

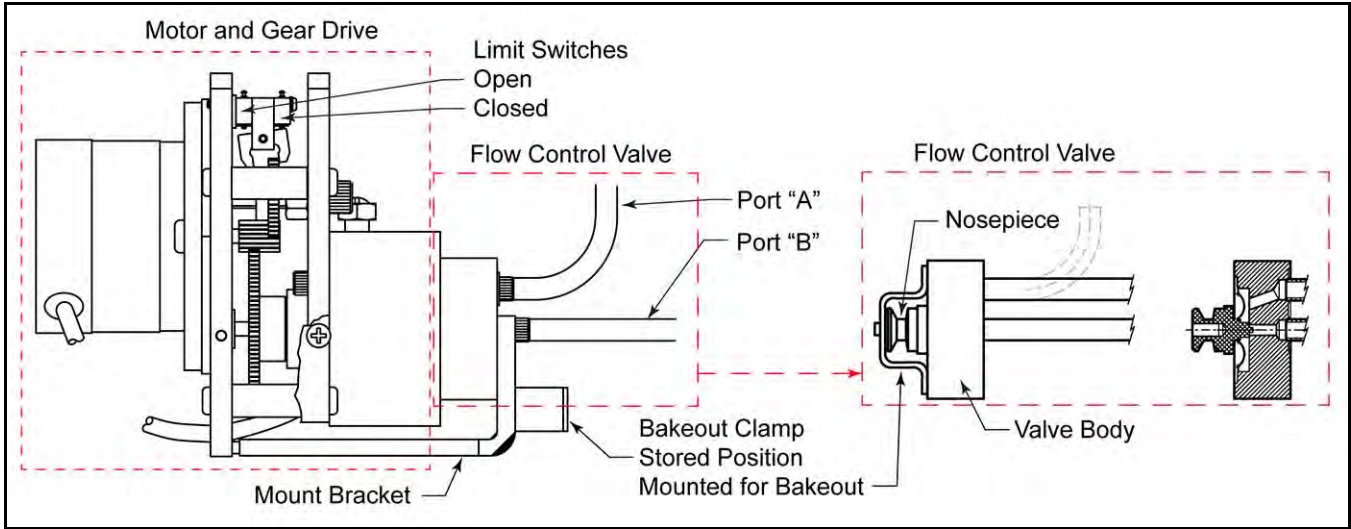
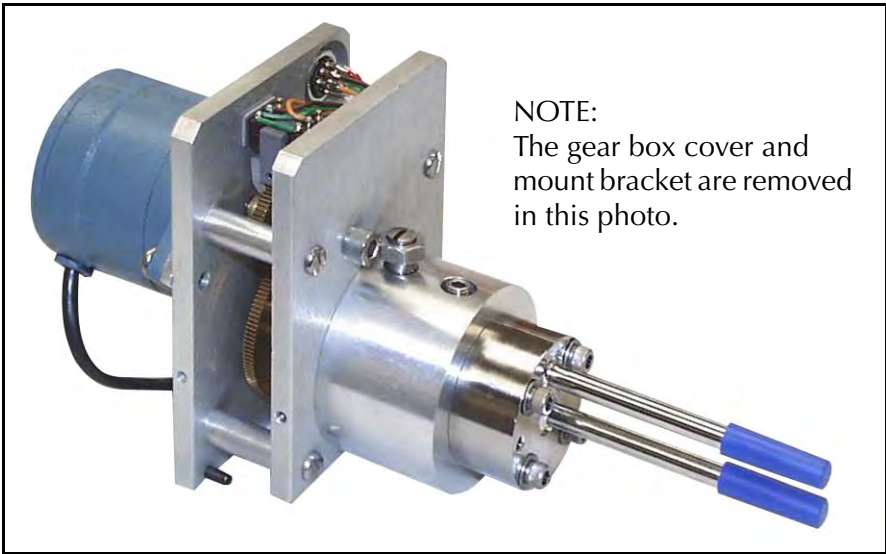
Series 245

Granville-Phillips® Series 245
Pressure/Flow Control Valve Assembly

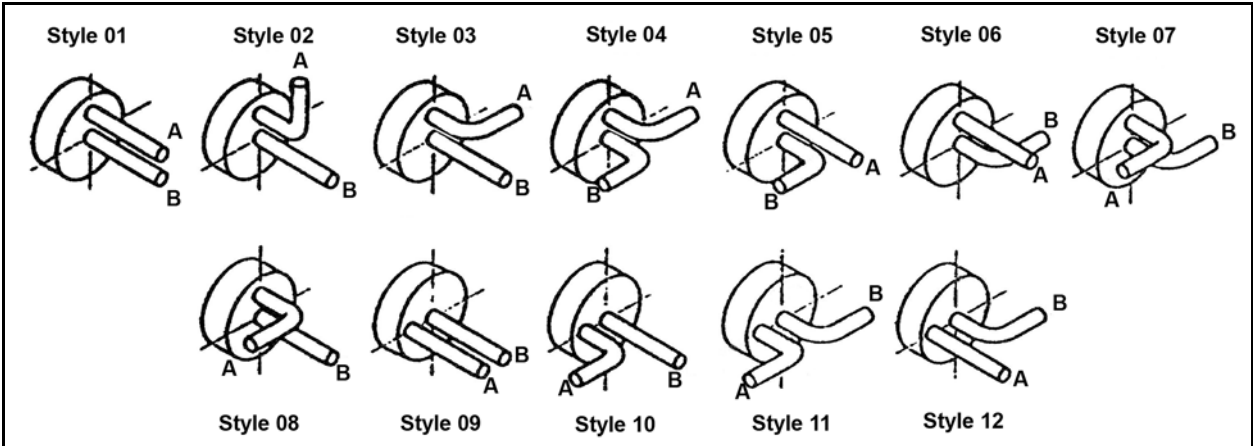


Instruction Manual

*Instruction manual part number 245001
Revision C - November 2016*



Tube Bend Styles



Series 245

Granville-Phillips® Series 245 Pressure/Flow Control Valve Assembly

This Instruction Manual is for use with Granville-Phillips Series 245 Pressure/Flow Control Valve Assembly. A list of applicable catalog numbers is provided on the following page.



Customer Service / Technical Support:

MKS Pressure and Vacuum Measurement Solutions

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Instruction Manual

Granville-Phillips® Series 245 Pressure/Flow Control Valve Assembly

Catalog numbers for Series 245 Valve Assemblies

Catalog Number	Description
Complete Assemblies	
245-11179	VALVE,MOTOR/DRIVE,VCR FLG,BEND 02
245-11450	VALVE,MOTOR/DRIVE,NW16CF BOTH PORTS,BEND 02
245-11885	VALVE,MOTOR/DRIVE,NW35CF B PORT ONLY,BEND 02
245-11929	VALVE,MOTOR/DRIVE,VCR,BEND 02
245-12013	VALVE,MOTOR/DRIVE,VCR BOTH PORTS,BEND 04
245-12688	VALVE,MOTOR/DRIVE,NW35CF BOTH PORTS,BEND 02
245-13135	VALVE,MOTOR/DRIVE,NW16CF PORT B ONLY,BEND 02
245-13893	VALVE,MOTOR/DRIVE,VCR BOTH PORTS,BEND 04
245-21509	VALVE,MOTOR/DRIVE, NW16CF BOTH PORTS, BEND 04
245-21578	VALVE,MOTOR/DRIVE,NW16CF B PORT ONLY,BEND 04
245-21591	VALVE,MOTOR/DRIVE,NW16CF,BEND 05,316SST PORT
245-23479	VALVE,MOTOR/DRIVE,NW35CF BOTH PORTS,BEND 03
245-24958	VALVE,MOTOR/DRIVE,VCR BOTH PORTS,BEND 04
245-25266	VALVE,MOTOR/DRIVE,VCR BOTH PORTS,BEND 02
245-27104	VALVE,MOTOR/DRIVE,VCR,BEND 02
245-28153	VALVE,MOTOR/DRIVE,316&PT,BEND 02
Replacement motor/gear drive assembly only (valve not included)	
245-216035	MOTOR/GEAR DRIVE ASSY
Replacement valve assembly only (motor/gear drive not included)	
245-15121	VALVE BODY,316SST&PLAT,VCR,SHORT PORT B, BEND 02
245-216036	VALVE BODY, w/SS TUBES
245-216037	VALVE BODY W/CUSEAL FLGS
245-216038	VALVE BODY W/CAJON VCR
245-216039	VALVE BODY W/CAJON VCO
245-216049	VALVE BODY W/MINICUS FLGS
Complete Assemblies with 8-inch extension between the motor and valve	
245-13277	VALVE,MOTOR/DRIVE,NW16CF,BEND 02, with 8-INCH EXTENSION/
245-13278	VALVE, MOTOR/DRIVE,NW16CF,BEND 02, with 8-INCH EXTENSION, ROTATED 180

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Chapter 1

General Information

1.1 Receiving Inspection

On receipt of the equipment, inspect all material for damage. Confirm that the shipment includes all items ordered. If items are missing or damaged, submit a claim as stated below for a domestic or international shipment, whichever is applicable.

If materials are missing or damaged, the carrier that made the delivery must be notified within 15 days of delivery, or in accordance with Interstate Commerce regulations for the filing of a claim. Any damaged material including all containers and packaging should be held for carrier inspection. Contact MKS Instruments, Inc./Granville-Phillips Customer Support for assistance if your shipment is not correct for reasons other than shipping damage.

1.2 International Shipment

Inspect all materials received for shipping damage and confirm that the shipment includes all items ordered. If items are missing or damaged, the airfreight forwarder or airline making delivery to the customs broker must be notified within 15 days of delivery. The following illustrates to whom the claim is to be directed.

- If an airfreight forwarder handles the shipment and their agent delivers the shipment to customs, the claim must be filed with the airfreight forwarder.
- If an airfreight forwarder delivers the shipment to a specific airline and the airline delivers the shipment to customs, the claim must be filed with the airline.

Any damaged material including all containers and packaging should be held for carrier inspection. Contact MKS/Granville-Phillips Customer Support for assistance if your shipment is not correct for reasons other than shipping damage.

1.3 Warranty

MKS Instruments, Inc. provides an eighteen (18) month warranty from the date of shipment for new MKS/Granville-Phillips Products. The MKS Instruments, Inc. General Terms and Conditions of Sale provides the complete and exclusive warranty for MKS/Granville-Phillips products. This document is located on our web site at www.mksinst.com, or may be obtained by contacting an MKS/Granville-Phillips Customer Service Representative.

1.4 Certification

MKS Instruments, Inc. certifies that this product met its published specifications at the time of shipment from the factory.

1.5 Customer Service / Technical Support

If the product requires service, contact the MKS, Granville-Phillips Division Customer Service Department at 1-303-652-4400 or 1-800-776-6543 for troubleshooting help over the phone.

If the product must be returned to the factory for service, request a Return Material Authorization (RMA) from Granville-Phillips. *Do not return products without first obtaining an RMA.* In some cases a hazardous materials disclosure form may be required. The MKS/Granville-Phillips Customer Service Representative will advise you if the hazardous materials document is required.

When returning products to Granville-Phillips, be sure to package the products to prevent shipping damage. Granville-Phillips will supply return packaging materials at no charge upon request. Shipping damage on returned products as a result of inadequate packaging is the Buyer's responsibility.

For Customer Service / Technical Support:

MKS Pressure and Vacuum Measurement Solutions

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Chapter 2

Safety

2.1 Safety Introduction

START BY READING THESE IMPORTANT SAFETY INSTRUCTIONS AND NOTES collected here for your convenience and repeated with additional information at appropriate points throughout this instruction manual.

These safety alert symbols in this manual or on the Product mean caution--personal safety, property damage or danger from electric shock. Read these instructions carefully.

	Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Caution indicates a hazardous situation or unsafe practice which, if not avoided, may result in minor or moderate personal injury.
	Indicates a situation or unsafe practice which, if not avoided, may result in equipment damage.



Notice	
<p>These instructions do not and cannot provide for every contingency that may arise in connection with the installation, operation, or maintenance of this product. If you require further assistance, contact MKS/Granville-Phillips at the address on the title page of this instruction manual.</p>	



This product was designed and tested to offer reasonably safe service provided it is installed, operated, and serviced in strict accordance with these safety instructions.

	 WARNING
	<p style="text-align: center;">Safety Precautions</p> <p>Failure to comply with these instructions may result in serious personal injury, including death, or property damage.</p> <p>Always observe and follow all safety notices that are provided throughout this instruction manual and on the product.</p>

These safety precautions must be observed during all phases of installation, operation, and service of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. MKS/Granville-Phillips disclaims all liability for the customer's failure to comply with these requirements.

- *Read Instructions* – Read all safety and operating instructions before operating the product.
- *Retain Instructions* – Retain the Safety and Operating Instructions for future reference.
- *Heed Warnings* – Adhere to all warnings on the product and in the operating instructions.
- *Follow Instructions* – Follow all operating and maintenance instructions.
- *Accessories* – *Do not* use accessories not recommended in this manual as they may be hazardous.

	 WARNING
	Electrical Shock or Personal Injury The service and repair information in this manual is for the use of Qualified Service Personnel. To avoid possible electrical shock or personal injury, do not perform any procedures in this manual or perform any servicing on this product unless you are qualified to do so.

	 WARNING
	Electrical Shock or Fire To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. Objects and Liquid Entry - Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Be careful not to spill liquid of any kind onto the products.

2.2 Responsibility

It is the responsibility of the Customer to comply with all local, state, and federal ordinances, regulations, and laws applicable to the installation, operation and service of this equipment.



It is the responsibility of the end user to provide sufficient lighting at work to meet local regulations.

Operation and Service of this equipment in strict accordance with the methods and procedures supplied by MKS/Granville-Phillips is the responsibility of the Customer.

MKS/Granville-Phillips assumes no liability, whatsoever, for any personal injuries or damages resulting from the operation or service of this equipment in any manner inconsistent or contrary to the methods supplied in Granville-Phillips literature including, but not limited to, manuals, instructions, bulletins, communications, and recommendations.

For emergencies and for product safety related matters, contact the MKS /Granville-Phillips Customer Service Department. See Section 1.5 or Section 6.5 for detailed information regarding how to contact MKS /Granville-Phillips Customer Service Representatives.

2.3 Grounding Requirements







	 WARNING
	<p>Proper Grounding</p> <p>All components of a vacuum system used with this or any similar high voltage product must be maintained at Earth ground for safe operation.</p> <p>Be aware that grounding this product does not guarantee that other components of the vacuum system are maintained at Earth ground.</p> <p>Connect power cords only to properly grounded outlets or sources.</p>

Grounding is very important! Be certain that ground circuits are correctly used on your ion gauge power supplies, gauges, and vacuum chambers, regardless of their manufacturer. Safe operation of vacuum equipment requires grounding of all exposed conductors of the gauges, the controller and the vacuum system. LETHAL VOLTAGES may be established under some operating conditions unless correct grounding is provided.







Ion producing equipment, such as ionization gauges, mass spectrometers, sputtering systems, etc., from many manufacturers may, under some conditions, provide sufficient electrical conduction via a plasma to couple a high voltage electrode potential to the vacuum chamber. If exposed conductive parts of the gauge, controller, and chamber are not properly grounded, they may attain a potential near that of the high voltage electrode during this coupling. Potential fatal electrical shock could then occur because of the high voltage between these exposed conductors and ground.

2.4 High Voltage

High Voltage is present in the unit when electrical power is applied to the electronics enclosure. Hazardous voltages may still be present for some time after disconnecting power to the electronics enclosure. Refer to the Installation and Service chapters for more information.

	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">High Voltage</p> <p>Be aware that when high voltage is present in any vacuum system, a life threatening electrical shock hazard may exist unless all exposed conductors are maintained at Earth ground.</p> <p>This hazard is not unique to this product.</p>
	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">High Voltage</p> <p>All conductors in, on, or around the vacuum system that are exposed to potential high voltage electrical discharges must either be shielded at all times to protect personnel or must be connected to Earth ground at all times.</p>
	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">High Voltage</p> <p>Be aware that an electrical discharge through a gas may couple dangerous high voltage directly to an ungrounded conductor almost as effectively as would a copper wire connection. A person may be seriously injured or even killed by merely touching an exposed ungrounded conductor at high potential.</p> <p>This hazard is not unique to this product.</p>

2.5 Over Pressure Conditions

	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Explosive Environment</p> <p>Do not use the Series 245 Valve in an environment of explosive or combustible gases or gas mixtures. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.</p>
	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Potential Automatic Operation</p> <p>It is the installer's responsibility to ensure that the automatic signals provided by the product are always used in a safe manner. Carefully check the system programming before switching to automatic operation.</p>
	<p style="text-align: center;"> WARNING</p> <p style="text-align: center;">Vacuum Chamber High Pressures</p> <p>Where an equipment malfunction could cause a hazardous situation, always provide for fail-safe operation. As an example, in an automatic backfill operation where a malfunction might cause high internal pressures, provide an appropriate pressure relief device.</p>

Danger of injury to personnel and damage to equipment exists on all vacuum systems that incorporate gas sources or involve processes capable of pressuring the system above the limits it can safely withstand.

For example, danger of explosion in a vacuum system exists during backfilling from pressurized gas cylinders because many vacuum devices such as ionization gauge tubes, glass windows, glass belljars, etc., are not designed to be pressurized.

Install suitable devices that will limit the pressure from external gas sources to the level that the vacuum system can safely withstand. In addition, install suitable pressure relief valves or rupture disks that will release pressure at a level considerably below that pressure which the system can safely withstand.

Suppliers of pressure relief valves and pressure relief disks can be located via an online search, and are listed on *ThomasNet.com* under "Relief Valves" and "Rupture Discs. **Confirm that these safety devices are properly installed before installing and operating the product.**

Ensure the following precautions are complied with at all times:

- (1) the proper gas cylinders are installed,
- (2) the gas cylinder valve positions are correct on manual systems,
- (3) and the automation is correct on automated gas delivery systems.

2.6 Damage Requiring Service

Disconnect the product from all power sources and refer servicing to Qualified Service Personnel under the following conditions:

- a. When any cable or plug is damaged.
- b. If any liquid has been spilled onto, or objects have fallen into the product.
- c. If the product has been exposed to rain or water.
- d. If the product does not operate normally even if you follow the operating instructions. Adjust only those controls that are covered by the operation instructions. Improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- e. If the product has been dropped or the enclosure has been damaged.
- f. When the product exhibits a distinct change in performance. This indicates a need for service.

Notice

Do not substitute parts or modify the instrument.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a service facility designated by Granville-Phillips for service and repair to ensure that safety features are maintained. Do not use this product if it has unauthorized modifications.

Notice

Safety Check - Upon completion of any service or repairs to this product, ask the Qualified Service Person to perform safety checks to determine that the product is in safe operating order.

See Service Guidelines, Section 1.5 for detailed information regarding how to contact MKS / Granville-Phillips Customer Service Representatives.

Chapter 3

Specifications

3.1 General Description

The Series 245 Pressure/Flow Control Valve provides wide-range, precision control pressure from ultra-high vacuum to 25 psig, and flow up to 2500 Torr liter/sec (400 scfh). The valve assembly is constructed entirely of low-vapor metals. There are no organic materials exposed to the gas flow.

The valve controls gases with temperatures ranging from 0 °C to 50 °C, and can be baked in the open position up to 450 °C.

3.2 Intended Use

The Series 245 Pressure/Flow Control Valve is used for pressure/flow control in a dynamic process by regulating the gas flow to compensate for gases being removed at constant or varying rates.

3.2.1 Improper Use

- Removal of any factory installed components.
- Modifying any factory installed components.
- Removal of any labeling or warranty seals.
- Operation of this device in any condensing vapor or liquid, or explosive environment.

3.3 Storage

- Store the valve assembly indoors between -40 °C to +70 °C (-40 °F to 158 °F).
- Bag the assembly in a sealed or shrink wrapped bag with desiccant.
- All of the components should be bagged and boxed together along with the instructions for future reference.

3.4 High Pressure Operation

If a pressurized gas source will be connected to the valve, the vacuum system must be protected against exploding from the buildup of a positive pressure which may be the result of a failure in the transducer or valve assembly. A suitable pressure relief valve or burst disc must be installed if the vacuum system cannot withstand the pressure from the gas source. Do not exceed maximum allowable inlet pressures specified in Table 3-1.

3.5 Chemicals

Use of certain corrosive gases can cause the valve to fail. These gases could then either leak through the sealed valve, or leak out into the atmosphere, thereby causing a health or safety hazard. Before a gas is to be used with the valve, it should be checked for compatibility with the following materials found within the valve body: fine silver and type 304 Stainless steel, or platinum and type 316 Stainless steel.

3.6 Specifications

Table 3-1 Specifications for the Series 245 Pressure/Flow Control Valve

Parameter	Specification
Pressure control range	10 ⁻¹¹ Torr (2 x 10 ⁻¹³ psia) to 1300 Torr (25 psig)
Maximum throughput	2500 Torr liters/sec. (400 scfh) with 175 psia on inlet, exhausting to 760 Torr (14.7 psia). Greater than 50 Torr liters/sec. (17 scfh) with one atmosphere (14.7 psia) pressure on inlet, exhausting to vacuum.
Leakage conductance	To vacuum: 10 ⁻¹² liters/sec. (1.3 x 10 ⁻¹⁰ cfh) maximum when free of dirt, dust, chips, or other contamination and when the seal region has not been deformed by misuse.
Valve body materials	Type 304 Stainless steel and fine silver or Type 316 Stainless steel and Platinum
Valve bakeout maximum temperature	Up to 450 °C with the motor removed and the bakeout clamp installed. The pressure inside the valve during bakeout should be less than 10 ⁻⁴ Torr (2x10 ⁻⁶ psia) so oxidation is kept to a minimum. See the bakeout procedure in this instruction manual.
Valve inlet maximum pressures	Port A = 25 psig; Port B = 200 psig
Valve weight	6 lb (2.7 kg)
Specifications and dimensions are subject to change without notice.	

3.6.1 Dimensions

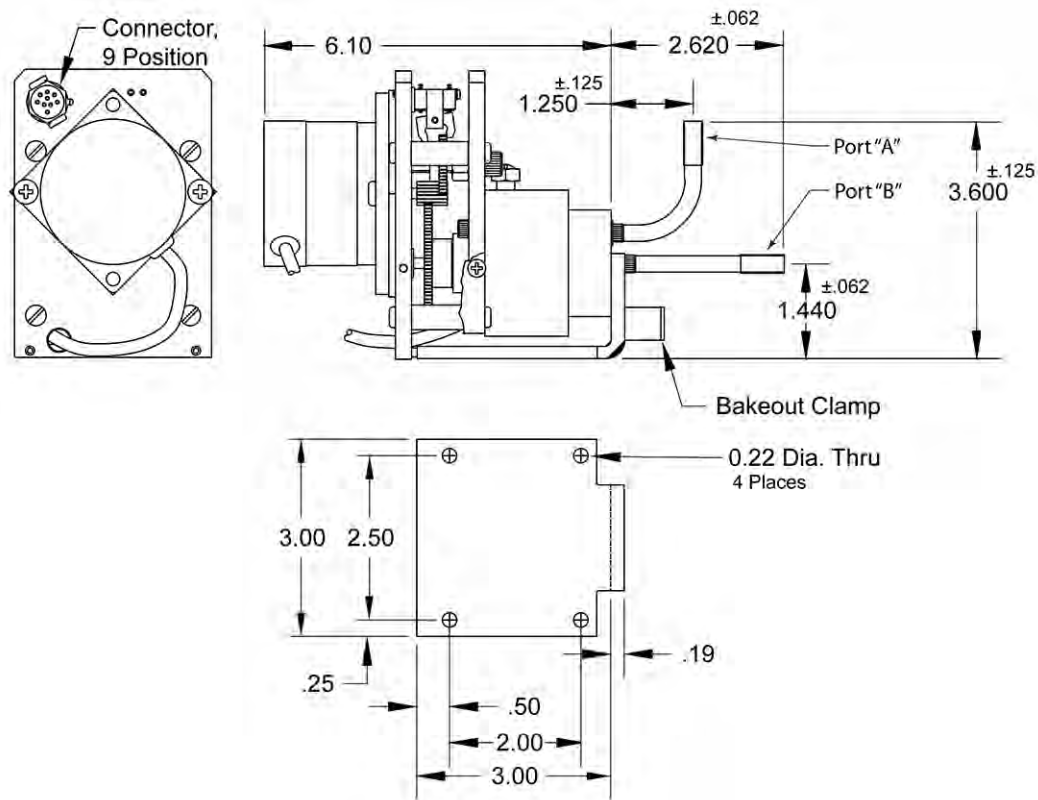


Figure 3-1: Dimensions of the Series 245 Pressure/Flow Control Valve

Chapter 4

Installation

4.1 Introduction

This section provides the information required to install a Series 245 Valve on a vacuum system and prepare the product for use.

The Series 245 Pressure/Flow Control Valve is a precision instrument. Successful use is dependent on strict adherence to procedures specified in these instructions. The metal-to-metal seal in the valve is particularly susceptible to damage by corrosive materials, excessive temperatures, and contamination by foreign particles. It is easily damaged through improper use or careless bakeout procedures. However, properly cared for, the valve will give long and useful service.

Use every precaution to prevent contamination from entering the valve. Keep the plastic caps on the valve ports until the valve is ready to be connected to the system. Store the valve assembly in a clean polyethylene bag as dust and abrasive material will damage the component parts.

4.1.1 Mounting Location and Orientation

The following statements should be considered when deciding where to mount the motor driven valve assembly on your system.

- The dynamic response of the system will depend upon the placement of the pressure transducer with respect to the valve assembly. Gas beamed directly at the pressure transducer may cause it to sense an erroneous pressure, especially at low pressures. For best dynamic response, locate the transducer near the valve assembly, but not directly in the inlet gas stream.
- The delay in system response when long, small bore tubulation is used between the valve and the chamber can cause control problems. If the assembly is to be mounted more than a few inches from the chamber, the diameter of the connecting tubing should be increased so the lag in system pressure response does not cause undue control problems.

The 245 valve assembly is shipped from the factory with the mounting plate attached. It may be mounted to operate in any position, but horizontal mounting is recommended. If it is necessary to remove the mounting plate from the valve assembly so it can be mounted to a rigid support, follow the instructions below:

1. Remove the two Allen head screws that attach the mounting bracket to the valve body.
2. Carefully slide the mounting bracket off the guide pins on the motor mounting plate.
3. After the mounting bracket is attached to a rigid support, reverse the steps above to mount the valve assembly back onto the mounting bracket.

4.1.2 Dimensions

- See Figure 3-1 in the Specifications Chapter.

4.1.3 Vacuum Connections

Three types of connections are available for the valve body.

4.1.3.1 Flange Connections

This procedure is applicable to the 2-3/4 in. o.d. CuSeal flange and the 1-5/16 in. o.d. Mini-CuSeal flange. Between each pair of mating flanges, insert a new, clean OFHC copper gasket, using care not to mar the gasket surfaces. Insert and gradually and uniformly tighten the flange bolts until the mating surfaces are in contact. It is important that the mating surfaces be in intimate contact for good mechanical strength.

4.1.3.2 Welding Connections

The welding connections are 1/4 in. o.d. x .035 in. wall Type 304 Stainless Steel which welds readily to any other 300 series Stainless Steel except the free machining grades. An inert atmosphere inside the tubulation must be used in all welding operations to prevent the formation of an oxide scale which might enter the valve and cause a malfunction. Gas Tungsten Arc Welding (GTAW or TIG) using an argon atmosphere inside the tubulation works well.

4.1.3.3 VCR Connections

Remove the plastic or metal bead protector cap from the fitting. If a gasket is used, place the gasket into the female nut. Assemble the components and tighten them to finger-tight. While holding a back-up wrench stationary, tighten the female nut 1/8 turn past finger-tight on stainless steel or nickel gaskets, or 1/4 turn past finger-tight on copper or aluminum gaskets.

4.2 Gas Source

In some cases where control is to be extended below 10^{-8} Torr, the inlet pressure will need to be reduced to below one atmosphere for optimum results.

For gas inlet pressures below one atmosphere, either valve port may be connected to the system and the other port to the gas source. To obtain the minimum volume and surface area in the system, connect the center port, port B, to the system. The maximum pressures to which each port may be subjected to is 200 psig applied at port B or 25 psig applied at port A.

When operating from a pressurized gas source, a suitable burst disc should be installed in the vacuum system to prevent system explosion should system pressure rise.

Moist gases such as undried air or gases containing oil or other contaminants are difficult to control at low flow rates. Liquid films form quickly on the sealing surface, producing a liquid seal which has only on or off properties and may result in pressure oscillations.

When moist gases are being controlled, a possible solution to the problem is to place a gas drying unit in the line between the gas source and the valve. An oil trap placed between the gas source and the valve will aid in keeping oil out of the valve when controlling gases containing oil.

It is recommended that a shut-off valve be installed between the gas source and the valve. This allows the gas source to be isolated from the system when performing bakeout.

4.3 Motor Interconnect Cable

Connect the motor interconnect cable between the controller and the 245 valve assembly. Carefully match up the pins to prevent damaging the connector.

Chapter 5

Operation

5.1 Operating Principles

The Series 245 Pressure/Flow Control Valve assembly is an electro-mechanical instrument designed to automatically regulate any parameter related to the introduction of gas pressure or flow of gas in a system. When combined with a suitable pressure or flow sensor and a vacuum pump, the 245 Valve assembly will accurately maintain any desired pressure or partial pressure in a system from 1300 Torr to less than 10^{-11} Torr.

Pressure control is accomplished by automatically and continuously admitting the correct gas flow to a dynamic system to compensate for gas being removed at constant or varying rates by pumps, adsorption or other means. The 245 pressure/flow control valve assembly may be controlled to permit continuously varying pressure conditions, can be used for backfilling, and can also be used as a flow controller when combined with a suitable pressure or flow sensor.

The Series 245 assembly consists of the driver and the pressure/flow control valve. The driver has a stepper motor, a precision screw and a hydraulic driver. The motor drives the screw through a gear train. A portion of the screw is the small piston in the hydraulic cylinder. The large piston in the cylinder is connected to the nosepiece of the flow control valve by the wedge screw. The ratio of the size of the small piston to that of the large piston causes the force to be multiplied by 9. The compensating screw on the hydraulic driver is used to set the position of the large piston so the valve is just closed (leak not greater than 10^{-10} cc per second).

The seal-off screw in the compensating screw seals the hydraulic fluid chamber. The movement of the large piston opens and closes the valve. A closed limit switch and an open limit switch are located in the gear train. When the valve is either full open or full closed, the corresponding limit switch will be activated. A signal from the activated limit switch stops the stepper motor.

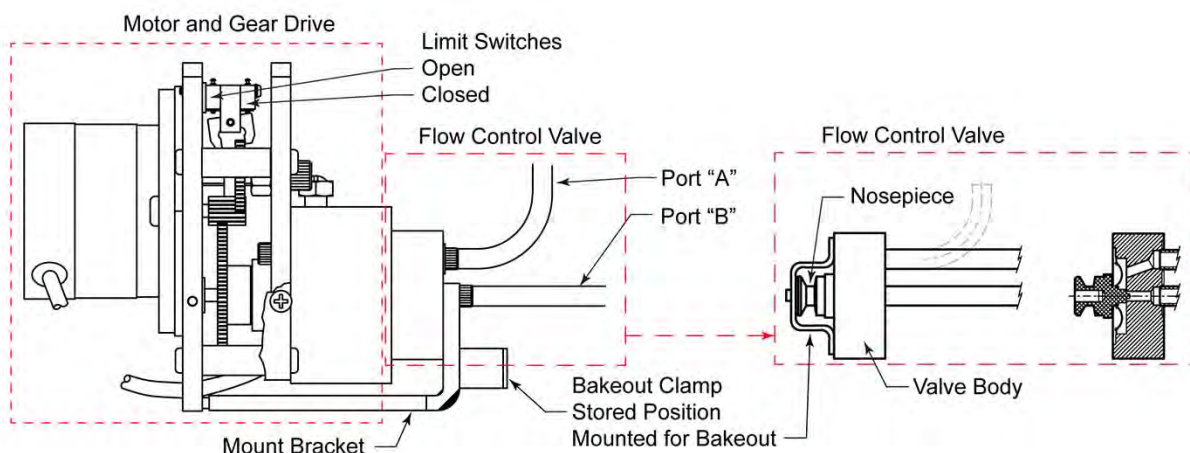


Figure 5-1: Series 245 Pressure/Flow Control Valve Assembly

A sensor senses the pressure in the vacuum chamber and sends a corresponding voltage to the input circuitry of the controlling electronics which conditions the input voltage and compares it with the reference voltage. The difference of the two voltages is the error signal. The error signal is used to control the stepper motor drive circuitry. The polarity of the error signal is used to open or close the valve to reduce the error signal to near zero.

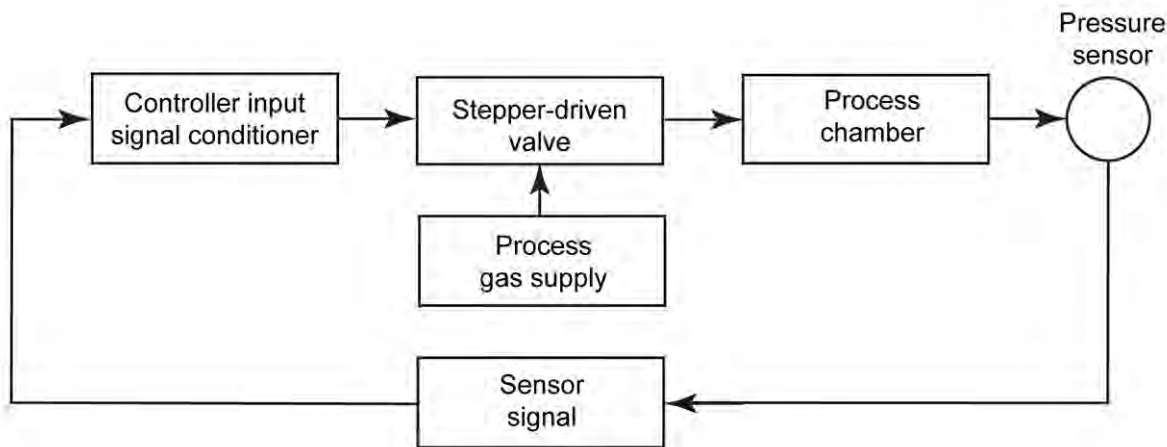


Figure 5-2: Feedback Control System Diagram

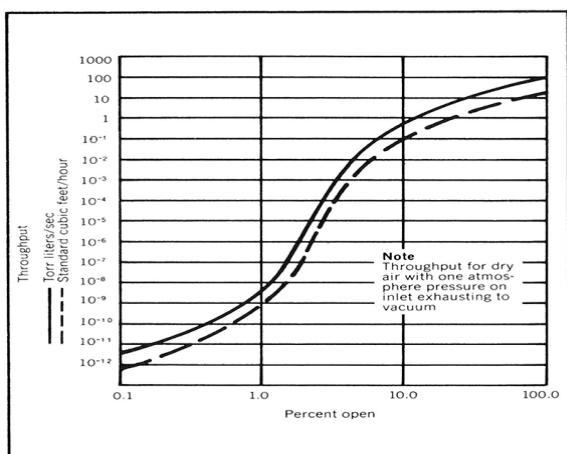
5.2 Temperature

The 245 valve is designed to be operated at ambient temperatures not exceeding 50 °C. It is not necessary to control the temperature of this unit during automatic operation as any change of leak rate due to temperature changes will automatically be compensated.

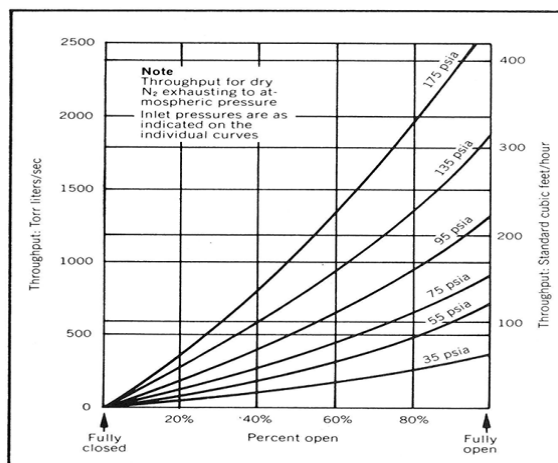
When the valve assembly is to be sealed during long periods, it may be desirable to control the ambient temperature of the valve. If the automatic control has been turned off, a drop of more than 10 °C may cause the valve to open slightly, permitting gas to leak into the system. If the valve has opened slightly due to an extreme decrease in temperature, it may be closed manually by turning the compensating screw (see Figure 6-1) clockwise 1/10 turn at a time.

5.3 Maximum Throughput

Maximum throughput is greater than 50 Torr liters/sec with atmospheric pressure on the inlet. Note that exhaust is to atmosphere.



Low pressure throughput of a typical Series 245 valve with one atmosphere pressure on the inlet.



High pressure throughput of a typical Series 245 valve.

Figure 5-3: Maximum Throughputs

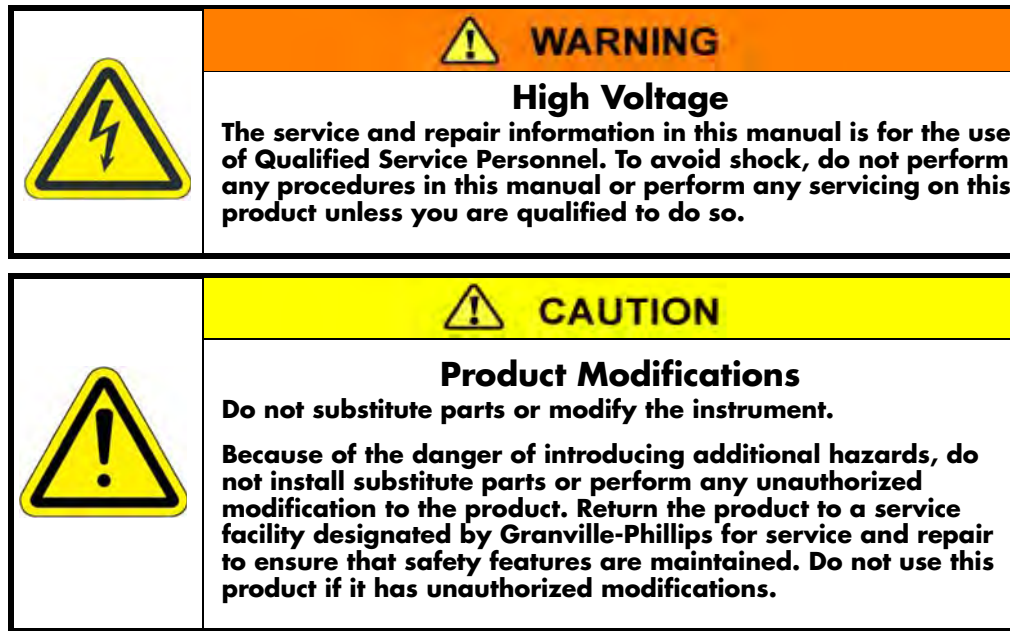
Chapter 6

Service & Maintenance

6.1 Introduction

The procedures in this section provide instructions for normal service issues that may be required during use of the Series 245 Pressure/Flow Control Valve.





NOTE: This product is designed and tested to offer reasonably safe service provided it is installed, operated, and serviced in strict accordance with these safety instructions.



6.2 Damage Requiring Service

Disconnect this product from all power sources, and refer servicing to Qualified Service Personnel if any the following conditions exist:

- The controller-to-motor interconnect cord, or plug is damaged.
- Liquid has been spilled onto, or objects have fallen into the product.
- The product has been exposed to rain or water.
- The product does not operate normally even if you have followed the Operation Instructions. Adjust only those controls that are covered in the instruction manual. Improper adjustment of other controls may result in damage and require extensive work by a qualified technician to restore the product to its normal operation.
- The product has been dropped or the enclosure has been damaged.
- The product exhibits a distinct change in performance. This may indicate a need for service.

	 CAUTION
	<p style="text-align: center;">Replacement Parts</p> <p>When replacement parts are required, be certain to use the replacement parts that are specified by Granville-Phillips, or that have the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock or other hazards.</p>
	 CAUTION
	<p style="text-align: center;">Safety Check</p> <p>Upon completion of any service or repairs to this product, ask the Qualified Service Person to perform safety checks to determine that the product is in safe operating order.</p>

6.3 Valve Bakeout Procedure

Baking the 245 valve helps reduce residual background gases and can help if contamination has occurred.

	 WARNING
	<p style="text-align: center;">Hot Surface</p> <p>Do not touch the valve or the immediate surrounding area of the vacuum chamber during the bake out process. Wait until the bake out process has finished and the area has cooled.</p> <p>Maximum bake out temperature of the valve with the motor/gear driver assembly removed is 450 °C.</p>

6.3.1 Preparation of the Valve for Bakeout

The motor/driver assembly *must* be removed for any bakeout. During bakeout the valve must be held in the open position by the bakeout clamp. Prepare the valve for bakeout as outlined below. See Figure 6-1, 6-2, and 6-3. A cutaway illustration of the driver and valve assembly is shown in Figure 6-4.

Do not remove or disconnect the Flow Control Valve from the vacuum system. Doing so introduces moisture or other contaminants, thereby defeating the results of the bakeout procedure. However, it is necessary to shut OFF the gas flow to the valve during bakeout.

1. Close the valve(s) between the gas source and the Series 245 Flow Control Valve assembly. Do not turn OFF the system vacuum pump.
2. Open the 245 Flow Control Valve using the manual switch on the controller. When the valve is fully open, the controller will indicate a full open position (refer to the manual provided with the controller). Turn OFF the controller.
3. Disconnect the controller-to-motor driver cable from the motor/drive assembly.

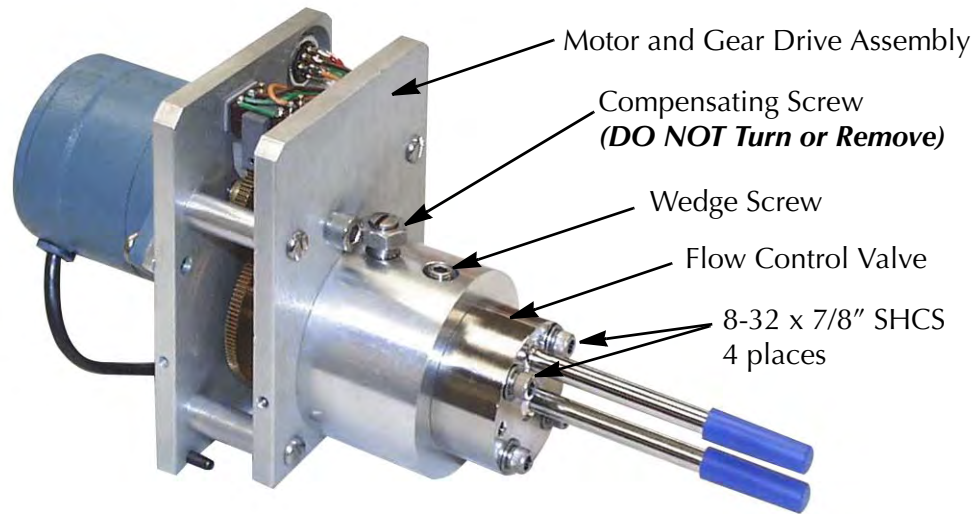


Figure 6-1: Series 245 Pressure/Flow Control Valve Assembly

4. Remove the wedge screw. See Figure 6-1 and 6-2.

Notice
Do NOT turn or remove the compensating screw.

5. Remove the four socket head cap screws from the valve, releasing the drive assembly from the valve.
6. Carefully slide the motor and driver away from the valve in a straight line parallel with its principal axis. Use care not to damage the valve.

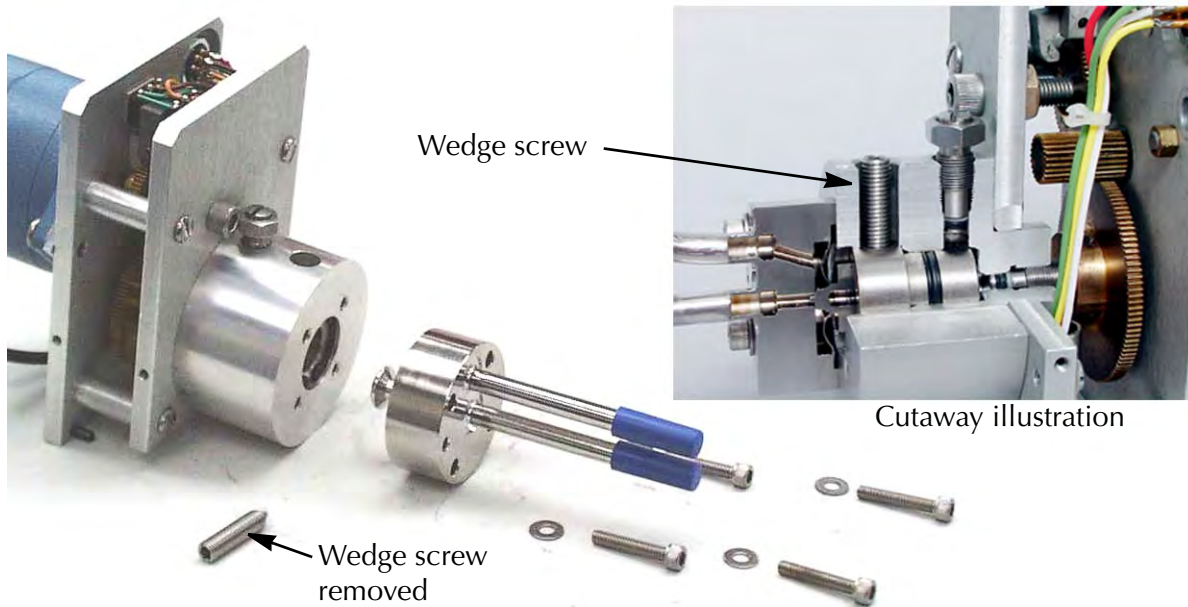


Figure 6-2: Disassembled Drive and Valve

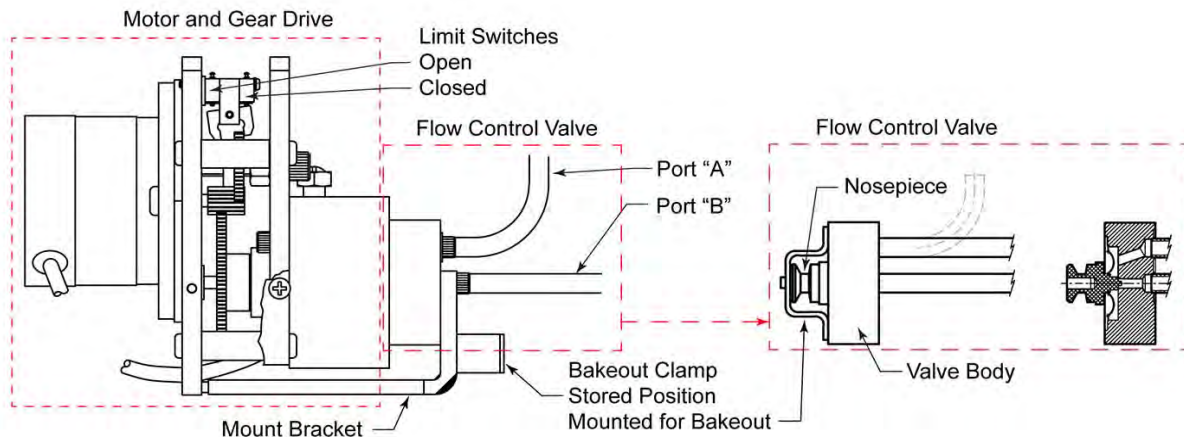


Figure 6-3: Motor Drive and Flow Control Valve Assembly

7. Remove the bakeout clamp from the mounting bracket and attach it to the nosepiece of the valve. Retract the nosepiece to the stop on the bakeout clamp.
8. Store the motor/driver assembly in a clean polyethylene bag. Dust and abrasive material can damage it.
9. The valve is ready for bakeout.

6.3.2 Bakeout the Valve

The valve may be baked at temperatures up to 450 °C provided both ports are maintained at pressures below 1×10^{-4} Torr. Low pressures are necessary to minimize oxidation of the silver sealing material.

6.3.3 After Bakeout

After the valve has cooled, re-attach the motor/driver assembly to the flow control valve.

1. Remove the bakeout clamp from the valve and re-attach it to the mount bracket. **DO NOT remove the nosepiece from the valve body.**
2. Use a lint-free cloth to thoroughly clean the mating surfaces of the driver and the valve.

Notice

Ensure the motor/driver in the fully open position. The motor/driver must never be attached to the valve unless the driver is in the fully open position.

3. Carefully slide the driver onto the valve, making certain the two guide pins have engaged the mounting plate. **Ensure the driver and valve are properly aligned.** Misalignment can cause damage to the sealing areas of the valve during installation and tightening of the four mount screws.
4. Insert and finger tighten the four 8-32 x 7/8" socket head cap screws securing the valve to the driver. **Recheck to be sure the driver and valve are properly aligned.**

5. Carefully tighten the four screws using a cross pattern to tighten them. Do not over tighten the screws.
6. Install and tighten the wedge screw against the nosepiece.

Notice

Do NOT turn the hex head compensating screw.

7. Turn ON the controller and check to be sure the valve closes properly.
8. The motor/driver and valve are now reassembled and ready for use.

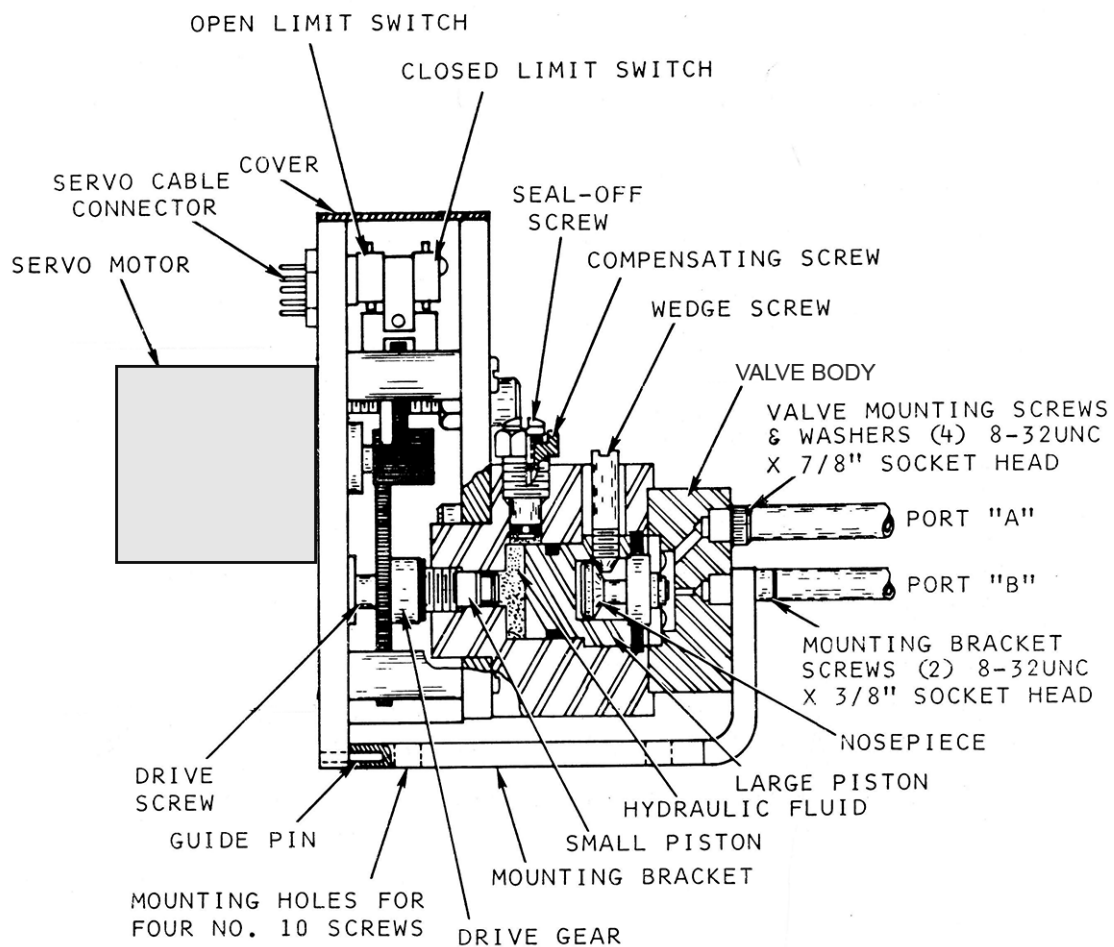


Figure 6-4: Components of the Series 245 Pressure/Flow Control Valve

6.4 Troubleshooting

Table 6-1 General Symptoms, Possible Causes & Corrections

Symptom	Possible Causes/Corrections
The motor does not operate properly in either automatic or manual mode.	<ol style="list-style-type: none"> The motor-to-controller cable is not connected. Connect the cable to the motor and controller. The motor-to-controller interconnect cable is defective. Repair or replace the cable. The motor is bound or defective. Contact Granville-Phillips Customer Support for factory repair.
The system fails to stabilize at the set pressure.	<ol style="list-style-type: none"> No source-gas pressure. Turn ON the source gas and set it to the proper pressure. The controller is not properly set up. Reset the controller according the instructions provided with the controller. The base pressure of the system may be above the set reference pressure. Reduce the base pressure. Extraneous noise and distortion greater than 10% of the sensor signal output. Filter the output of the sensor signal.
The valve does not close tightly.	<ol style="list-style-type: none"> The valve mounting screws are not properly tightened. Tighten the screws as required. The compensating screw is backed out. Turn the compensating screw clockwise 1/10 turn and observe a decrease in the pressure of the vacuum system. If no change is observed, check the hydraulic fluid level. Insufficient hydraulic fluid in the valve. Use the manual switch on the controller to open the valve. Remove the compensating screw and fill hole to bottom of the threads with hydraulic oil. The fluid must have a minimum viscosity of 150 SSU at 100 °F. (Three oils that have the property mentioned above are Oil Dyne, Inc. #0-D15, Mobil #DTE 24 and Texaco #RANDO HDA). Be sure all the bubbles are dissipated. Remove the seal-off screw from the compensating screw. Replace the compensating screw without the seal-off screw and engage the threads six full revolutions. Fill the center recess in the compensating screw to bring the oil level to the top of the screw hole. Install the seal-off screw and O-ring tight enough to seal the hydraulic chamber. Hold the hex head compensating screw with a wrench while tightening the seal-off screw. Use the manual switch on the controller to close the valve. Turn the compensating screw clockwise 1/10 turn at a time and observe a decrease in pressure of the vacuum system. The set screw on the drive gear is loose. Contact Granville-Phillips Customer Support. Sealing surfaces are contaminated. Replace the valve. Cleaning is usually not effective.

Symptom	Possible Causes/Corrections
The valve does not open fully.	<ol style="list-style-type: none"> The compensating screw is screwed in too far. If the valve is operated at too high an ambient temperature the hydraulic fluid expands and the valve cannot be fully opened. Back out the compensating screw 1/10 turn at a time to relieve the condition. Hydraulic fluid has trapped air bubbles Replenish the hydraulic fluid supply. See "Insufficient hydraulic fluid in the valve", above.
The valve envelope leaks.	Contact Granville-Phillips Customer Support for factory repair.
Hydraulic fluid is leaking around the drive screw.	The O-ring is damaged or compressed. Contact Granville-Phillips Customer Support for factory repair.

6.5 Customer Service / Technical Support

If the product requires service, contact the MKS, Granville-Phillips Division Customer Service Department at 1-303-652-4400 or 1-800-776-6543 for troubleshooting help over the phone.

If the product must be returned to the factory for service, request a Return Material Authorization (RMA) from Granville-Phillips. *Do not return products without first obtaining an RMA.* In some cases a hazardous materials disclosure form may be required. The MKS/Granville-Phillips Customer Service Representative will advise you if the hazardous materials document is required.

When returning products to Granville-Phillips, be sure to package the products to prevent shipping damage. Shipping damage on returned products as a result of inadequate packaging is the Buyer's responsibility.

For Customer Service / Technical Support:

MKS Pressure and Vacuum Measurement Solutions

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Fax: 303-652-2844
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Series 245

Granville-Phillips[®] Series 245 Pressure/Flow Control Valve Assembly



Customer Service / Technical Support:

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Instruction Manual

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