



VACUUM COMPONENTS

National Electrostatics Corp.

Vacuum Valves

DESIGN

Reliable all-metal valves manufactured by NEC utilize the principle of a stainless steel knife edge embedded into a softer metal seal of either aluminum or gold. Although the actual mechanism may vary in appearance, the NEC valves universally employ a toggle mechanism which provides constant seal forces until an external adjustment is necessary.

Whether actuated by hand, air, or other remote method, the unique NEC toggle mechanism provides a sealing force independent of operator or facility variations. Longer seal life is the natural result.

Two groups of valves are available including:

- **Metering valves** for critical metering of gases into vacuum from high pressure sources.
- **Straight through valves** for applications requiring clearance for particle or optical beam transmission.

METERING VALVES

These valves readily adjust to a helium mass spectrometer leak tight condition for fine control of gases into ultra-high vacuum from bottle pressures in excess of 2000 psi. The fact that all materials in the vacuum volume are UHV compatible contributes to the uniqueness of these valves. Moreover, the external construction provides ambient pressure isolation and can operate in environments ranging from rough pump vacuum to over 200 psi.

Variations of this valve include manual and motorized versions. Motors currently offered include 60 Hz, 400 Hz and stepper options. Motor drive packages can also be provided which allow voltage isolation of 5 kV between valve and motor.

STRAIGHT THROUGH VALVES

The straight through valve series VS2 is designed for applications requiring optical, straight-through clearance. Three actuator styles are available.

Model VS2P: This remotely operable model is actuated by air pressure. It both opens and closes in a fraction of a second.

Model VS2F: The fast acting version is an especially unique product. The Model VS2F was designed for those applications which require emergency closure to protect against catastrophic vacuum failure. A leak-tight seal is produced within 35 milliseconds of detected vacuum failure.

Model VS2M: This manual valve is actuated by a quick single motion of the operating handle.



Gas Metering Vacuum Valve



All-metal gas metering valve with 1/4" O.D. tube ends.

APPLICATIONS

The NEC all-metal gas metering valve is ideally suited for applications requiring the fine control of gas flow into a vacuum where corrosive gases are used or ultra-clean conditions are a requirement. There are no organic compounds inside the operating vacuum volume of this valve.

The NEC metering valve regulates the flow of gas from vacuum tight shut-off to rates exceeding 100 atm-cc/hr. Input pressures can be as high as 2000 psi.

The original applications for these valves include the control of gas flow into ion beam sources and the control of gas flow into ion beam stripper canals in the terminals of NEC Pelletron® accelerators.

DESIGN

The valve mechanism consists of a slightly curved flexure strip which axially loads a soft gold seat into a stainless steel knife edge. As a transverse load is applied to the strip, it tends to straighten, thereby applying a sealing force.

The sensitivity is controlled by the extent the flexure has been straightened upon contact with the knife edge. This extent is adjustable by means of a manual adjustment screw. The flow rate is controlled by a differential screw which provides the transverse load to the flexure strip.

The valve head assembly can be reoriented to position the outlet port to meet your specific requirements. The standard valve seat is 24K gold. Aluminum or nickel are also available as seat material.

All materials in the vacuum volume are UHV compatible. No o-rings or other seals containing organic compounds are used.

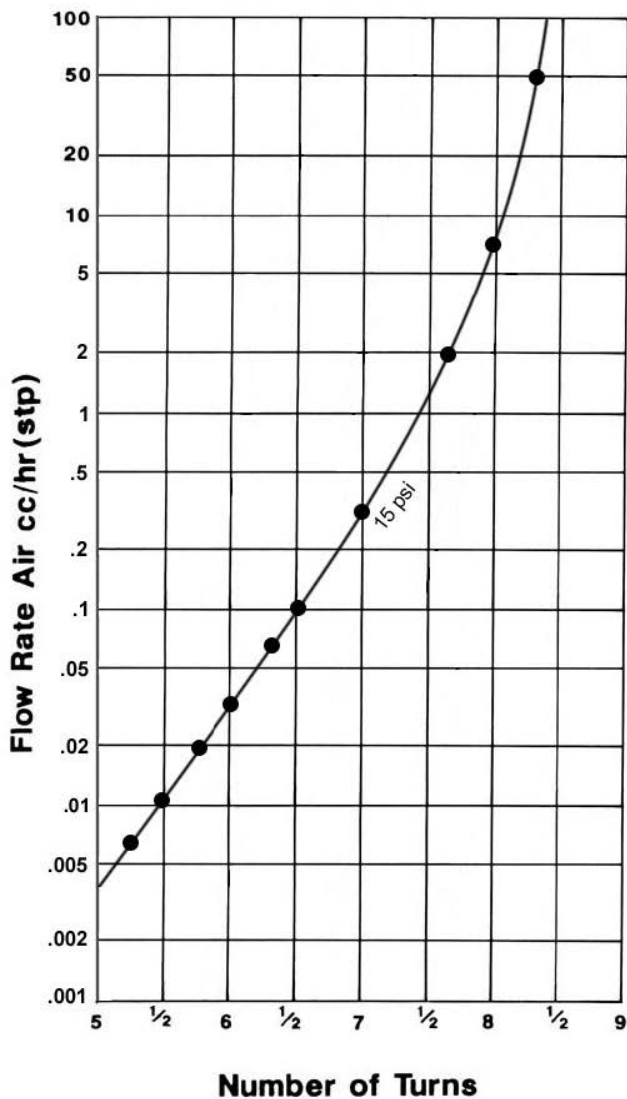
This stainless steel valve is fully ambient pressure isolated which is ideal for operation in environments that vary from high vacuum to high pressure.

The basic valve is provided with a manual graduated knob. Remote versions are available with either 60 Hz, 400 Hz or stepper motor drives. A multi-turn positive read-out potentiometer and limit switches are included in the drive.

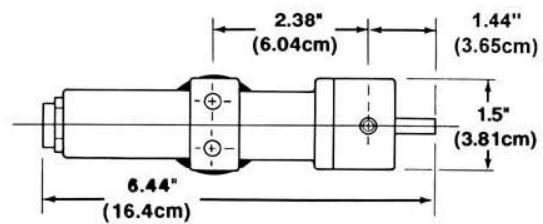
The standard inlet and outlet tubes are 0.25" O.D. stainless steel tubing. Custom welded fittings or flanges are available upon request.

SPECIFICATIONS

- **Connection:** Standard inlet and outlet tubes are 0.25" O.D., stainless steel. Custom fittings and flanges are available.
- **Maximum Inlet Pressure:** 2000 psi
- **Flow Rates:** Less than 2×10^{-10} atm-cc/sec to 100 atm-cc/hr.
- **Seat Material:** Gold (standard)

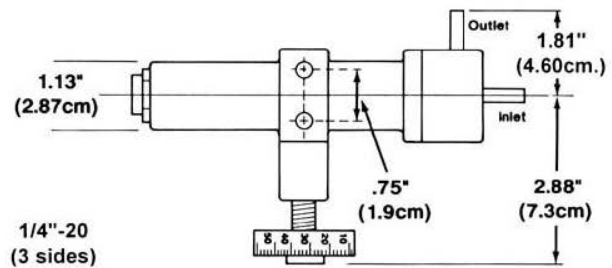


Typical flow rate vs. shaft rotation for 15 psia inlet pressure



Outlet tube angle supplied as shown. Customer can reorient to any other of the 90° positions, but valve control sensitivity will change from the factory settings.

Valve head assembly is replaceable.
(Catalog No.: 23V020020)



ORDERING INFORMATION

Catalog No. 2GA020000

Straight Through Vacuum Valves



Straight through fast acting valve, VS2F

APPLICATIONS

The NEC all-metal straight through valve is ideal for applications that require ultra-high vacuum compatibility and rapid, reliable closure. The fast acting model is ideal for application that require an emergency closure in case of catastrophic failure of an ultra-high vacuum system.

These ultra-high vacuum valves utilize a short stroke toggle mechanism which allows a single quick motion for closure. This is a distinct advantage over the standard screw type sealing mechanisms. The fast valve is actuated by the NEC coaxial pressure sensor.

These valves have been in use for more than 20 years in a wide variety of vacuum and ion beam systems throughout the world.

DESIGN

There are no organic materials used in the construction of the NEC straight through valve. It is bakeable to 300°C in the open position. Three models of straight through valves are available: Pneumatic (VS2P), Manual (VS2M), and Fast Acting (VS2F).

VS2P and VS2M

The sealing mechanism is a replaceable aluminum disk that is pressed against a stainless steel knife edge by a toggle mechanism. This assures repeatable vacuum tight seals to better than 10^{-12} std. liters/second. No adjustment is required to assure this repeatable vacuum tight condition. This is not the case with most screw type mechanisms commonly used on other valves.

There is a simple external adjustment which allows a variation in the pressure applied to the aluminum disc on the stainless steel knife edge without breaking vacuum. Approximately 50 closures can be performed before adjustment is necessary and several hundred closures can be performed before replacement of the aluminum disc is indicated.

All materials in the vacuum volume are UHV compatible. The movable mechanism is stainless steel bellows sealed. With the exception of the replaceable aluminum sealing disk and molybdenum aperture, all materials are stainless steel.

VS2F

There are three parts to the NEC fast acting valve system; the spring drive all-metal valve, coaxial pressure sensor and the trigger circuit. The following describes the fast acting valve only.

The fast acting valve (VS2F) is identical in construction and sealing principle to the VS2P and VS2M straight through valves with the addition of a unique spring closure to actuate the toggle mechanism.

When a signal is received from the pressure sensor due to a pressure rise, a special solenoid releases the trigger and the spring drive actuates the toggle mechanism for reliable closures in less than 35 milliseconds after the trigger signal is received.

In factory tests, 50 successful fast closings were made on the same aluminum seat without replacement. If the valve fails to seal, a simple in-line adjustment provides another series of successful closures without changing seals or breaking vacuum.

This valve can be operated in either the manual or fast acting mode. Resetting is done manually with a cocking handle supplied with the valve.

As with other NEC straight through valves, all flanges compatible with nominal 2" stainless steel tubing are available. Special extensions have been provided to accommodate 2.75" O.D. flanges.

Although designed for UHV systems, applications permitting o-ring seals can take advantage of an optional seal disk incorporating a Viton o-ring. This would be particularly valuable on systems that experience frequent vacuum failures.

OPTIONS

The NEC all-metal straight through valve has nominal 2" stainless steel tubing. It is available with NEC and ConFlat flanges in sizes consistent with that dimension. In addition, 2.75" and other ConFlat flanges can be accommodated on special order. The aperture is then necessarily omitted.

SPECIFICATIONS

■ Control:	VS2M: Manual VS2P: Pneumatic, remotely controlled. Activated by low voltage control solenoid. VS2F: Emergency closure in less than 35 milliseconds. Manual reset.
■ Open conductance:	37.4 liters/sec without aperture 33 liters/sec with molybdenum aperture in place
■ Leak rate when closed:	Less than 1×10^{-12} standard liters/sec
■ Bake-out:	300°C in the open position
■ Tube extensions and flanges:	Nominal 2" (5.1 cm) diameter stainless steel tubing ConFlat flanges standard. Other types available upon request.
■ Entrance aperture:	1.38" (3.5 cm) diameter Removable molybdenum aperture has 1.25" (3.2 cm) diameter
■ Length along beamline:	9.5" (24 cm) with 6" O.D. CF flanges Exact length dependent on flange type

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