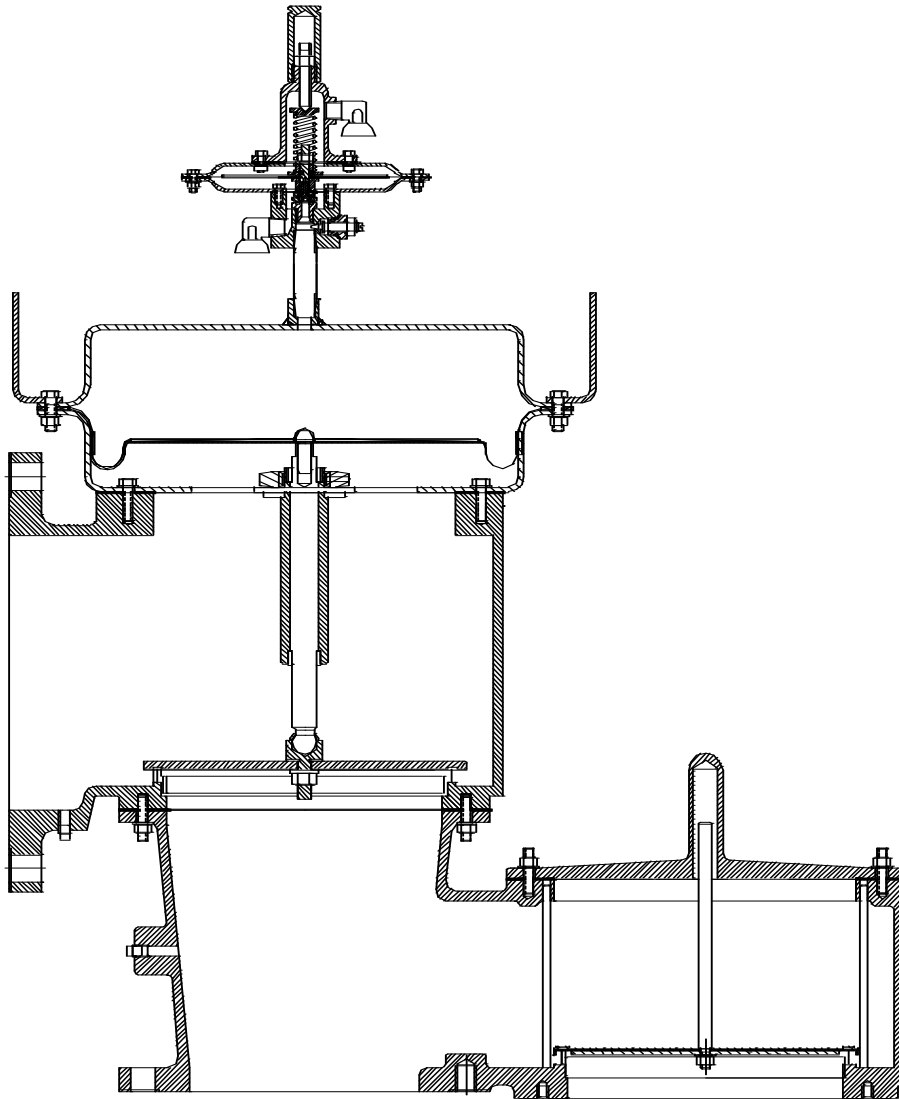


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# Installation, Operation and Maintenance

## MODELS 1500, 1520, 1530, 1560



IOM1500.0  
October, 2002



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NOTE:  
For a list of abbreviations used in this manual, refer to Table 8.

## INTRODUCTION

Pressure and/or vacuum relief valves are used on liquid storage tanks and other process vessels or systems to prevent structural damage due to excess internal pressure or vacuum.

Storage tanks are pressurized when liquid is pumped in, compressing the existing vapor or when increasing temperature causes increased evaporation or expansion of existing vapor. Conversely, a vacuum may be created when pumping out or due to decreasing temperature. To prevent damage, vapor must be allowed to escape or enter the tank at a specified pressure or vacuum condition. The volume rate of venting depends upon the tank size, volatility of the contents, the pumping rate and the temperature. See API Standard 2000 for the procedures to determine venting requirements.

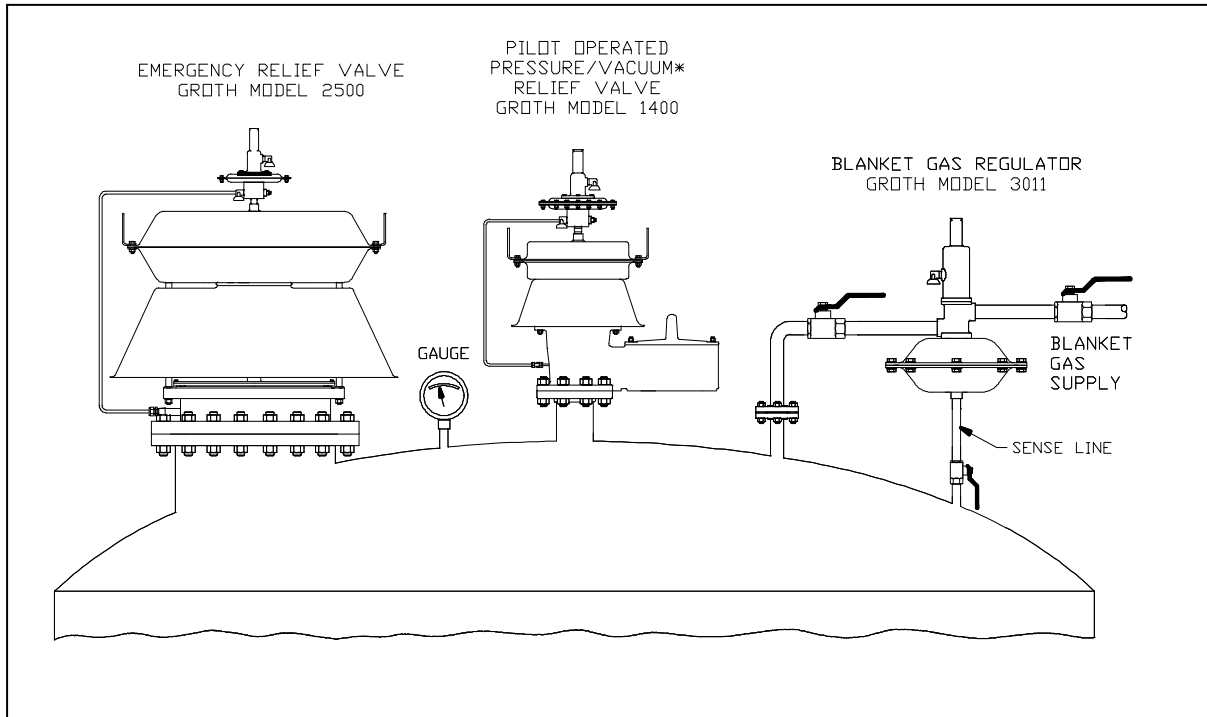
The pilot operated relief valve has two principal advantages over other types of relief valves:

- 1) It is bubble tight to set pressure.
- 2) It achieves the full open position at 10% above set pressure.

These characteristics permit operating pressures nearer to the maximum allowable working pressure of the tank. High operating pressures reduce evaporation and total venting volume, thereby reducing product loss and the cost of processing emissions. A tank may also have provisions for emergency pressure relief due to fire exposure and/or inert gas blanketing of the vapor space. A typical tank installation is shown in Figure 1 which includes a 1500 Pilot Operated Pressure/Vacuum Relief Valve, a Gas Blanketing Regulator (Model 3011) and a 2500 Emergency Pressure Relief Valve which provides protection under fire or other abnormal conditions. Groth Corporation manufactures all of these devices.

A Pilot Operated Valve (POV) must be carefully maintained by a qualified valve technician. It should only be assembled under clean conditions, preferably in a service shop environment. Carefully read and understand this manual before attempting to repair a 1500 series POV. Groth Corporation provides repair services for all products manufactured by the Groth Products Group.

**FIGURE 1: TANK INSTALLATION - SAFETY EQUIPMENT**

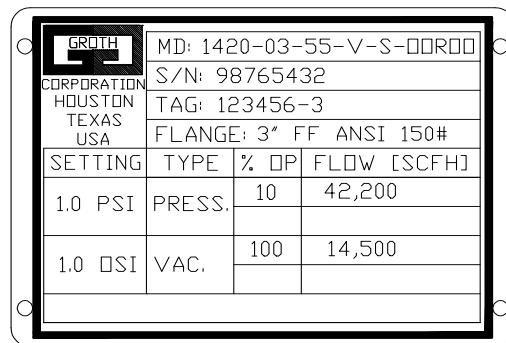


\*Pressure relief is pilot operated, vacuum relief is weight loaded.

The 1500 Series Pilot Operated Valves are designed to provide pressure and/or vacuum relief for API 620 and 650 tanks. Several configurations are available; these are summarized in Table 1 below. Each type is available with either a standard FEP film or with an O-Ring pallet. A variety of material options are available depending on the type of service.

The nameplate below shows the basic information that is listed on each relief valve:

**FIGURE 2: GROTH NAMEPLATE**



Model	P	V	Vacuum Operation
1500	✓	✓	Weight Loaded
1520	✓	✓	Weight Loaded
1530	✓		Not Available
1560	✓		Not Available

**For information not contained in this manual, please contact:**

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**13650 N. Promenade Blvd,**  
**Stafford, Texas 77477**  
**281-295-6800 (phone)**  
**281-295-6995 (fax)**

## PILOT VALVE DESIGN AND FUNCTION

Each application must be reviewed to ensure material compatibility of all metal and soft good components with the service conditions. The pallet assembly and wetted components are available in Aluminum or 316 SS; they may be upgraded to Hastelloy C or other alloys for severe corrosive service. Diaphragms are all FEP film; other soft goods can be specified as Buna-N, Viton, or Kalrez. The standard sense tubing is 316 SS; it is available in Kynar for severe corrosive chemicals.

The pilot valve is set at the factory to comply with the specification on the purchase order. The range of adjustment will depend on the spring installed and will be stamped on the nameplate. The pressure setting may be

changed within the design range either while on line or in a service shop. Observe the proper setting and testing procedure in the appropriate pilot valve manual.

This manual is intended to provide recommended procedures and practices for installation, operation, and maintenance of the Groth Series 1500 Pilot Operated Valve (POV) Series. Any standard procedures and practices developed for a specific plant or process may supersede this manual. Although this manual cannot cover all possible contingencies, following these guidelines should provide safe, reliable pilot valve performance.

Note: This manual covers the operation and maintenance of only the main valve; refer to the appropriate manual for the pilot valve instructions.

### SAFETY WARNINGS

*This section is an overview of safety guidelines that should be followed during the installation, operation, and maintenance of your valve. To understand the context of these instructions and warnings, read and understand this complete manual.*

*The purpose of a POV is to prevent excessive pressure in a tank or process system. The valve must be designed for the proper MAWP and flow requirements of the system. Consult API Standard 2000 for tank protection sizing procedures. An improperly specified or functioning relief valve may result in structural damage to the tank or system.*

*In the event of an actuator diaphragm failure, the valve will vent pressure to the atmosphere, causing the pressure relief valve to fail in the OPEN position. The valve will function like a weight loaded valve under this condition with a lower setting point, and will normally provide rated flow capacity. Consult factory for any questions related to this over-pressure condition.*

*POV relief pressure and blowdown are set at the factory per purchase order specifications.*

*The set pressure and range of adjustability are stamped on the pilot valve nameplate. DO NOT*

*attempt to readjust the set pressure beyond the limit specified on the nameplate.*

*The pilot sense line is either 3/8" OD SS tubing, or 1/2" NPT Kynar pipe. It must be kept open and unobstructed to ensure that the pilot "senses" actual tank pressure. For applications where tank vapors may condense or "polymerize" in the sense tube or pilot valve, a nitrogen purge may be required to prevent internal obstruction of the tube. Consult the factory for recommendations.*

*DO NOT attempt to remove the pilot valve from the main valve without removing or isolating the relief valve from the system. ALTERNATIVE MEANS OF PRESSURE RELIEF MUST BE PROVIDED WHEN THE VALVE IS OUT OF SERVICE. After isolating the relief valve, bleed all pressure from both main and pilot valve before removing the valve. Consult the pilot valve manual before attempting to repair it. Both the pilot valve and POV are exposed to process vapors. Observe all plant procedures and Material Safety Data Sheet recommendations for the products in the system when inspecting, adjusting or servicing the valves. Vents on the body and spring bonnet of the pilot valve must be clean and unobstructed for proper and safe operation of the valve. These vents should be inspected periodically, and cleaned or replaced, if necessary.*

## SHIPPING, INSPECTION AND STORAGE

The POV is packed and supported to prevent damage or contamination during shipping. It should be similarly protected during subsequent handling and storage. Always keep all ports plugged to prevent intrusion of foreign materials. Inspect the valve for any sign of damage that may have occurred in shipment and report this to the carrier. If there are indications of physical damage or internal contamination, the valve must be disassembled, cleaned and inspected before installation. The spring adjustment cap and blowdown screw locknut may be "car sealed" to ensure that the factory pressure setting has not been altered.

Inspect the valve for any sign of damage that may have occurred in shipment and report this to the carrier and Groth Corporation.

Lifting eyes are provided on the upper actuator for handling the valve. To avoid damage to the lower flange surface, set the valve on a soft clean gasket material until it is ready to be installed. It should be stored in a clean environment until it is to be mounted on the tank.

The pilot pickup fitting is in the body and must be kept completely free of all foreign materials. DO NOT store the valve directly on the ground.

## INSTALLATION

The 1500 Series valves are precision devices that must be handled carefully to ensure seat tightness.

1. At installation, the valve should be smoothly lifted into position using the lifting eyes on the actuator. Use the actuator housing to align the valve directly over the tank nozzle. Do NOT use the pilot valve or pickup line to pull the valve into position.
2. Aluminum valve bodies should be connected with flat faced 150# ANSI flanges. A full faced gasket is recommended. Mating flanges should be flat within .020" and clean, free of scratches, corrosion and tool marks.
3. Each valve is leak tested at the factory as part of our standard inspection procedures.
4. Inspect the gasket; make sure that the material is suitable for the service. Gasket dimensions are listed below, Table 2. Full

gaskets must be used with flat face flanges. Either full or ring gaskets may be used with raised face flanges.

150# ANSI Flange*	O.D.	I.D.	B.C.	Hole	Qty
2" RF	4.12"	2.38"	---	---	---
3" RF	5.38"	3.50"	---	---	---
4" RF	6.88"	4.50"	---	---	---
6" RF	8.75"	6.62"	---	---	---
8" RF	11.00"	8.62"	---	---	---
10" RF	13.38"	10.80"	---	---	---
12" RF	16.12"	12.80"	---	---	---
2" FF	6.00"	2.00"	4.75"	0.75"	4
3" FF	7.50"	3.00"	6.00"	0.75"	4
4" FF	9.00"	4.00"	7.50"	0.75"	8
6" FF	11.00"	6.00"	9.50"	0.88"	8
8" FF	13.50"	8.00"	11.75"	0.88"	8
10" FF	16.00"	10.0"	14.25"	1.00"	12
12" FF	19.00"	12.0"	17.00"	1.00"	12

\* RF = Raised Face , FF = Flat Face

5. Lubricate all studs and nuts with an appropriate thread lubricant. If stainless steel fasteners are used, use an anti-seize lubricant such as moly-disulfide (Table 6).
6. Center the gasket within the bolt circle of the tank nozzle flange.
7. Set the valve carefully on the nozzle.
8. Install nuts and lock washers and torque all fasteners to half the recommended value in a staggered, alternating pattern. *Consult with Plant and/or Maintenance Personnel for appropriate practices and standards.*

Size	Qty Holes	Bolt (UNC)	Torque (lb-ft)	
			Raised Face	Flat Face
2"	4	5/ 8" - 11	31	81
3"	4	5/ 8" - 11	43	106
4"	8	5/ 8" - 11	29	68
6"	8	3/ 4" - 10	51	101
8"	8	3/ 4" - 10	78	142
10"	12	7/ 8" - 9	75	138
12"	12	7/ 8" - 9	93	179

\*Note : Torque values are based on a gasket factor  $m = 3.5$ , gasket factor  $y = 4000$  psi, operating pressure = 30 psi

9. Make sure that the flanges are not distorted and that the gasket is evenly compressed.
10. Make up the final torque and check that no further nut rotation occurs.

11. Normally, the pilot sense is integral to the valve assembly. However, if the optional remote sense connection is specified, an external sense line must be installed. See the appropriate manual or attached tag for recommendations. If the valve utilizes a 1402 Pilot Valve, there will be two connections to the tank. The connections can only be combined (with a tee) at the tank connection.

## MAINTENANCE

### **Safety Warning**

*If the valve must be removed from the tank for any reason, make sure that all pressure has been released before the flange fasteners are loosened. Refer to your company procedures before venting the tank pressure and when handling toxic or otherwise hazardous materials. Observe all standard safety precautions as specified on Material Safety Data Sheets for the product(s) in the system while removing the valve and when repairing it.*

The 1560 POV does not require routine lubrication or adjustments. It should be checked periodically, at least twice a year, to confirm that the valve is functioning properly and that the set point is correct. Test connections can be provided to facilitate testing the valve in the field.

The pilot valve is designed to function in a fail-safe manner. The failure of a seal or diaphragm will cause pressure to be vented to the atmosphere; the resulting loss in pressure will cause the main valve to open under rising pressure.

Periodic inspection for seat tightness should be done to ensure compliance with local air pollution control requirements. If the valve relieves to the atmosphere, this may be accomplished with a gas detector calibrated for the principle product in the system.

The valve will need to be periodically removed from the tank for inspection of diaphragms, gaskets and seals. When this is done, the valve must be handled carefully using the lifting eyes on the actuator housing.

Refer to handling instructions listed in the Installation section of this manual.

If a vapor leak is detected, it will likely be from one of the following sources:

1. Pilot valve

2. Main valve actuator
3. Main valve diaphragm
4. Body - nozzle flange joint gasket

Refer to the troubleshooting section of this manual or the pilot valve manual for probable causes for these type of problems.

The main and pilot valve actuator housings, valve bodies, pallet assemblies and other components are exposed to the process vapor.

## DISASSEMBLY

The 1500 series valves can be simplified into three modules. These modules can be seen in the figures below :

Weatherhood  
Outlet  
Vacuum (integral with body)

Before any disassembly or assembly , make sure that there is NO PRESSURE (positive or negative) in the system.

### **Outlet/ Weatherhood Disassembly**

1. Disconnect the tubing connections (pilot to main valve).
2. Remove the pilot valve. Refer to appropriate pilot valve manual for disassembly instructions.
3. Remove all fasteners holding the actuator housings together.
4. Carefully lift the upper housing to avoid damaging the actuator diaphragm.
5. Remove the housing gaskets.
6. Remove the actuator diaphragm and the screw holding the support plate.
7. Remove the actuator support plate.
8. Remove the fasteners holding the lower housing to the body (Models 1520 & 1560), or weatherhood posts (Models 1500 & 1530).
9. Lift lower housing and stem guide assembly. This assembly will slide over the stem.
10. Lift the stem and pallet assembly out of the valve, invert it, and hold the stem in a soft chuck vise (to avoid damage to the stem).
11. Remove the nut, to disassemble the pallet assembly.

### Vacuum Disassembly

1. Remove the nuts from the cover.
2. Lift the cover.
3. Remove the gasket.
4. Lift the stem-pallet assembly. (Make note of the weights. The valve must be reassembled with the weights in the same location to achieve the specified settings.)
5. Invert the assembly.
6. Remove the nut holding the assembly together.

### ASSEMBLY

Inspect all guides for corrosions, damage or product build up. Also inspect the vacuum cover guide bore. Check the metal seating surfaces for pitting, corrosion or product build up. **It is recommended to replace ALL soft goods including diaphragms, O-Rings and cover gaskets.** Note, the stem guide has internal Teflon bushings.

If the seats are damaged they must be lapped using a flat ground metal disc with fine grit emery cloth attached and lapping compound. Wipe the seating surface clean before assembly.

To assemble a valve, reverse the disassembly procedure.

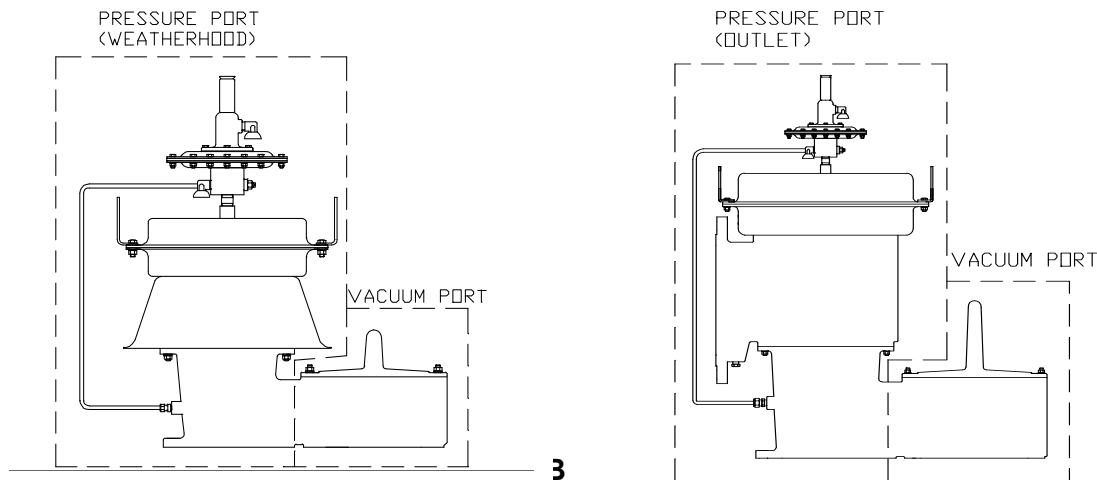
### FIGURES AND TABLES

The following figures are to assist in identifying components during disassembly and assembly of the Groth 1500 Series valves. The actual configurations might vary because of special applications and customers' request, but the operation and function is similar.

Figure 5 through Figure 8 include a NOTE column. For an explanation of the NOTES, see Table 4 below.

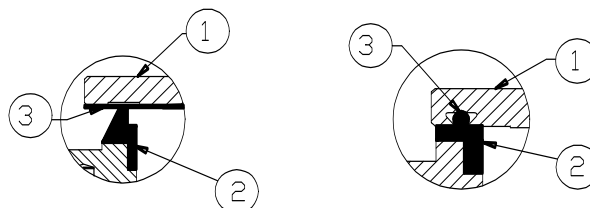
- For Lubricants suggested, see Table 6.
- For Troubleshooting Guide, see Table 7.
- For Abbreviations, see Table 8.

**FIGURE 3 : VALVE PORT IDENTIFICATION**



**FIGURE 4 : AVAILABLE SEAT CONFIGURATIONS**

ITEM	DESCRIPTION
1	Pallet*
2	Seat**
3	Diaphragm (Fig 4.1) O-Ring (Fig 4.2)



\* Actual pallet may not resemble drawing. Pallet design varies with operation.

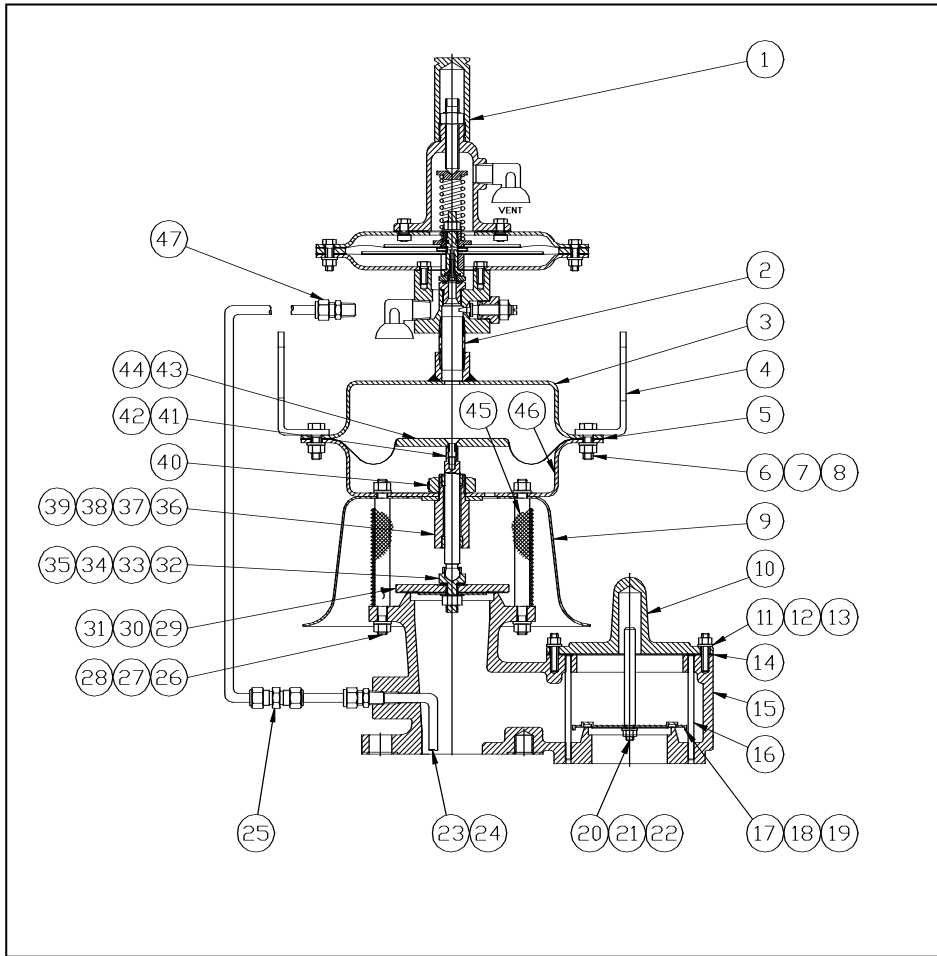
\*\* Seat can be integral (machined into body), or a ring insert. (Depends on the body material).

<b>TABLE 5 : PART NUMBERS FOR VACUUM PALLET ASSEMBLIES</b>							
<b>Component</b>	<b>Valve Size</b>						
	<b>2"</b>	<b>3"</b>	<b>4"</b>	<b>6"</b>	<b>8"</b>	<b>10"</b>	<b>12"</b>
FEP Diaphragm, 10 mil	80040162	80040362	80040562	80040762	80040962	80041162	80041362
FEP Diaphragm, 20 mil	80040154	80040357	80040568	80040761	80040963	80041167	80041354
Gasket, Outlet (bottom)	80040159	80040359	80040559	80040759	80040959	80041159	80041359
Gasket, Cover (top)	80040158	80040358	80040558	80040758	80040958	80041158	80041358
O-Ring (plate pallet) -Viton®	89107010 ( #010 70 durometer)			89107012 ( #012 70 durometer)			

Setting	< 4 OSI		4 - 8 OSI		8 - 12 OSI		12 - 16 OSI	
Diaphragm	10 mil	20 mil	10 mil	20 mil	10 mil	20 mil	10 mil	20 mil
Quantity	1	---	---	1	1	1	---	2

\* Please provide the valve serial number and pressure/vacuum settings when ordering replacement parts.

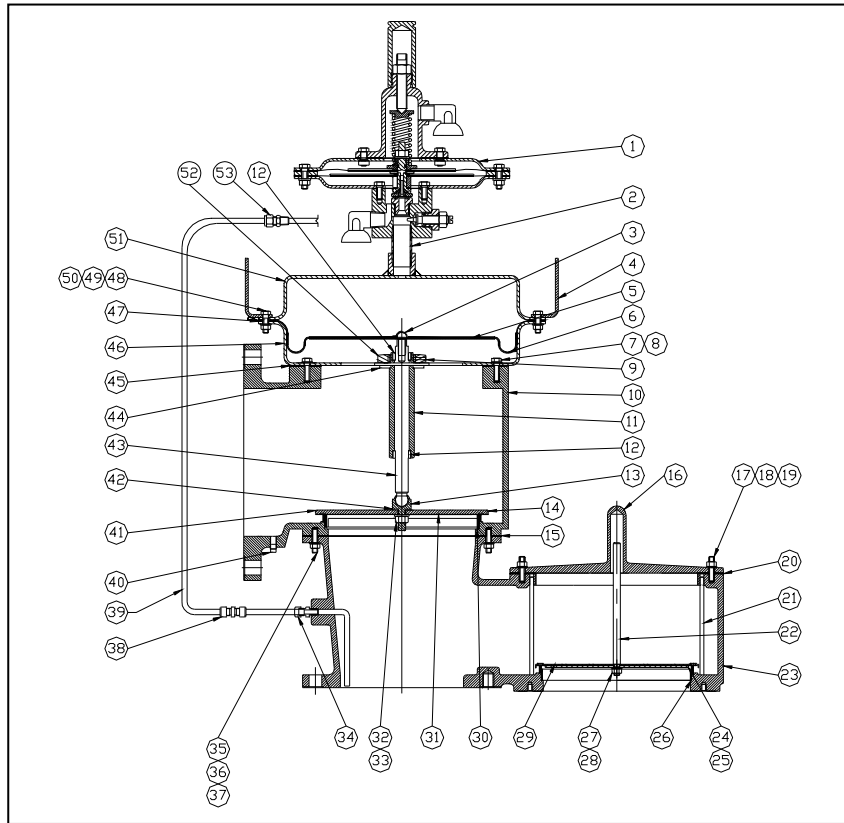
**FIGURE 5 : MODEL 1500**



ITEM	DESCRIPTION	NOTE
1	Pilot Valve Assembly	
2	Pipe Nipple	
3	Upper Diaphragm Case	
4	Lifting Eye	
5	Gasket – Actuator	4
6	Hex Bolt	
7	Hex Nut	
8	Lock Washer	
9	Weatherhood	
10	Cover – Vacuum	
11	Lock Washer	
12	Hex Nut	
13	Stud	
14	Gasket – Cover	2
15	Body	
16	Guide Rod – Vacuum	
17	Pallet – Vacuum	
18	Retainer Plate – Vacuum	
19	Diaphragm – Vacuum	1
20	Stem – Vacuum	
21	Hex Nut	
22	Lock Washer	
23	Tubing	
24	Male Connector	

ITEM	DESCRIPTION	NOTE
25	Connector	
26	Weatherhood Post	
27	Lock Washer	
28	Hex Nut	
29	Pallet – Pressure	
30	Diaphragm, Pressure Pallet	1
31	Retainer Plate – Pressure	
32	Swivel Fitting	
33	Belleville Washer	
34	Hex Nut	
35	Seal - Guides	1
36	Stem Guide	
37	Washer – Stem Guide	
38	Hex Jam Nut	
39	Bushing	3
40	Set Screw	
41	Stem – Pressure	
42	Screw	
43	Support Plate	
44	Diaphragm	4
45	Screen	
46	Lower Diaphragm Case	
47	Male Connector	

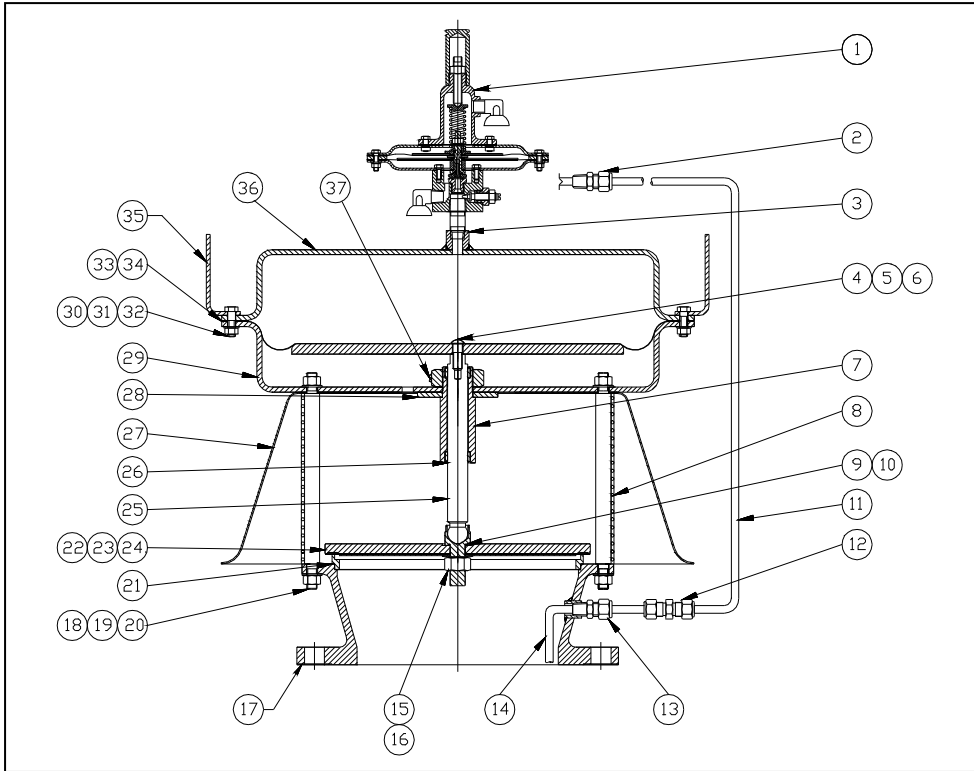
**FIGURE 6 : MODEL 1520**



ITEM	DESCRIPTION	NOTE
1	Pilot Valve Assembly	
2	Pipe Nipple	
3	Button Head Cap Screw	
4	Lifting Eye	
5	Support Plate	
6	Diaphragm, Actuator	4
7	Hex Bolt	
8	Lock Washer	
9	Set Screw	
10	Outlet	
11	Stem Guide	
12	Bushing	3
13	Swivel Fitting	
14	Pallet	
15	Gasket	2
16	Vent – Cover	
17	Stud	
18	Lock Washer	
19	Hex Nut	
20	Gasket	2
21	Guide Rod	
22	Stem	
23	Body	
24	Diaphragm – Vacuum Pallet	1
25	Retainer Plate	
26	Seat Ring	
27	Lock Washer	

ITEM	DESCRIPTION	NOTE
28	Hex Nut	
29	Pallet	
30	Seat Ring	
31	Retainer Plate	
32	Hex Nut	
33	Belleville Washer	
34	Male Connector	
35	Stud	
36	Hex Nut	
37	Lock Washer	
38	Union Connector	
39	Tubing	
40	Drain Plug	
41	Diaphragm, Pressure Pallet	1
42	Seal	1
43	Stem	
44	Washer	
45	Gasket	2
46	Lower Diaphragm Case	
47	Gasket, Actuator	4
48	Hex Bolt	
49	Hex Nut	
50	Lock Washer	
51	Upper Diaphragm Case	
52	Hex Jam Nut	
53	Male Connector	

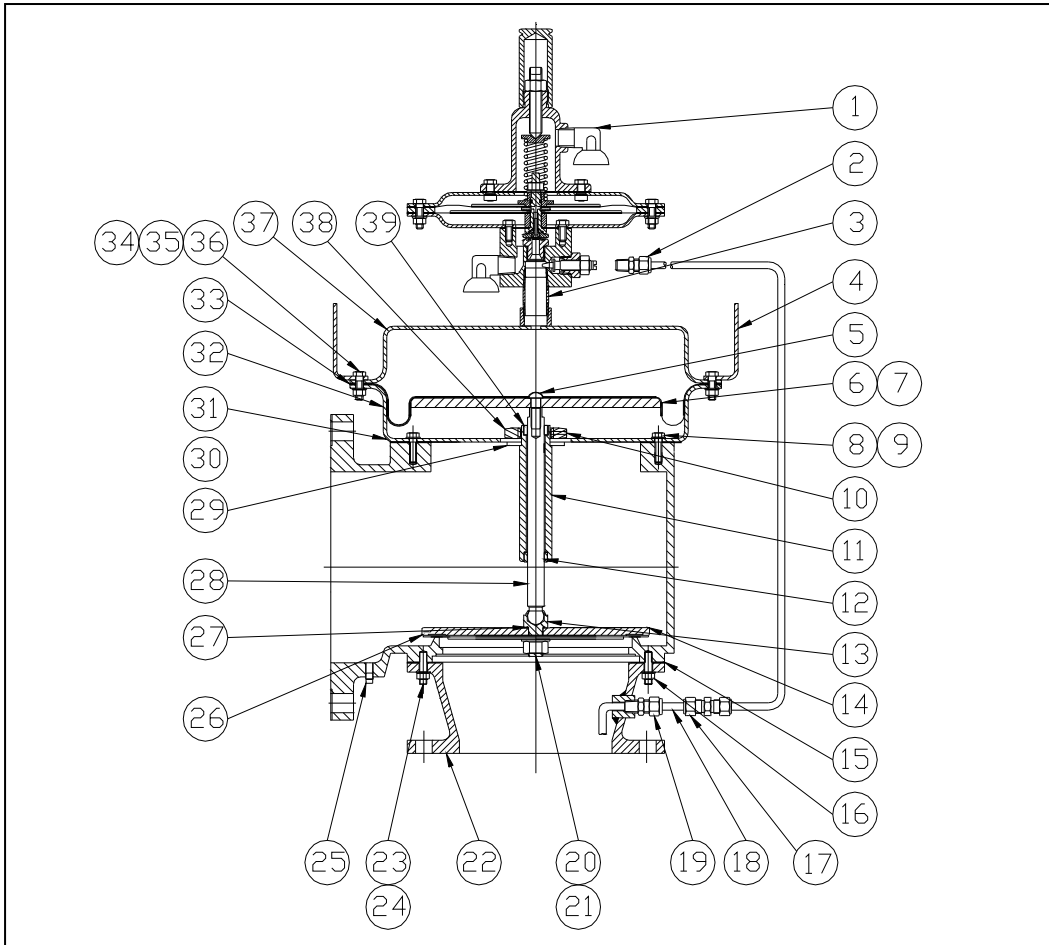
**FIGURE 7 : MODEL 1530**



ITEM	DESCRIPTION	NOTE
1	Pilot Valve Assembly	
2	Male Connector	
3	Pipe Nipple	
4	Cap Screw	
5	Support Plate	
6	Hex Jam Nut	
7	Stem Guide	
8	Screen	
9	Seal – Swivel Guide	1
10	Swivel Fitting	
11	Tubing	
12	Union Connector	
13	Male Connector	
14	Pick – up Fitting	
15	Belleville Washer	
16	Hex Nut – Swivel	
17	Inlet	
18	Weatherhood Post	
19	Lock Washer	

ITEM	DESCRIPTION	NOTE
20	Hex Nut	
21	Seat Ring	
22	Pallet	
23	Diaphragm, Pressure Pallet	1
24	Retainer Plate	
25	Stem	
26	Bushing – Stem Guide	3
27	Weatherhood	
28	Washer – Stem Guide	
29	Lower Actuator Housing	
30	Hex Bolt	
31	Lock Washer	
32	Hex Nut	
33	Diaphragm – Actuator	4
34	Gasket – Actuator	4
35	Lifting Lug	
36	Upper Actuator Housing	
37	Set Screw	

**FIGURE 8 : MODEL 1560**



ITEM	DESCRIPTION	NOTE
1	Pilot Valve Assembly	
2	Male Connector	
3	Pipe Nipple	
4	Lifting Eye	
5	Cap Screw	
6	Support Plate	
7	Diaphragm, Actuator	4
8	Hex Bolt	
9	Lock Washer	
10	Set Screw	
11	Stem Guide	
12	Bushing – Guides	3
13	Swivel Fitting	
14	Pallet - Pressure	
15	Gasket	2
16	Lock Washer	
17	Union Connector	
18	Tubing	
19	Male Connector	
20	Hex Nut	

ITEM	DESCRIPTION	NOTE
21	Belleville Washer	
22	Inlet	
23	Stud	
24	Hex Nut	
25	Drain Plug	
26	Diaphragm, Pressure Pallet	1
27	Seal	1
28	Stem	
29	Washer	
30	Outlet	
31	Gasket	2
32	Lower Diaphragm Case	
33	Gasket	2
34	Hex Bolt	
35	Hex Nut	
36	Lock Washer	
37	Upper Diaphragm Case	
38	Hex Jam Nut	
39	Bushing – Guides	3

TABLE 6 : LUBRICANTS – RECOMMENDATIONS		
FASTENER LOCATION	LUBRICANT – SEALANT	MANUF. & PART NO.
Actuator Fastener	Dry Moly Film	Crown #6080 or equal
Stem Guide	MS2 Lubricant	Fel-Pro [Loctite] #51048 or equal
Stem/Swivel Fitting	Silicone Lubricant	Dow Corning #33 or equal

**Note:** Lubricant selection must consider process environment.

TABLE 8 : ABBREVIATIONS			
ANSI	American National Standards Institute	NPT	National Pipe Thread
API	American Petroleum Institute	POV	Pilot Operated Valve
BOM	Bill of Materials	PSIG	Pounds/Sq. Inch – Gauge
DPHGM	Diaphragm	PTFE	Teflon
FEP	Fluorocarbon Film (Teflon)	SS	Stainless Steel
MAWP	Maximum Allowable Working Pressure	WC	Water Column
MS2	Moly – Disulfide		

The nameplate on the Groth Series 1500 Pilot Operated Valve contains the model number, serial number, set pressure and flow capacity. The model number contains additional information about materials of construction and options. The following chart will assist in relating the model number to the specifications of your pilot operated valve:

## PRODUCT LIMITED WARRANTY

- A. Seller warrants that products which are manufactured by Seller, are manufactured in accordance with published specifications and free from defects in material and/or workmanship for a period of (12) twelve months. Seller, at its option, will repair or replace any product returned intact to the factory, transportation charges prepaid, which Seller, upon inspection shall determine to be defective in material and/or workmanship. The foregoing shall constitute the sole remedy for any breach of Seller's warranty.
- B. THERE ARE NO UNDERSTANDINGS, AGREEMENTS, REPRESENTATIONS, OR WARRANTIES, EXPRESS OR IMPLIED (INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING PRODUCTS) UNLESS SPECIFIED IN THE SALES CONTRACT. THIS CONTRACT STATES THE ENTIRE OBLIGATION OF SELLER.  
Seller makes no warranties, either express or implied, except as provided herein, including without limitation thereof, warranties as to marketability, merchantability, for a particular purpose or use, or against infringement of any patent of products. In no event shall Seller be liable for any direct, incidental or consequential damages of any nature, or losses or expenses resulting from any defective new product or the use of any such product, including any damages for loss of time, inconvenience, or loss of use of any such product.
- C. The original Manufacturer shall be solely responsible for the design, development, supply, production, and performance of its products hereunder, and the protection of its trade name or names, if any. It assumes no responsibility, for product modified or changed in any way by its agent or customer. Any such modifications or changes to products sold by Seller hereunder shall make the product limited warranty null and void.
- D. The Manufacturer shall be under no obligation to manufacture, sell, or supply, or to continue to manufacture, sell or supply any of the Products.