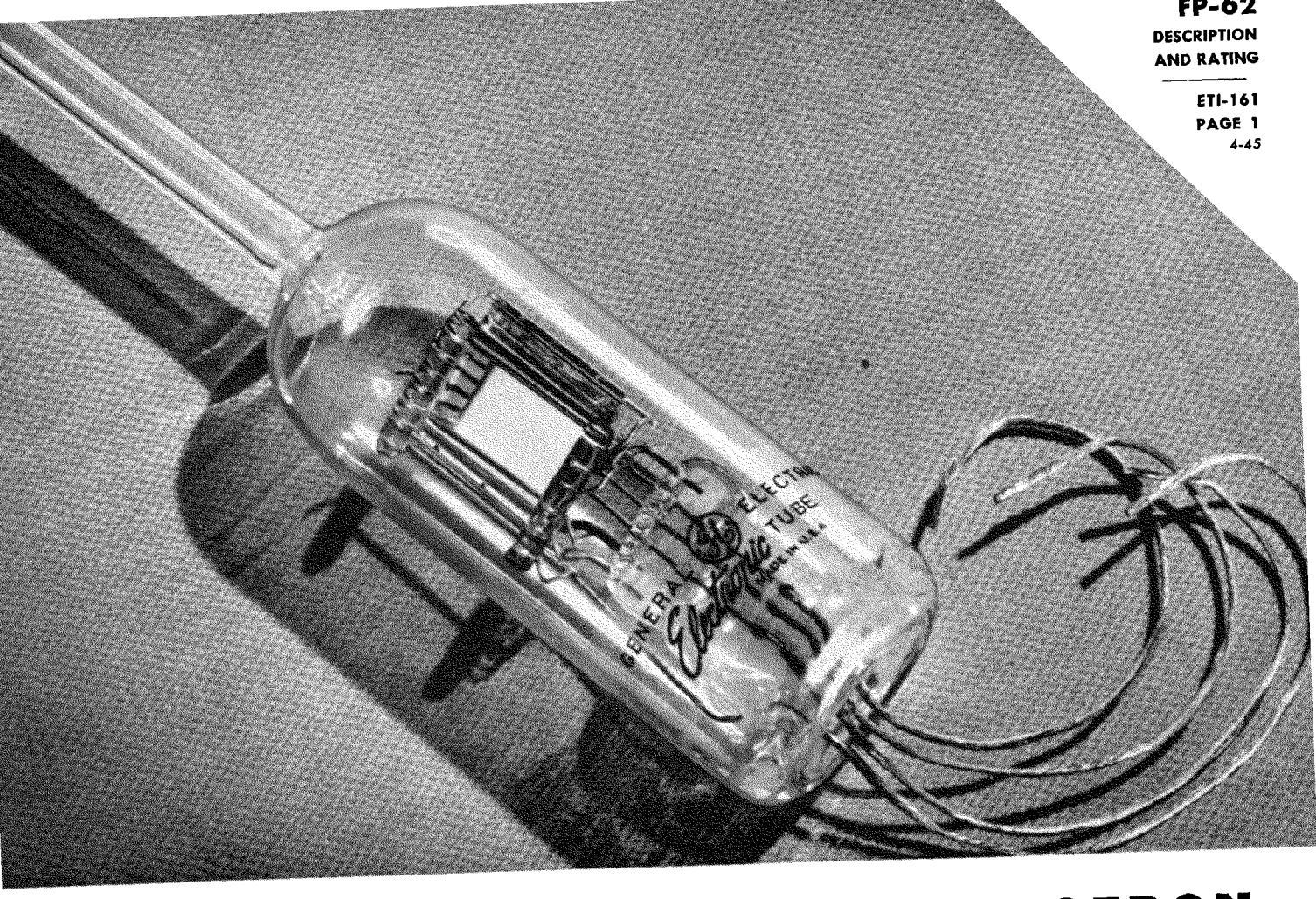



# PLIOTRON

## DESCRIPTION

The FP-62 ionization gage embodies several unique design features which make this tube an efficient and reliable device for the measurement of gas pressures.

Stem leakage is entirely eliminated by mounting the plate, which serves as the positive ion collector, on glass beads and by bringing the plate lead out through the side of the stem. The grid, which serves as the "anode," and the filament, are mounted in the usual manner with the grid between the collector and the filament. The measurement of the small ionization currents associated with low pressures is made possible because of design features which result in high insulation resistance of the collector circuit. Since both the plate and the grid are made of molybdenum and have smooth surfaces, they may be heated to a temperature high enough to drive out all occluded gas within a reasonable time and can readily be heated by bombardment, in case high-frequency heating equipment is not available.

Freedom of the filament from contamination by ordinary gases is assured by its pure tungsten composition. To withstand the effects of flexing in service, the leads to the electrodes are made of a special stranded cable.

For most measurements, where up to twenty per cent error may be tolerated, the sensitivity figures given below may be used. For more accurate measurements, however, the gage should be calibrated with a McLeod gage each time it is installed.

The FP-62 will accurately and conveniently measure gas pressures over a range of 100 microns to as low as 0.001 micron. Not only is it sufficiently sturdy for general use, but it is also sensitive enough for the most delicate measurements.

This gage has a high sensitivity characteristic and, since the parts are rigidly mounted, it will hold its calibration to a very close degree.

## TECHNICAL INFORMATION

### GENERAL CHARACTERISTICS

| | | |
|---|---|---|
| Number of electrodes | 3 | |
| **Electrical** | | |
| Filament—pure tungsten | | |
| Normal voltage, approx. | 4.5 | volts |
| Normal current, approx. | 1.48 | amperes |
| Maximum current | 1.68 | amperes |
| Normal operating conditions | | |
| Collector voltage | −22.5 | volts |
| Grid voltage | 112.5 | volts |
| Grid current | 10 | milliamperes |
| Average sensitivity (collector current per micron of pressure of dry air at normal operating conditions) approx | 40 | microamperes |
| **Mechanical** | | |
| Bulb material | | hard glass |
| Maximum "bake-out" temperature | 500 | centigrade |

### TYPICAL CALIBRATION

| | | |
|---|---|---|
| Grid voltage | 112½ | volts |
| Collector or plate voltage | −22½ | volts |
| Grid current | 10 | milliamperes |

| Gas | Collector Current in Microamperes per Micron Pressure |
|---|---|
| Helium | 5.6 |
| Neon | 9.0 |
| *Nitrogen | 39.5 |
| Argon | 54.0 |

* The value given for nitrogen is correct for dry air since the oxygen cleans up when the filament is lighted.

## INSTALLATION AND OPERATION

INSTALLATION: The FP-62 is of hard glass and may be used on either hard- or soft-glass systems. When it is sealed to a soft-glass system a graded seal must be used. The gage is furnished exhausted and sealed off and with a tubulation for sealing it into the system. The gage should be kept in this form until it is ready to be used. The end of the tubulation is then cut off and the gage sealed into the system, care being taken that no constriction is formed between the bulb and the system. For accurate results, the gage should be placed as near as possible to the point at which the pressure is to be measured. The gage should be mounted with its axis vertical. The stem may be either up or down, whichever is more convenient. Since, in sealing the gage into the system, the end of the tubulation is cut off and air is let in, it is necessary to exhaust and degas the gage before it can be used. For this reason the gage is furnished unbased to permit its being baked out.

Where high voltages are used in the system and where there is a possibility of a gaseous discharge to the electrodes of the gage, a wire or guard ring should be inserted in the seal when sealing to the system. This wire or guard ring should then be well grounded.

Care should be taken against shorting the leads while anyone is working around the system. The entire collector circuit should be well insulated to prevent the introduction of external sources of leakage. The glass around the collector lead should be clean so that there will be no leakage at that point.

For working at low pressures it is necessary to degas the gage thoroughly. At these low pressures the gas occluded from the metal parts and from the glass may cause the gage to read higher than the actual pressure in the system. Before the gage is used, it should be degassed as follows:

1. Bake out with the rest of the system (do not exceed 500 C).
2. Connect the grid and plate leads to the positive 500-volt d-c supply.
3. Bombard at 1000 C plate temperature for 20 minutes. This is accomplished by regulating the filament voltage to give approximately 40 to 80 milliamperes total current.

Note: Only a d-c voltage supply should be used in this operation.

OPERATION: Measurements are taken with the gage by placing a positive voltage on the grid and a negative voltage on the collector. The filament voltage is increased until the grid current reaches the desired value. The negative current to the collector is then a measure of the gas pressure.

The calibration curve of the gage is nearly a straight line, especially at pressures below one micron. By checking a few points of collector current and gas pressure against a McLeod gage, the curve can be plotted and extrapolated down to

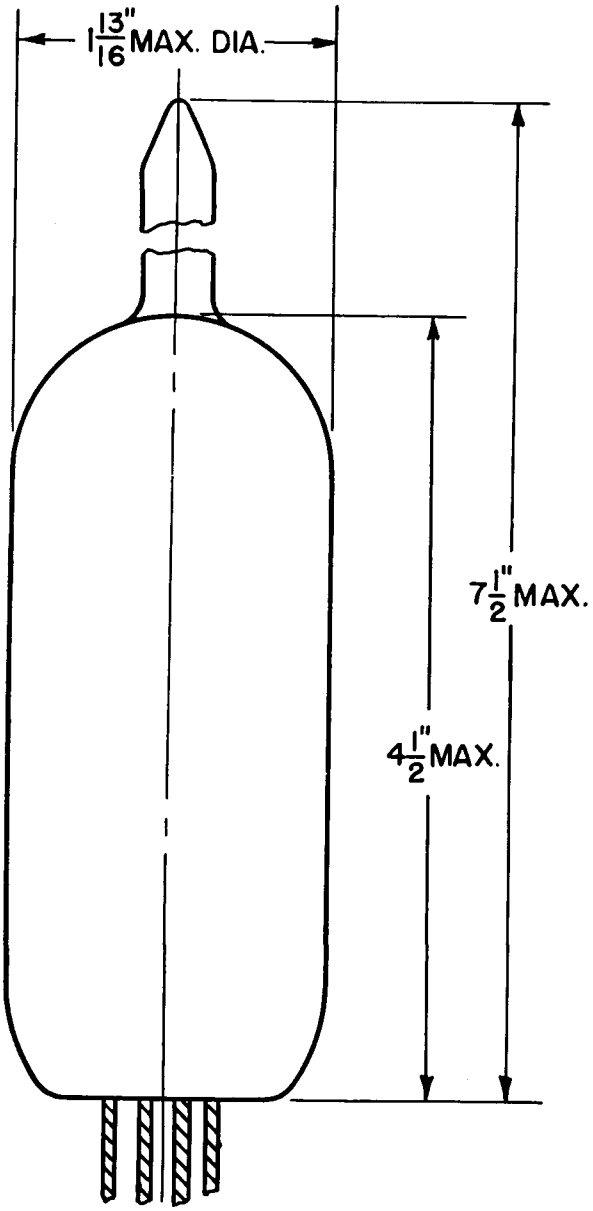
zero current at zero pressure. Typical calibrations for various gases are shown on page 2.

It can reasonably be expected that, as long as the arrangement of the electrodes of the gage remains unchanged, the calibration will also remain constant. Excessive overheating during degassing or rough handling may warp or change the relative positions of the electrodes. Leakage arising in the collector circuit can also cause a change in the calibration. This, however, can be detected by looking for a residual leakage current with the filament cold.

## OPERATING NOTES

The filament should not be lighted until the pressure has been reduced to a low value. Care should be taken during bombardment that the gas evolved does not cause the current to increase steadily until the filament burns out or the electrodes are warped. A series resistor will be found satisfactory for avoiding such trouble. As a further precaution, bombardment should not begin until the pressure is below one micron.

In taking readings at extremely low pressures, there are two sources of inaccuracy which may be present. The gage will clean up the gas slowly and give too low a reading. Furthermore, the rate of flow, or rather drift of gas, at low pressure is slow and the gage may read high or low depending on which way the pressure is changing. For best results it is recommended that the filament be turned off and the system allowed to equalize for several minutes. Following this period of equalization the filament should again be lighted and a reading taken as soon as possible.




OUTLINE
FP-62 PLIOTRON

K-4903555

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