

Using the Series 360 *STABIL-ION*® Extended Range Gauge with Granville-Phillips Vacuum Gauge Controllers

Series 303, 307 (EB Degas Only), and 350



Series 360 *STABIL-ION* Gauge and Cable



Series 307 Vacuum Gauge Controller



Series 350 UHV Ionization Gauge Controller



Series 303 Vacuum Process Controller

This Bulletin discusses the wiring details, parts, and adjustments required for connecting the Series 360 *STABIL-ION* Gauge to compatible Granville-Phillips Vacuum Gauge Controllers (VGCs). Proper gauge emission current and sensitivity settings are given, as are guidelines for degassing the *STABIL-ION* Gauge.

The information, recommendations, descriptions, and safety notations in the Application Bulletin are based on Granville-Phillips' experience and judgment with respect to the subject application. If further information is required, please contact Customer Service at the location listed on the back of this bulletin.

The chart on the back page shows which Granville-Phillips Controllers can operate the Series 360 *STABIL-ION* Extended Range Gauge (Catalog No. 360120.) For proper electrical connections, Series 360 Gauge Cables (Catalog Nos. 360112 through 360117) must be used. Other cables cannot be safely modified to operate the *STABIL-ION* Gauge.

The two adjustments required for pressure readout accuracy are **Emission Current** and **Sensitivity**.

Emission Current Adjustments

Using the chart, adjust emission current to one of two values, depending on the vacuum system pressure being read:

for 2.0×10^{-2} to 5.0×10^{-8} Torr:
use **0.1 mA emission current** (I_e)

for 5.0×10^{-4} to 2.0×10^{-10} Torr
use **4.0 mA emission current** (I_e)

While other emission currents can be used, this alters the sensitivity of the *STABIL-ION* Gauge,

causing changes that lessen accuracy in the pressure readout.

(Note that Series 360 Cables operate both gauge filaments simultaneously.)

Sensitivity Adjustment

At the two suggested Emission Currents, *STABIL-ION* Gauge sensitivity for air/nitrogen is:

<u>Emission Current</u>	<u>Sensitivity</u>
0.1 mA	46/Torr
4.0 mA	42/Torr

The *STABIL-ION* Gauge sensitivity is about 4.5 times greater than typical glass gauges (10/Torr) and about 2 to 5 times the sensitivity of commonly-used "nude" gauges (25/ or 10/Torr). Adjusting VGC sensitivity to one of the two values above ensures that the pressure indication from the *STABIL-ION* Gauge is not in error by a factor of 2 or 5 (see your Operating Manual for complete instructions on adjusting sensitivity.)

Controller	Sensitivity	Emission Current	Degas
307 & 350 Note: With the 350 VGC, use only the left "Gauge 1" side of the front panel switch to light the filaments. The "Gauge 2" position will not operate the Gauge.	<ul style="list-style-type: none"> Open front panel display door by turning the right screw CCW. While the Gauge is off, flip "Cal" switch to the left. Adjust the top display reading using a small screwdriver in the "Sensitivity" adjustment CCW so that the display reads 4.6^{+1} (46/Torr at .1 mA), or 4.2^{+1} (42/Torr at 4 mA). (See the emission/sensitivity table on the front page.) <p>For the 307 UHV model, repeat the above for IG2, using the right "Cal" switch position.</p>	<ul style="list-style-type: none"> With the front panel display door and the "Cal" switch still to the left, flip the "I_e Range" switch to the left-most ".1" position. Turn on the Gauge Filament and confirm that the display reads 1.0^{-4} (mA). If not, adjust the "I_e Adjust" setting with a screwdriver to read 1.0^{-4}. For 4.0 mA Emission, place the "I_e Range" switch in the 10.0 position, and adjust the "I_e Adjust" CCW to read 4.0^{-3}. Place the "Cal" switch back to the center position and close the door. <p>For the 307 UHV model, repeat the above for IG2, using the right "Cal" switch position.</p>	<ul style="list-style-type: none"> Series 307 with EB Degas circuit 307005: Automatically supplies 40 watts degas power. Series 307 with UHV: Degas is adjustable up to 40 watts. Series 307 Standard: Degas power will be affected by emission setting, e.g. at 0.1 mA, power = 16 W at 4 mA, power = 40 W. Series 350: Automatically supplies 40 watts degas power.
303	Program in the desired Sensitivity setting using Function 21. Be sure to program IG1 and IG2 if <i>STABIL-ION</i> Gauges are used on both channels. (See Section 3-45 in the Series 303 Instruction Manual.)	Using Function 12, set "Maximum Emission Current" to either 0.1 or 4.0 ma. Using Function 36, "Fix Emission Current" so that it does not automatically range (vary). (See Section 3-36 in the Series 303 Instruction Manual.)	The 303 VGC can be programmed to supply higher degas power, but the factory default setting is for 40 watts degas power. Please ensure, by using Function 7, that "Maximum Degas Power" is set to 40 watts and no more.

More about Degas:

The VGC must have Electron Bombardment (EB) Degas to degas the *STABIL-ION* Gauge. A maximum of 40 watts degas power is recommended to avoid filament damage.

Proper degas time depends on the water vapor load or contamination level inside the Gauge. We generally recommend 10 to 20 minutes degas time. The vacuum system pressure must be below 5.0×10^{-5} Torr before our VGC circuits allow degas to begin. A rough pressure indication is generally seen on the pressure display during degas (depending on the VGC model). When the pressure indication levels off after an initial rapid rise and fall, cleaning is complete, and degas may be switched off.

The Effects of Improved Accuracy and Stability

After using conventional hot cathode gauges tubes that are accurate to about $\pm 25\%^*$ of reading, or cold cathode (Inverted Magnetron) gauges that can be inaccurate by $\pm 75\%^*$, the far more accurate pressure reading provided by the *STABIL-ION* Gauge can be a surprise, and different than expected. In some cases it is necessary to re-characterize the process steps to accommodate to the new, more accurate pressure measurement. This is a normal event, and is to be expected.

In other situations, depending on the vacuum system process steps and contamination level, the pressure read-out characteristics may not be significantly different than previously experienced.

* P.C. Arnold and S.C. Borichevsky, J. Vac. Sci. Technol. A 12 (2) 568 (1994).

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