



## Safe and Efficient Testing = Gas Train Safety

Periodically Combustion Safety Inc. comes across little known safety items or procedures that can greatly enhance a plant's ability to safely maintain combustion equipment. We developed email-based Combustion Safety Program Updates to more completely get the word out. Let us know if this update helped.

Safe and efficient gas train component testing is everyone's goal. This article discusses the risks associated with various test methods and equipment to make testing easier and more accurate. Two possible approaches are discussed. One centers around the use of palm or 3-way valves for making access to gas train components easier. The other focuses on the use of momentary switches to make tightness testing of safety shut-off, blocking, and vent valves safer and easier to do.

### Basic High/Low Gas Pressure Switch Testing

There are numerous methods to test gas train pressure switches. These range from changing set points to removing switches for bench testing. Changing set points is the least desirable method but is often the easiest. When set points are temporarily changed a number of risk factors occur. These include the following:

- a. The technician may forget to reset the device to the original set point.
- b. The technician may not reset the device accurately.
- c. The device may not trip at the same system pressure despite the technician moving the scale back to the same point.
- d. The device may still not trip at its set point even though it has tripped at a different alternate test set point.

The most preferable method is bench testing. In this case, the device is actually removed from the equipment and tested with an external pressure source. This is expensive, time consuming, and carries with it another set of risks.

These include the following:

- a. The technician may mishandle the device during removal or reinstallation.
- b. The reinstallation could cause piping leakage.
- c. The removal and reinstallation may carry an electric shock risk.

Testing switches with an external pressure source while they are on a piece of equipment is also another method that bears consideration. In this case, the following risks need to be managed:

- a. The technician faces the possibility of damaging other components while pressurizing the system.
- b. The technician faces the risk of gas leaks and being exposed to natural gas.
- c. Air is injected into the piping system making for the possibility of a flammable mixture in the piping system.

### Palm or Three-way Valves To Enhance Testing Access

The use of momentary palm switches or 3-way valves to be retrofit to gas trains makes for the possibility of testing with an external pressure source while components are still installed. One must be very careful in the selection of the specific

momentary palm valve and be sure that it is approved by the authority having jurisdiction. This system is in use in a number of major facilities and has worked to enhance the quality of regularly performed testing.



Momentary Palm Valve

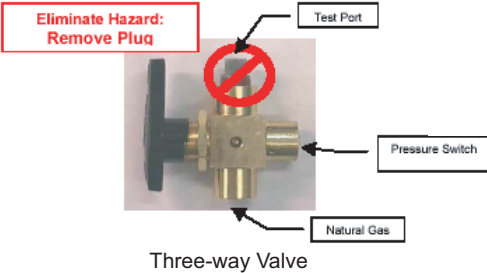
It is important to make sure that all equipment is properly locked out and made safe prior to attempting any testing.

When using the palm valve or 3-way system for testing low-gas pressure switches, one would close the main manual valve and leak test it. This would trap gas downstream of it between it and the safety shut-off valve (SSOV). By actuating (holding in) the palm valve the port would open draining a small amount of gas to the surrounding area. Likewise a 3-way valve could be positioned to perform the same function.

This would put the gas pressure immediately below the switch to atmospheric pressure. The unit



should then not be able to light off. In this case an external pressure source could then be connected to the vent port and with the palm valve being held open the switch could be pumped up to its set point in an accurate manner until a volt ohm or continuity tester indicated a switch trip. Likewise a 3-way valve could be positioned to perform the same function.



The proper installation of either palm valves or 3-way valves to enhance serviceability is critical to ending up with a safer more functional installation. If the installation is not done properly safety can be severely compromised. An important issue is how to comply with NFPA 86, section 5-2.10.

*5.2-10 Safety devices shall not be bypassed electrically or mechanically. This requirement shall not prohibit the safety device testing and maintenance in accordance with 5-2.5. When a system includes a "built-in" test mechanism that bypasses any safety device, it shall be interlocked to prevent operation of the system while the device is in the test mode, unless listed for that specific purpose.*

A palm valve or 3-way valve that has a vent port open to the low gas pressure switch sensing line drains away a small volume of gas and trips the switch. This prevents firing and serves as an interlock. Hence, the valve can not be left by mistake in a compromising position and the equipment run. If, on the other hand this same valve is installed on the high gas pressure switch, it can be left or failed in a position that allows for the switch function to be compromised. In this case, the vent being open on a high gas pressure switch line would

bleed off pressure in such a way that the switch would not accurately sense the gas train pressure.

In our opinion, the installation of these kinds of test valves only meets the intent of 5.2-10 when they are installed in such a way as to make for an interlock by having both switches (high and low gas pressure) taken off from the same sensing line.

When selecting a palm button valve or a 3-way valve for this kind of service, we have not found any that are listed for natural gas use. Instead we found many that are WOG, (water, oil, gas), rated. However, the WOG designation is not the same as having a specific rating for natural gas. NFPA 86 makes provisions for this in section 5.2-1 that reads as follows.

*5.2-1 All safety devices shall be listed for the service intended. Safety devices shall be applied and installed in accordance with this standard and the manufacturers instructions.*

*Exception: Where listed devices are not available for the service intended, the selected device shall require approval by the authority having jurisdiction.*

This means that if you choose to apply a palm or a 3-way valve you will need to get written approval by your insurer for not only the new configuration but the specific manufacturer of the valve.

When considering 3-way valves and palm valves make sure that you consider issues such as seals that are installed. In some cases, if you are using a fuel other than natural gas, corrosion and seal leakage can be an issue. For example, some landfill gasses and off gasses from refinery and chemical operations require special seal considerations.

In selecting between palm valves and 3-way valves each method has certain pros and cons. 3-way valves offer the benefit of having a spring return.

However, this can easily be defeated with a piece of duct tape over the palm actuator. They are also generally not lockable. We have found a manufacturer of 3-way valves in the size range and rating required that offers a lockable valve. This provides the benefit of being able to secure the valve in a safe position.

Another possible hazard to consider with palm valves and/or 3-way valves is the proper treatment of the vent ports. Our firm has published a special alert notice, #1011A on our web site ([www.combustionsafety.com](http://www.combustionsafety.com)), regarding this hazard. In all cases these vents must never be plugged or valved off. This can defeat the safety interlock feature of the installation method proposed.

### Momentary Switches For Tightness Testing Safety/Speed

Tightness testing of SSOV, blocking, and vent valves can expose technicians to elements of risk. Caution must be used when putting valves into a test position. Technicians must typically put each valve into a position where natural gas pressure is exerted on one side while the other side is a tightly sealed section of pipe except for the leakage measuring outlet. This is usually done through the use of temporary wires, commonly known as "jumper wires", in panels by very experienced electricians.



Momentary Tightness Test Switches

In any case, care must be taken to be sure that a safe process is developed for your specific equipment and its configuration.



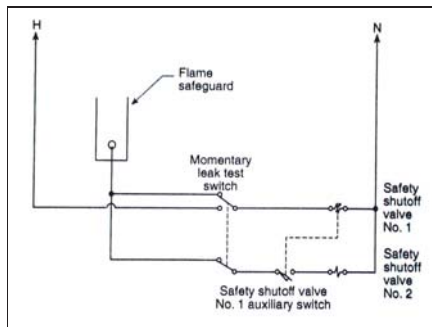
# Combustion Safety, Inc.

This means proper lockout and isolation of power and fuel sources while testing is taking place.

Technicians manipulating valves and systems to get each valve sequentially into the proper position face the risk of electrical shock and the possibility that temporary jumper wires are incorrectly installed or left in panels by-passing critical safety circuitry.

Many sites have purchased new equipment configured with testing mode switches that allow valves to be manipulated with equipment off without the need for electricians to enter panels to install temporary test wiring. In many cases, customers have retrofit existing equipment to include these switches.

The use of these switches is a well known practice in many industries. In fact, typical schematics for accomplishing the required switching is included in the appendix of the National Fire Protection Associations standard for ovens and furnaces (NFPA 86, Section A-5-7.2.3, 1999 Edition, Pg 86-50).



NFPA 86 Sketch

When retrofitting a panel to accomplish more safe and efficient testing capabilities make sure to have your modifications reviewed and approved by the authority having jurisdiction (usually your insurance company). Most major insurers are familiar with this kind of capability and have readily provided approvals in the past. 🌟

## Company Information

The industry's leading combustion equipment safety experts can provide a training program to specifically meet the needs of your facility. This hands-on operations safety training is available for all types of combustion equipment. Our workshops will give you what you need to recognize unsafe conditions, perform required maintenance, and operate equipment more efficient. For more information on how our testing, training, engineering services, burner tuning, or specialty parts can be of benefit to you please call us or visit our web site at [www.combustionsafety.com](http://www.combustionsafety.com)