SmartTrak 100 Ultra-High Pressure

Safety Guide

This Safety Guide is applicable for SmartTrak® 100HP Ultra-High Pressure Mass Flow Meters and Controllers.

Ultra-High Pressure Safety

Operating equipment under very high pressures does have safety risks of which you should be aware. This guide is intended to educate the end-user in general terms of the risks of high pressure applications and is not a complete registry of all high pressure do's and don'ts. It is recommended that end-users educate themselves on the specifics of their application and read any information their employer provides on the subject.

Please read this Safety Guide in its entirety, the Quick Install Guide, and refer to the SmartTrak 100 Series Instruction Manual, Chapter 2 for complete installation and operation instructions.

Ultra-High Pressure Specifications

The 100HP mass flow controller or meter can be used for a variety of flow rates, pressure drops, inlet pressures, and gas types. However, each unit must be tuned specifically for each of these different applications. The 100HP is rated to 5000 psig (345 barg) operating pressure, 7500 psig (517.1 barg) burst pressure (**unless otherwise listed** on the enclosure data label). You must know the capacity of each specific model, as it will vary for specific gases and applications.

Warning!
The working pressure is stated on the flow meter and controller label. Check label and process pressure before installing in the line. If the pressure values listed do not match that of your application, the instrument should **not** be used. **Consult the factory** for the next steps.

Specified leak rate maximum: As little as 4 sccm at 5000 psid (345 bard) with a maximum of 5% of full scale flow**.** Sierra recommends the use of a positive shut-off valve in series with the 100HP. Make sure the Cv of the shut-off valve is sufficiently large so as to not cause a choked flow condition at rates less than the full scale of the 100HP.

Gas Cylinder Pressure Specifications

No mass flow meter or controller is universally functional for every application and this is particularly true when dealing with pressures above 1500 psig (103 barg). The 100HP is designed to be used at or below 5000 psig (345 barg).

Thus, the 100HP is fully capable of controlling GSA standard, lower-pressure gas cylinders. However, some gas cylinders can reach pressures exceeding 6000 psig (413.7 barg) and therefore are not incompatible with the 100HP. While the 100HP is designed for use with most gas cylinders, never use the 100HP to control pressures exceeding 5000 psig (354 barg).

It's important to note that gas properties are pressure-dependent. *All pressure ratings are based on compressed nitrogen,* and many gases cannot be used with the 100HP at 5000 psig (345 barg). Oxygen is a good example of this. Please consult the data label of your meter or controller for the most specific ratings, or *consult the factory.*

Pre-Installation Safety Procedures

1. Please read all instructions and cautionary markings on the instrument, as well as all appropriate sections of the SmartTrak 100 Series Instruction Manual, Chapter 2 and Appendix D before using this product.
2. General operation, display interface, PC software and electrical installation are same as a standard SmartTrak 100 Series mass flow meter and controller.
3. Verify proper connection of all pressure sources and electrical signals prior to applying pressure or power to the 100HP. See SmartTrak 100 Series Instruction Manual, Chapter 2 for complete installation and operating instructions.

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4. **Pressurization Procedures**

Warning!
Always bleed your pressure line down to atmospheric pressure BEFORE installation.

- Slowly apply pressure to the system. Open process valves slowly to avoid flow surges. When applying pressure to the system, take care to avoid unnecessary pressure shocks in the system.
- Check for leaks around the meter inlet and outlet connections. If no leaks are present, bring the system up to operating pressure.
- **Never test for leaks with a liquid leak detector**. If liquid seeps into the electronics or the sensor compartment, the instrument may be damaged. Instead, use a pressure---decay test (if liquid MUST be used at all, limit it to the fittings and keep it off the body of the instrument).
- Increase pressure gradually up to the level of actual operating conditions. *Follow standard practice for pressurized systems.*

Warning!
Do not operate this instrument in excess of the specifications listed on the data label, in this addendum, or in the SmartTrak 100 Series instructional manual. *Failure to heed this warning can result in equipment damage, failure, serious injury or death.*

5. Apply power only after reviewing wiring diagrams in the SmartTrak 100 Series Instruction Manual, Chapter 2 .
6. **Do not apply power to the output loop.** This is NOT a loop-powered device.
7. Apply gas flow only after checking plumbing connections for leaks.
8. Field service of this unit by the customer voids this unit's warranty and is not advised. Send unit to Sierra Instruments for service.

Warning!
If this equipment is not properly serviced, serious personal injury and/or damage to the equipment can result from the potentially high operating pressures. *Please insure that the process line pressure is removed prior to* removal for *service.*

Pressure Drop & Hyper-Cooling Cautions

For specific minimum required pressure drops for given flow rate, gas and known inlet pressure, consult the factory. Flow of high pressure gases through a constriction causes cooling, because the gas robs latent energy as it transitions energy from potential to kinetic. This is a function of compressibility, the heat transfer coefficient, thermal expansion coefficient, and other gas properties. Simply put, as gas expands rapidly, it cools down. This effect is known as hyper-cooling or more technically known as the Joule-Thomson effect.

This effect is magnified by the flow rate vs. pressure, with the largest magnitude of hyper-cooling occurring in cases of high flow rates with large pressure drops across the flow meter or controller control valve. For best accuracy and performance, it is recommended that a form of thermal packing, gas temperature conditioning, convective heating, or line heating be employed to mitigate this effect. ***Sierra is not responsible for variation in calibration due to gas or system conditions.***