Edwards

Instructions

07-D145-37-880
October 1980
Supersedes
07-D145-33-881

CP25 PENNING GAUGE HEAD

Model	Code
CP25-K	07-D145-37-000

Communication with Edwards

Any communication relating to the subject of these instructions should be addressed to Edwards High Vacuum or to the supplier from whom it was purchased.

Please specify:

1 The model, serial number and code
2 The date of purchase
3 Your order number and the suppliers sales reference

Equipment should not be returned to the supplier without prior arrangement.

Damage in transit

If any damage has occurred in transit, it is important to inform both the carrier and the supplier within three days of delivery.

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1 Specification

Operating voltage	2300V at 0.7mA maximum
Volume added to system	36 cm^3
Vacuum coupling	CP25-K 25mm flange
Dimensions	length 117 mm overall diameter 63mm overall
Weight	0.8 kg net, including lead
Lead (attached)	2m long. Fitted with coaxial plug
Coupling parts (supplied)	KF 25 viton 'O' ring KF 25 centring ring

Optional accessories

KF25/25 clamping ring Extension leads	5m, 15m and 30m

Ordering details

Description		Code
Penning gauge head (CP25K with KF25 flange)		07-D145-37-000
KF25 Viton 'O' ring		08-H021-24-025
KF25 Centring ring		08-C105-14-081
KF25/25 clamping ring		08-C105-14-401
Extension leads	5m	07-D368-13-005
	15m	07-D368-14-015
	30m	07-D368-14-030

2 Installation

General

Do not loosen the nut at the lead end of the head.

Do not allow anything to fall into the open end of the head.

Before fitting the O-ring, lubricate it very slightly with an approved vacuum lubricant, just enough to give a shiny surface.

2.1 New installations

The vacuum system must be fitted with a branch tube (external diameter 28 $\pm$ 0.13mm) for the gauge head. Although the head will work in any attitude, it is recommended that the branch tube is positioned so that it extends vertically from the system.

WARNING The maximum internal pressure to which the gauge head may be subjected is 2 bar.

2.2 Branch tube with KF termination

Fit the gauge head, using the KF 'O' ring and centring ring supplied. A KF25/25 clamping ring will be required, available from Edwards, code number 08-C105-14-401.

2.3 Branch tube with screwed termination

If the branch tube has a screwed termination, fit the gauge head using the KF 'O' ring and centring ring. An SC25 coupling nut will be required, available from Edwards, code number 08-C110-04-431 (pack of five).

2.4 CONNEXION TO CONTROL UNIT

High voltage exists at the head connexion of the control unit when switched on.

Switch off the control unit before connecting the gauge head.

Plug the gauge head lead into the socket on the back of the control unit, with the optional extension lead if used.

Cleat the lead to secure supports.

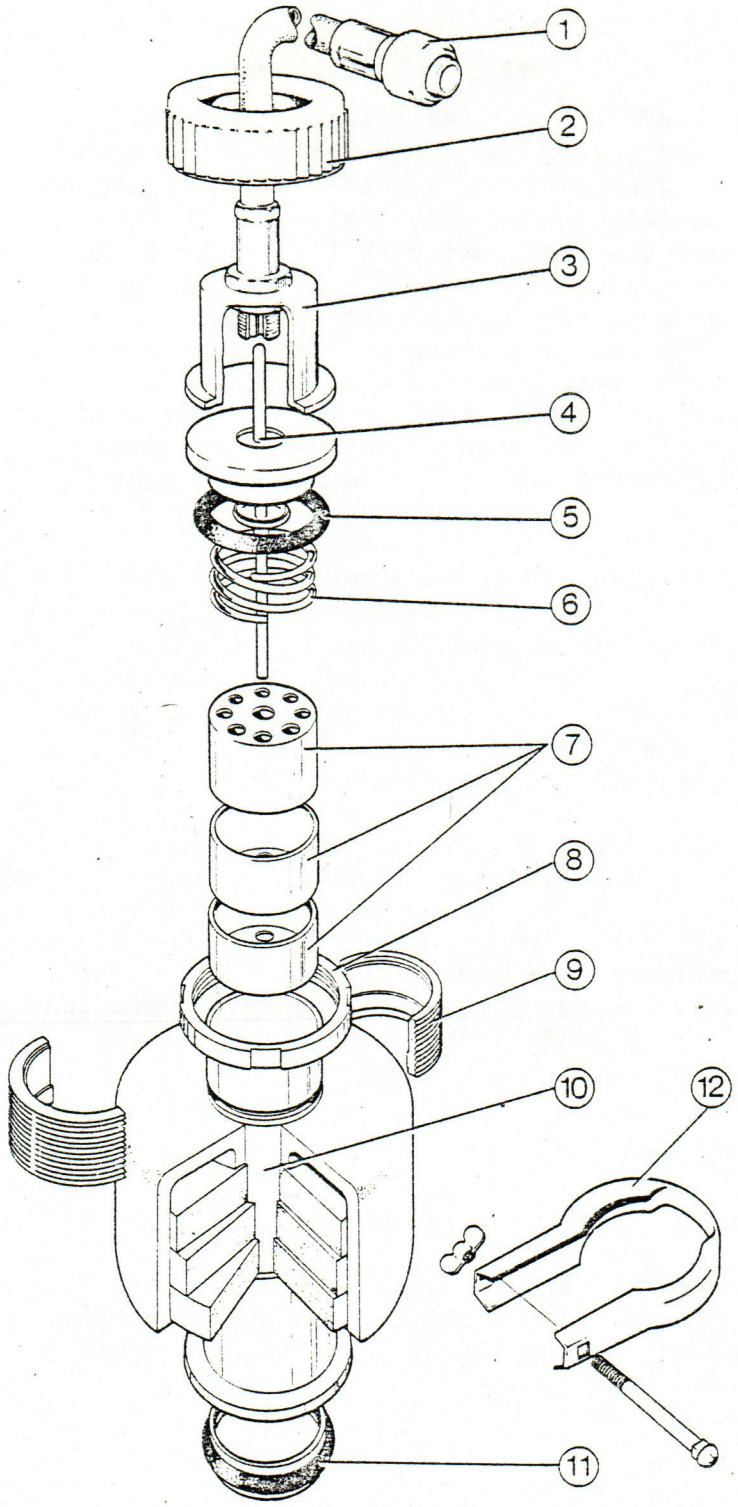
3 Description (Fig. 1)

The gauge head is a coaxial assembly of which the main structual part is the tubular metal body 10, which connects to the vacuum system by means of an Edwards KF clamping ring, Fig. 1 item 12.

The body is sealed by the O-ring 5, compressed between the flange of the anode assembly 4 and the end of the body tube 10. The external structure is completed by the sleeve 9 (located by the groove in 10), the lock nut 8 and the earth cap 3, all clamped by the top nut 2 screwed on to 9.

The internal parts form a coaxial electrode system. The three cathode cups 7 are located by the counterbore in 10 and held in place by the stainless steel spring 6. The anode rod passes through the central holes in 7 and is supported by the glass-to-metal seal in 4. The rod engages the coaxial socket of the cable termination inside 3.

Outside the body are three ceramic ring magnets which produce, within the body, an axial magnetic field of about 55 $mWb^{-1} m^{2}$ (550 gauss). The magnets locate on the shoulder of 10 and are clamped against it by the locknut 8. The magnets are fixed to their containing envelope.



1	Plug on cable	7	Cathode cups
2	Top nut	8	Moulded locknut
3	Earth cup	9	Threaded sleeve in two parts
4	Anode assembly	10	Body with magnets and cover (CP25K)
5	O-ring	11	KF25 Centring ring and 'O' ring
6	Spring	12	KF25/25 clamping ring

Fig. 1 Penning gauge head CP25-K

4 Operating principle

The voltage of 2.3 kV d.c. applied between the anode and cathode produces a glow discharge inside the head when the pressure there is below about 100 mbar. Electrons are drawn from the cathode and accelerate towards the anode, but the magnetic field deflects them so that they follow a complex spiral path which is very much longer than the electrode spacing. Collisions with the gas molecules ionize the gas, producing positive ions and additional electrons; both cause further ionization. The sum of the positive ion current to the cathode and the electron current to the anode consitutes the gauge head current which is measured by the associated control unit.

The current is approximately proportional to the gas pressure up to about 10^{-4} mbar; at higher pressures the current rises at a diminishing rate until it reaches a maximum at about 1 mbar, thereafter falling until the discharge goes out at about 100 mbar. When the pressure is reduced from atmospheric, the current varies in approximately the same way in reverse.

This behaviour, which is characteristic of the Penning gauge, must be remembered because it causes a false indication of a very low pressure to be given when the real pressure is above about 100 mbar. Any pressure dependent switches linked to the Penning gauge, for example the Controller 201, should be interlocked to prevent incorrect operation. The usual method is to inhibit the Penning switch with a signal derived from a Pirani or similar gauge.

5 Maintenance

The gauge head needs no routine maintenance.

If unstable or incorrect pressure readings occur, and the cable connexion to the control unit is sound, contamination of the gauge head may be suspected. Dismantle, inspect and clean it as described below.

Dismantling

Warning Switch off the gauge control unit and unplug the gauge head before dismantling.

1 Allow the pressure to rise to atmosphere in the vacuum system. Remove the head.

2 Hold the head upright with the lead at the top (to make sure the loose internal parts do not fall out). Unscrew the moulded nut 2.

3 Lift the earth cup 3 straight off, taking care not to strain the anode rod. Check the internal electrical connexion to the rod.

4 Carefully lift out the anode assembly 4 and O-ring 5.

5 Invert the head to allow the compression spring 6, and the three cathode cups 7 to fall out on to lint-free fabric.

Note: If it is very inconvenient to detach the gauge head from the vacuum system, it may be left in position. The head can then be dismantled as described above except that the three cups must be fished out with a wire hook.

Cleaning

Gently abrade the anode rod with fine (grade 100) glass paper until the contaminant is removed and a shiny metal surface is obtained. Take care not to bend the rod.

Similarly clean the cathode cups and if necessary, the internal surface of the body.

Wash all the cleaned components in three or four changes of pure acetone or a proprietary organic solvent and allow to dry thoroughly.

After cleaning, handle the components only with nylon gloves.

Reassembly

1 Hold the gauge head body upright; insert the first baffle cup, base first.

2 Insert the second cathode cup, base first.

3 Insert the third cathode cup, open end first.

4 Insert the spring.

5 Seat the O-ring on the shoulder of the flange of the anode assembly. Put the earth cap on top of the anode assembly, taking care that the anode rod engages the socket centrally.

6 Hold the anode assembly and earth cup together by their flanges. Carefully thread the anode rod through the central holes of the cathode cups.

7 Lower the assembly until the O-ring locates in the groove around the top of the body.

8 Check that the sealing surfaces are coaxial and well seated, then screw on the top nut hand tight.

Anode rod

In dismantling and reassembly, care must be taken not to bend the anode rod. To check that the rod is straight and central, assemble the head without the baffle cup and inspect the interior through the open end of the body tube.

If necessary the rod may be realigned; do not strain the glass to metal seal.