

EDWARDS
APG100 Active Pirani Gauge

Description	Item Number
APG100 - XM NW16	D026-01-000
APG100 - XM NW25	D026-02-000
APG100 - XLC NW16	D026-03-000
APG100 - XLC NW25	D026-04-000



1. Electrical connector
2. Set-point button
3. Cal button
4. Status LED
5. Electronics housing
6. Vacuum flange

Figure 1 - General view of the APG100

	Instruction Manual	
	D026-01-880 Iss B	Jan 09

Introduction

Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards APG100 Active Pirani Gauge. You must use the APG100 as specified in this manual.

Read this manual before you install and operate the APG100. 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 symbols appear on the APG100:

-
- Warning - refer to accompanying documents.
-
- Edwards offer European customers a recycling service.

Description

The APG100 is a Pirani gauge which measures vacuum pressures in the range 10⁻⁴ mbar to 1000 mbar. It operates using the principle of thermal conductivity in which the rate of heat loss from a heated filament is dependent on the pressure of gas surrounding the filament.

The APG100 is available in two versions: the 'M' version can measure pressure down to 10⁻³ mbar and is suitable for general applications; the 'LC' version can measure pressure down to 10⁻⁴ mbar and is also suitable for use in corrosive applications.

A general view of the gauge is shown in Figure 1. The gauge features a detachable tube which allows a replacement to be fitted in the event of contamination or failure of the filament. There are two push-button switches on the top of the gauge. The switch labelled "CAL" is used for atmosphere and vacuum calibration and the switch labelled "S/P" is used to adjust the set-point threshold.

Electrical data

Electrical supply voltage	15 to 30 V d.c. nominal 13.5 V minimum 32 V maximum
Maximum power consumption	1 W
Max inrush current	150 mA
Electrical connector	FCC68 / RJ45 8-way
Pressure output signal	
Range	1.9 to 9.1 V
Error range	output < 1.8 V or output > 9.2 V
Min load impedance	10 kΩ
Max output current	1 mA
Set-point	
Adjustment range	1.8 to 9.2 V
Hysteresis	500 mV
Max external load rating	30 V d.c., 100 mA
Gauge identification resistance	
APG100-XM	36 kΩ
APG100-XLC	43 kΩ

Materials exposed to vacuum

Filament	
APG100-XM	Tungsten / Rhenium
APG100-XLC	Platinum / Iridium
Tube	Stainless Steel 316L & 304L
Filter	Stainless Steel 316L
Other	Glass, Ni, NiFe, PTFE (APG100-XLC only)

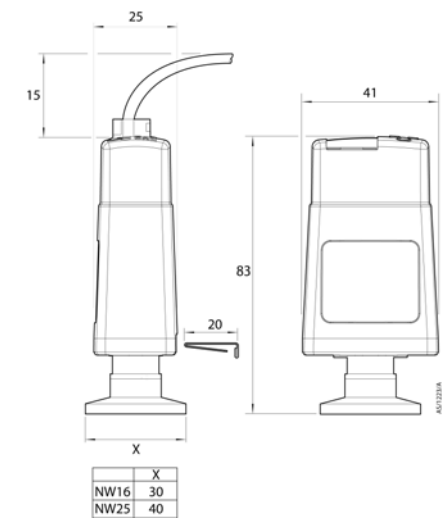
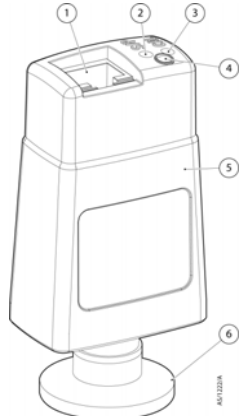


Figure 2 - Dimensions (mm)

Installation

Unpack and inspect

Remove all packing materials and protective covers. Check the APG100. If the APG100 is damaged, notify your supplier and carrier in writing within three 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 APG100 if it is damaged.

If the APG100 is not to be used immediately, replace the protective covers. Store the APG100 in suitable conditions as described in Technical Data section.

Fit the APG100 to a vacuum system

WARNING
You must use a Co-seal or trapped 'O' ring carrier to connect an APG100 to a vacuum system if the pressure is likely to exceed atmospheric pressure. Standard centring rings are not suitable for use above atmospheric pressure.

WARNING
Do not use the APG100 for safety critical applications. The APG100 is not intended to be fail-safe.

The APG100 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 the Maintenance section.

To connect the APG100 to your vacuum system:

- Use an 'O' ring / centring-ring or Co-Seal to connect an APG100 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 APG100 with an NW16 flange to an NW10 flange.

In accordance with good practice, we recommend that your vacuum system has a secure Earth (ground) connection, and that the tube of the APG100 is electrically connected to the vacuum system.

Connect to an Edwards Controller

The APG100 is compatible with the TIC and ADC digital controllers and the AGD analogue display from Edwards. The controllers will automatically recognise the gauge and display the measured pressure.

To connect to a Edwards controller use a cable which is terminated in suitable connectors. These cables are available from Edwards.

Connect to your own electrical equipment

CAUTION

Do not make any connection to the gauge identification pin (pin 4) as this may cause the gauge to malfunction.

A schematic diagram of the recommended electrical connections to the APG100 is shown in Figure 4. The pins on the electrical connector are used as shown in Table 1. Refer to the Technical Data section for more detailed specifications.

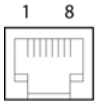
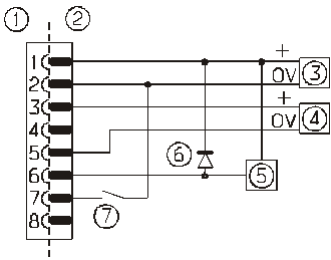


Figure 3 - RJ45 8-way connector

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

Table 1 - Pins on the APG100 electrical connector



1. APG100 electrical connector socket
2. Cable electrical connector plug
3. Electrical supply
4. Voltmeter
5. d.c. relay (optional)
6. Back EMF suppression diode (optional)
7. Remote calibration switch (optional)

Figure 4 - Recommended electrical connections

Do not connect the electrical supply ground (pin 2) to the signal ground (pin 5). If you do, the APG100 output signal will be inaccurate.

When using the APG100 in an electrically noisy environment you should ensure that your measuring equipment is adequately immune to interference. All Edwards controllers have adequate immunity.

The set-point output on pin 6 is an active low open-collector transistor suitable for driving a d.c. relay or control logic. If you connect a relay you must use a suppression diode, to protect the gauge from transient voltages generated when the relay is switched off, as shown in Figure 4.

Make a connection to pin 7 if you require remote calibration. Momentarily (>50ms) connect pin 7 to pin 2 (ground) to automatically adjust the atmosphere or vacuum reading. Refer to the Maintenance section for the correct procedure.

Operation

WARNING
Do not use the APG100 to measure the pressure 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.

Pressure measurement

When the APG100 is connected to a power supply the status LED will turn amber for approximately 2 seconds. The status LED will then turn green if the gauge is operating correctly or red if an error is detected. Refer to the fault finding guide.

If the gauge is connected to a Edwards controller the display will indicate the measured pressure.

If the gauge is connected to a voltmeter convert the voltage (V) to pressure (P) using the following equations:

$$\begin{aligned} P &= 10^{(V - 6)} & P \text{ in mbar} \\ P &= 10^{(V - 6.125)} & P \text{ in Torr} \\ P &= 10^{(V - 4)} & P \text{ in Pa} \end{aligned}$$

For example if the measured voltage V = 4 V, then the measured pressure P = 1 x 10⁻² mbar. Refer to Figures 5 and 6.

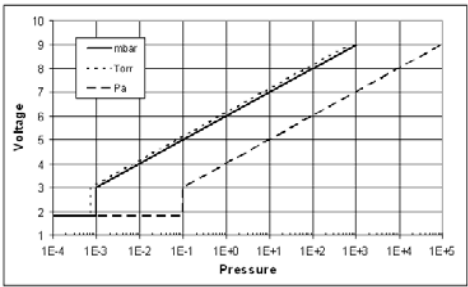


Figure 5 - Voltage to pressure conversion for APG100-XM

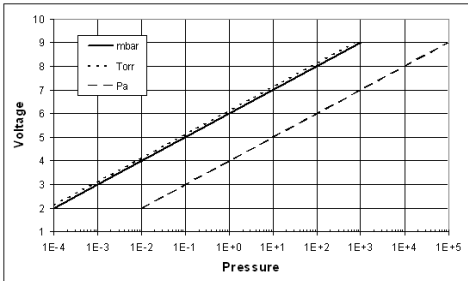


Figure 6 - Voltage to pressure conversion for APG100-XLC

Gas dependency

The APG100 is calibrated for use in nitrogen, and will read correctly with dry air, oxygen and carbon monoxide. For any other gas type a conversion is required in order to obtain the correct pressure reading. Figures 7 and 8 show the conversion for 6 common gases: nitrogen, argon, carbon dioxide, helium, krypton and neon.

If you are using a Edwards TIC controller, the gas calibration data is built into the controller.

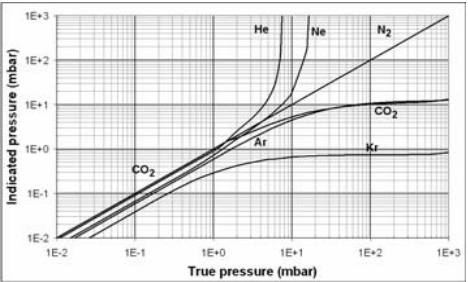


Figure 7 - Gas dependency of APG100-XM

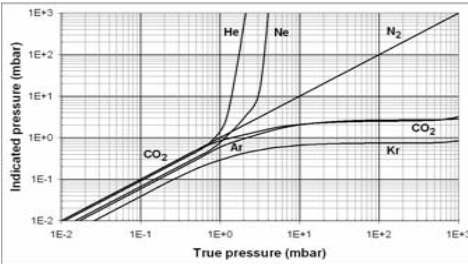


Figure 8 - Gas dependency of APG100-XLC

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Gas	GCF
He	1.1
Ne	1.5
N ₂	1.0
Ar	1.7
CO ₂	1.0
Kr	2.6

CAUTION
When the 'S/P' button is pushed the gauge output will change. Do not push the 'S/P' button to adjust the set-point if the change in output could cause a malfunction of your system.

Error condition	Output (V)	TIC Display	ADC Display	AGC Display
Broken filament or tube removed	9.5	Filament Fail	Err 25	Err E
Calibration error	9.6	Cal Error	Err 26	Err F



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

Symptom	Possible cause	Remedy
LED not lit	Incorrect electrical supply voltage. Supply polarity reversed.	Check electrical supply and connections
Pressure reading incorrect	Vacuum leak	Leak check vacuum system
	Tube has drifted and requires adjustment	Perform the atmosphere and vacuum adjustments
	Tube contaminated	Replace the tube
Gauge indicates calibration error	Adjustment has been attempted at an inappropriate pressure	Repeat the adjustment but make sure that the pressure is at atmosphere or good vacuum
	Wrong type of tube is fitted	Check that correct type of tube is fitted (M or LC)
	New tube has been fitted	Perform 'Adjustment for new tube'
	Tube has drifted outside permissible limits and can no longer be adjusted	Replace the tube
Gauge indicates broken filament	Tube is missing	Fit the tube and remove then re-insert the electrical connector
	Wrong type of tube is fitted	Check that correct type of tube is fitted (M or LC)
	Filament is broken	Replace the tube
