



## **NUPI Americas Pneumatic Leak Test For Compressed Air & Gas Systems**

NUPI Americas Warranty requires the installed NUPI Americas compressed air & gas piping systems pass common testing methods, including the NUPI Americas Pneumatic Pressure Test which is detailed in this document, or a Pressure Testing which specifically required by the authority having local jurisdiction. NUPI Americas Pneumatic Pressure Testing requires the passing of a three-step pressure test, 1) Testing System at 10% Test Pressure, 2) Testing System at 50% Test Pressure, and 3) Testing System at Full Test Pressure. Pressure testing is to occur immediately after the product's installation and before the product is put into service. Pressure test results shall be submitted to NUPI Americas directly after the completion of the facility's pressure test. As part of the pressure testing program NUPI Americas makes available the "Pneumatic Pressure Test Submittal Sheets", and "Bldg. Pressure Test Log" as a means of recording and presenting pressure testing results. In additions to submitting these sheets it may also be necessary to submit electronic pdf drawing to show pressure test sections which were tested. Electronic pressure test logs collected from electrofusion machines and similar data collection devices are to be provided with the pressure test forms when electronic pressure test records are available. Electronic fusion records from electrofusion machines, and butt fusion loggers shall also be provided when available. All electronic pressure test recording files and electronic fusion records are to be provided on flash drive storage with pressure test submittal sheets. Please contact NUPI Americas for questions and concerns regarding pressure testing NUPI Americas piping systems. Any exceptions to the NUPI Americas pressure testing procedures, pressure testing policy, and warranty must be provided in writing by NUPI Americas.

**"NUPI Americas Leak Testing For Compressed Air & Gas Systems" document is only to be used for leak testing compressed air and compressed gas systems, it is not to be used for leak testing or pressure testing liquid systems such domestic cold and hot water, chilled water, heating water, circulating water, chemical feed, etc., nor is it to be used for testing negative pressure (vacuum) systems. Liquid systems are to be leak tested with water, per "NUPI Americas Pressure Testing For Liquid Systems".**

**SDR 17 Niron Pipe is not to be used in compressed air, or compressed gas systems. Heavier walled SDR11, SDR 9 and SDR 7.3 Niron Cool-Pro Pipe and Nupi America's Flexite pipe are acceptable for compressed air/gas system. Niron Cool-Pro is made of UV resistant material and is suited for outdoor installation.**



Failure during a pneumatic pressure test can be extremely violent and dangerous. In a compressed gaseous media test, significant stored energy is applied to compress the gaseous media in addition to pressurizing the system. If failure occurs, the stored energy will be suddenly released and will be extremely violent compared to failure an incompressible liquid system. Therefore, facility owners, engineers, and contractors should use the upmost caution, and rigid safety measures when testing with compressed gases.

Recommendations provided in this document does not purport to address all of the safety concerns associated with testing with compressed gas. It is the sole responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. The user accepts sole responsibility and assumes complete liability for the risks associated with conducting a compressed air test with Niron PP-RCT Piping and Flextite systems.

#### DETERMINING TEST PRESSURES

The “Test Pressure” used to pressure test a compressed air/gas system is calculated by taking the **Design Pressure times a factor of 1.1 to 1.33**. Design Pressure, at minimum, is the pressure at the most severe condition, while the system is in service. Once the test pressure has been determined, care must be taken to make sure that the Test Pressure selected does not exceed the pressure limits of devices in the system and will not exceed the Maximum Allowable Operating Pressure of the pipe, which is temperature dependent, and shown in **Table 1**.

Table 1 – Maximum Allowable Operating Pressure of Pipe

Niron Pipe	For Use In Compressed Air/Gas Systems	Operating Temperature	Max. Allowable Operating Pressure of Pipe	Operating Temperature	Max. Allowable Operating Pressure of Pipe	Operating Temperature	Max. Allowable Operating Pressure of Pipe
Cool Pro SDR 17	No						
Cool Pro SDR 11	Yes	73 F	245 psi	120 F	170 psi	180 F	100 psi
Cool Pro SDR 9	Yes		309 psi		215 psi		120 psi
Cool Pro SDR 7.3	Yes		388 psi		270 psi		150 psi
Flextite	Yes		300 psi		300 psi		300 psi

## LEAK TEST OVERVIEW

During pressure testing, the pressure test areas shall be zoned off and evacuated. Only staff involved with pressure testing the system shall be allowed to be present in those areas. The appropriate PPE gear including, and not limiting safety glasses, gloves, hardhat, and steel toe boots shall be provided to those performing the pressure test and working in pressure testing areas. Under no circumstance shall the compressor be left operating and unmonitored during pressure testing. Pressures shall be monitored regularly during the pressure test, as shall pipe temperatures. Pipe temperatures shall be monitored prior to testing and during pressure testing to verify pipe pressure ratings shown in **Table 1** are not exceeded due to increase in pipe temperatures. Areas where elevated pipe temperatures may occur at are in piping directly downstream of the compressor, pipe exposed to heat sources such as steam conditioning equipment, boilers, heat exchangers, and direct sun light exposure. **Pneumatic leak testing should not be performed below 40 F temperature as PP-RCT becomes less ductile, and more brittle at the lower temperatures.** Pressure test media will be that of non-toxic, non-flammable gas.

Before conducting the leak test verify the following:

- 1) All fusions are of good quality and have fully completed their cooling times.
- 2) All fusion equipment has been removed from the work area.
- 3) Concrete supports, blocking, and anchors in the test section have cured to provide sufficient strength to withstand pressure thrust forces. Pipe has been properly secured to supports.
- 4) The test section has been completely isolated from the system and piping within the test section has been restrained against disjoining and movement to prevent injury or damage in the event of catastrophic failure.
- 5) All low pressure rated components that could be damaged by the test pressure have been removed from the system or isolated from exposure to the test pressure. All isolation and closure components used to isolate and close off the system shall be rated for pressures equal to or greater than the Test Pressure applied to the test section.
- 6) Equipment used to pressure test the system has been inspected prior to conducting leak testing. Excessively worn, deteriorated or damaged equipment shall not be used in pressure testing the system. Equipment that is not capable of proper operation shall not be used. Equipment utilized in the pressure testing system shall include but not be limited to compressor (oil free preferred), pressure regulator, isolation valve, gauge cock for bleeding system, pressure snubbers for gauges, pressure gauges/sensors, and temperature gauge. A continuous pressure-recording device is recommended.
- 7) At least two calibrated pressure gauges or sensors shall be installed in the test section. Pressure monitory instrumentation shall be properly scaled for the test pressure and accurate to within two percent (2%) of full scale. The gauge or sensor full scale value

shall not be more than twice the test pressure, and scale graduations shall be no greater than two percent (2%) of the full-scale value. A continuous pressure-recording device is recommended.

- 8) All temperature measuring equipment such as pyrometers or infrared temperature gauges shall be accurate to within 5.4°F (3°C).
- 9) A calibrated pressure relief valve shall be installed in the test section. Relief pressure shall be set to relieve pressure from the system at relief pressure not more than 5 psi (34.5 kPa) or 3 percent above Test Pressure. The pressure relief valve shall be calibrated 12 months prior to use and shall be tested just prior to pressure testing.
- 10) Pressure monitoring/regulating equipment and temperature sensing instrumentation shall be calibrated against a recognized standard acceptable to the authority having jurisdiction. Equipment used in testing shall be calibrated 12 months prior to use. Calibration records shall be made available to the authority having jurisdiction. Pressure monitoring/regulating equipment and temperature sensing instrumentation calibrated more than 12 months prior to use and those damaged, or otherwise incapable of proper operation shall not be used.

#### SYSTEM INSPECTION PRIOR TO PRESSURE TESTING

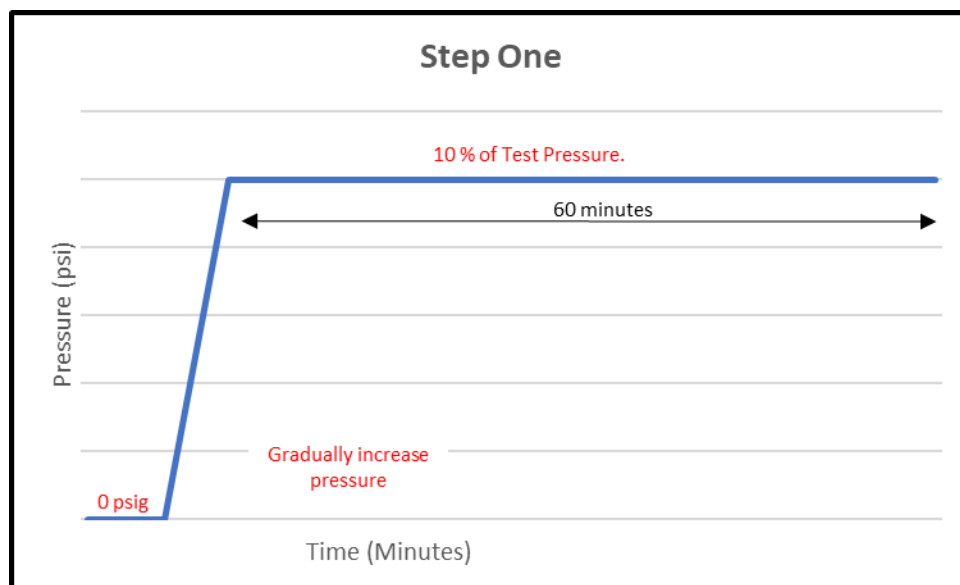
Before performing the pressure test the system shall be visually inspected. Inspection shall include but not be limited to a visual inspection of joints, mechanical connections, and clamps. Replace deformed joints and repair connections as necessary prior to testing. Inspect socket fusion joints. A proper socket fused joint shall have an insertion depth mark and a uniform double bead configuration whose beads are in direct contact with one another, without gap, or have a flat single bead which presses tight against the fitting when a cold ring was utilized during fusion. Pipe shall be properly aligned within the socket fusion fittings and electrofusion fittings. Spray out will not be present on the exterior of a fused electrofusion fitting, all electrofusion fittings should be marked, and pipe scrape areas visible. Butt fusion weld beads will be smooth and round. Fusion bead heights and bead formation will be consistent when compared to pipe having the same size and SDR. Butt fusion joints should also be marked with fusion information. Instabranches, and electrolets shall be marked to indicate sidewall pipe main has been drilled out, and pipe wall scraping should be visible. All flanges shall be marked, properly secured, have a gasket between flanges, and flange bolts evenly threaded around the flange. Metallic thread connections shall have Teflon tape/pipe dope to prevent leakage, and overtightening. Pipe clamps should be secured, but not over tightened. Metric pipe clamps shall be utilized rather than emporia clamps. Exterior pipe wall shall be inspected and free of cracks and impact markings.

## PNEUMATIC PRESSURE TEST

NUPI Americas pneumatic pressure test method a is three-step test method, Step One of Pressure Test – Test System at 10% Test Pressure shown in **Figure 1**, Step Two of Pressure Test – Test System at 50% Test Pressure shown in **Figure 2**, and Step Three of Pressure Test – Test System at the Test Pressure shown in **Figure 3**.

### Step One of Pressure Test

- 1) Determine and document the Test Pressure.
- 2) Slowly ramp the test section up to a pressure which is 10% of the Test Pressure. Inspect the system for leaks, especially mechanical connections. A leak finder solution can be applied to areas of the piping system to assist with leak detection. The compressed air will cause the leak finder solution to bubble when a leak is present. Ultrasonic equipment can also be used to detect leaks.
- 3) If necessary, depressurize system, and repair leak areas. After leak repair, repressurize the system slowly until pressure is 10% of Test Pressure.
- 4) Isolate the system at the 10% of test pressure for one hour to see if less the 5% pressure drop occurs. If less than 5% pressure drop has occurred in the test section, then the test section passes Step 1 of the pressure test. Upon passing Step 1 of the pressure test proceed to Step 2, otherwise repair system leaks, and retest the system.
- 5) Document the initial “10% Test Pressure”, and pressure after 60 minutes of isolation on the “Pneumatic Pressure Test” submittal.



**Figure 1 – Step One Pressure Test**

### Step Two of Pressure Test

- 1) Slowly ramp test section pressure up from 10% Test Pressure, increasing the pressure in 10% increments of Test Pressure. Hold the pressure long enough for pipe strain to equalize, and to inspect the system for leaks before proceeding to raise the pressure to the next pressure increment.
- 2) Inspect, and repair leaks as necessary. If depressurization of the system is required to repair a leak, bring pressure back up to the 10% Test Pressure after the repair and begin increasing pressure in 10% increments of the Test Pressure until the pressure equals to 50% of the Test Pressure. As in step 1 of this procedure, always hold the pressure long enough for pipe strain to equalize and to inspect test section before moving up to the next pressure increment.
- 3) Once system pressure reaches 50% of Test Pressure isolate the system for one hour. If less than 5% pressure drop has occurred in the test section, then the test section passes the test. Upon passing Step 2 of the test proceed to Step 3, otherwise repair system leaks, and retest the system.
- 4) Document the initial “50% Test Pressure”, and the pressure after 60 minutes of isolation on the “Pneumatic Pressure Test” submittal.

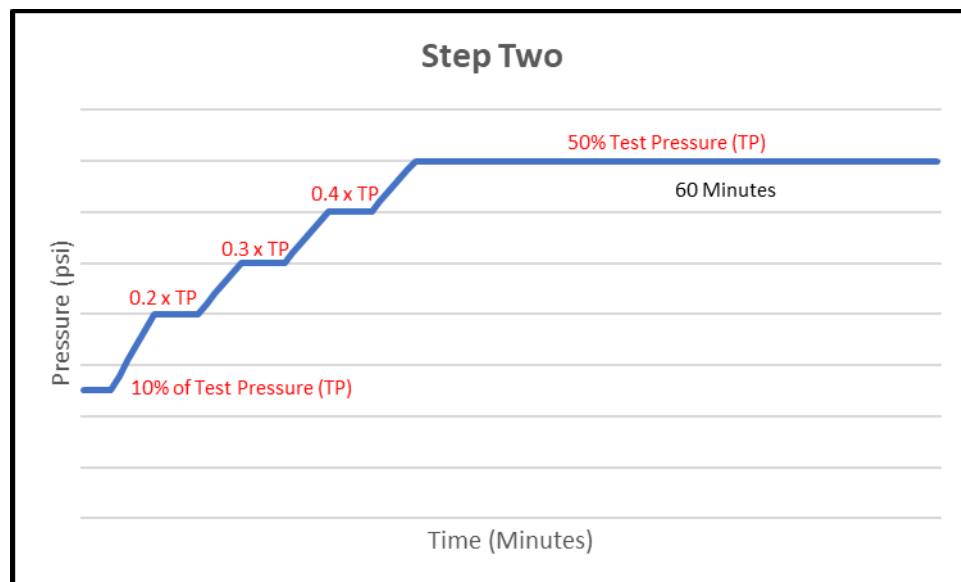
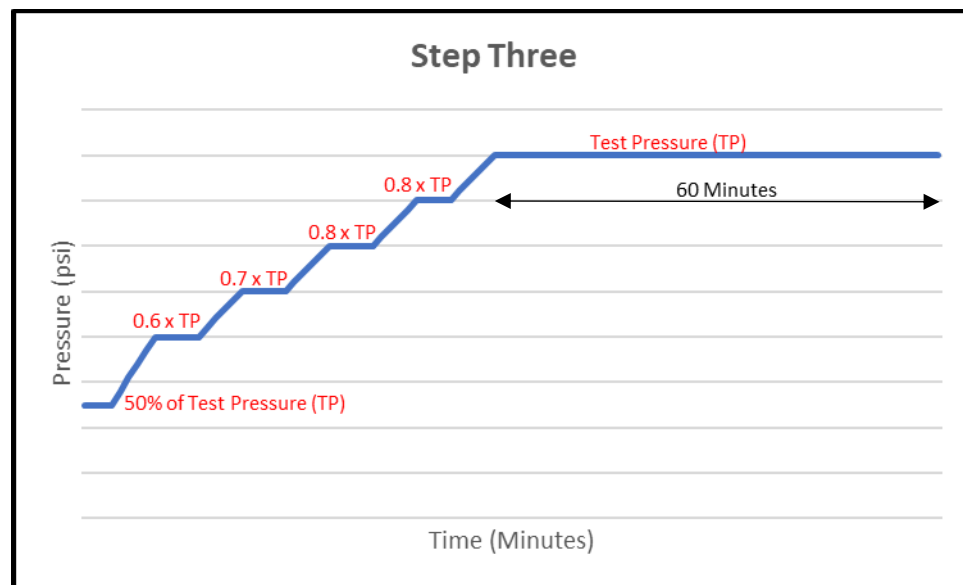


Figure 2 – Step One Pressure Test

### Step Three of Pressure Test - Final Pressure Test

- 1) Slowly ramp test section pressure up from the 50% Test Pressure, increasing the pressure in 10% increments of the Test Pressure. Holding the pressure long enough for pipe strain to equalize, and to inspect the system for leaks before proceeding to raise the pressure to the next pressure increment.
- 2) Inspect, and repair leaks as necessary. If depressurization of the system is required to repair a leak, bring pressure back up to the 50% Test Pressure after the repair and begin increasing pressure in 10% increments of the Test Pressure until Test Pressure is reached. As in step 1 of this procedure, always hold the pressure long enough for pipe strain to equalize and to inspect test section before moving up to the next pressure increment.
- 3) Once system pressure reaches the Test Pressure isolate the system for one hour. If less than 5% pressure drop has occurred in the test section during the one-hour isolation period, then the test section passes the test. Upon passing Step 3 of the test proceed, the test section is considered to have passed the pneumatic pressure.
- 4) Document the initial "Test Pressure", pressure after 60 minutes of isolation, and test conclusion (passed or failed) on the "Pneumatic Pressure Test" submittal.



**Figure 3 – Step Three of Pressure Test – Final Pressure Test**



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## OTHER CONSIDERATIONS

Some manufacturers of accessory items (not supplied by Nupi Americas) prohibit or restrict compressed air and compressed nitrogen testing of their products. Contact the component manufacturer for information about testing with gaseous media under pressure with their component. Where the manufacturer of a test section component prohibits or restricts pressurized gaseous media testing of their component, pressurized gaseous media (pneumatic) testing shall not be used without the consent and authorization of the component manufacturer. Otherwise, the component should be removed or isolated from the system during the test.