SERIES MTG

Mini TUFF GUARD® Isolators

Installation Instructions

⚠ IMPORTANT SAFETY INFORMATION

Read all instructions carefully before installation. Ensure system is depressurized before beginning work. Use appropriate personal protective equipment (PPE) when handling chemicals or pressurized systems. Verify chemical compatibility of all materials with your specific application.

⚠ DRY CHLORINE GAS WARNING

Mini TUFF GUARD Isolators are NOT recommended for dry chlorine gas service. Since thermoplastics are made from hydrocarbon-based materials, most plastics—including PVC, CPVC, and PP—will react chemically with dry chlorine. These reactions can be vigorous and dangerous, potentially resulting in the uncontrolled release of chlorine gas.

This restriction applies to dry chlorine in either the liquid or gaseous phase. *Chlorinated water (wet chlorine) is acceptable*—when moisture is present, these materials exhibit better chemical tolerance. For dry chlorine applications, consult Marquest Scientific for alternative solutions.

PRE-ASSEMBLED UNITS

If you purchased your Mini TUFF GUARD Isolator with an instrument pre-installed from Marquest Scientific, the assembly has already been filled and is ready for use. **Skip directly to Section E: System Installation.**

Section A: Materials of Construction

Component	Material Options
Body	PVC, CPVC, PP, or PVDF
Diaphragm (Media Side) - Wetted	PTFE/FKM Composite (Virgin PTFE)
Diaphragm (Instrument Side) - Non-Wetted	FKM

Compatible Instruments

The Mini TUFF GUARD Isolator is designed to work with a variety of pressure-sensing instruments:

- **Analog Pressure Gauges** – 2.5" diameter (63mm) dial case or smaller only
- **Compact Pressure Transmitters**
- **Compact Pressure Transducers**
- **Compact Pressure Switches**

⚠ INSTRUMENT SIZE RESTRICTION

Mini TUFF GUARD Isolators should ONLY be used with analog pressure gauges having a dial case diameter of 2.5 inches (63mm) or smaller. Larger gauges require more fill fluid displacement volume than the Mini TUFF GUARD can provide, which may result in inaccurate readings or gauge malfunction.

Section B: Filling the Upper Chamber (Isolator)

The upper chamber (above the diaphragm) must be filled with a liquid compatible with the instrument, isolator, diaphragm, and operating conditions.

Compatible Fill Fluids

- Aqueous glycerine (70% USDA 99.9% Glycerin / 30% Distilled Water) - Our standard fill
- Mineral oil
- Silicone oil
- Distilled water
- Fluorocarbon Oil (Halocarbon 4.2 Oil) - For use with oxidizers, halogens, and aggressive chemical service
- PFPE Lubricant (Krytox GPL 101) - For use with oxidizers, halogens, and aggressive chemical service
- Other compatible liquids as specified by your application requirements

Procedure

1. Locate the orifice at the bottom of the instrument thread.
2. Carefully add fill liquid through the orifice, taking care not to bridge the orifice and trap air in the upper chamber.
3. Continue filling until the liquid level is at or slightly above the O-ring instrument seal.
4. Inspect for air bubbles and repeat if necessary.

Section C: Filling the Instrument

The instrument internal cavity must be filled with the same fill fluid used in the isolator upper chamber. **Complete removal of air is critical for accurate pressure measurement.** Even a small air bubble (as small as a grain of rice) can cause significant measurement errors or gauge malfunction.

Select the appropriate filling method below based on your instrument type and accuracy requirements.

Instrument Type	Filling Difficulty	Recommended Method
Analog Gauge	More difficult – Bourdon tube can trap air at closed end	C.1 Manual method for general use; C.2 Vacuum method for high accuracy
Transmitter	Easier – Small cylindrical dead leg fills readily	C.3 Direct fill with orifice bridging
Transducer	Easier – Small cylindrical dead leg fills readily	C.3 Direct fill with orifice bridging
Pressure Switch	Easier – Small cylindrical dead leg fills readily	C.3 Direct fill with orifice bridging

C.1 Analog Gauges – Manual Fill (General Applications)

Analog gauges contain a Bourdon tube – a curved, sealed tube that straightens under pressure to move the pointer. The closed end of this tube can trap air, making complete filling more challenging than with electronic sensors.

Instrument Requirements: The bottom face of the ¼" NPT instrument thread should be flat and smooth with a ¼" maximum hole diameter.

Procedure:

1. Invert the gauge (dial face down).
2. Add fill fluid through the instrument orifice using a syringe or squeeze bottle.
3. To vent trapped air: Cover the orifice with your thumb while keeping the gauge face toward your palm.
4. Shake vigorously up and down to dislodge air bubbles from the Bourdon tube.
5. Remove thumb, add additional fluid to replace displaced air.
6. Repeat steps 3–5 until no more air bubbles emerge when shaking.

C.2 Analog Gauges – Vacuum Fill (High-Accuracy Applications)

Recommended when high accuracy is required or when the manual method fails to remove all air. Requires a vacuum filling station or manifold.

Procedure:

1. Connect the gauge to a vacuum manifold via the pressure port.
2. Place the fill fluid reservoir below the gauge in the vacuum chamber.
3. Evacuate the system to approximately 28" Hg vacuum (or as low as practical).
4. While maintaining vacuum, slowly rotate or manipulate the gauge to help trapped air escape.
5. Open the fill fluid valve to allow degassed fluid to be drawn into the evacuated Bourdon tube.
6. Slowly release vacuum and verify the gauge is completely filled.
7. Repeat evacuation and fill cycle if air pockets remain.

> ***Why Vacuum Filling?***
> Vacuum filling ensures complete air removal from the Bourdon tube. Under vacuum, trapped air expands and escapes more readily. When fill fluid is introduced under vacuum, it flows into the evacuated space without trapping air pockets. This is especially important for low-pressure ranges where even small air bubbles cause significant measurement errors.

C.3 Transmitters, Transducers, and Switches – Direct Fill

Electronic pressure sensors (transmitters, transducers, and switches) typically have a small cylindrical dead leg cavity below the actuating diaphragm. This simple geometry fills more easily than the curved Bourdon tube found in analog gauges.

Procedure:

1. Invert the sensor (process connection facing up).
2. Using a syringe or dropper, add fill fluid through the orifice until the cavity is full.
3. Gently tap the sensor body to release any trapped air bubbles.
4. Top off with additional fluid as needed.
5. **Bridge the orifice:** Apply a small amount of vacuum grease or petroleum jelly (Vaseline) across the orifice opening to create a temporary seal. This prevents fill fluid from draining during assembly.
6. Keep the sensor inverted until ready to assemble to the isolator.

> 💡 **TIP: Orifice Bridging**
> A thin film of vacuum grease or Vaseline across the sensor orifice acts as a temporary seal during the brief time needed to invert and thread the sensor into the isolator. The grease will be displaced during assembly

and dissolve into the fill fluid without affecting measurement accuracy. This technique is especially helpful when working alone or when precise fluid retention is needed.

CRITICAL NOTE

NEVER use thread sealant of any type on the instrument thread! The instrument seals on the O-ring provided at the bottom of the female instrument thread. This is a venting thread that allows pressure to escape during assembly.

Section D: Assembling the Instrument to the Isolator

Procedure:

1. Ensure both the isolator upper chamber and instrument are properly filled per Sections B and C.
2. Invert the filled instrument (for electronic sensors, the orifice should be bridged with grease).
3. Carefully align and thread the instrument into the ¼" NPT female venting thread on the isolator.
4. Continue threading until the instrument bottoms against the O-ring and increased resistance is felt.
5. **Hand tighten only.** Do not use tools to tighten the instrument connection.
6. Orient the gauge or sensor display for optimal viewing angle before final hand tightening.

Section E: System Installation

Procedure:

1. Apply 3 to 4 wraps of high-density PTFE thread sealant tape to the male thread of the isolator or the male thread of the system connection.
2. Join the instrument/isolator assembly to the system by threading together.
3. Tighten using the larger diameter of the upper chamber of the isolator OR the wrench flats provided on the lower chamber.
4. Verify the installation is leak-free before pressurizing the system.

⚠ WARNING

Do NOT tighten or loosen using the instrument. When removing the assembly from the system, use ONLY the wrench flats provided on the lower chamber. Using the instrument body or gauge case as a leverage point can damage the instrument or break the seal between instrument and isolator.

Section F: Quick Reference Summary

DO ✓	DO NOT ✗
Use gauges 2.5" (63mm) or smaller	Use gauges larger than 2.5" (63mm)
Fill chamber above O-ring level	Trap air in chambers or instrument
Remove all air from instrument	Use thread sealant on instrument thread
Use vacuum grease to bridge sensor orifice	Over-tighten with tools
Hand tighten instrument to isolator	Tighten or loosen using the gauge/sensor
Use PTFE tape on system threads	Use incompatible fill fluids or chemicals
Use wrench flats for removal	Skip leak testing after installation

Section G: Troubleshooting

Symptom	Likely Cause / Solution
Gauge reads erratically or sluggishly	Air trapped in system. Disassemble and refill using vacuum method for gauges, or repeat fill procedure for sensors.
Gauge needle doesn't return to zero	Air in Bourdon tube, or gauge may have been over-pressured. Try vacuum refilling. Replace gauge/ diaphragm if damage suspected.
Fluid leaks at instrument thread	O-ring damaged or missing. Check O-ring condition and reseat. Do not use thread sealant – it interferes with proper sealing.
Transmitter output drifts	Air in fill system or incompatible fill fluid. Verify fill fluid compatibility and refill system completely.