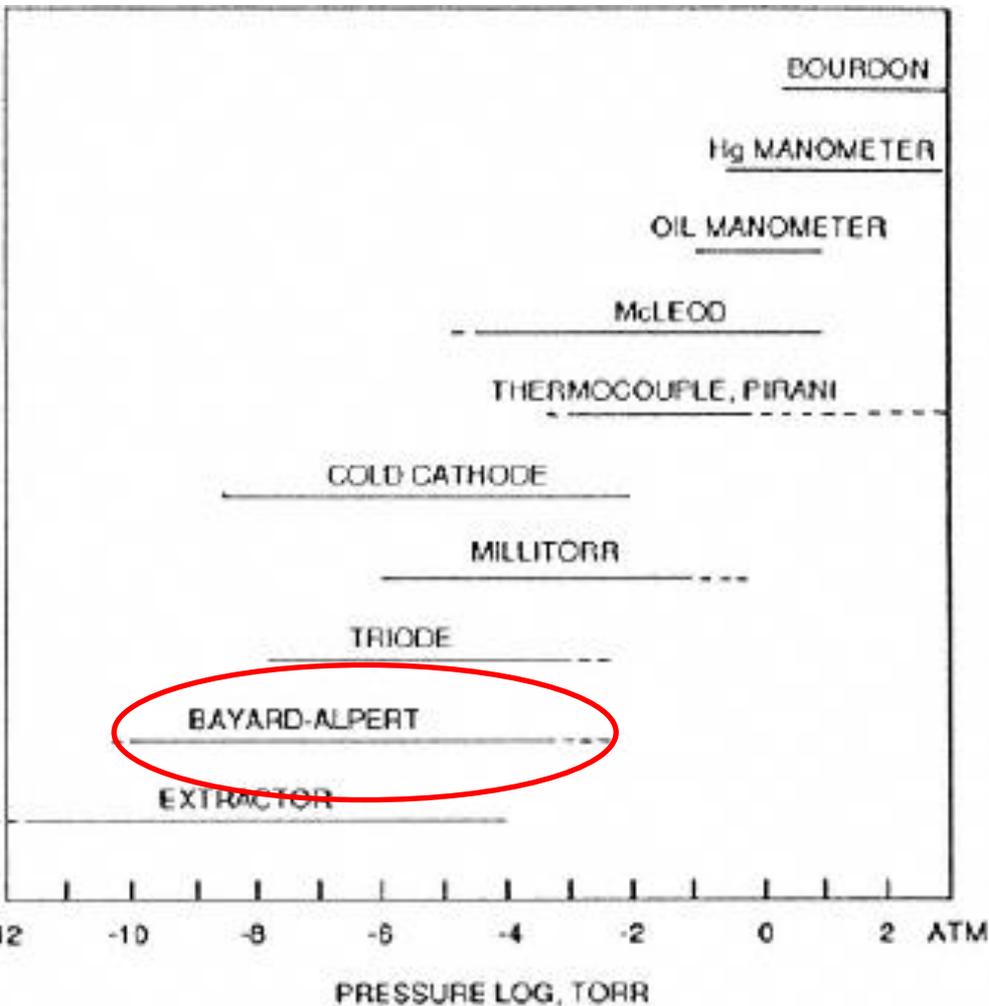


B-A Gauge **(Bayard-Alpert Gauge)**

Radha Gobinda Bhuin
CY10D047
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Introduction:



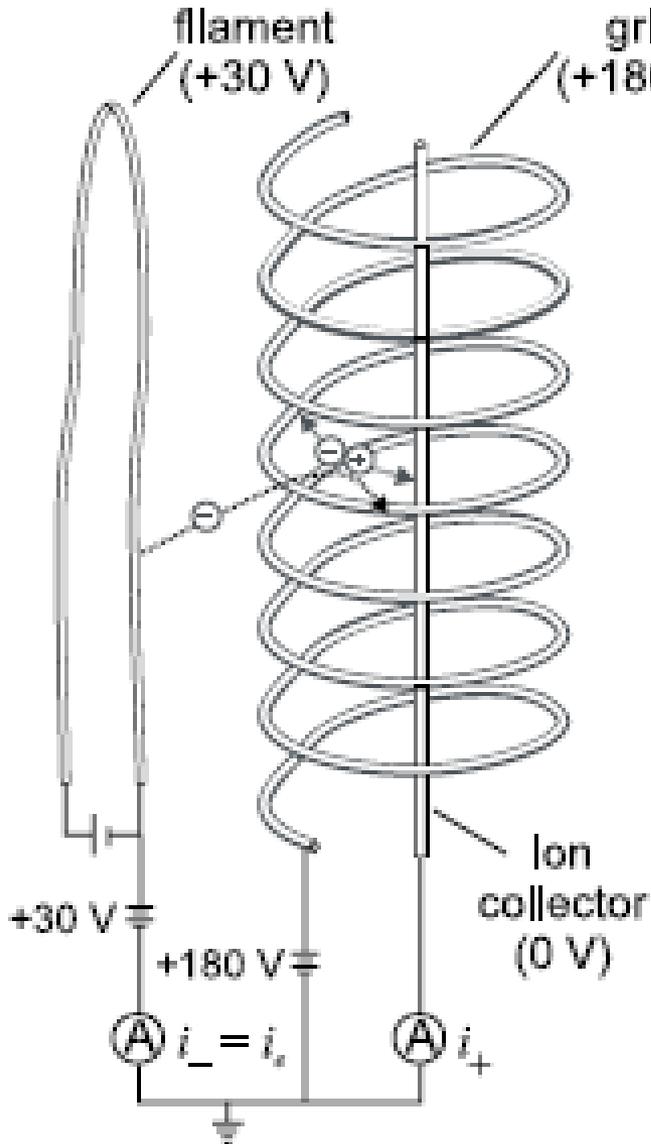
❖ B-A (Bayard-Alpert) gauge is a kind of vacuum gauge which works in high to ultrahigh vacuum.

❖ B-A gauge ionizes the gas molecules within the gauge volume, collects those ions on a thin ion collector wire, and measures the resulting current to the ion collector to determine the number of molecules present and indicates a pressure based on that measurement.

❖ The Bayard-Alpert gauge was invented by R.T. Bayard & D. Alpert in 1950 to overcome a limitation in vacuum pressure measurement by the triode gauge.

❖ The solution proposed by Bayard and Alpert was to reconfigure the collector and grid of the triode gauge to lower the current from the X-ray effect.

Operating Principles of Bayard-Alpert Ionization Gauges:



❖ A B-A gauge is a hot filament style ionization gauge.

❖ Filaments are yttria-coated iridium, thoria-coated iridium, or uncoated tungsten.

❖ Hot filament (cathode) emits electrons.

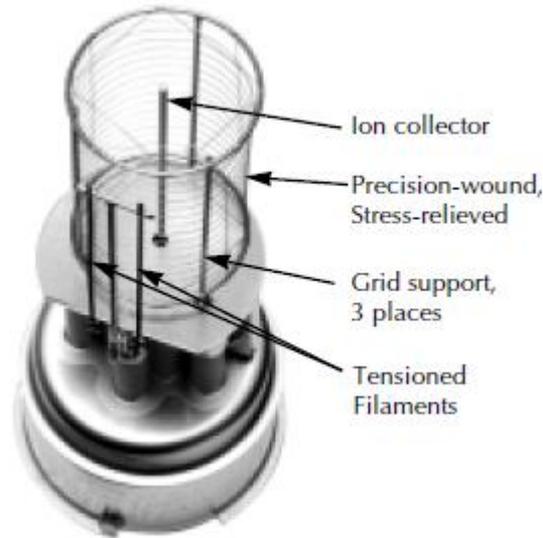
❖ Molecules are ionized and collected.

❖ Pressure reading is determined by the electronics from the collector current.

❖ As the pressure indication is linear, the hot cathode B-A gauge is generally considered to be the most accurate continuous indicator for pressures below 1×10^{-3} Torr.

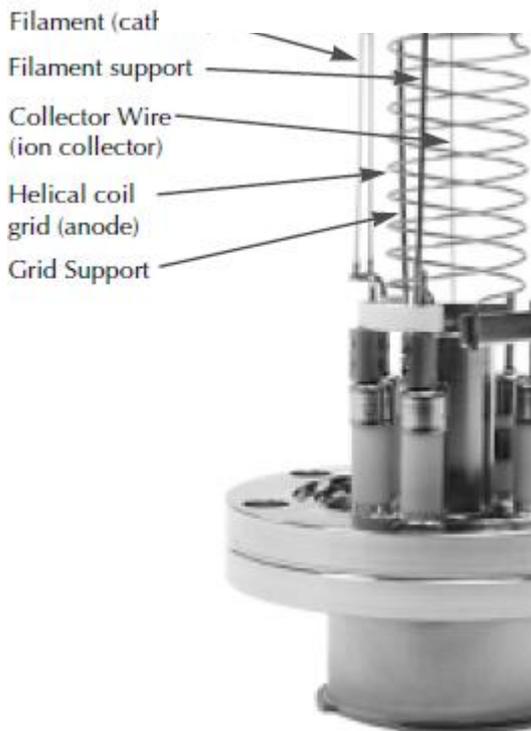
X Ray Limit of Bayard-Alpert Gauges:

- ❖ The low end of the operating range of a B-A gauge is determined by the X-ray limit of this type of gauge.
- ❖ X-rays are produced when the electrons emitted by the cathode impact the grid (anode).
- ❖ Because of the geometry of the B-A gauge, only a small fraction of the X-rays emitted from the grid are intercepted by the ion collector.
- ❖ When the X-rays strike the collector they cause electrons to be photoelectrically ejected from the collector. This photoelectron current from the ion collector is detected the same as positive ions arriving at the ion collector and consequently adds to the ion current.
- ❖ X-ray current limits the pressures that can be measured, and is equivalent to a pressure reading in the 10^{-10} to 10^{-11} Torr ranges.
- ❖ The X-ray limit refers to the lowest pressure indication that may be obtained in a gauge when all the output current is due to X-ray induced photoemission and there is an absence of gas.



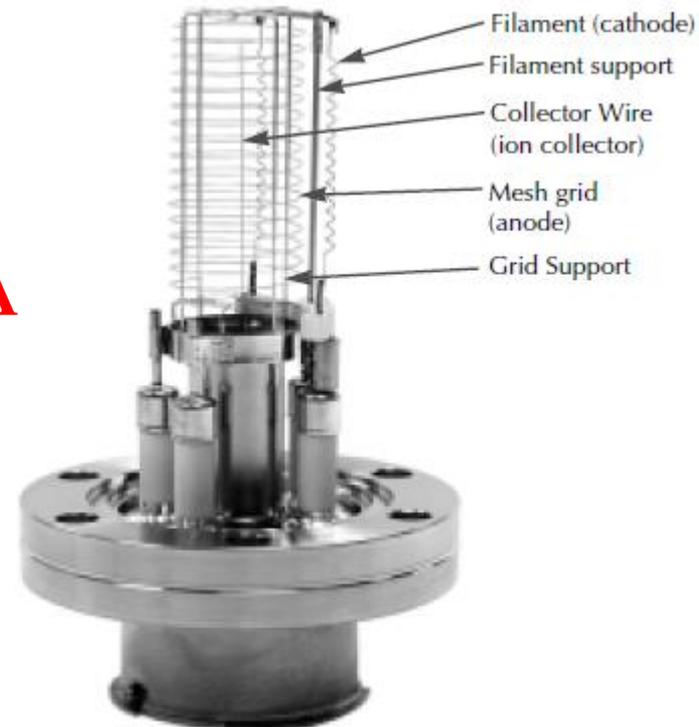
Glass B-A Gauge

STABIL-ION® Gauge



Nude Bayard-Alpert Gauge with thoria-coated iridium filament

Different types of B-A gauges



UHV Nude Bayard-Alpert Gauge with dual tungsten filaments

Degassing Bayard-Alpert Gauges:

- ❖ There are two types of degassing techniques: Electron Bombardment (EB), and Resistive.
- ❖ EB degas must be used for UHV nude gauges with fine-wire mesh grids and can also be used for glass or nude gauges with helical coil grids.
- ❖ Resistive degas can only be used for gauges with helical grids.

Advantages and disadvantages:

- ❖ B-A gauges are capable of measuring pressures between 10^{-2} and 10^{-10} Torr. They produce gas dependent readings.
- ❖ Accuracy is good of the B-A Gauge. However, due to increased outgassing, a bakeout and/or degassing are often required to achieve the full advantage with the B-A gauges.
- ❖ In most cases, a longer delay is required to obtain a stable reading from a B-A gauge.
- ❖ B-A gauges are more easily calibrated because of their linear response to pressure.



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Thanks