

Instruction Manual

APGX-H

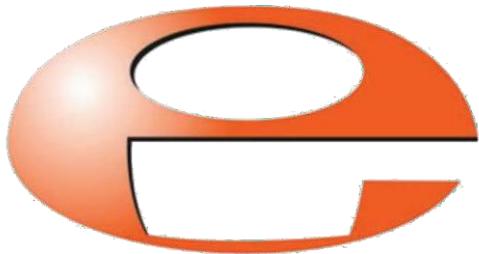


Description	Item Number
APGX-H-NW16-AL	D023-91-000
APGX-H-NW25-ST/ST	D023-92-000
APGX-H-NW16-ST/ST	D023-95-000
APGX-H-1/8 NPT-ST/ST	D023-96-000

Original Instructions

EDWARDS

Official Distributor in Australia



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Vacuum and Thin Film Technology

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EDWARDS
Declaration of Conformity

Edwards Ltd,
Innovation Drive,
Burgess Hill,
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RH15 9TW, UK

The following product

Active Pirani Gauge

APGX-H-NW16-AL	D02391000
APGX-H-NW25-ST/ST	D02392000
APGX-H-NW16-ST/ST	D02395000
APGX-H-1/8 NPT-ST/ST	D02396000

Is in conformity with the relevant requirements of European CE legislation:

2014/30/EU	Electromagnetic compatibility (EMC) directive
2012/19/EU	Waste from electrical and electronic equipment (WEEE) directive
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive

Based on the relevant requirements of harmonised standards:

EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements
EN 61326-2-3:2013 (Class B Emissions, Industrial Immunity)	Electrical equipment for measurement, control and laboratory use. EMC requirements. Particular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

The product also complies with the following:

CSA-C22.2 No.61010-1-12	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
UL61010-1 3 rd Edition	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

This covers all product serial numbers from the date of this declaration onwards.



Larry Marini, Senior Technical Manager

17.01.2019, Eastbourne

Date and Place

This product has been manufactured under a quality management system certified to ISO 9001:2015.

This declaration is based on the requirements of EN ISO 17050-1 and the relevant directives.

Material Declaration

In accordance with the requirements of the Chinese regulatory requirement on the Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products Order No. 32 (also known as 'China RoHS2') and SJ/T 11364 Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products:

Product	Product Label	Meaning
D02391000 APGX-H-NW16-AL D02392000 APGX-H-NW25-ST/ST D02395000 APGX-H-NW16 ST/ST D02396000 APGX-H-1/8 NPT ST/ST		<p>This product contains hazardous substances in at least one of the homogeneous materials used which are above the limit requirement in GB/T 26572 as detailed in the declaration table below.</p> <p>These parts can safely be used for the environmental protection use period as indicated.</p>

材料成分声明 Materials Content Declaration

部件名称 Part name	有害物质 Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
印刷电路组件 (PCA) Printed Circuit Assembly (PCA)	X	O	X	O	O	O
电缆/电线/连接器 Cable/wire/connector	X	O	O	O	O	O
机械部件 Mechanical Components	X	O	O	O	O	O

O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T 26572 标准规定的限量要求。X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

NOTE: These products are EU RoHS compliant, the following Exemptions apply:

- 6(b) Lead as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% lead by weight
- 7(a) Lead in high melting temperature type solder (i.e. lead based alloys containing 85% by or more)
- 7(b) Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signalling, transmission, and network management for telecommunications
- 7(c) I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound
- 7(c) II Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher
- 8(b) Cadmium and its compounds in electrical contacts
- 15 Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages
- 34 Lead in cermet-based trimmer potentiometer elements

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Associated publications

Publication title	Publication number
Vacuum pump and vacuum system safety	P400-40-100

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards APGX-H (Linear Convection Gauge). You must use the APGX-H as specified in the manual.

Read this manual before you install and operate the APGX-H. Important safety information is highlighted as **WARNING** and **CAUTION** instructions; you must obey these instructions. The use of **WARNINGS** and **CAUTIONS** is defined below.



WARNING

Warnings are given where failure to observe the instruction could result in injury or death to people.

CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process

The following IEC warning labels appear on the pump:



Warning - refer to accompanying documentation.



Warning - Edwards offer European customers a recycling service.

The units used throughout this manual conform to the SI international system of units of measurement.

1.2 Description

The APGX-H is a thermal conductivity (Pirani) gauge that uses the principle of convection to improve sensitivity around atmospheric pressure. It is capable of measuring pressure between 3×10^{-4} mbar and 1333 mbar (2.3×10^{-4} Torr and 1000 Torr). The APGX-H can measure the full range of pressures in any orientation. The tube is detachable from the electronics housing and is available as a replacement part.

The APGX-H requires a 14.5 to 30 V d.c. power supply: it has a 0 - 10 V d.c. analogue linear output which is related to pressure. The APGX-H is compatible with all of the Edwards AGCs (Active Gauge Controllers), and appropriate versions of the Edwards TICs (Turbo Instrument Controllers) and AGDs (Active Gauge Displays). Alternatively you can use an independent power supply for the APGX-H and read the APGX-H output signal with a voltmeter or an analogue-to-digital converter.

The gauge has two LEDs that indicate the status of the gauge and that of the set-point output. The gauge also has an error monitoring capability. In the event of an error being detected, an error voltage is sent to the pressure signal output and the status LED indicates an error has occurred.

An 8-way electrical connector socket on the APGX-H (Figure 1, item 2) is used to connect the APGX-H to your AGC, TIC, AGD or electrical supply and voltmeter. Electrical cables fitted with suitable connector plugs are available

as accessories. A gauge identification signal is available on the electrical connector: this signal is used by Edwards AGCs and TICs to identify which type of gauge is connected.

The APGX-H is available in four tube options with different fittings for connection to your vacuum system: An 1/8 inch NPT male threaded connection is available in stainless steel, an NW25 flange is available in stainless steel or an NW16 flange is available in either stainless steel or aluminium.

A sintered phosphor-bronze filter is fitted to the end of the gauge to reduce the affects of contamination and turbulence in the vacuum system when pumped down or vented to atmospheric pressure.

The APGX-H contains two patented temperature sensing devices. The APGX-H uses these devices to compensate the output for the effects of changes in ambient temperature.

Two push button switches are situated on the top cover of the APGX-H (see [Figure 5](#)). The switch labelled 'CAL' is used for setting the atmospheric and vacuum reading. The switch labelled 'SET TRIP' allows you to change the operating pressure of the set-point device.

The set-point output device is an open collector transistor. If you use an Edwards AGC, TIC or AGD, the APGX-H set-point is not used.

Inside each gauge tube is a device to store calibration information. Every time the 'CAL' switch is pressed to adjust the vacuum or atmosphere pressure readings, the new calibration information is downloaded into the tube. If the tube is inserted into a different electronics housing, the new calibration information will be used automatically.

1.3 Gas dependency

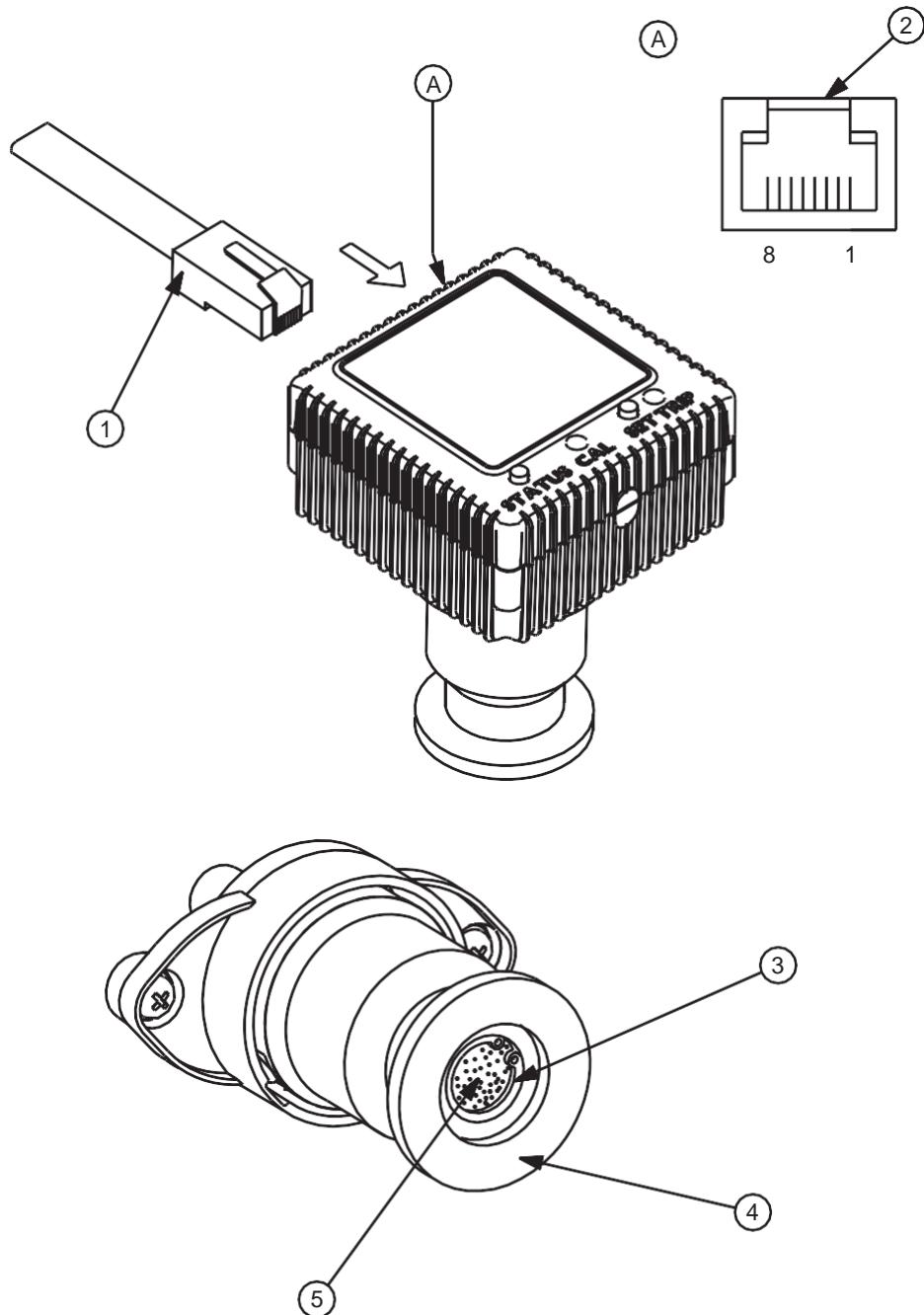
The rate of heat transfer through a gas is dependent upon the pressure, and the RMM (relative molecular mass) of the gas. Therefore, the output signal of the APGX-H is also gas dependent.

The output signal voltage to pressure conversions equation applies for nitrogen and dry air, but can also be used when you measure the pressure of gasses which have a similar RMM, such as oxygen and carbon monoxide.

Generally:

- With gasses which have a lower RMM than nitrogen, the pressure indicated by the APGX-H will be higher than the actual gas pressure
- With gasses which have a higher RMM than nitrogen, the pressure indicated by the APGX-H will be lower than the actual gas pressure

Detailed tables of voltage output as a function of pressure are available on request; contact your supplier or Edwards.

Figure 1 - General View of the APGX-H (NW16 APGX-H Shown)

1. Cable connector plug
2. APGX-H connector socket
3. Filter retaining circlip
4. Vacuum flange
5. Sintered filter

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2 Technical Data

2.1 Mechanical data

Dimensions	Refer to Figure 2
Mass	
APGX-H NW16 ALI	110 g
APGX-H NW16 ST/ST	160 g
APGX-H NW25 ST/ST	170 g
APGX-H $\frac{1}{8}$ NPT ST/ST	150 g
Volume of gauge tube	11 cm ³
Enclosure rating	IP40

2.2 Performance, operating and storage conditions

Ambient temperature	
Operation	+5 to +60 °C
Storage	-30 to +70 °C
Ambient humidity (operation)	80% RH up to 31 °C decreasing linearly to 50% at 40 °C and above
Operating conditions	2000 m (indoor use only)
Maximum internal pressure	10 bar absolute (9 bar gauge)
Pressure range	1333 to 3×10^{-4} mbar (1000 to 2.3×10^{-4} Torr)
Filament operating temperature (above ambient)	100 °C
Pollution degree	2

2.3 Electrical data

Note: The electrical power consumption of the APGX-H is reduced when the system is at vacuum. The relationship between the output signal voltage and pressure is described in [Section 4.1](#).

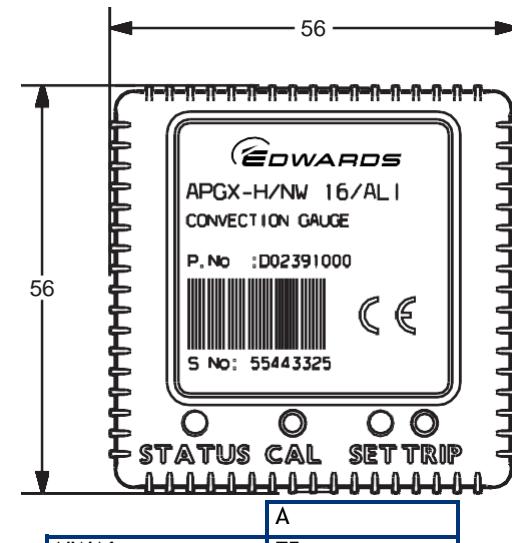
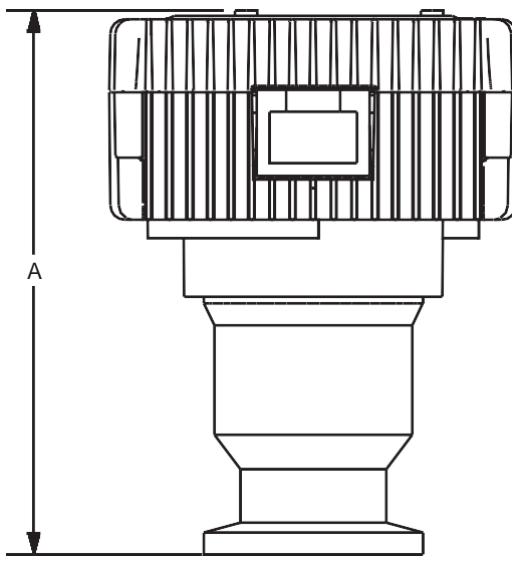
Electrical supply	
Type	NEC Class 2 or Limited Power or Limited Energy
Voltage	+14.5 V to +30 V d.c.
Maximum power consumption	1.5 W
Start-up current	120 mA
Electrical connector	FCC68 / RJ45 type, 8-way
Pressure output signal	
Range	1.9 V to 9.125 V d.c.
Error range	output < 1.8 V d.c. or output > 9.2 V d.c.
Min load impedance	10 kΩ
Max output current	1 mA
Set-point	
Adjustment range	1.8 V to 9.3 V

Hysteresis	500 mV
Max external load rating	30 V d.c., 100 mA
Max 'on' voltage	1.3 V (at 100 mA)
Gauge identification resistance	39 kΩ

2.4 Materials exposed to vacuum

Filament	Tungsten
Sintered filter	Phosphor-bronze
Gauge tube	Aluminium or stainless steel (316L)
Other	Nickel, fluoroelastomer, PTFE

Figure 2 - Dimensions (mm) NW16 APGX-H Shown



	A
NW16	75
NW25	75
1/8 inch NPT	87

3 Installation

3.1 Unpack and inspect

Remove all packing materials and protective covers and check the APGX-H.

If the APGX-H is damaged, notify your supplier and carrier in writing within 3 days: state the Item Number of the gauge together with your order number and your suppliers invoice number. Retain all packing materials for inspection. Do not use the APGX-H if it is damaged.

If the APGX-H is not to be used immediately, replace the protective covers. Store the APGX-H in suitable conditions as described in [Section 6](#).

3.2 Fit the APGX-H to a system



WARNING

You must use a Co-seal or trapped 'O' ring carrier to connect an APGX-H with NW flanges to a vacuum system if the pressure is likely to exceed atmospheric pressure.

Standard centring rings are not suitable for use above atmospheric pressure.

CAUTION

Do not use the electronics housing to tighten the $1/8$ inch NPT gauge to a vacuum system. This could permanently damage the electronics.

Note: To ensure compliance with the rated EMC immunity specifications, you must ensure the APGX-H tube is electrically connected to an earthed vacuum system.

The APGX-H can be mounted in any orientation however the gauge tubes are individually factory calibrated in nitrogen whilst vertical. For correct pressure indication in your chosen gauge orientation, the gauge should be recalibrated at atmospheric pressure. Edwards recommends mounting the gauge tube vertical in order to minimise the build up of process particulates and condensable vapours within the gauge.

For optimum accuracy it is recommended that both the atmosphere and vacuum adjustment is carried out before use. Refer to [Section 5.1](#) for information on atmosphere and vacuum adjustment.

To connect the APGX-H to your vacuum system:

- Use an 'O' ring / centring-ring or Co-Seal and clamp to connect an APGX-H with an NW16 or NW25 flange to a similar flange on the vacuum system.
- Use a stepped 'O' ring carrier or Co-Seal to connect an APGX-H with an NW16 flange to an NW10 flange.
- Wrap several layers of PTFE tape around the NPT coupling on the APGX-H $1/8$ inch NPT tube. Gently screw the tube into the female NPT fitting until finger tight. Using a $5/8$ inch spanner on the base of the tube, rotate the tube approximately 1 turn to achieve a vacuum seal.

3.3 Electrical connections



WARNING

If the APGX-H malfunctions, the APGX-H pressure output may be incorrect. If such a failure could cause injury to people or damage equipment, you must install a suitable control system to indicate the failure and, if necessary, to close down your process system.

3.3.1 Connect to an Edwards AGC, TIC or AGD display

Connect the APGX-H to the controller or display with a cable which is terminated in suitable connectors. Suitable cables are available from Edwards (refer to [Section 7](#)).

Note: Your AGC or TIC must have a version of software that is compatible with the APGX-H. If the AGC or TIC does not recognise the APGX-H, then an upgrade to the software is required. Refer to the TIC Instruction Manual for more information on downloading the latest version of the TIC software. For upgrades to AGC software, please contact Edwards.

3.3.2 Connect to your own supply and control equipment

Note: Do not connect any voltage to the gauge identification pin (pin 4) as this may cause permanent damage to the APGX-H.

A schematic diagram of the recommended electrical connections to the APGX-H is shown in [Figure 3](#).

The pins on the APGX-H electrical connection socket are used as shown in [Table 1](#). The relevant specifications are given in [Section 2](#).

When using the gauge in an electrically noisy environment you should ensure that your measuring electronics is adequately immune to high frequency interference. All Edwards controllers have adequate immunity.

Table 1 - Pins on the APGX-H Electrical Connector Socket

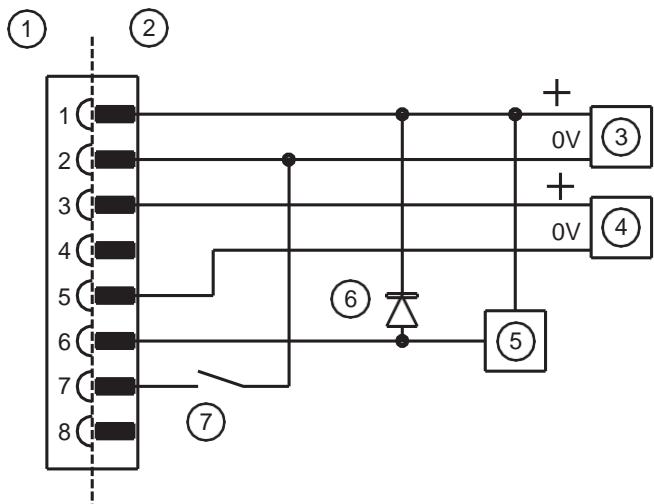
Pin number	Use
1	Electrical supply positive
2	Electrical supply ground (0 V)
3	Pressure measurement output signal
4	Gauge identification
5	Signal ground
6	Set-point output signal
7	Remote calibration input
8	Not connected

Note: Do not connect the electrical supply ground (pin 2) to the signal ground (pin 5). If you do, the APGX-H output signal will be inaccurate.

The connections to pins 6 and 7 are optional. Make the connection to pin 6 if you want to connect the set point signal to a d.c. relay: you must connect a suppression diode between pins 1 and 6 to protect the APGX-H from transient voltages generated when the d.c. relay is switched off.

The remote calibration input pin has a 47 kΩ pull-up resistor to the positive supply voltage inside the gauge. Connecting pins 2 and 7 will enable the remote setting of the atmospheric output to 1000 mbar (750 Torr) when the gauge is at atmosphere and the vacuum output to 0.0×10^{-4} mbar (0.0×10^{-4} Torr) when the gauge is at vacuum. Atmospheric calibration at pressures between 700 mbar (525 Torr) and 1100 mbar (825 Torr) can be performed manually (refer to [Section 5.1.3](#)) however this option is not available remotely.

Figure 3 - Schematic Diagram of Recommended Electrical Connection



1. APGX-H electrical connector socket	5. d.c. relay (optional)
2. Cable electrical connector plug	6. Back EMF suppression diode (optional)
3. Electrical supply	7. Remote calibration switch (optional)
4. Voltmeter	

3.3.2.1 Set-point

The set-point output is an open-collector transistor with a series diode. When the pressure falls to the set-point value, the transistor output changes to on (closed or low impedance) and the set-point LED switches on (amber). The set-point has a fixed hysteresis of 500 mV: the set-point output and LED go off when the pressure rises to 500 mV above the set-point pressure.

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4 Operation



WARNING

Do not use the APGX-H to measure the pressures of explosive or flammable gasses or mixtures. The gauge contains a heated filament which normally operates around 100 °C above ambient temperature. The temperature of the filament can be substantially higher under fault conditions.

4.1 Pressure measurement

Immediately after connecting the APGX-H to a power supply, the status LED will rapidly flash red and green for approximately 2 seconds while calibration information is downloaded from the tube to the electronics housing. The status LED will then turn green if the gauge is operating correctly.

For most accurate pressure measurement, allow the APGX-H to warm-up for at least 10 minutes and then use the procedure described in [Section 5.1](#) to adjust the APGX-H.

If the APGX-H is connected to an Edwards AGC, TIC or AGD, the display will indicate the corresponding pressure.

If the APGX-H is connected to a voltmeter, convert the measured voltage to the corresponding pressure using the following equation:

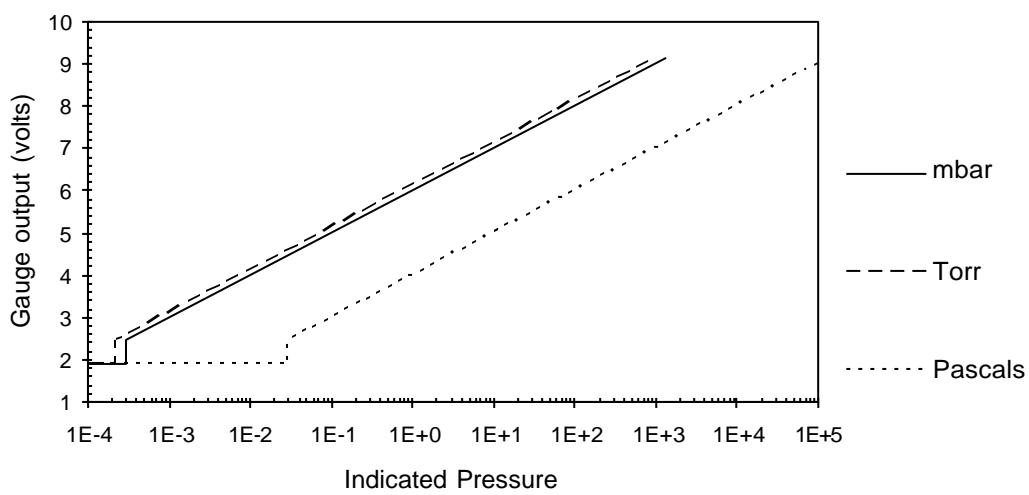
$$P = 10^{(V-6)} \text{ mbar}$$

$$P = 10^{(V-6.125)} \text{ Torr}$$

$$P = 10^{(V-4)} \text{ Pascal}$$

where V is the measured voltage in volts. For example, if the measured voltage V = 4 volts, then the pressure P = 1 $\times 10^{-2}$ mbar. Refer to [Figure 4](#).

Figure 4 - Pressure-Voltage Characteristics of the APGX-H



4.2 Set-point adjustment

Note: If you use an Edwards AGC, TIC or AGD the APGX-H set-point is not used.

The default value for the set-point is 1 mbar.

To read the voltage at which the set-point output signals are activated, press the 'SET TRIP' switch (see [Figure 5](#)) with an appropriate tool. The output of the gauge will indicate the set-point level for 3 seconds after which the output will read the normal voltage output.

To adjust the voltage at which the set-point output signal is activated, press the 'SET TRIP' switch and hold it down for more than 3 seconds. The set-point voltage will start scrolling upwards. Release the switch as soon as you reach the desired trip voltage. To make finer adjustment, release the 'SET TRIP' switch just before the desired set-point voltage is reached and immediately depress the switch as many times as required. Each depression will increase the set-point voltage by approximately 10 mV. When the set-point voltage reaches 9.3 V it will jump to 1.8 V and increase again. Refer to [Section 4.1](#) to determine the operating voltage which corresponds to a given pressure.

The APGX-H has an error monitoring facility, which ensures that the set-point output signal is off:

- For approximately 2 seconds immediately after the APGX-H is switched ON
- When the pressure output signal is out of range
- When an error voltage is detected. See [Section 4.3](#).

If required the set-point operating voltage can be adjusted to 1.8 V. This ensures that the set-point output is permanently off.

If required, the set-point signal can be used to indicate when the gauge is operating correctly. Adjust the set-point operating voltage to greater than 9.2 V. The set-point output will then be ON if the gauge is operating normally, and OFF if an error condition is detected.

4.3 Error monitoring

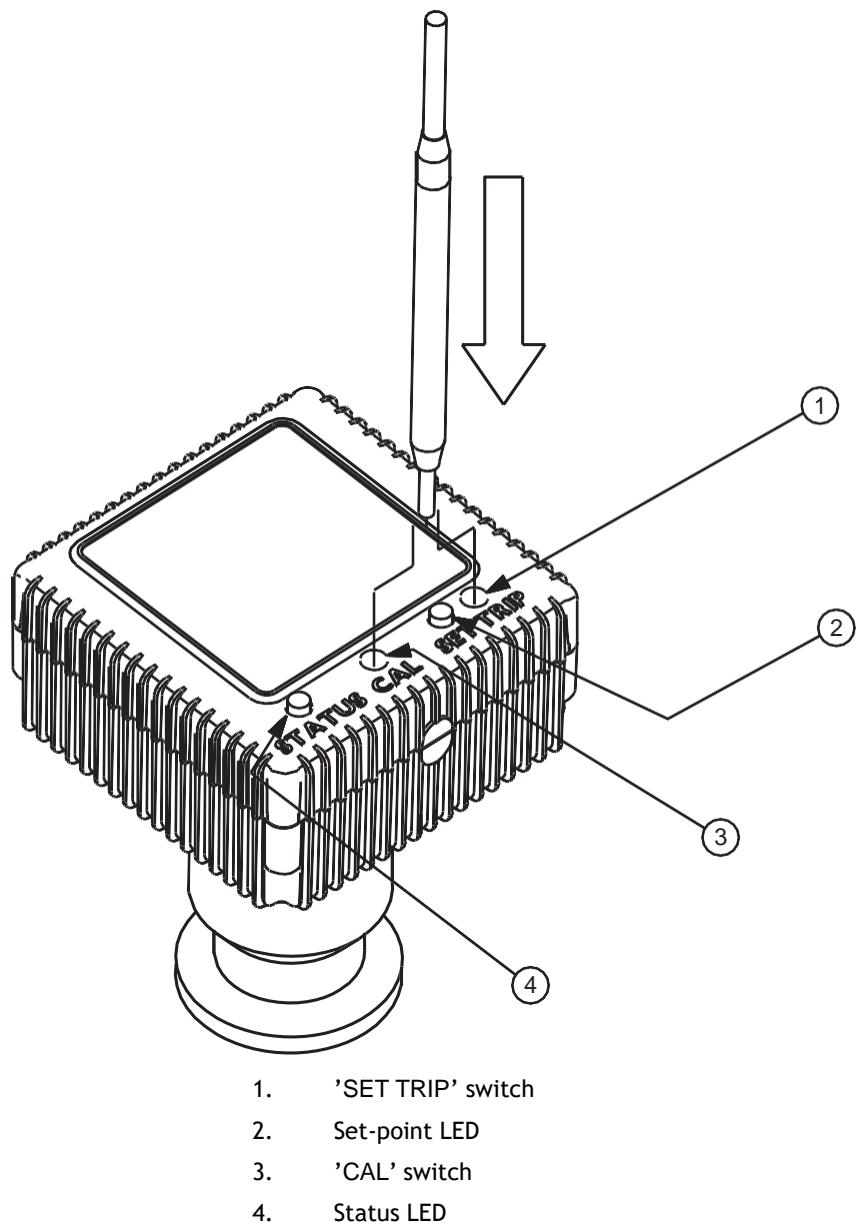
If an error occurs during operation of the APGX-H, then the status LED will turn red to indicate an error. Refer to [Section 5.4](#) for a fault finding guide.

The error condition is reset (cleared) when the power to the gauge is removed.

Table 2 - Error Indication

Error Condition	Output Voltage	AGC Output	TIC Output
Broken filament	9.5 V	ERR E	Filament Fail
Calibration error	9.6 V	ERR F	Cal Error
Tube disconnected	9.7 V	NOTUBE	No Tube

The set-point will be disabled as soon as one of the above errors is detected.

Figure 5 - Adjust the APGX-H

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5 Maintenance

CAUTION

Do not clean the interior of the gauge tube as you can damage the filament.

You can replace the sintered filter and its retaining circlip on 'NW' flange tubes. On $1/8$ inch NPT tubes the sintered filter cannot be replaced.

5.1 Atmosphere and vacuum adjustment

Every APGX-H gauge is individually calibrated before shipment however thermal conductivity gauges in general can drift with time or as contamination builds up on the filament. Use the procedures outlined below to adjust the vacuum and atmosphere settings of the APGX-H. The frequency of which they should be repeated will vary depending on the level and nature of contamination associated with the process. The atmosphere adjustment is particularly important if the APGX-H is installed in any orientation other than vertical or if the orientation is changed.

5.1.1 Atmosphere adjustment

1. Switch on the power supply to the APGX-H and allow it to operate for at least 10 minutes. Ensure that the green status LED is lit.
2. With the vacuum system at atmospheric pressure, press the 'CAL' switch. The status LED will flash red and the voltage output of the gauge will read approximately 9 V. If the APGX-H is connected to an Edwards AGC, TIC or AGD, the display will read approximately 1000 mbar (750 Torr).

5.1.2 Vacuum adjustment

1. Reduce the system pressure to 1×10^{-5} mbar (7.5×10^{-6} Torr) or below and allow the gauge to operate for at least 10 minutes.
2. Press the 'CAL' switch. The status LED will flash red and the voltage output will read approximately 1.9 V. If the APGX-H is connected to an Edwards AGC, TIC or AGD, the display will read 0.0E-4 mbar (0.0E-4 Torr).

Every time 'CAL' is pressed, the new calibration values are stored inside the tube. If the tube is then transferred to a different electronics housing, the latest values stored inside the tube will automatically be used.

If required, the factory calibration values can be recalled by performing a factory values reset. Refer to [Section 5.1.4](#).

5.1.3 Atmosphere adjustment at pressures other than 1000 mbar (750 Torr)

If the barometric pressure is known, it is possible to adjust the gauge to read the atmospheric pressure rather than the default value of 1000 mbar (750 Torr). The gauge can be adjusted for barometric pressures between 700 mbar (525 Torr) and 1100 mbar (825 Torr).

Use the 'CAL' push button switch to adjust the APGX-H.

1. Switch on the power supply to the APGX-H and allow it to operate for at least 10 minutes.
2. With the vacuum system at atmospheric pressure, press and hold the 'CAL' switch for more than five seconds. The voltage output of the gauge will begin to decrease in steps of approximately 10 mV. Release the 'CAL' switch just before the desired voltage is reached. To make finer adjustment, release the 'CAL' switch and immediately depress the switch as many times as required. If the switch is released for more than four seconds, the value will be stored. When the output reaches around 8.85 V, the voltage will quickly ramp up to around 9.04 V. The output will then ramp down slowly. Refer to [Section 4.1](#) for formulae to convert output voltage to pressure).

If the APGX-H is connected to an Edwards AGC, TIC or AGD, the display will indicate the corresponding pressure.

5.1.4 Reset factory calibration values

Note: *Performing a factory values reset will overwrite any existing calibration data stored in the tube.*

The use of factory calibration reset will not correct a filament that has drifted with time or due to contamination.

Perform the following procedure in order to restore the calibration values when the gauge was initially manufactured:

1. Disconnect the power supply to the gauge.
2. With the power disconnected, press and hold the 'CAL' switch.
3. Switch on the power to the gauge with the 'CAL' switch still depressed and hold the switch down until the status LED flashes red. This takes approximately six seconds. The factory calibration values will now be restored.

5.2 Clean the filter

CAUTION

You must remove the filter to clean it. Do not clean the filter in position in the body tube as permanent damage to the filament can occur.

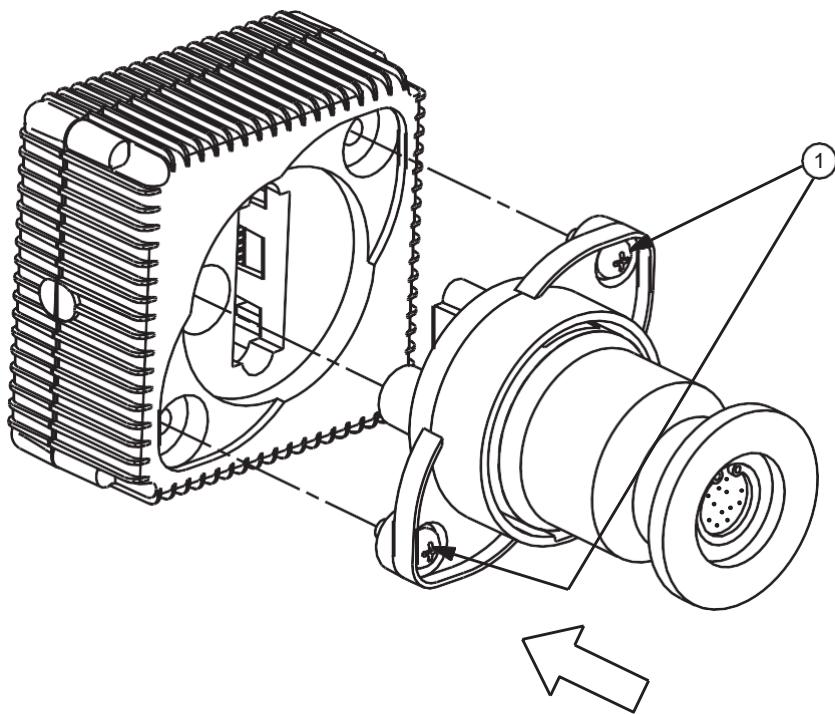
Refer to [Figure 1](#) and use the following procedure to clean the filter. The filter can only be replaced on NW flange versions of the gauge.

1. Switch off the electrical supply, ensure that the vacuum system is at atmospheric pressure and remove the APGX-H from the vacuum system.
2. Use circlip pliers to remove the filter-retaining circlip (3); ensure that you do not damage sealing surface on the flange or the inside of the body tube. Remove the filter (5).
3. Inspect the filter. If the filter is damaged or cannot be cleaned, replace the filter; a filter replacement kit is available as a spare (refer to [Section 7](#)).
4. Use a suitable cleaning solution to degrease the filter, then wash the filter repeatedly in clean water.
5. Wash the filter with a suitable solvent to remove all traces of water and then thoroughly dry the filter.
6. Refit the filter into the body tube and refit the circlip.

5.3 Replacing the tube

Loosen the two screws and detach the tube from the electronics housing. Plug the replacement tube into the podule and secure the tube retaining screws (item 1 in [Figure 6](#)). To ensure a good electrical connection between the tube and electronics housing, the securing screws should be tightened. The new tube contains calibration information preset in the factory however for optimum performance and accuracy it is recommended that the vacuum and atmosphere adjustment described in [Section 5.1](#) is carried out before use.

Figure 6 - Replace the APGX-H Tube



1. Tube securing screws

5.4 Fault finding

Table 3 - Fault Finding Information

Symptom	Remedy
The indicated pressure is incorrect	Check the electrical connections and ensure that the electrical supply is correct. Perform the atmosphere and vacuum adjustment described in Section 5.1 . If this fails to solve the problem, you will need to replace the tube. Refer to Section 7.2 .
Gauge indicates calibration error	Check the electrical connections and ensure pin 7 is not connected to 0 V. If this fails to solve the problem: <ul style="list-style-type: none">• Adjustment has been performed at an inappropriate pressure; repeat the adjustment referring to Section 5.1.• The tube has drifted outside permissible limits and the gauge can no longer measure pressure accurately. You will need to replace the tube. Refer to Section 7.2.
Gauge indicates broken filament	The filament has broken and the gauge can no longer measure pressure. You will need to replace the tube. Refer to Section 7.2 .
Gauge indicates tube disconnected	Ensure that the tube is plugged into the electronics housing. If this fails to solve the problem the gauge is faulty and should be replaced.

5.5 Calibration service

A calibration service is available for all Edwards gauges. Calibration is by comparison with reference gauges, traceable to National Standards. Contact Edwards for details.

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6 Storage and Disposal

6.1 Storage

Return the APGX-H to its protective packaging and store the gauge in clean dry conditions until required for use. Do not exceed the storage temperature conditions specified in [Section 2](#).

When required for use, prepare and install the APGX-H as described in [Section 3](#).

6.2 Disposal

Dispose of the APGX-H and any components safely in accordance with all local and national safety and environmental requirements.

Alternatively, you may be able to recycle the APGX-H and/or cables; contact Edwards or your supplier for advice (also see below).

The APGX-H and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment. Edwards offer European customers a recycling service for the APGX-H/cables at the end of the product's life. Contact Edwards for advice on how to return the APGX-H/cables for recycling.

Particular care must be taken if the APGX-H has been contaminated with dangerous process substances or if the gauge has been overheated or has been in a fire. Fluoroelastomers are used in the APGX-H; these are safe in normal use, but can decompose into dangerous breakdown products if heated to 260°C and above.

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7 Spares and Accessories

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, United Kingdom, U.S.A. and a world wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from your nearest Edwards company or distributor. When you order, please state for each part required:

- Model and Item Number of your equipment
- Serial number (if any)
- Item Number and description of part

7.2 Spares

Spare	Item Number
Replacement electronics housing	D023-91-800
Replacement tube APGX-H-NW16-ST ST	D023-95-801
Replacement tube APGX-H-NW16-AL	D023-91-801
Replacement tube APGX-H-NW25-ST ST	D023-92-801
Replacement tube APGX-H-1/8 NPT - ST ST	D023-96-801
Filter Replacement Kit	D023-91-805

The Filter Replacement Kit contains 5 filter-retaining circlips and 5 filters.

7.3 Accessories

The cables for use with the APGX-H are as follows. These cables are supplied with 8-way male electrical connectors on both ends.

Cable length		Item Number
0.5 m	18 inches	D400-01-005
1 m	3 feet	D400-01-010
3 m	10 feet	D400-01-030
5 m	15 feet	D400-01-050
10 m	30 feet	D400-01-100
15 m	50 feet	D400-01-150
25 m	80 feet	D400-01-250
50 m	150 feet	D400-01-500
100 m	325 feet	D400-01-999

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Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must send us a completed Declaration of Contamination of Vacuum Equipment and Components - Form HS2. The HS2 form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

We provide instructions for completing the form in the Declaration of Contamination of Vacuum equipment and Components - Procedure HS1.

If you are returning a vacuum pump, note the following:

- If a pump is configured to suit the application, make a record of the configuration before returning the pump. All replacement pumps will be supplied with default factory settings.
- Do not return a pump with accessories fitted. Remove all accessories and retain them for future use.
- The instruction in the returns procedure to drain all fluids does not apply to the lubricant in pump oil reservoirs.

Download the latest documents from www.edwardsvacuum.com/HSForms/, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to Edwards.

Note: *If we do not receive a completed HS2 form, we will not accept the return of the equipment.*

