

Instruction Manual

Pirani Vacuum Gauges (For use with 500, 1000, 1700, 2000 and 4000)

Description	Item Number
PRH10K	D021-59-000
PRM10K	D021-66-000
PRM10KCR	D021-57-000
PRL10K	D021-58-000



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For return of equipment, complete the HS Forms at the end of this manual.

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards Pirani Gauges. Read this manual before attempting to install and operate the gauges.

This manual contains essential safety information which supplements the safety features of the gauges. Safety procedures are 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 persons.

CAUTION

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

The following symbol appears on the gauges:



From August 2005, Edwards will offer European customers a recycling service.

1.2 General

This range of Pirani gauge heads has been specially developed for use with the Edwards Series 500, 1000, 1700, 2000 and 4000 vacuum measurement and control instruments. The total pressure range covered is 1000 to 10^{-4} mbar. Four gauge heads are used: PRH10K, PRM10K, PRM10KCR (corrosion resistant) and PRL10K. The pressure range of each gauge head is given in the specification.

The gauge heads all operate on the Pirani principle, at a low pressure, the thermal conductivity of any gas varies with pressure. The interior of the gauge head is open to the vacuum system and contains a filament that is electrically heated. The amount of heat lost from the filament (by conduction) to the surrounding gas diminishes as the gas pressure falls so the filament temperature rises. The electrical resistance of the filament is therefore increased. The filament forms one arm of a Wheatstone bridge which is balanced at atmospheric pressure and becomes unbalanced as the pressure decreases.

This imbalance signal is used in a feedback circuit to adjust the bridge voltage and bring the filament resistance back to its original value. These heads therefore operate in a constant temperature mode and the bridge voltage is a function of pressure.

Each gauge head contains a compensating resistor to minimise the effects of changes in ambient temperature. The gauge heads also contain potentiometer controls to adjust the atmosphere and vacuum settings.

The gauge heads terminate in an NW10 flange connection, and are supplied complete with two metres of connecting lead. Extension leads are available. See [Section 7](#) for ordering numbers. Outline drawings of the gauge heads are shown in [Figure 1](#) and [2](#).

- PRH10K:** The high pressure limit of the PRH10K has been extended by mounting the filament horizontally. This makes use of convection currents to transfer heat away from the filament and so improve the high pressure sensitivity. The head is supplied complete with sintered filter.
- PRM10K:** This device is the basic constant temperature unit in this range of gauge heads and is particularly useful for users requiring a compact head. The gauge offers a wider operating range with more accuracy than the PRE.
- PRM10KCR:** Having the same dimensions and pressure range as the PRM10K, the PRM10KCR has a stainless steel body and offers improved corrosion resistance.
- PRL10K:** The low pressure limit of the PRL10K has been achieved by use of a long fine filament. The head is supplied complete with a sintered filter.

Figure 1 - PRH10K gauge head

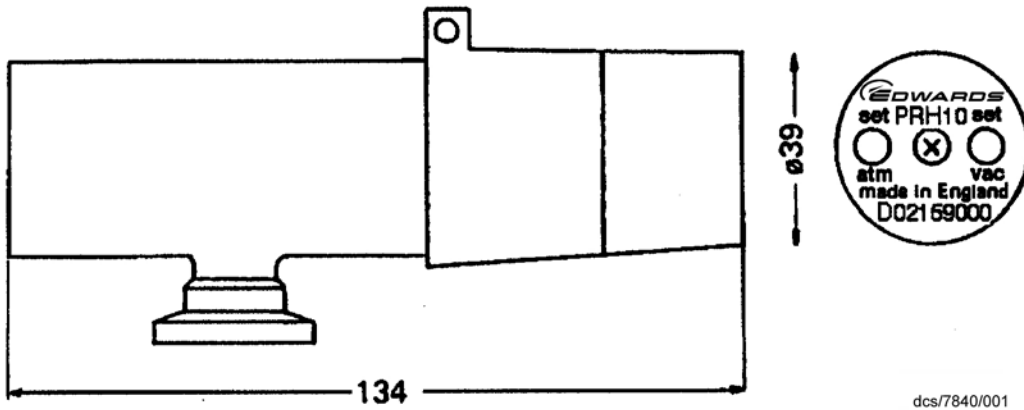
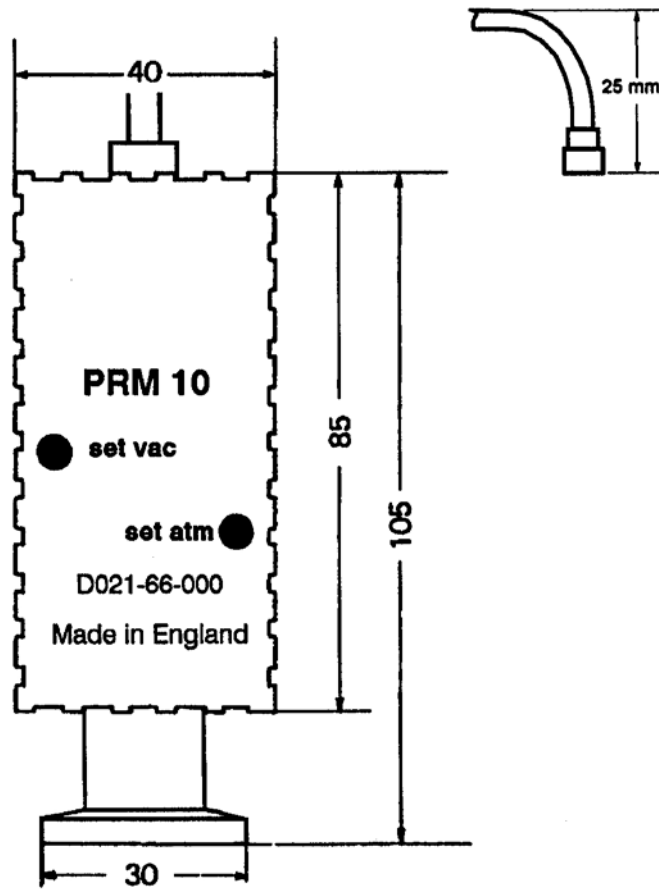


Figure 2 - PRH/PRM/PRL gauge heads



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2 Technical data

2.1 Pressure range

PRH10K	1000 to 10^{-3} mbar
PRM10K	200 to 10^{-3} mbar
PRM10KCR	200 to 10^{-3} mbar
PRL10K	10 to 10^{-4} mbar

2.2 Mechanical data

External dimensions

Length overall

PRH10K	134 mm
PRM10K	105 mm
PRM10KCR	105 mm
PRL10K	105 mm

Lead (integral)

2 m

Weight

PRH10K	360 g
PRM10K	240 g
PRM10KCR	270 g
PRL10K	245 g

Gauge tube volume

PRH10K	65 cm ³
PRM10K	4.3 cm ³
PRM10KCR	4.3 cm ³
PRL10K	4.3 cm ³

2.3 Materials exposed to vacuum system

The materials listed below are used in the construction of the gauge heads and will be exposed to vacuum when in use.

PRH10K:

Stainless steel (AISI 304), PTFE, gold plated tungsten, phosphor bronze, tungsten and nickel.

PRM10K:

Aluminium (HE30TF), platinum/10% rhodium, PTFE, nickel, phosphor bronze and ceramic.

PRM10KCR:

Stainless steel (AISI 304), platinum/10% rhodium, PTFE, nickel and phosphor bronze.

PRL10K:

Aluminium (HE30TF), gold plated tungsten, PTFE, phosphor bronze and nickel.

2.4 Operating conditions

Filament operating temperature

PRM, PRL and PRH

130 °C

Maximum internal pressure

2 bar absolute

3 Installation

3.1 Unpacking and inspection

Remove all packing materials and protective covers and check the gauge head for damage. If the gauge is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the gauge together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the gauge if damaged.

3.2 General

CAUTION

Never vent a vacuum system by disconnecting a Pirani gauge head. The result turbulence may cause filament damage.

Mount gauge heads as close as possible to the point at which the pressure is to be measured. Use a short branch tube with an internal diameter no less than that of the gauge head. Long, narrow and angled connections can cause a significant reading error.

Mount the gauge heads with the face of the NW10 flange horizontal. The body tubes of the gauge heads except the PRH10K will then be vertical, as required. Always mount the body tube of the PRH10K horizontally; in any other attitude re-adjustment will be required and the high pressure sensitivity will be reduced.

The PRH10K and PRL10K are fitted with a phosphor bronze sintered filter in the throat of the vacuum connection. This reduces both the amount of contamination reaching the filament and the effect of turbulence on the filament.

3.3 Connection to the vacuum system



WARNING

The internal pressure of the gauge heads must not exceed 2 bar absolute, (1 bar gauge). It is possible to inadvertently pressurise the PRH10K when operating with argon and other high molecular weight gases as the indicated pressure is lower than the true pressure.



WARNING

Do not use these gauge heads to measure the pressure of explosive or flammable gases and gas mixtures. The sensing element normally operates at a temperature of approximately 130 °C (depending on ambient temperature). It is possible that malfunction or momentary transients could raise the filament above the ignition temperature of combustible mixtures which might then explode.

The gauge heads terminate in NW10 flanges. To connect to a branch tube terminating in a NW10 flange a centring ring with O-ring and a clamp will be required.

Edwards offer a full range of vacuum connections and pipeline components which are described in our catalogue.

3.4 Connection to the control unit

CAUTION

Do not connect or disconnect the gauge head from the control unit when the unit power is on. This may result in damage to the filament.

Plug the lead into the back panel socket on the control unit, using the optional extension lead if required. Secure the lead to a support a short distance above the gauge head to avoid straining the vacuum connection. Switch on the power to the control unit.

4 Operation



WARNING

Do not use the Pirani gauges to measure the pressure of explosive or flammable gases or mixtures. The gauge contains a heated filament which could promote the explosion or fire of such gases.



WARNING

When measuring gases of high molecular weight the pressure indicated can be well below the true pressure. Ensure that the gauge is not over-pressurised when using heavy gases.

CAUTION

Never vent a vacuum system by disconnecting a Pirani gauge. The resulting turbulence may cause filament damage.

CAUTION

Although the filament operates at 130 °C above ambient it is possible that higher temperatures may be experienced under fault conditions or during transients.

4.1 Adjustment of PRH, PRL and PRM gauges

The 'set atm' and 'set vac' adjustment potentiometers on the gauge heads are factory adjusted prior to despatch by should be checked on installation and periodically if most accurate operation is required.

Check the adjustment at any time using the following adjustment procedure. When operating the gauge head in a contaminating atmosphere, a periodic check is recommended.

If necessary reference should be made to the operating instructions of the appropriate controller for a description of the operation procedure to check the adjustment of the gauge head.

4.1.1 1000 Series control unit

1. Connect the gauge head to the vacuum system and control unit as described above. Allow at least 15 minutes for the instrument to stabilise.
2. With the system pressure at atmospheric, select the appropriate input for display and then press 'C'. A number in the range + 99 mV to - 99 mV (or '+ E' if outside this range) is displayed which is a measure of the deviation of the bridge voltage from a factory determined setting.
3. Adjust the reading to zero by turning the gauge head 'set atm' potentiometer.
4. Reduce the system pressure (as indicated by another gauge head) to 1×10^{-4} mbar (or below) for PRH10K and PRM10K/PRM10KCR or 1×10^{-5} (or below) for PRL10K. The control unit should again display a reading in the range + 99 mV to - 99 mV, showing the bridge voltage deviation at vacuum.
5. Adjust the gauge head 'set vac' potentiometer until the reading is zero.
6. Repeat [Step 2](#) to [5](#) until the reading at both atmospheric pressure and vacuum is zero.

4.1.2 2000 Series control unit

1. Connect the gauge head to the vacuum system and control unit as described above. Allow at least 15 minutes for the instrument to stabilise.
2. With the system pressure at atmospheric, select the display type 'DIAGNOSTIC INTERNAL', then select 'manual read gauges' followed by the gauge head number and 'diagnostic'.
3. Adjust the gauge head 'set atm' potentiometer until the display shows values indicated below:

PRH10K	-3432 mV
PRM10K	-3330 mV
PRM10KCR	-3330 mV
PRL10K	-3500 mV

4. Reduce the system pressure (as indicated by an independent pressure gauge) to 1×10^{-4} mbar (or below) for PRH10K and PRM10K/PRM10KCR or 1×10^{-5} mbar (or below) for PRL10K.
5. Adjust the 'set vac' potentiometer until the display shows -64 mV, (for all gauge heads).
6. Repeat [Step 2](#) to [5](#) until the reading at both atmospheric pressure and vacuum are correct.

4.2 Adjustment of PRM gauges

4.2.1 500 Series control unit

1. Connect the gauge to the vacuum system and plug in its connector to the 500 Series controller.
2. With the system at atmospheric pressure, note the instrument reading and if necessary adjust the 'set atm' potentiometer on the gauge head to set the needle on the 'atm' mark.
3. Pump down to 1×10^{-3} mbar, check the reading and if necessary adjust the 'set vac' potentiometer until the meter reads 10^{-3} mbar.
4. Recheck the 2 and 3 above. If there is insufficient range of adjustment on either potentiometer, the gauge head should be returned to Edwards under the Edwards Exchange/Replacement service.

4.3 Recorder outputs

Graphs showing the recorder output versus indicated pressure for the Edwards Pirani module for different gauge heads are given in the respective Controller instructions.

5 Maintenance



WARNING

Cleaning solvents may produce fumes that are toxic and/or flammable. Such solvents should only be used in well ventilated areas away from electronic equipment or flames.

CAUTION

The interior of the gauge tube must not be cleaned as damage to the filament may occur. If contamination is suspected the gauge should be returned to Edwards for exchange/replacement.

5.1 General

In normal use the gauge heads do not require maintenance, except for cleaning the filters on the PRH and PRL gauges, but extended operation in a contaminating atmosphere may change the gauge head adjustment. If this is suspected, the recommended procedure is to return the gauge head to Edwards exchange/replacement service.

5.2 Cleaning the filter - PRH and PRL gauges only

Switch off the power supply and remove the gauge from the vacuum system.

The filter must be removed for cleaning. It must not be cleaned in position in the body tube.

The filter is located in the flange end of the body tube and is retained by a circlip. Using a pair of circlip pliers remove the circlip being careful not to mark the body tube wall.

The filter should first be degreased using a proprietary solvent, then washed repeatedly in clean water and finally with methanol to remove all traces of water. The filter should be thoroughly dried.

Reassemble the filter into the body tube and replace the circlip.

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6 Storage and disposal

6.1 Storage

Store in a cool dry place.

6.2 Disposal

Dispose of the gauge head and any components safely in accordance with all local and national safety and environmental requirements.

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

The gauge and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment, 2002/96/EC. From August 2005, Edwards will offer European customers a recycling service for the gauge/cables at the end of the product's life. Contact Edwards for advice on how to return the gauge/cables for recycling.

Particular care must be taken if the gauge has been used in a hazardous environment.

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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 Accessories and spares

The following accessories and spares for the Pirani Vacuum Gauge Heads are available from Edwards:

Ordering number

Product description	Item Number
Pirani gauge head PRH10K	D021-59-000
Pirani gauge head PRM10K	D021-66-000
Pirani gauge head PRM10KCR	D021-57-000
Pirani gauge head PRL10K	D021-58-000
Sintered filter NW10 O-ring carrier for PRM10K and PRM10KCR gauge heads	D021-58-020

7.2.1 Extension leads for PRL/PRM/PRH10K

5 m	D368-17-005
15 m	D368-17-015
30 m	D368-17-030

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Appendix A1

Electronic interface	FCC68/RJ45 Type 8 way
Pin Allocation Function	
1	Power supply positive voltage
2	Power supply common
3	Gauge signal output/set point trip level
4	Gauge identification signal
5	Signal common
6	Set point open drain transistor output
7	Read set point trip level
8	No connection

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