

Specifications for Valve Pressure Test Stand

- **General Requirements:**

- Quantity: One Valve Pressure Test Stand consisting of a user-friendly control station with one universal valve-clamping station.
- Valve Pressure Test Stand will be located in a conditioned shop (70-80°F). Maximum continuous space available for the test stand is 12' x 7' x 14' tall, (includes rear and side access). Provide footprint diagrams of components for evaluation of alternate placements.
- Valve Pressure Test Stand shall be built to ASME 31.3, ASME Section VIII Division 1 or 2, and other national codes and standards to enable safe testing of both new and repaired valves.
- ¹Manual / Semi-automated testing and measuring performance of pressure relief valves (PRV), (Section VIII, gas and liquid), comparing results of test to standards: NBBI NB 23 Part 4, ASME PTC25, API 527, and API 576.

¹**Clarification:** Semi-automatic or automatic control of the test pressure for relief valves is desired for consistent test repeatability. Full manual control with control panel visual test parameters (analog gauges or digital meters) shall be provided for the purposes of reliability, redundancy, and for non-standard testing. Semi-automated or automatic control is not a code requirement and shall be priced as an option. Automatic test control as an option shall include but is not limited to pressure ramp rates, pressure hold points, and limits on maximum pressure set points.

- Valve Pressure Test Stand to provide code based pass/fail determination (when in automatic testing mode) and detailed test reports via a digital test monitoring system. Test monitoring system can be portable plug in unit or integrated into control panel. Provisions for manual data input shall be provided of key valve parameters and visual data recording. Data collected shall include but not limited to pressure versus time, leak rates versus pressure, and seat lift detection vs. pressure.
- Provide automated and manual leak detection via a clear water cup with bubble tubes sized for the API 527 test standard.
 - Include: Automatic bubble counter and set of leak detection PRV port plugs for 1/2" to 10" for PRV outlet ports.
- Provide a standard flow meter cascade for manual reading of higher gas leak rates, cfm range to be based on vendor experience rates for shutoff and control valves.
- Provide sufficient accumulator and test vessel capacity to determine seat leakage near set point, set point, and seat lift, ("pop") for PRV. Reference NBIC Part 4 Supplement 5.
- Provide equipment needed to perform PRV back pressure test up to 30 psig.
- Manual testing of shutoff valve (SV) and control valve (CV) integrity and leak rates.

- Reversible seat leakage testing from both sides of shutoff valves and control valves with one setup is required.
- Provide a “closed” water test system with a built-in reservoir, level monitoring/control, water filtration, pump to fill test valves, and sufficient on board capacity to support specified tests.
- Capture and recycling of test and vented water to the reservoir is required.
- TMDE (Test measurement and Diagnostic Equipment) all analog and digital measuring devices used for test control and monitoring, safety, and code compliance must meet the Air Force AFMETCAL TMDE requirements as defined by AFI 21-113 and Tech Order 00-20-14. In short, these items require periodic calibrations defined by AFMETCAL.

- Provide the following information for all TMDE devices provided with this procurement;

- Manufacturer
- Model Number
- Functional Description
- OEM (Original Equipment Manufacturer) calibration data sheets.

Exception: Pressure gauges and devices used only to indicate the presence of pressure are exempt from TMDE calibration requirements and should be labeled FIO (For Indication Only).

- Analog pressure gauges with maximum indicating pressure greater than 160 psig shall have a solid-front case design, an optically clear shatter-resistant window made of high-impact, non-cracking plastic, heat-treated glass, or laminated glass, and a pressure-relieving back panel or pressure blow out plug(s) sufficiently sized to prevent rupture of the case.
- Provide a means to quickly replace gauges with appropriate gauge to match pressure range being tested.
- Vendor shall supply all voltage reducing/rectifying, air pressure regulating, water/air filtration, voltage reduction, and interface points required to adapt unit to AEDC utilities (see AEDC Supplied Interfaces and Services below).
- Pressure Relief Valves, (Section VIII for gas and liquid) 1/2” to 8”
 - **Test Requirements:**
 - Operator should be able to test relief valves in a manual mode.
 - Automated mode should record and graphical display full test with limits shown based of test standards or user requirements.
 - Set Pressure determination: from simmer to “pop” for gas and steady stream to “gush” for liquid.
 - Seat leakage measured.
 - Gas/water testing capability.
 - Seat lift determination, with test data recording.
 - Discharge baffle/muffler to contain water blow off and mute air blast.
 - Automatic Verification: Compares found set pressure to desired set point and leakage (per ASME/API Standards).
 - Pressure: 0 to 6,000 psig gas or liquid for testing of PRV (set pressure, seat-leakage,) both threaded and flanged ranging from 1/2” to 8”. This to

include but not limited to spring and pilot operated relief valves. The minimum requirements to meet are shown in the table below:

PRV Inlet Size Pressure	0 – 1000 psig	1001 – 3300 psig	3301 – 4400 psig	4401 – 4620 psig	4621 – 6000 psig
1/2" to 1.5"	X	X	X	X	X
2.0"	X	X	X	X	
3.0" to 4.0"	X	X	X		
6.0" to 8"	X				

- Shutoff and Control Valves, (SV, CV), including butterfly, ball, plug, globe, check, and gate; 1" to 16".
 - **Test Requirements:** Record and graphical display of the full test with limits shown based of test standards or user requirements.
 1. Body Leakage.
 2. Seat Leakage.
 3. Gas/water testing capability.
 - a. Gas testing in the range of 0 to 100 psig
 - b. Water testing in the range of 0 to 10,000 psig
 4. Ability to operate valve under pressure, (stroke testing within limits of flanges).
 - **Pressure:** 0 to 10,000 psig water for testing of SV/CVs, (body, seats), flanges ranging from 1" to 16". This includes but not limited to gate, globe, check, ball, plug, and butterfly valves. See SV/CV clamping requirements below.
- **Valve Clamping Stand/ Test Station:** Provide a universal clamping station capable of testing the full range of RVs, and SV/CVs to 16-inch diameter.
 - Provide hydraulic multi-clawed bottom flange clamping system coupled with top flange supported by a double post adjustable clamping system for adapting clamping system to various length shut off and control valve sizes. Upper arm to swing out of the way for loading valves on to table.
 - Valve clamping stand(s) shall have the capability to clamp all relief valves listed in test requirements and provide adequate capacity to sufficiently test valve's set pressure (simmer to "pop" for gas and steady stream to "gush" for liquid).
 - SV and CV clamping system capabilities, valve nominal diameter, shall be provided based on design to handle the full RV requirement.²

²**Note:** Clamping of SV/CVs are limited by the test press, the valve diameter, and design of the clamping stand. A 70-ton clamping stand may be limited to a 4" diameter class 2500# (2.88" ID bore) valve (to 9,275 psig test

- pressure). Larger high-pressure SV/CVs will be blind flange tested, see alternate tap testing.
- Full protective shielding for bench operator and surrounding workers
 - Standard one-piece fixed shield for the panel operator, plus an independent moveable shield for coworker protection.
 - Shields shall be metal framed clear polycarbonate construction at least 12mm thick
 - Provide full complement of flanged and threaded valve adaptors and test connections for use with the clamping stand.
 - For pressure relief valves the stand shall accommodate:
 - 1/2" to 8" flanged relief devices both raised face/Ring Joint flanges.
 - 1/2" to 1-1/2" NPT relief devices.
 - Adaptors to test pilot valve independently or main body.
 - For SV/CVs the stand shall accommodate:
 - 1" to 4" SV/CV with NPT threads
 - 1" TO 16" SV/CV with both raised face/Ring Joint flanges.
 - Alternate Tap Testing: Provide alternate test tap to allow remote flanged testing separate from the clamping test station.
 - The test location to be determined by the customer.
 - The control and data collection software to be configured to support relief or shutoff valve tests at alternate location.
 - Provide high pressure hoses and fittings to support above remote testing; Two, (2) x 3/8" minimum dia. (one 10' and one 20' length).
 - **Control Panel:** Manual Operation with automatic data recording. Integrated or plug in PC/PLC system with A/D conversion unit, calibrated transducers, flat screen display and inkjet printer. USB ports and LAN (wire or wireless) network capable.³
 - Functionality designed to support relief, shutoff and control valve test requirements.
 - Ergonomic stainless or painted steel construction.
 - Front mounted controls for all functions.
 - Single point stop button or stop switch.
 - Interlocks to prevent testing valve above valve code requirements, exceeding the design of clamping system, or testing improperly clamped valves.
 - **Option:** Automatic set pressure testing with ramp rate controls, Price as Optional
 - Test in progress warning beacon.
 - Pressure outputs/inputs for clamping test stand.
 - Selectable auxiliary output for remote blind flange testing.
 - Analog or digital displays of test pressures.
 - Provision for in place calibration of gauges, and transducers; see TMDE requirements above.
 - Provide access or easy removal of components for bench calibration.
 - Leakage visual bubble cup and cascade flow measurement bank.
 - Automatic recording of all test requirements.
 - Digital graphing capability of test parameters, (pressure vs leakage, etc.).

- Backup copies of all vendor developed software/programs
 - PC based operating system shall be Microsoft Windows 10 or newer.
 - Removable or external hard drive for data and report transfer.³
 - ³**Note:** USB devices, thumb or flash drives, and unapproved computer based devices are not allowed to be connected to the AEDC base-wide network due to DoD security concerns. Removable hard drives that have been virus scanned are allowed for data and report transfers and system updates. The valve pressure test stand may be connected to a local network in the future.
 - Provide all control compartments to NEMA12 standards.
 - Provide power disconnects for maintenance lock out tag out of main unit and auxiliary component/skids.
- **Gas and Hydrostatic Test Supply:** The Gas and Hydrostatic Supply Systems shall include all necessary equipment to meet the specified pneumatic and hydro test requirements, including but not limited to compressors, boost pumps, manifolds, storage vessel(s), test vessel(s), and interconnect piping.
 - Package shall be skid mounted for ease of installation.
 - Noise limited to 85dBA at 3 feet. Enclose as required to meet sound levels.
 - Provide air to air heat exchangers for equipment and high-pressure air cooling if required.
 - Interconnecting piping/hoses shall be prefabricated based on location to be determined after contract award. Bids shall be based on locating all components within fifteen feet (15') of the control station.
 - Final installation will accomplished on site by AEDC crafts. Weld certifications available.
 - Provide on board single point power disconnect for maintenance lock out tag out of the main unit and auxiliary component/skids.
- **Integrated or Stand-alone Valve Control Panel.** Actuator control package used to open and close valve to perform stroke tests on a variety of valve types and designs, adjust trims and set limit switches, etc.
 - Provide following regulated outputs and displays:
 - 0-5vdc, with step and variable outputs with digital meter
 - 0-20 mA, with step and variable outputs with digital meter
 - 24vdc on/off power, with switch and power indication
 - 0-20 psig air with regulator, isolation valves and digital readout
 - 0-100 psig air with regulator, isolation valves and digital readout
 - Input: 110VAC
- **Vendor Options:**
 - Price as an option automatic test control as defined in the general requirements.
 - Provide optional pricing for a weather protection of the gas supply skid for locating outside.
 - If more cost effective, other configurations can be provided, such as two standard stand-alone systems or two clamping stations and one control panel. Other configurations will be evaluated based on cost savings, and functionality.
- **Customer (AEDC) Supplied Interfaces and Services:**
 - Power supplied at 460VAC, up to 60 amps 3 phase, 120 VAC, 30 amps, 1 phase.

- Potable water supply at 60 to 100 psig, up to 3 gpm.
- Water drain piping, (floor drains are not available)
- Shop Air supplied at 110 psig, up to 200 SCFM.
- Labor for onsite installation and startup of test bench, clamping stand, gas and supply skid.
- **Documentation provided by vendor:**
 - With Delivery of Unit:
 - Operating Manual, Electrical Manual, Maintenance Manual, & Schematics, three (3) hardcopies plus DVD version for electronic storage.
 - Manuals shall include Test procedures, O&M requirements, OEM parts lists and descriptions, system drawings, schematics, safety precautions, operational instructions, and troubleshooting guides.
 - Test, Measurement, and Diagnostic Equipment (TMDE); All components and devices used to evaluate, measure, and document valve function tests are considered TMDE.
 - Provide a list of embedded TMDE items including manufacturer, model, serial number, technical specs, and location.
 - Provide calibration data sheet).
 - Gauges and devices used for indication only shall not be considered TMDE. Label these gauges “For Indication Only” or “FIO”.
 - Factory QC Test certificates. Backup copies of vendor developed software.
- **Installation/Training:**
 - Installation will be at the Arnold Air Force Base, TN; Arnold Engineering Development Complex, Model Shop, Building 451.
 - Installation of the test unit will be accomplished by AEDC personnel.
 - The contractor shall observe and verify the installation prior to startup.
 - Qualified contractor personnel shall provide training on machine features and operation on site following the installation.
- **Installation and Startup Supplies:**
 - Lifting, leveling, and floor attachment hardware, if required.
 - Supply of consumables and spare parts, such as filters, o-rings, gaskets, needle valves, and other consumables based on vendor experience.
- **Verification:** After installation the Contractor shall perform functional tests in accordance with a test plan provided by the contractor/manufacture at delivery. On site functionality tests shall be performed and documented by the factory trained servicemen/technician following installation as part of the startup.
- **Warranty:** This machine shall be warranted against any defects in material, parts, and workmanship for a total of 24 months after the date of installation.
- **Operation and Maintenance Support, Parts and On-Site Service:**
 - The OEM/Contractor shall have the capability to service the equipment, (labor and parts), or the equipment shall be able to be serviced by a local qualified OEM representative. The Contractor or representative shall be capable of responding

to a repair service call on-site within 10 work days and provide repair parts delivery within 72 hours after placement of order.

- **Delivery:** Deliver Machine to AEDC for off-loading by AEDC personnel.
- **Reference Documents:**
 - API Standard 527 – Seat Tightness of Pressure Relief Valves; This standard covers the methods for determining the seat tightness of metal and soft seated pressure relief valves, including the maximum acceptable leakage rates are defined for set pressures from 15 psig to 6000 psig.
 - API RP 576 – Inspection of Pressure-Relieving Devices; This Code provides instructions for flow capacity testing and for in-service and bench testing.
 - ASME PTC25 – Pressure Relief Devices, Performance Test Codes; This Code provides instructions for flow capacity testing and for in-service and bench testing.
 - ASME/BPVC Sec VIII-1 – Section VIII Division 1 Rules for Construction of Pressure Vessels; This Code provides details at which the relief valve must be set and acceptable tolerances.
 - NBBI NB 23 Part 4 – National Board Inspection Code (NBIC) – Part 4 Pressure Relief Devices; This document provides information and guidance to ensure pressure relief devices are installed properly, information and guidance needed to perform and document inspections and testing for pressure relief devices, and information and guidance to perform, verify, and document acceptable repairs to pressure relief devices.
 - AIR FORCE METROLOGY AND CALIBRATION (AFMETCAL) MANAGEMENT, AFI 21-113, [https://standards.globalspec.com/std/13317448/AFI 21-113](https://standards.globalspec.com/std/13317448/AFI%2021-113) This instruction implements AFI 21-1, Managing Aerospace Equipment Maintenance. It provides instruction on how to operate and manage the AFMETCAL Program. It applies to all Air Force activities.
 - OSHA 29 CFR 1910.95 Occupational Noise Exposure
 - OSHA 29 CFR 1910.147 The control of hazardous energy (LOTO)