested precautions when using gases other than nitrogen (N_2):

Install a pressure relief valve or burst disk on your chamber, to protect it from overpressure. Post a warning label on your gauge readout that states "Do Not Exceed ____ Torr Indicated Pressure" (fill in the blank for maximum indicated pressure for the gas you use) so that an operator using the gauge will not exceed a safe pressure.

6 Display

6.1 Display - Torr

The table below shows the displayed readings at various pressures for selected gases when engineering units selected is in Torr.

True Pressure [Torr]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04
2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04	2.00E-04
5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04	5.00E-04
1.00E-03	1.00E-03	7.00E-04	8.00E-04	1.00E-03	1.10E-03	4.00E-04	1.50E-03	1.50E-03	1.30E-03	7.00E-04	1.70E-03
2.00E-03	2.00E-03	1.40E-03	1.60E-03	2.00E-03	2.30E-03	1.00E-03	3.10E-03	1.30E-03	2.40E-03	1.50E-03	3.30E-03
5.00E-03	5.00E-03	3.30E-03	4.00E-03	4.40E-03	5.00E-03	2.30E-03	7.60E-03	7.00E-03	6.00E-03	3.50E-03	7.70E-03
1.00E-02	1.00E-02	6.60E-03	8.10E-03	9.70E-03	1.10E-02	4.80E-03	1.47E-02	1.35E-02	1.21E-02	7.10E-03	1.53E-02
2.00E-02	2.00E-02	1.31E-02	1.61E-02	1.98E-02	2.22E-02	9.50E-03	2.99E-02	2.72E-02	2.43E-02	1.41E-02	3.04E-02
5.00E-02	5.00E-02	3.24E-02	4.05E-02	4.92E-02	5.49E-02	2.35E-02	7.25E-02	6.90E-02	6.00E-02	3.48E-02	7.72E-02
1.00E-01	1.00E-01	6.43E-02	8.20E-02	9.72E-02	1.07E-01	4.68E-02	1.43E-01	1.36E-01	1.21E-01	7.00E-02	1.59E-01
2.00E-01	2.00E-01	1.26E-01	1.65E-01	1.94E-01	2.10E-01	9.11E-02	2.75E-01	2.62E-01	2.50E-01	1.41E-01	3.15E-01

(continued)

Table "Displayed pressure readings vs. true pressure - units in Torr" (continued)

True Pressure [Torr]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
5.00E-01	5.00E-01	3.12E-01	4.35E-01	4.86E-01	4.89E-01	2.17E-01	6.11E-01	5.94E-01	6.87E-01	3.59E-01	7.81E-01
1.00E+00	1.00E+00	6.00E-01	9.40E-01	9.70E-01	9.50E-01	4.00E-01	1.05E+00	1.04E+00	1.55E+00	7.45E-01	1.60E+00
2.00E+00	2.00E+00	1.14E+00	2.22E+00	1.94E+00	1.71E+00	7.00E-01	1.62E+00	1.66E+00	4.13E+00	1.59E+00	3.33E+00
5.00E+00	5.00E+00	2.45E+00	1.35E+01	4.98E+00	3.34E+00	1.28E+00	2.45E+00	2.62E+00	2.46E+02	5.24E+00	7.53E+00
1.00E+01	1.00E+01	4.00E+00	OP	1.03E+01	4.97E+00	1.78E+00	2.96E+00	3.39E+00	OP	2.15E+01	2.79E+01
2.00E+01	2.00E+01	5.80E+00	OP	2.23E+01	6.59E+00	2.29E+00	3.32E+00	3.72E+00	OP	5.84E+02	3.55E+02
5.00E+01	5.00E+01	7.85E+00	OP	7.76E+01	8.22E+00	2.57E+00	3.79E+00	4.14E+00	OP	OP	8.42E+02
1.00E+02	1.00E+02	8.83E+00	OP	2.09E+02	9.25E+00	2.74E+00	4.68E+00	4.91E+00	OP	OP	OP
2.00E+02	2.00E+02	9.79E+00	OP	2.95E+02	1.23E+01	3.32E+00	5.99E+00	6.42E+00	OP	OP	OP
3.00E+02	3.00E+02	1.13E+01	OP	3.80E+02	1.69E+01	3.59E+00	6.89E+00	7.52E+00	OP	OP	OP

(continued)

Table "Displayed pressure readings vs. true pressure - units in Torr" (concluded)

True Pressure [Torr]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
4.00E+02	4.00E+02	1.35E+01	OP	4.85E+02	2.24E+01	3.94E+00	7.63E+00	8.42E+00	OP	OP	OP
5.00E+02	5.00E+02	1.61E+01	OP	6.04E+02	2.87E+01	4.21E+00	8.28E+00	9.21E+00	OP	OP	OP
6.00E+02	6.00E+02	1.88E+01	OP	7.30E+02	3.64E+01	4.44E+00	8.86E+00	9.95E+00	OP	OP	OP
7.00E+02	7.00E+02	2.18E+01	OP	8.59E+02	4.61E+01	4.65E+00	9.42E+00	1.07E+01	OP	OP	OP
7.60E+02	7.60E+02	2.37E+01	OP	9.41E+02	5.39E+01	4.75E+00	9.76E+00	1.11E+01	OP	OP	OP
8.00E+02	8.00E+02	2.51E+01	OP	9.97E+02	5.94E+01	4.84E+00	9.95E+00	1.14E+01	OP	OP	OP
9.00E+02	9.00E+02	2.85E+01	OP	OP	7.95E+01	4.99E+00	1.05E+01	1.20E+01	OP	OP	OP
1.00E+03	1.00E+03	3.25E+01	OP	OP	1.11E+02	5.08E+00	1.11E+01	1.27E+01	OP	OP	OP

Notes: OP = Overpressure (Display shows PR OVER PRS)

Examples:

1) Using nitrogen (N_2), pressure display shows 1.00E+01 Torr. True pressure of nitrogen is 1.00E+01 Torr.
2) Using argon (Ar), pressure display shows 8.83E+0 Torr. True pressure of argon is 1.00E+02 Torr.
3) Using oxygen (O_2), pressure display shows 4.86E-01 mTorr. True pressure of oxygen is 5.00E-01 Torr.

6.2 Display - mBAR

The table below shows the displayed readings at various pressures for selected gases when engineering units selected is in mbar.

True Pressure [mBAR]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04
3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04	3.00E-04
6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	4.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
1.30E-03	1.30E-03	9.00E-04	1.10E-03	1.30E-03	5.00E-04	5.00E-04	2.00E-03	2.00E-03	1.70E-03	9.00E-04	2.30E-03
2.70E-03	2.70E-03	1.90E-03	2.10E-03	2.70E-03	3.10E-03	1.30E-03	4.10E-03	4.10E-03	3.20E-03	2.00E-03	4.40E-03
6.70E-03	6.70E-03	4.40E-03	5.30E-03	6.70E-03	5.90E-03	3.10E-03	1.01E-02	9.30E-03	8.00E-03	4.70E-03	1.02E-02
1.33E-02	1.33E-02	8.80E-03	1.07E-02	1.29E-02	1.46E-02	6.40E-03	1.95E-02	1.79E-02	1.61E-02	9.50E-03	2.03E-02
2.60E-02	2.60E-02	1.74E-02	2.14E-02	2.63E-02	2.95E-02	1.26E-02	3.98E-02	3.620E-02	3.23E-02	1.87E-02	4.05E-02
6.66E-02	6.66E-02	4.31E-02	5.39E-02	6.55E-02	7.31E-02	3.13E-02	9.66E-02	9.19E-02	7.99E-02	4.63E-02	1.00E-01
1.30E-01	1.30E-01	8.57E-02	1.10E-01	1.20E-01	1.40E-01	6.23E-02	1.90E-01	1.80E-01	1.60E-01	1.00E-01	2.10E-01
2.60E-01	2.60E-01	1.60E-01	2.10E-01	2.50E-01	2.70E-01	1.20E-01	3.60E-01	3.40E-01	3.30E-01	1.80E-01	4.10E-01

(continued)

Table "Displayed pressure readings vs. true pressure - units in mBAR" (continued)

True Pressure [mBAR]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
6.66E-01	6.66E-01	4.10E-01	5.70E-01	6.40E-01	6.50E-01	2.80E-01	8.10E-01	7.90E-01	9.10E-01	4.70E-01	1.04E+00
1.33E+00	1.33E+00	7.90E-01	1.25E+00	1.29E+00	1.26E+00	5.30E-01	1.39E+00	1.38E+00	2.06E+00	9.90E-01	2.13E+00
2.66E+00	2.66E+00	1.51E+00	2.95E+00	2.58E+00	2.27E+00	9.30E-01	2.15E+00	2.21E+00	5.50E+00	2.11E+00	4.43E+00
6.66E+00	6.66E+00	3.26E+00	1.79E+01	6.63E+00	4.45E+00	1.70E+00	3.26E+00	3.49E+00	3.27E+02	6.98E+00	1.00E+01
1.33E+01	1.33E+01	5.33E+00	OP	1.37E+01	6.62E+00	2.37E+00	3.94E+00	4.51E+00	OP	2.86E+01	3.71E+01
2.66E+01	2.66E+01	7.73E+00	OP	2.97E+01	8.78E+01	3.05E+00	4.42E+00	4.95E+00	OP	7.78E+02	4.73E+02
6.66E+01	6.66E+01	1.04E+01	OP	1.03E+02	1.09E+01	3.42E+00	5.05E+00	5.51E+00	OP	OP	1.01E+03
1.33E+02	1.33E+02	1.17E+01	OP	2.78E+02	1.23E+01	3.65E+00	6.23E+00	6.54E+00	OP	OP	OP
2.66E+02	2.66E+02	1.30E+01	OP	3.93E+02	1.63E+01	4.42E+00	7.98E+00	8.55E+00	OP	OP	OP
4.00E+02	4.00E+02	1.50E+01	OP	5.06E+02	2.25E+01	4.78E+00	9.18E+00	1.00E+01	OP	OP	OP

(continued)

Table "Displayed pressure readings vs. true pressure - units in mBAR" (concluded)

True Pressure [mBAR]	N_2	Ar	He	O_2	CO_2	KR	Freon 12	Freon 22	D_2	Ne	CH_4
5.33E+02	5.33E+02	1.79E+01	OP	6.46E+02	2.98E+01	5.25E+00	1.01E+01	1.12E+01	OP	OP	OP
6.66E+02	6.66E+02	2.14E+01	OP	8.05E+02	3.82E+01	5.61E+00	1.10E+01	1.22E+01	OP	OP	OP
8.00E+02	8.00E+02	2.50E+01	OP	9.73E+02	4.85E+01	5.91E+00	1.18E+01	1.32E+01	OP	OP	OP
9.33E+02	9.33E+02	2.90E+01	OP	1.14E+03	6.14E+01	6.19E+00	1.25E+01	1.42E+01	OP	OP	OP
1.01E+03	1.01E+03	3.15E+01	OP	1.25E+03	7.18E+01	6.33E+00	1.30E+01	1.47E+01	OP	OP	OP
1.06E+03	1.06E+03	3.34E+01	OP	1.32E+03	7.91E+01	6.45E+00	1.32E+01	1.51E+01	OP	OP	OP
1.19E+03	1.19E+03	3.79E+01	OP	OP	1.05E+02	6.65E+00	1.39E+01	1.60E+01	OP	OP	OP
1.33E+03	1.33E+03	4.33E+01	OP	OP	1.47E+02	6.77E+00	1.47E+01	1.69E+01	OP	OP	OP

Values listed under each gas type are in mBAR.

Notes: OP = Overpressure (Display shows PR OVER PRS)

Examples:

1) Using nitrogen (N_2), pressure display shows pressure measurement of 1.33E+01 mBAR. True pressure of nitrogen is 1.33E+01 mBAR.
2) Using argon (Ar), pressure display shows pressure measurement of 1.17E+01 mBAR. True pressure of argon is 1.33E+02 mBAR.
3) Using oxygen (O_2), pressure display shows pressure measurement of 1.29E-02 mBAR. True pressure of O2 is 1.33E-02 mBAR.

7 DeviceNet Operation

7.1 Supported DeviceNet Objects for ODVA compliance

The PGE500 supports all standard DeviceNet objects, attributes and services required for ODVA certification.

Class	Object
1	Identity
2	Message Router
3	DeviceNet Object
4	Assembly
5	Connection

7.2 Supported DeviceNet Objects compliant with Semi Guidelines

The PGE500 supports DeviceNet objects, attributes and services required for S-Analog Sensor Object Subclass 2, Heat Transfer Vacuum Gauge.

Class	Object
30 hex	S-Device Supervisor
31 hex	S-Analog Sensor
34 hex	S-Gas Calibration
35 hex	Trip Point

7.3 Other supported DeviceNet Objects

The PGE500 supports the Discrete Output Object, Class 9, get attribute 3 Value only. Two instances are supported indicating the state of the Trip Points.

7.4 Configuring the DeviceNet switches

- Turn off power to the PGE500 by disconnecting the 5-pin DeviceNet Micro Connector from the network.
- Set the MAC ID Switches (Node Address Switches) to the correct address (0-63). Default is 63.
- Set the data Rate switch to the network baud rate. Default is 125KBaud.
- Turn on power to the PGE500 by reconnecting the 5-pin DeviceNet Micro Connector from the network.

7.5 Allocating DeviceNet connections to the PGE500

The master must use a DeviceNet object command to open Polled and Explicit connections. Other connection types are not supported. The example below allocates polled and explicit connections.

Service	4B hex
DeviceNet Class	3
Instance	1
Allocation data Bit1=Polled, bit0=Explicit	3
Master ID	0

7.6 Configuring Expected Packet Rate

The default Expected Packet Rate is 2.5 seconds. If message rate is slower this attribute must be changed before the allocated connections expire. The example below sets the Explicit packet rate to never expire. Use instance 2 to change the Polled packet rate.

Service	10 hex
Connection Class	3
Instance	1
Attribute	9
Data	0

7.7 Configuring Polled I/O data format

The PGE500 can provide input polled pressure data in UINT integer or REAL floating point formats, with or without BYTE status data. If a polled connection is established before this message, remove and reestablish the connection. The status byte indicates Warning in bit 5 (reading lower than zero vacuum, calibration needed) and Alarm in bit 1 (sensor failure). Default configuration is 1 byte status and 4 bytes floating point pressure.

Format	Set Service	Assembly Class	Instance	Attribute	Data
2 bytes integer pressure	10 hex	4	0	65 hex	1
1 byte status and 2 bytes integer pressure	10 hex	4	0	65 hex	2
4 bytes floating point pressure	10 hex	4	0	65 hex	4
1 byte status and 4 bytes floating point pressure	10 hex	4	0	65 hex	5

7.8 UINT 2 byte integer pressure

The integer value is proportional to the pressure measured by the PGE500. The table below provides the conversion from integer to Torr pressure.

Pressure	Integer value	Pressure	Integer value
0.0001	453	10	5986
0.001	464	15	6246
0.01	566	20	6523
0.015	613	30	6736
0.02	660	50	6912
0.05	885	65	6995
0.075	1031	100	7060
0.1	1157	150	7118
0.2	1558	200	7172
0.35	1935	300	7311
0.5	2306	400	7473
0.65	2573	500	7622
0.85	2888	600	7747
1	3086	700	7851
2	4007	760	7909
3	4552	900	8019
5	5204	1000	8086

7.9 DeviceNet Protocol for PGE500

The INFICON PGE500 module is based on the Open DeviceNet Vendors Association (ODVA) and S-Analog Sensor Object Class Subclass 02 (Heat Transfer Vacuum Gauge) standards. The command set includes public and vendor-specific classes, services and attributes.

DeviceNet communication requires identifier fields for the data. The use of the identifier fields provides the means for multiple priority levels, efficient transfer of I/O data, and multiple con-

sumers. As a node in the network, the PGE500 produces data on the network with a unique address. All devices on the network that need the data listen for messages. When other devices on the network recognize the PGE500's unique address, they use the data

Instance	Master Data	Device Data	Data Type	Description	Type
1 (default)	None	00 00	UINT	UINT vacuum pressure	Open
2	None	00 00 00	BYTE,UINT	BYTE status, UINT vacuum pressure	Open
4	None	00 00 00 00	REAL	REAL vacuum pressure	Open
5	None	00 00 00 00 00	BYTE, REAL	BYTE status, REAL vacuum pressure	Open

Polled I/O Messaging Summary

7.9.1 Standard Objects

There is a single instance of the Identity Object for the PGE500. No class attributes are supported. All of the instance attributes are contained in ROM or EEPROM.

7.9.1.1 Identity Object

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	1	1	1	None	633	UINT	Vendor Identification	Open
0Ehex	1	1	2	None	28	UINT	Product Type	Open
0Ehex	1	1	3	None	100	UINT	Product ID	Open
0Ehex	1	1	4	None	1.01	STRUCT	Firmware Revision	Open
0Ehex	1	1	5	None	00 00	WORD	Status and Fault Information	Open
0Ehex	1	1	6	None	00 00 00 00	UDINT	Serial Number	Open
0Ehex	1	1	7	None	PGE500	S-STRING	Identification	Open
05hex	1	1	None	None	None		Reset module to Power-Up State	Open

Explicit Message Summary - Identity Object

7.9.1.2 DeviceNet Object

There is a single instance of the DeviceNet Object for the PGE500. No class attributes are supported.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	3	1	1	None	0	USINT	Get node address, range 0-63	Open
0Ehex	3	1	2	None	0	USINT	Get baud rate, range 0-2	Open
0Ehex	3	1	5	None	00 00	STRUCT	Get allocation choice, range 0-3 Get master ID, range 0-63	Open
0Ehex	3	1	6	None	0	BOOL	The Node Address Switch(es) have changed since last power–up/reset.	Open
0Ehex	3	1	7	None	0	BOOL	The Baud Rate Switch(es) have changed since last power–up/reset.	Open
0Ehex	3	1	8	None	00	USINT	Actual value of Node Address switches	Open
0Ehex	3	1	9	None	00	USINT	Actual value of Baud Rate switch	Open
4Bhex	3	1	None	03 00	Success	STRUCT	Set allocation choice, range 0-3 Set master ID, range 0-63	Open
4Chex	3	1	None	3	Success	BYTE	Release allocation, range 0-3	Open

Explicit Message Summary - DeviceNet Object

7.9.1.3 Connection Object - Explicit Message Connection

There are two instances of the Connection Object PGE500. Instance #1 is assigned to the Explicit Message Connection. Instance #2 is assigned to the Polled I/O Connection. The following two tables below show the attributes and the predefined values of each.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	5	1	1	None	3	USINT	Get state of the object, range 0-5	Open
0Ehex	5	1	2	None	0	USINT	Get instance type, explicit	Open
0Ehex	5	1	3	None	83hex	BYTE	Get transport class trigger	Open
0Ehex	5	1	4	None	FB 05	UINT	Get produced connection ID	Open
0Ehex	5	1	5	None	FC 05	UINT	Get consumed connection ID	Open
0Ehex	5	1	6	None	21hex	BYTE	Get initial communication characteristics	Open
0Ehex	5	1	7	None	18 00	UINT	Get produced connection size	Open
0Ehex	5	1	8	None	18 00	UINT	Get consumed connection size	Open
0Ehex	5	1	9	None	C4hex 09	UINT	Get expected packet rate, range 0-65535	Open
10hex	5	1	9	00 00	Success	UINT	Set expected packet rate	Open
0Ehex	5	1	0Chex	None	1	USINT	Get watchdog timeout action, 1 or 3	Open
10hex	5	1	0Chex	1	Success	USINT	Set watchdog timeout action, 1 or 3	Open
0Ehex	5	1	0Dhex	None	00 00	UINT	Get produced connection path length	Open
0Ehex	5	1	0Ehex	None	4	EPATH	Get produced connection path	Open

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	5	1	0Fhex	None	00 00	UINT	Get consumed connection path length	Open
0Ehex	5	1	10hex	None	4	EPATH	Get consumed connection path	Open

Connection Object - Explicit Message Connection

7.9.1.4 Connection Object - Polled I/O Data

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	5	2	1	None	3	USINT	Get state of the object, range 0-5	Open
0Ehex	5	2	2	None	1	USINT	Get instance type, I/O	Open
0Ehex	5	2	3	None	82hex	BYTE	Get transport class trigger	Open
0Ehex	5	2	4	None	FF 03	UINT	Get produced connection ID	Open
0Ehex	5	2	5	None	FD 05	UINT	Get consumed connection ID	Open
0Ehex	5	2	6	None	01hex	BYTE	Get initial communication characteristics	Open
0Ehex	5	2	7	None	0500	UINT	Get produced connection size	Open
0Ehex	5	2	8	None	01 00	UINT	Get consumed connection size	Open
0Ehex	5	2	9	None	00 00	UINT	Get expected packet rate, range 0-65535	Open
10hex	5	2	9	00 00	Success	UINT	Set expected packet rate	Open
0Ehex	5	2	0Chex	None	0	USINT	Get watchdog timeout action	Open
10hex	5	2	0Chex	0	Success	USINT	Set watchdog timeout action	Open
0Ehex	5	2	0Dhex	None	06 00	UINT	Get produced connection path length	Open

10hex	5	2	0Dhex	06 00	Success	UINT	Set produced connection path length	Open
0Ehex	5	2	0Ehex	None	01	EPATH	Get produced connection path	Open
10hex	5	2	0Ehex	01	Success	EPATH	set produced connection path	Open
0Ehex	5	2	0Fhex	None	06 00	UINT	Get consumed connection path length	Open
0Ehex	5	2	10hex	None	00	EPATH	Get consumed connection path	Open
10hex	5	2	10hex	00	Success	EPATH	Set consumed connection path	Open

Connection Object - Polled I/O Connection

7.9.1.5 Discrete Output Point Object

There are two instances of the Discrete Output Point Object. Instance 1 operates Relay 1 and instance 2 operates Relay 2.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	09	1 or 2	3	None	0	BOOL	Get Output point value	Open
10hex	09	1 or 2	3	0	Success	BOOL	Set Output point value	Open

Explicit Message Summary - Discrete Output Point Object

7.9.1.6 S-Device Supervisor Object

This object models the interface, functions and behavior associated with the management of application objects for devices within the "Hierarchy of Semiconductor Equipment Devices".

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	30hex	1	3	None	VG	SHORT STRING	Device Type	Open
0Ehex	30hex	1	4	None	E54-0997	SHORT STRING	SEMI Standard Revision Level	Open
0Ehex	30hex	1	5	None	INFICON AG	SHORT STRING	Manufacturer's Name	Open
0Ehex	30hex	1	6	None	PGE500	SHORT STRING	Manufacturer's Model Number	Open
0Ehex	30hex	1	7	None	V1.01	SHORT STRING	Software Revision Level	Open
0Ehex	30hex	1	8	None	100	SHORT STRING	Hardware Revision Level	Open
0Ehex	30hex	1	9	None	50005384	SHORT STRING	Manufacturer's Serial Number	Open
0Ehex	30hex	1	0Bhex	None	02	USINT	Device Status	Open
0Ehex	30hex	1	0Chex	None	00	BYTE	Exception Status	Open
0Ehex	30hex	1	0Fhex	None	01	BOOL	Alarm Enable	Open
10hex	30hex	1	0Fhex	01	Success	BOOL	Alarm Enable	Open
0Ehex	30hex	1	10hex	None	01	BOOL	Warning Enable	Open
10hex	30hex	1	10hex	01	Success	BOOL	Warning Enable	Open

Explicit Message Summary - S-Device Supervisor Object

7.9.1.7 S-Analog Sensor Object

The S-Analog Sensor Object models the acquisition of a reading from the convection sensor in the PGE500. The Heat Transfer Gauge Subclass is implemented here. Values in the Device Data column are examples.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	De-scription	Type
0Ehex	31hex	1	3	None	CAhex	USINT	Data Type	Open
0Ehex	31hex	1	4	None	13 01	ENGUNITS	Data Units	Open
10hex	31hex	1	4	13 01	Success	ENGUNITS	Data Units	Open
0Ehex	31hex	1	5	None	01	BOOL	Reading Valid	Open
0Ehex	31hex	1	6	None	44 42 7C F9	REAL	Pressure Value	Open
0Ehex	31hex	1	7	None	00	BYTE	Status, Alarm and Warning State	Open
0Ehex	31hex	1	0Bhex	None	CAhex	USINT	Offset-A Data Type	Open
0Ehex	31hex	1	0Chex	None	00 00 00 00	REAL	Offset-A, An amount added prior to Gain to derive Value	Open
0Ehex	31hex	1	0Dhex	None	CAhex	USINT	Gain Data Type	Open
0Ehex	31hex	1	0Ehex	None	3F 80 00 00	REAL	Gain, An amount scaled to derive Value	Open
0Ehex	31hex	1	0Fhex	None	3F 80 00 00	REAL	Unity Gain Reference	Open
0Ehex	31hex	1	23hex	None	00 00	UINT	Calibration Object Instance	Open
0Ehex	31hex	1	60hex	None	00	USINT	Status Extension	Open
0Ehex	31hex	1	63hex	None	02	USINT	Subclass = Heat Transfer Vacuum Gauge	Open

Explicit Message Summary - S-Analog Sensor Object

7.9.1.8 S-Gas Calibration Object

The S-Gas Calibration Object affects the behavior of an associated S-Analog Sensor object instance; a device profile will show a relationship between these two objects where an S-Gas Calibration Object is used.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	Description	Type
0Ehex	34hex	1	3	None	0D 00	UINT	Gas Standard Number = Nitrogen	Open
0Ehex	34hex	1	4	None	01 00	UINT	Valid Sensor Instance	Open

Explicit Message Summary - S-Gas Calibration Object

7.9.1.9 Trip Point Object

The Trip Point Object models the action of trip points for the PGE500, corresponding to the set point relays. There are two instances of this object supported by this device. Values in the Device Data column are examples.

Service	Class	Instance	Attribute	Master Data	Device Data	Data Type	Description	Type
0Ehex	35hex	1 or 2	5	None	44 2F 00 00	REAL	Low Trip Point	Open
10hex	35hex	1 or 2	5	44 2F 00 00	Success	REAL	Low Trip Point	Open
0Ehex	35hex	1 or 2	6	None	00	BOOL	Low Trip Enable	Open
10hex	35hex	1 or 2	6	00	Success	BOOL	Low Trip Enable	Open
0Ehex	35hex	1 or 2	7	None	00	BOOL	Output Status	Open
0Ehex	35hex	1 or 2	8	None	01	BOOL	Polarity of Output as derived to Status.	Open
0Ehex	35hex	1 or 2	9	None	01	BOOL	Override	Open
0Ehex	35hex	1 or 2	0Ahex	None	40 E4 92 49	REAL	Hysteresis	Open
10hex	35hex	1 or 2	0Ahex	40 E4 92 49	Success	REAL	Hysteresis	Open
0Ehex	35hex	1 or 2	0Chex	None	01 24	Packed EPATH	Destination	Open
0Ehex	35hex	1 or 2	0Dhex	None	01	BOOL	Output of the object	Open
0Ehex	35hex	1 or 2	0Ehex	None	01 24	Packed EPATH	Specifies the path of the Source attribute	Open
0Ehex	35hex	1 or 2	0Fhex	None	44 41 27 30	REAL	Input to the object	Open
0Ehex	35hex	1 or 2	11hex	None	CAhex	USINT	Data Type of Input	Open

Explicit Message Summary - Trip Point Object

8 Service

8.1 Calibration

Every INFICON module is calibrated prior to shipment using nitrogen (N_2). However, you can calibrate the instrument by adjusting zero (vacuum) and span (atmosphere) using the procedure described previously in section 4.6.4 titled "Calibration". Zero and span (atmosphere) calibration affect the displayed value and the output signal. Zero calibration optimizes performance of the gauge when operating at a low pressure range of 1.00×10^{-4} Torr to 1.00×10^{-3} Torr. If your minimum operating pressure is higher than 1.00×10^{-3} Torr, it is not normally necessary to perform calibration at zero and thus span calibration should be adequate. If you are able to evacuate your system to below 1.00×10^{-4} Torr, it is always a good practice to check and set zero if necessary. This will also improve performance in cases where gauge contamination is causing higher readings than 1.00×10^{-4} Torr even though the system has been evacuated to below 1.00×10^{-4} Torr. Care should be exercised when using gases other than nitrogen (N_2).

8.2 Maintenance

In general, maintenance is not required for your INFICON module. Periodic performance checks may be done by comparing the gauge to a known reference standard.

8.3 Troubleshooting

Indication	Possible Cause	Possible Solution
Display is off / blank	No power	Check power supply & power cable
Readings appear very different from expected pressure	The process gas is different from the gas used to calibrate the PGE500	Correct readings for different gas thermal conductivity. See section 5 on using the gauge with different gases
	Module has not been calibrated or has been calibrated incorrectly	Check that zero and span are adjusted correctly
Readings are noisy or erratic	Loose cables or connections	Check and tighten connections
	Contamination	Inspect gauge for signs of contamination such as particles, deposits, discoloration on gauge inlet. Return to factory for possible cleaning
	Vibration	Ensure gauge is not mounted where excessive vibration is present
Gauge cannot be calibrated - zero and span can't be adjusted	Contamination	Return to factory for possible cleaning
	Sensor failure for other cause	Replace sensor inside PGE500 module

(continued)

Table "Troubleshooting" (concluded)

Indication	Possible Cause	Possible Solution
Setpoint does not actuate	Incorrect setup	Check setpoint setup
Display shows "PR OPN CKT"	Sensor wire damaged	Replace sensor inside PGE500 module
Display shows "PR OVER PRS"	System pressure over 1000 Torr	Reduce pressure
	Faulty electronics	Repair or replace PGE500 electronics
Atmospheric pressure reads too high and can't be set to correct value	Contamination	Return to factory for possible cleaning
	Sensor wire damaged	Replace sensor inside PGE500 module
Atmospheric pressure reads too low and can't be set to correct value	Sensor wire damaged	Replace sensor inside PGE500 module
	Contamination	Return to factory for possible cleaning

8.4 Contamination

The most common cause of all vacuum gauge failures is contamination of the sensor. Noisy or erratic readings, the inability to set zero or atmosphere and total gauge failure, are all possible indications of gauge contamination.

Contamination can be generally characterized as either:

A) a reaction of process gases with sensor elements, or

B) an accumulation of material on the sensor elements. Sensors that fail due to chemical reaction are generally not salvageable. Sensors that fail due to condensation, coatings, or particles may possibly be restored by cleaning.

A) Reactive Gases

If process gases react with the materials of construction of the sensor, the result is corrosion and disintegration of the sensor over time. The chemistry of the gases used for plasma etching and other reactive semiconductor processes are examples where this failure mode is possible. In this case, cleaning can't solve the problem because the sensor has been destroyed. The sensor or module must be replaced.

If you experience this failure mode quickly or frequently, you should consider a different vacuum gauge for your application. Thermal vacuum gauges may be available with different sensor materials that are not as reactive with your particular process gases. The standard gold plated tungsten sensor used in the INFICON convection gauge is offered for use with air and inert gases such as N_2, argon, etc. INFICON also offers platinum sensors for applications not compatible with gold plated tungsten.

There is no material that is universally chemical resistant; your choice of vacuum gauge (as well as all other vacuum components) should take into consideration the potential reactions between your process gases and the materials of construction. Consider what effect water vapor will have when combined with your process gases because a finite amount of water will enter the chamber during venting to atmosphere with air.

B) Oil, Condensation, Coatings, and Particles

If the failure is due to an accumulation of material in the gauge, we may be able to restore your gauge or module by cleaning. Contamination may be as simple as condensed water, or as difficult as solid particles.

Oils and hydrocarbons: Exposure of the gauge internal surfaces to oils and hydrocarbons can result in sensor contamination. Some of these types of contamination may be removed by cleaning the gauge. If there is the possibility of oil back streaming from wet vacuum pumps, it is recommended that a filter or trap be installed to prevent contamination of components of your vacuum system.

Condensation: Some gases (such as water vapor) can condense on sensor surfaces, forming a liquid coating that changes the rate at which heat is removed from the sensor (which changes the calibration). The sensor can often be restored simply by pumping on the gauge between process cycles. A dry N_2 purge will help speed up drying, or the gauge may be gently heated provided temperature doesn't exceed the specified limit of 40 °C, operating.

Coatings: Some gases can condense on sensor surfaces, forming a solid coating, which changes the rate at which heat is removed from the sensor. Some of these coatings may be removed by cleaning the gauge.

Particles: Particles generated by the process may enter the gauge during the process cycle or during the venting cycle. The result is interference with heat removal from the sensor. In this case, cleaning may be able to remove particles from the gauge. However, particulate contamination is the most difficult to remove as particles can become stubbornly trapped inside the gauge. In some processes, solid particles are created during the process throughout the chamber including inside the gauge. Particles tend to form on cooler surfaces such as in a gauge at room temperature. You may slow down the build-up of particles in the gauge by keeping the gauge warm (within specified limits) during the process cycle.

Particles in the process chamber may be swept into the gauge during the vent cycle. The PGE500 has a screen built into the gauge port to help keep the largest particles out of the gauge. In very dirty applications, or where particles are small enough to get through the screen, an additional filter installed on the inlet may help prolong the gauge life.

In some vacuum processes, desorbed and sputtered materials from the process may enter vacuum components connected to the process vacuum chamber by line-of-sight transport, especially under high vacuum conditions, i.e., in the molecular flow regime. To prevent materials that may be transported via line-of-sight momentum from entering your vacuum gauge or other components, it is advisable to install some form of apparatus that will block the line-of-sight. In many cases a simple 90° elbow may help prevent or reduce the transport of particles from entering your vacuum gauge.

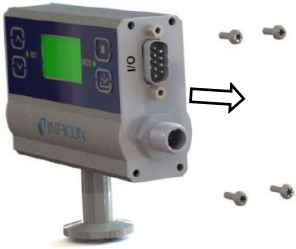
In the event of gauge contamination please contact the factory to return the gauge for possible cleaning if the gauge has not been exposed to hazardous materials.

8.5 Module and sensor replacement

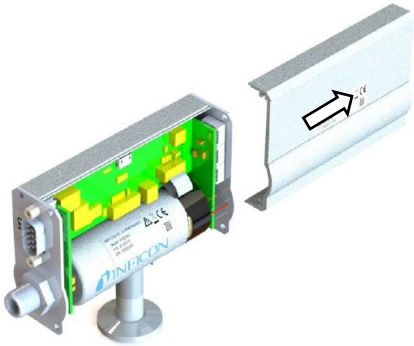
The sensor in the PGE500 can be replaced in the field. Once a new sensor is installed the procedure described in section 4.6.4 must be followed to set atmosphere and zero.

To replace the sensor, disconnect the cable from the gauge and remove the gauge from the vacuum system. Use the following procedure to replace sensor:

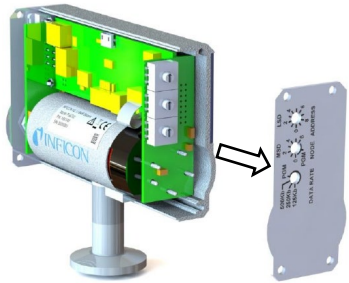
❶ Remove all 8 Torx screws from both side panels of the enclosure.



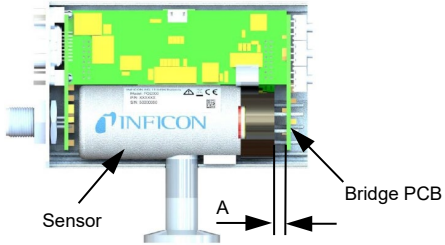
❷ Remove the back panel by lifting it off from the enclosure.



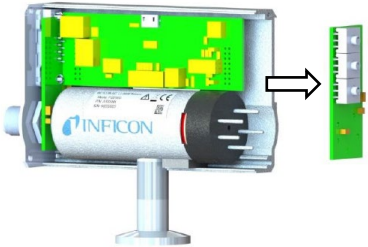
❸ Remove the side panel that covers the three mechanical switches.



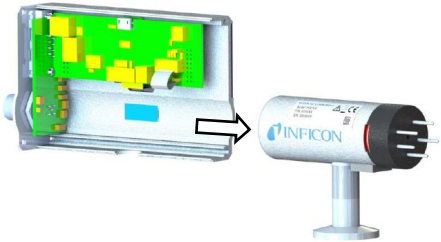
❹ Note how far the pins protrude through the bridge PCB by measuring dimension A show below. This dimension will be used for proper reinstallation of the sensor assembly.



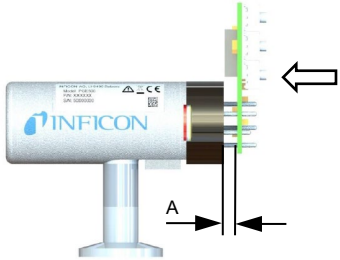
❺ Remove the bridge PCB from the assembly.



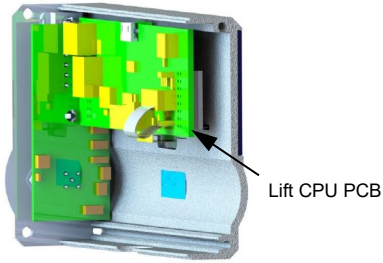
❻ Remove the sensor from the assembly by pulling it up and out of the enclosure assembly.



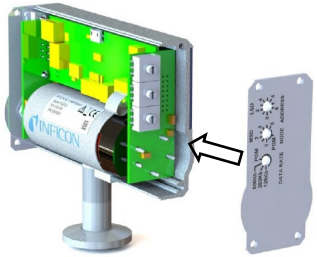
❼ Push pins of new sensor through the holes in the Bridge PCB. Set Dimension A as previously measured in step 4.



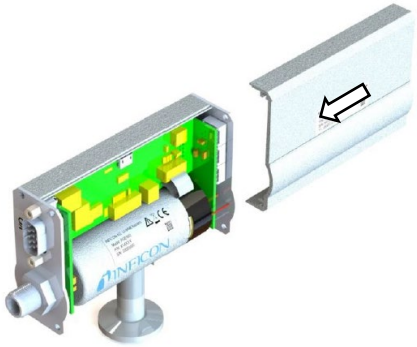
❽ GENTLY lift the CPU PCB and install the bridge PCB / sensor assembly into the CPU PCB.



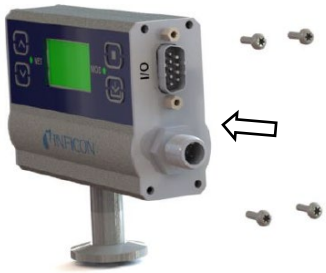
❾ After reinstalling the bridge PCB / sensor into the CPU PCB reinstall the side panel.



❿ Reinstall the back panel …



… and reattach all 8 Torx screws on both side panels of the enclosure. Reinstall in vacuum system. Set atm. and zero again.



9 Factory Service and Support

If you need help setting up, operating, troubleshooting, or obtaining a return materials authorization number (RMA number) to return the module for diagnosis, please contact us during normal business hours Monday through Friday, at +423 / 388 3111. Or e-mail us at reachus@inficon.com.

10 Returning the Product

WARNING

Forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or microbiological hazard) can be detrimental to health and environment.

Products returned to INFICON should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination *).

*) Form under www.inficon.com

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

11 Disposal

DANGER

Contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

WARNING

Substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

- Non-electronic components

  Such components must be separated according to their materials and recycled.
- Electronic components

  Such components must be separated according to their materials and recycled.

12 Spare Parts

When ordering spare parts, always indicate

- all information on the product nameplate
- description and ordering number according to the spare parts list

Gold Plated Tungsten Sensor	Ordering no.
PGE500 Spare Sensor KF 16, W	352-550
PGE500 Spare Sensor KF 25, W	352-551
PGE500 Spare Sensor KF 40, W	352-552
PGE500 Spare Sensor 16 CFR, W	352-553
PGE500 Spare Sensor 40 CFR, W	352-554
PGE500 Spare Sensor 4 VCR, W	352-555
PGE500 Spare Sensor 8 VCR, W	352-556
PGE500 Spare Sensor ⅛"NPT, W	352-557

Platinum Sensor	Ordering no.
PGE500 Spare Sensor KF 16, Pt	352-560
PGE500 Spare Sensor KF 25, Pt	352-561
PGE500 Spare Sensor KF 40, Pt	352-562
PGE500 Spare Sensor 16 CFR, Pt	352-563
PGE500 Spare Sensor 40 CFR, Pt	352-564
PGE500 Spare Sensor 4 VCR, Pt	352-565
PGE500 Spare Sensor 8 VCR, Pt	352-566
PGE500 Spare Sensor ⅛"NPT, Pt	352-567

EU Declaration of Conformity

CE

We, INFICON, hereby declare that the equipment mentioned below comply with the provisions of the following directives:

- 2014/30/EU, OJ L 96/79, 29.3.2014
  (EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
  (RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Pirani Gauge Enhanced

PGE500

Standards

Harmonized and international / national standards and specifications:

- EN 61000-6-2:2005 (EMC: generic immunity standard)
- EN 61000-6-4:2007 + A1:2011 (EMC: generic emission standard)
- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

31 July 2020

Dr. Christian Riesch
Head of Development

31 July 2020

Marco Kern
Product Manager

Notes

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