

## 720 SmartLine Pressure Measurement

Allectra is pleased to offer the **SmartLine** range of pressure measurement systems from Thyracont.

**SmartLine** is available with: i) Pirani, cold cathode, or a combined Pirani/hot and Pirani/cold cathode gauge, ii) a variety of mounting flanges, iii) with or without on-device display.

Gauges with on-device displays can be configured with a SLN4 power supply for a cost-effective and compact pressure monitoring solution. All gauges have an RS485 interface.

### Power supplies:

- On-device display versions only need the SLN4, no further cable is needed.
- Devices without display need a VD12S2 or VD14S4 (2 or 4 channel respectively) controller. The VD14S4 is new and sacrifices some interfaces to make space for the extra channels. Both VD12S2 and VD14S4 need an interface cable (W1515006) for every device to be controlled. These can control all of the SmartLine gauges, including those with on-device display.

### Overview:

720-xxxxxxx	Rough vacuum		UHV/high-vacuum		Full range	
Range	1000mbar - 1x 10 <sup>-4</sup> mbar (5x10 <sup>-4</sup> mbar for VCP)		2x10 <sup>-3</sup> mbar - 5x 10 <sup>-9</sup> mbar		1000mbar - 5x 10 <sup>-10</sup> mbar (VSH) 1000mbar - 5x 10 <sup>-9</sup> mbar (VSM)	
Gauge Type	with display	no display	with display	no display	with display	no display
<b>Pirani</b>	KF16 CF16	VSP63DL VSP64DL	VSP63D VSP64D			
<b>Pirani corrosive media</b>	KF16 CF16	VCP63DL VCP64DL	VCP63D VCP64D			
<b>Cold cathode</b>	KF25 KF40 CF40		VSI17DL VSI18DL VSI19DL	VSI17D VSI18D VSI19D		
<b>Combined Pirani/ hot cathode</b>	KF25 KF40 CF40				VSH87DL VSH88DL VSH89DL	VSH87D VSH88D VSH89D
<b>Combined Pirani/ cold cathode</b>	KF25 KF40 CF40				VSM77DL VSM78DL VSM79DL	VSM77D VSM78D VSM79D
<b>Power supply / Controller</b>	SLN4	VD12S2 or VD14S4	SLN4	VD12S2 or VD14S4	SLN4	VD12S2 or VD14S4
<b>Cable</b>	X	W1515006	X	W1515006	X	W1515006



VSM79DL



VSM79D

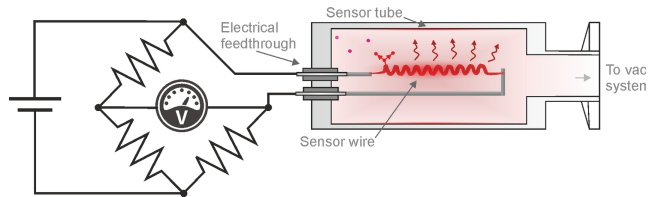
For illustration:

## Different Pressure Measurement Gauge Types

- A **Pirani** pressure measurement sensor is used for rough or pre-vacuum.

It functions by maintaining a heated filament at constant temperature in vacuum; the power (current) needed to maintain that temperature is proportional to the vacuum level.

Heat loss is through conduction; conduction is pressure dependent. The current needed to maintain constant temperature reduces as pressure reduces, pressure calibration is from the current. The lower pressure limit of Pirani technology is in the  $10^{-4}$ mbar range.

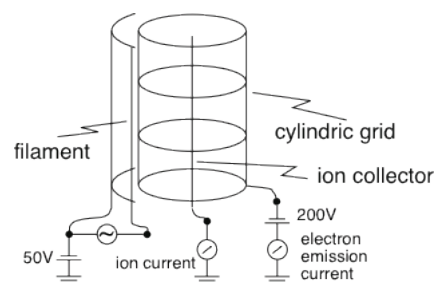


from <https://sens4.com/pirani-working-principle.html>

- An ion gauge is used for high and ultra-high vacuum

A **hot cathode ion gauge (Bayard-Alpert)** has a filament, high-voltage grid and collector. The filament emits electrons, they accelerate toward the grid and as they travel through the vacuum they collide with the few atoms & molecules present, ionising them (making ions). These ions arrive at the collector, which detects a current proportional to the number of ions arriving. As the current is dependent on the number of ionised molecules arriving at the collector, which itself depends on the number of atoms & molecules present in the vacuum, a lower current indicates a lower vacuum.

Because the filament is 'heated' it is considered a hot cathode gauge.



[https://philiphofmann.net/ultrahighvacuum/ind\\_iongauge.html](https://philiphofmann.net/ultrahighvacuum/ind_iongauge.html)

A **cold cathode ion gauge (Penning)** uses an electrical and magnetic field to 'pull' the electrons from the filament; thus it is considered 'cold'. The ionisation occurs in the electrical and magnetic field, and the collector collects ions and gives a current measurement proportional to the pressure, similarly to the hot cathode gauge.

Further reading:

<https://www.thinksrs.com/downloads/pdfs/applicationnotes/IG1hotapp.pdf>

Ion gauges are available as 'enclosed' and 'nude' gauges. Nude gauges offer slightly lower lowest pressure, but because ion gauges emit electrons (and some x-rays) they can be incompatible with some sensitive experiments. Thyracont gauges are enclosed so they do not expose the vacuum chamber to the sensor's emitted particles.

**Hot vs Cold Cathode:**

	<b>Hot Cathode</b>	<b>Cold Cathode</b>
<b>Pressure sensitivity</b>	Better	Worse
<b>Pressure range</b>	Better	Worse
<b>Filament lifetime</b>	Worse	Better
<b>Compatibility with in-vacuum gas dosing</b>	Worse	Better
<b>Robustness</b>	Worse	Better

At lowest pressure the hot cathode gauge has better sensitivity and thus reaches a lower range than the cold cathode gauge.

SmartLine also offers a version of a Pirani to be used in aggressive media (corrosive gases). The standard filament is substituted with a chemically more resistant Pt/Rh (Platinum/Rhodium) filament.



720 SmartLine Pressure Measurement Range