

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

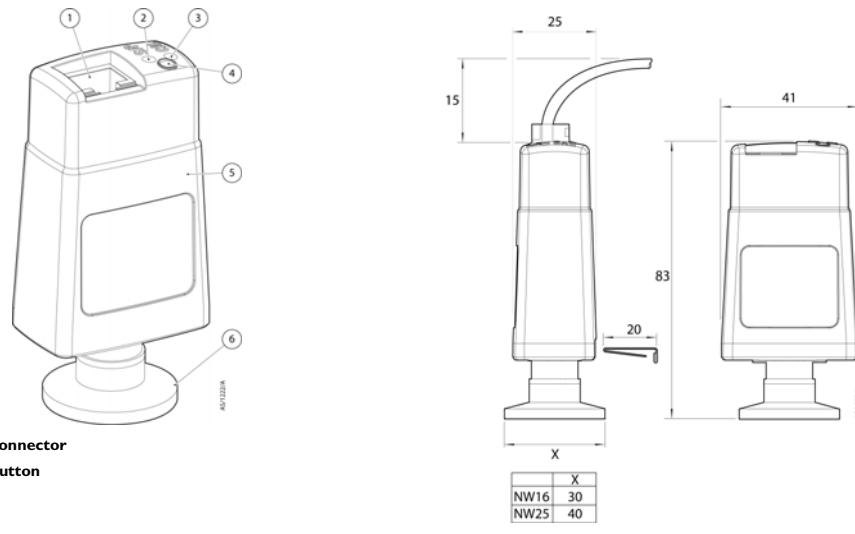


Figure 1 - General view of the APG100

| 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.

Technical Data

Mechanical data

| Dimensions | Refer to Figure 2 |
|-------------------------|-------------------|
| Mass: | |
| NW16 versions | 85 g |
| NW25 versions | 100 g |
| Internal volume of tube | 5 cm ³ |
| Enclosure rating | IP40 |

Performance, operating and storage conditions

| | |
|---------------------------|---|
| Measurement range | |
| APG100-XM | 10 ⁻³ to 1000 mbar |
| APG100-XLC | 10 ⁻⁴ to 1000 mbar |
| Accuracy | |
| APG100-XM | typically ± 15 % at < 100 mbar |
| APG100-XLC | typically ± 15 % at < 10 mbar |
| Ambient temperature | |
| Operating | 5 to 60 °C |
| Storage | -30 to +70 °C |
| Bakeout temperature | 150 °C (with electronics housing removed) |
| Humidity | 80 % RH up to 31 °C decreasing linearly to 50 % RH at 40 °C and above |
| Maximum altitude | 3000 m (indoor use only) |
| Maximum internal pressure | 10 bar absolute (9 bar gauge) |
| Filament temperature | 100 °C above ambient |

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) |

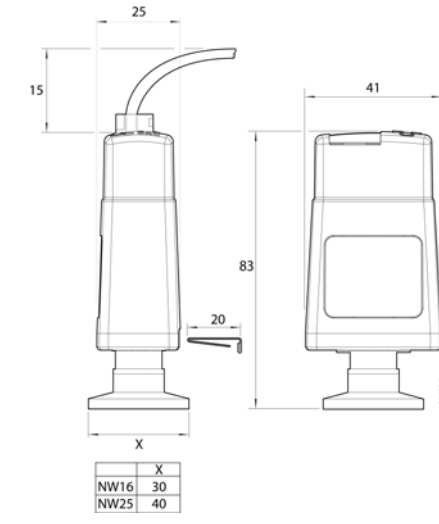


Figure 2 - Dimensions (mm)

| | X |
|------|----|
| NW16 | 30 |
| NW25 | 40 |

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.

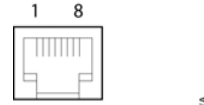
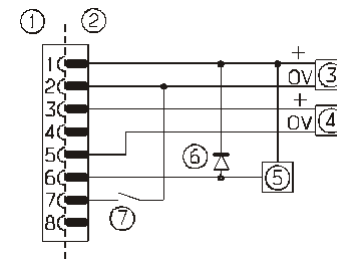


Figure 3 - RJ45 8-way connector

| 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 gases 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:

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

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

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

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.

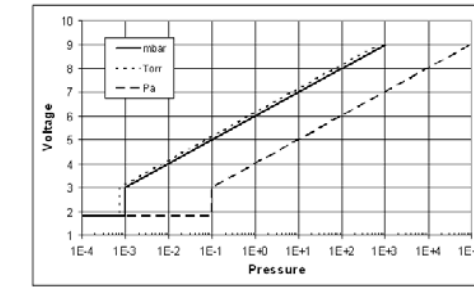


Figure 5 - Voltage to pressure conversion for APG100-XM

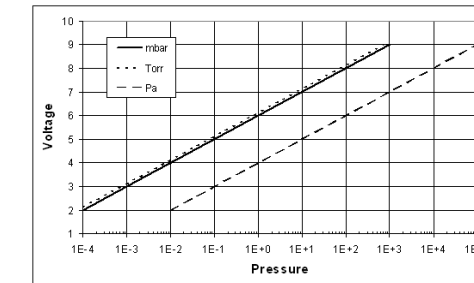


Figure 6 - Voltage to pressure conversion for APG100-XLC

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.

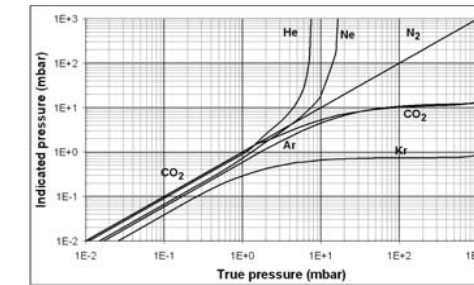


Figure 7 - Gas dependency of APG100-XM

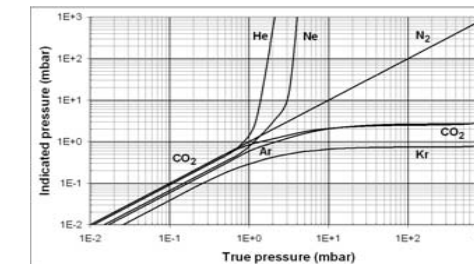


Figure 8 - Gas dependency of APG100-XLC

PLEASE CONTACT ANY OF THESE COMPANIES FOR DETAILS OF OTHER SALES AND SERVICE CENTRES IN YOUR AREA.

| EUROPE/ UNITED KINGDOM | AMERICAS USA HEADQUARTERS |
|--|--|
| EDWARDS Manor Royal Crawley West Sussex RH10 9LW Tel +44 (0)1293 528844 Fax +44 (0)1293 533453 | EDWARDS One Edwards Park 301 Ballardvale Street Wilmington, MA 01887 Tel +1 978 658 5410 Fax +1 978 658 7969 Toll free (USA only) 1 800 848 9800 |

| CANADA | GERMANY |
|---|---|
| EDWARDS 5975 Falbourne Street Mississauga, Ontario L5R3W6 Canada Tel +1 800 387 4076 Fax +1 905 501 1225 | EDWARDS Ammerthalstraße 36 85551 Kirchheim Munich Tel +49 89 991 9180 Fax +49 89 991 91899 |

| ITALY | EDWARDS |
|---|--|
| EDWARDS Via Carpaccio 35 20090 Trezzano sul Naviglio Milan Tel +39 02 48 4471 Fax +39 02 48 401638 | Wilhelm Klein GmbH Eckenerstrasse 1 D-73730 Esslingen Postfach 10 03 28 Tel +49 (0)711/93 18 30-0 Fax +49 (0)711/93 18 30-3 |

| FRANCE | BELGIUM |
|--|--|
| EDWARDS 125 Avenue Louis Roche 92238 Gennevilliers, Cedex Paris Tel +33 1 47 98 24 01 Fax +33 1 47 98 44 54 | EDWARDS Bergensesteenweg 709 B1600 Sint-Pieters-Leeuw Brussels Tel +32 2 363 0030 Fax +32 2 363 00640 |

| INDIA | ISRAEL |
|---|--|
| EDWARDS LTD INDIA HEADQUARTERS 203 Surya Kiran Building 19 Kasturba Gandhi Marg New Delhi - 110 001 India Tel +91 11 5151 0065 Fax +91 11 5151 0245 | EDWARDS ISRAEL VACUUM LTD 5 Habarzel Boulevard Gat 2000 Industrial Zone Qiryat Gat 82000 Israel Tel +972 8 681 0633 Fax +972 8 681 0640 |

| BRAZIL | JAPAN |
|--|--|
| DO BRASIL LTDA Rua Bernardo Wrona 222 02710 São Paulo-SP Brazil Tel +55 11 3952 5000 Fax +55 11 3965 2766 | HEADQUARTERS EDWARDS 5F Sanshikaikan Building 1-9-4 Yurakucho Chiyoda-Ku Tokyo, 100-0006 Tel +81 (0)3 6212 6771 Fax +81 (0)3 6212 6780 |

| CHINA | KOREA |
|--|--|
| EDWARDS TRADING (SHANGHAI) CO. LTD. 23 Fu Te Road (N) Wai Gao Qiao Free Trade Zone Pudong Shanghai, 200131 PRC China Tel +86 21 5866 9618 Fax +86 21 5866 9993 | HEADQUARTERS SONGWON EDWARDS LTD. 5th FL, Daewoo Engineering Bldg. 9-3 Sunae-dong Bundang-gu, Sungnam City Kyungki-do Korea Tel +82 31 716 7070 Fax + 82 31 738 1001 |

| TAIWAN, R.O.C. | SINGAPORE |
|--|---|
| EDWARDS TAIWAN LIMITED No. 434 Chung hua Road Toufen Town, Miaoli County 351 Taiwan Tel +886 37 611422 Fax +886 37 611401 | EDWARDS (ASIA) 42 Loyang Drive Loyang Industrial Estate Singapore 508962 Tel +65 6546 8408 Fax +65 6546 8407 |

