

Consolidated®

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Consolidated® Pilot Operated Safety Relief Valve Type 2900 Series



MPV™
Modular Pilot
Valve Types

39MV07-2
39MV37-2

39PV07-2
39PV37-2

Series
2900

OPTIONS:

- Backflow Preventer
- Filter
- Manual Blowdown
- Pressure Differential Switch
- High Temperature
- Low Temperature
- Dirty Service

CON-29
March, 2003



P.O. Box 1430
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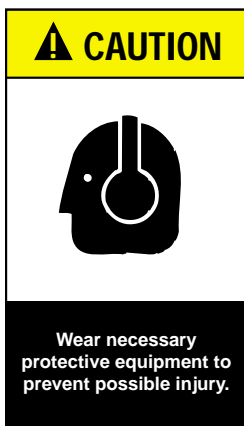
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ATTENTION
Hazards or unsafe practices which **COULD** result in product or property damage.



WARNING
Hazards or unsafe practices which **COULD** result in severe personal injury or death.



CAUTION
Hazards or unsafe practices which **COULD** result in minor personal injury.

SECTION III. Product Safety Sign and Label System

If and when required, appropriate safety labels have been included in the rectangular margin blocks throughout this manual. Safety labels are vertically oriented rectangles as shown in the *representative examples* (left and below), consisting of three panels encircled by a narrow border. The panels can contain four messages which communicate:

- The level of hazard seriousness.
- The nature of the hazard.
- The consequence of human, or product, interaction with the hazard.
- The instructions, if necessary, on how to avoid the hazard.



DANGER
Immediate hazards which **WILL** result in severe personal injury or death.

The top panel of the format contains a signal word (**DANGER, WARNING, CAUTION** or **ATTENTION**) which communicates the level of hazard seriousness.

The center panel contains a pictorial which communicates the nature of the hazard, and the possible consequence of human or product interaction with the hazard. In some instances of human hazards the pictorial may, instead, depict what preventive measures to take, such as wearing protective equipment.


The bottom panel may contain an instruction message on how to avoid the hazard. In the case of human hazard, this message may also contain a more precise definition of the hazard, and the consequences of human interaction with the hazard, than can be communicated solely by the pictorial.

⚠ WARNING



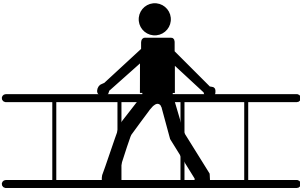
Improper use or repair of pressurized media or steam device may result in severe personal injury or death.

⚠ WARNING



Heed all container label warnings.

⚠ WARNING



Provide and use guarding to prevent contact with heated and/or pressurized parts.

⚠ WARNING



Do not work with valves while under the influence of intoxicants or narcotics.

⚠ WARNING



All potential hazards may not be covered in this manual.

⚠ WARNING



Improper tools or improper use of right tools could result in personal injury or product damage.

SECTION IV. Safety Alerts! Read – Understand – Practice

1. **WARNING:** Allow the system to cool to room temperature before cleaning, servicing or repairing the system. Hot components or fluids can cause severe personal injury or death.
2. **WARNING:** Always read and comply with safety labels on all containers. Do not remove or deface the container labels. Improper handling or misuse could result in severe personal injury or death.
3. **WARNING:** Never use pressurized fluids/gas/air to clean clothing or body parts. Never use body parts to check for leaks or flow rates or areas. Pressurized fluids/gas/air injected into or near the body can cause severe personal injury or death.
4. **WARNING:** It is the responsibility of the owner to specify and provide guarding to protect persons from pressurized or heated parts. Contact with pressurized or heated parts can result in severe personal injury or death.
5. **WARNING:** Do not allow anyone under the influence of intoxicants or narcotics to work on or around pressurized systems. Workers under the influence of intoxicants or narcotics are a hazard both to themselves and other employees and can cause severe personal injury or death to themselves or others.
6. **WARNING:** Incorrect service and repair could result in product or property damage or severe personal injury or death.
7. **WARNING:** This valve product line is not intended for radioactive nuclear applications. Some valve products manufactured by Dresser, Inc. may be used in radioactive environments. Consequently, prior to starting any operation in a radioactive environment, the proper "health physics" procedures should be followed, if applicable.
8. **WARNING:** Use of improper tools or improper use of right tools could result in personal injury or product or property damage.

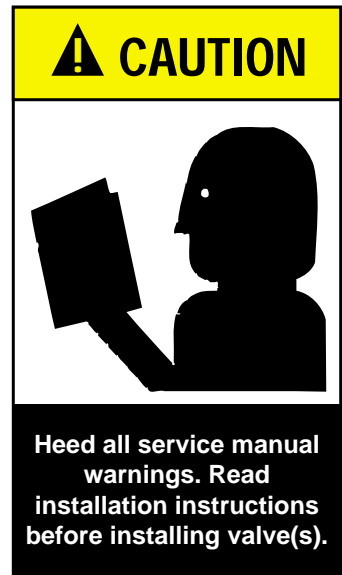
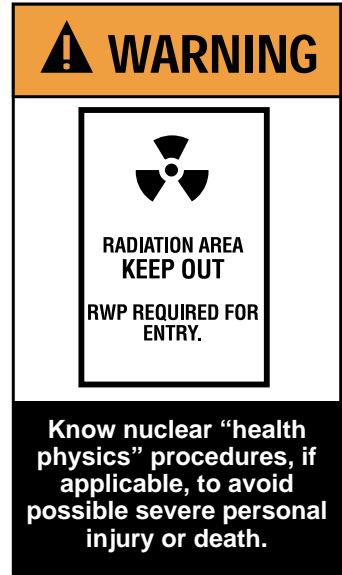
9. **WARNING:** These WARNINGS are as complete as possible but not all-inclusive. Dresser cannot know all conceivable service methods nor evaluate all potential hazards.

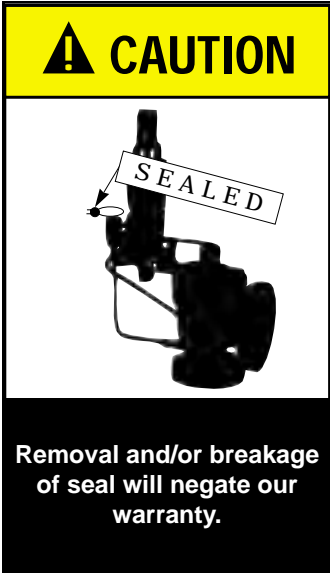
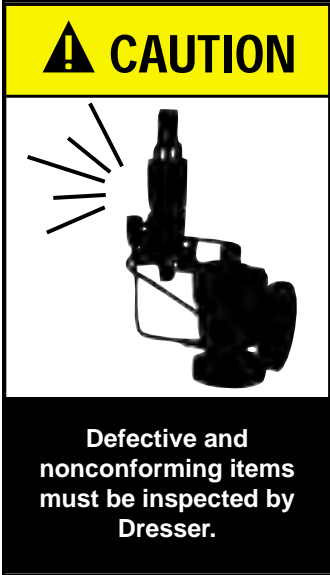
Cautions Concerning Product Warning Labels

1. **CAUTION:** Heed all service manual warnings. Read installation instructions before installing valve(s).
2. **CAUTION:** Wear hearing protection when testing or operating valves.
3. **CAUTION:** Wear appropriate eye and clothing protection.
4. **CAUTION:** Wear protective breathing apparatus to protect against toxic media.

NOTE:

Any service questions not covered in this manual should be referred to Dresser's Service Department, Phone (318) 640-6055.





SECTION V. Warranty Information

***Warranty Statement** – Dresser, Inc. warrants that its products and work will meet all applicable specifications and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship.

CAUTION: Defective and nonconforming items must be held for Dresser's inspection and returned to the original F.O.B. point upon request.

Incorrect Selection or Misapplication of Products - Dresser, Inc. cannot be responsible for customer's incorrect selection or misapplication of our products.

Unauthorized Repair Work – Dresser, Inc. has not authorized any non-Dresser affiliated repair companies, contractors or individuals to perform warranty repair service on new products or field repaired products of its manufacture. Therefore, customers contracting such repair service from unauthorized sources must do so at their own risk.

Unauthorized Removal of Seals – All new valves and valves repaired in the field by Dresser Field Service are sealed to assure the customer of our guarantee against defective workmanship. Unauthorized removal and/or breakage of this seal will negate our warranty.

**Refer to Dresser's Standard Terms of Sales for complete details on warranty and limitation of remedy and liability.*

SECTION VI.

HANDLING

1. CAUTION: Flanged valves, either crated or uncrated, should always be kept with the inlet flange down, in the normal installation position, to prevent misalignment and damage to internal parts.
2. CAUTION: Pressure relief valves, either crated or uncrated, should never be subjected to sharp impact. Particular care should be exercised when the valve is being loaded onto or unloaded from a truck, and when it is being hoisted into position for installation.
3. CAUTION: Never attempt to lift the full weight of the valve by the pilot assembly, external devices or tubing. Lift the valve by the eyebolts shown on figure safety sign.

STORAGE

Pressure relief valves should be stored in a dry environment and protected from the weather. They should not be removed from the skids or crates until immediately prior to installation on the system. This includes both inlet and outlet protectors.

FLANGE PROTECTORS

Flange protectors and sealing plugs should not be removed until the valve is to be installed on the system. This includes both inlet and outlet protectors.

⚠ CAUTION



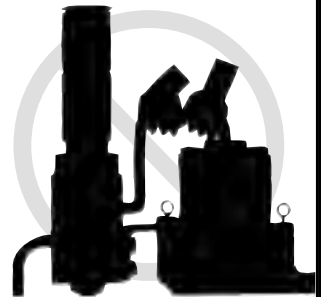
Always keep valve in an upright position when handling or storing.

⚠ CAUTION



Do not subject valves to sharp impact.

⚠ CAUTION



Never attempt to lift the valve by anything other than the eyebolts.

⚠ CAUTION



Prevent dirt from entering outlet or inlet port.

⚠ CAUTION



Always install valve in a vertical, upright position

SECTION VII.

PRE-INSTALLATION AND INSTALLATION

CAUTION: After the valve is uncrated and protective devices removed, exercise care to prevent dirt and other foreign matter from entering either the inlet or the outlet port.

Mounting Instructions –

CAUTION: Pressure relief valves should be mounted in a vertical, upright position. Installing a valve in any other position will adversely affect its operation in varying degrees as a result of induced misalignment of parts.

No stop valve should be placed between the pressure vessel and its relief valve except as permitted by Code regulations. If a stop valve is located between the pressure vessel and pressure relief valve, its port area should equal or exceed the nominal internal area of the piping to the relief valve inlet. Pressure drop in the piping from the vessel to the relief valve must not exceed 3% of the valve set pressure when it is flowing at full capacity.

Flanges and gasket surfaces must be free from dirt and debris when valves are installed. Flange bolts should be tightened evenly to prevent distortion of the valve body and inlet nozzle. The length, size and maximum change in height of the remote sensing line should be verified through analysis, taking into account the requirement to re-charge the dome through the pilot valve. On request, Dresser will assist in the analysis to determine the appropriate length, size and maximum change in height for the sensing line and to determine the correct capacity of the pressure relief valve. Before start-up, be sure all threaded joints are tight and secure.

SECTION VIII.

Hydrostatic Testing –

Prior to hydrostatic test of the pressure vessel system, the pilot-operated safety relief valve should be removed and the mounting flange for the valve blocked.

Service Considerations –

For best performance, pressure relief valves should be serviced annually unless maintenance history dictates otherwise. They should be located for easy access and removal for service.

Remote Sensing –

If the pressure drop between the source of pressure in the equipment to be protected and the pressure at the relief valve inlet exceeds 3%, the sensing line to the pilot valve should be connected directly to the equipment being protected. The optional sensing ring should not be installed. For remote sensing, 3/8-inch diameter tubing is adequate for distances up to 10 feet, (3.048 m).

For block valve and other special installation features consult API 520 or the factory.

SECTION IX.

General Introduction

*"A pilot operated pressure relief valve is a pressure relief valve in which the major relieving device is combined with and is controlled by a self-actuated auxiliary pressure relief valve."

**Source: ASME Code, Section VIII – Div. 1, Paragraph UG-126.*

The CONSOLIDATED® Modular Pilot Valve (MPV) is designed to provide reliable performance characteristics and stable operation within a pressure range of 15 to 3750 psig.

SECTION IX.A

Pilot Valve Introduction

Standard pilot construction consists of 316SS parts with nitrile o-rings with Teflon® based seals throughout. Standard Steam and High Temperature Pilot Construction consists of 316SS parts with Teflon® o-rings and seals. Alternate materials can be provided by contacting the factory.

Pilot Valve Features

- One pilot fits all main valves
- Standard o-ring seals
- Superior seat tightness
- Accurate adjustment of blowdown and set point
- Positive closure after blowdown
- Reduces icing and clogging
- Field test connection
- Remote sensing
- External blowdown adjustments

Service and Applications

Model	Service	Pressure Range	Temperature Range
39PV07 GS, SS, or LS	Gas, Air, Steam or Liquid	15 psig to 750 psig 1.05 kg/cm ² to 52.7 kg/cm ²	-40°F to +505°F -40°C to +262°C
39MV07 GS or SS	Gas, Air or Steam	15 psig to 750 psig 1.05 kg/cm ² to 52.7 kg/cm ²	-40°F to +505°F -40°C to +262°C
39MV07 LS	Liquid	15 psig to 750 psig 1.05 kg/cm ² to 52.7 kg/cm ²	-40°F to +505°F -40°C to +262°C
39PV37 GS, SS or LS	Gas, Air, Steam or Liquid	751 psig to 3750 psig 52.8 kg/cm ² to 263.6 kg/cm ²	-40°F to +505°F -40°C to +262°C
39MV37 GS or SS	Gas, Air or Steam	751 psig to 3750 psig 52.8 kg/cm ² to 263.6 kg/cm ²	-40°F to +505°F -40°C to +262°C
39MV37 LS	Liquid	751 psig to 3750 psig 52.8 kg/cm ² to 263.6 kg/cm ²	-40°F to +505°F -40°C to +262°C

TABLE I

Note: With the installation of the heat exchanger, temperature range may be expanded to -450°F to 1200°F.

Main Valve pressure and temperature limitations are combined in pressure class categories according to ANSI Standards. Conversely, the pressure and temperature limits of the Pilot Valve are presented separately.

NOTE:

WHEN REPLACING OR REPAIRING THE MAIN VALVE AND PILOT VALVE ASSEMBLY, PAY PARTICULAR ATTENTION TO THE PRESSURE AND TEMPERATURE LIMITATIONS FOR BOTH THE MAIN VALVE AND PILOT VALVE TO ENSURE COMPATIBILITY.

SECTION IX.B

Main Valve Introduction

The CONSOLIDATED® 2900 Pilot Operated Safety Relief Valve (POSRV) cast bodies are designed to meet the API 526 spring loaded specified inlet and outlet connection combinations. API orifice sizes range from 1" – 10" pressure ratings from 150 – 1500 class. The standard metal seat is the same design that has been successfully utilized in the CONSOLIDATED® SRV for over 50 years.

Capacities are certified by National Board of Boiler and Pressure Vessel Inspectors and published in their NB18 entitled "Pressure Relief Device Certifications."

Main Valve Features

- Orifice controlled capacity
- Superior tightness
- Removable nozzles for replacement or remachining
- Standard O- Ring sizes: readily available, easily replaced
- Meets ASME Section VIII, Div. 1
- National Board certified capacities
- Uses many parts standard on 1900 Series SRV

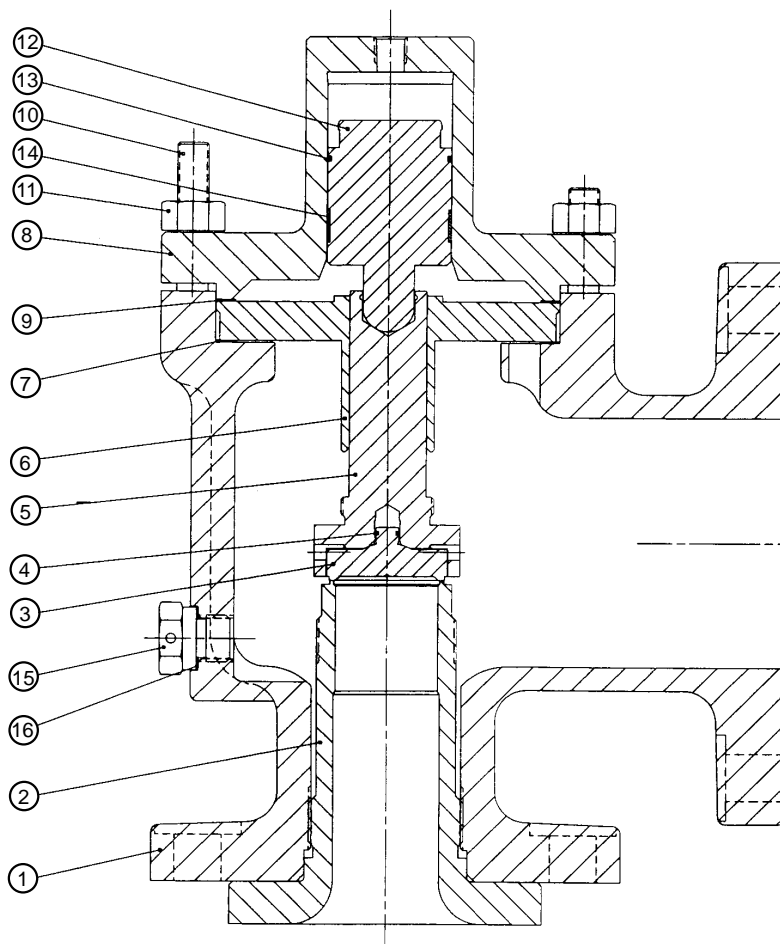


FIGURE 1

REF. NO.	NOMENCLATURE
1	BASE 1905-1916 1920-1926
1A	BASE PLUG 1905-1916 1920-1926
2	NOZZLE
3	DISC
4	DISC RETAINER
5	DISC HOLDER
6	GUIDE
7	GUIDE GASKET
8	COVER PLATE
9	COVER PLATE GASKET
10	BASE STUD
11	STUD NUT
12	MAIN VALVE PISTON
13	MAIN VALVE PISTON O-RING
14	GUIDE RING
15	PLUG/ADAPTER
16	PLUG/ADAPTER GASKET

SECTION X. 2900 Series MPV Operational Descriptions

SECTION X.A 2900 Series with Type 39PV (Pop) Pilot Operational Descriptions

PV VALVE CLOSED (Normal Position)

System pressure from the main valve inlet is fed to the dome by the pilot through interconnecting tubing. This equalizes the pressure on the top of the piston with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the piston is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.

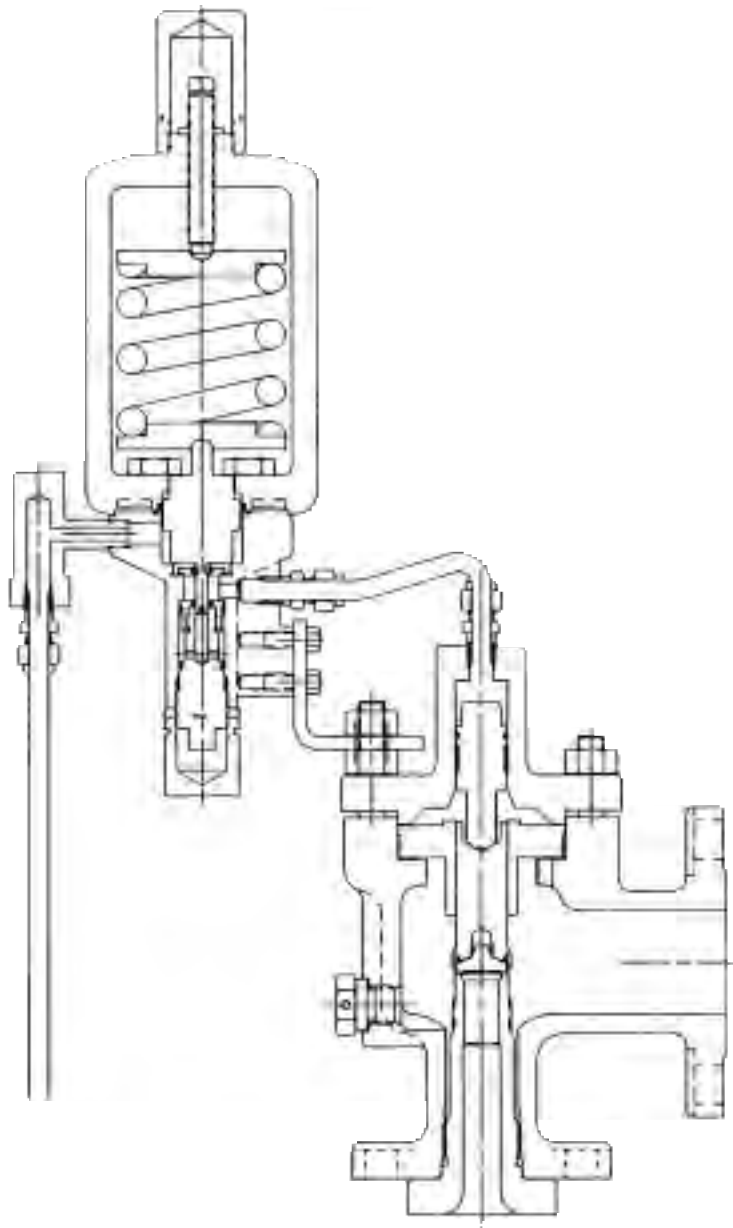


FIGURE 2

SECTION X.A Continued

PV VALVE OPEN (Relieving Position)

As inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to atmospheric pressure. The main valve disc is allowed to lift off the seat as the fluid force overcomes the now removed pressure load above the main valve piston. The valve discharges to relieve system pressure.

When the discharging main valve reduces the inlet pressure to the pre-set blowdown pressure of the pilot, the pilot piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve piston. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the piston and disc closes the main valve.

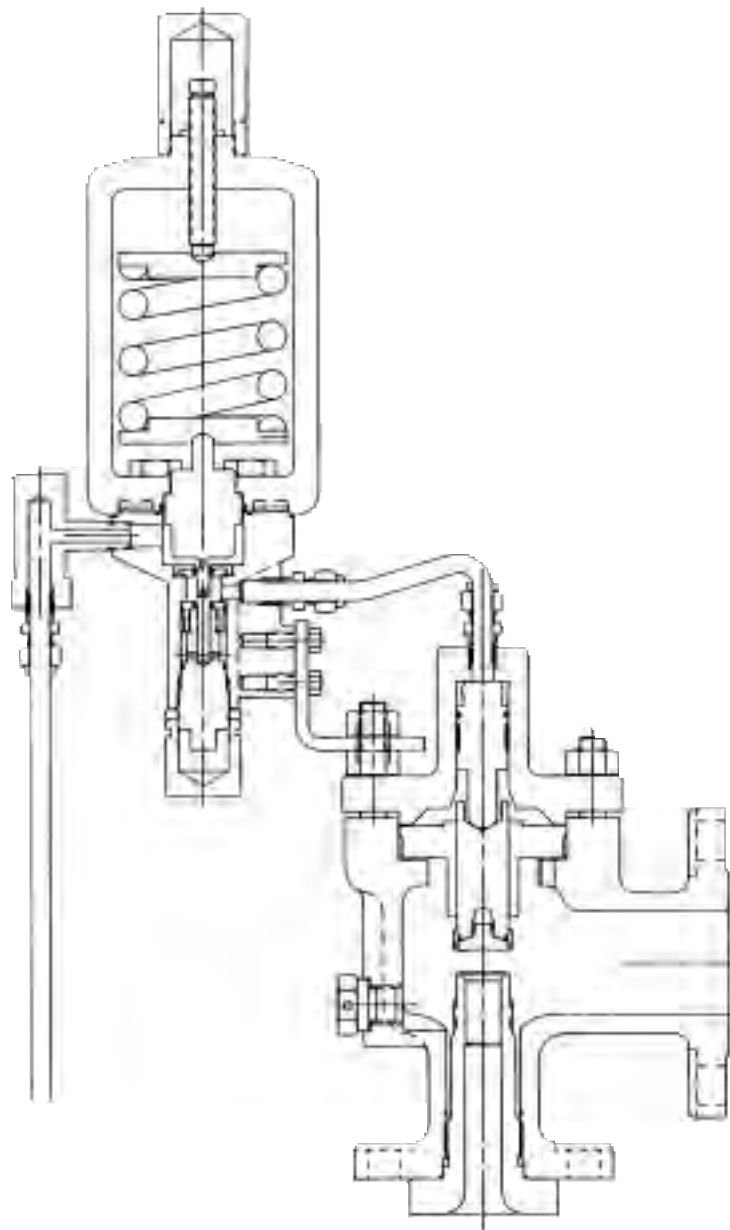


FIGURE 3

SECTION X.B

2900 Series 39 MV (Modulating) Pilot – Operational Description

MV VALVE CLOSED (Normal Position)

System pressure from the main valve inlet is fed to the dome by the pilot through interconnecting tubing. This equalizes the pressure on the top of the piston with inlet pressure on the seating surface (bottom) of the disc. Since the area of the top of the piston is larger than the area of the seating surface, the differential area results in a net downward force keeping the main valve tightly closed.

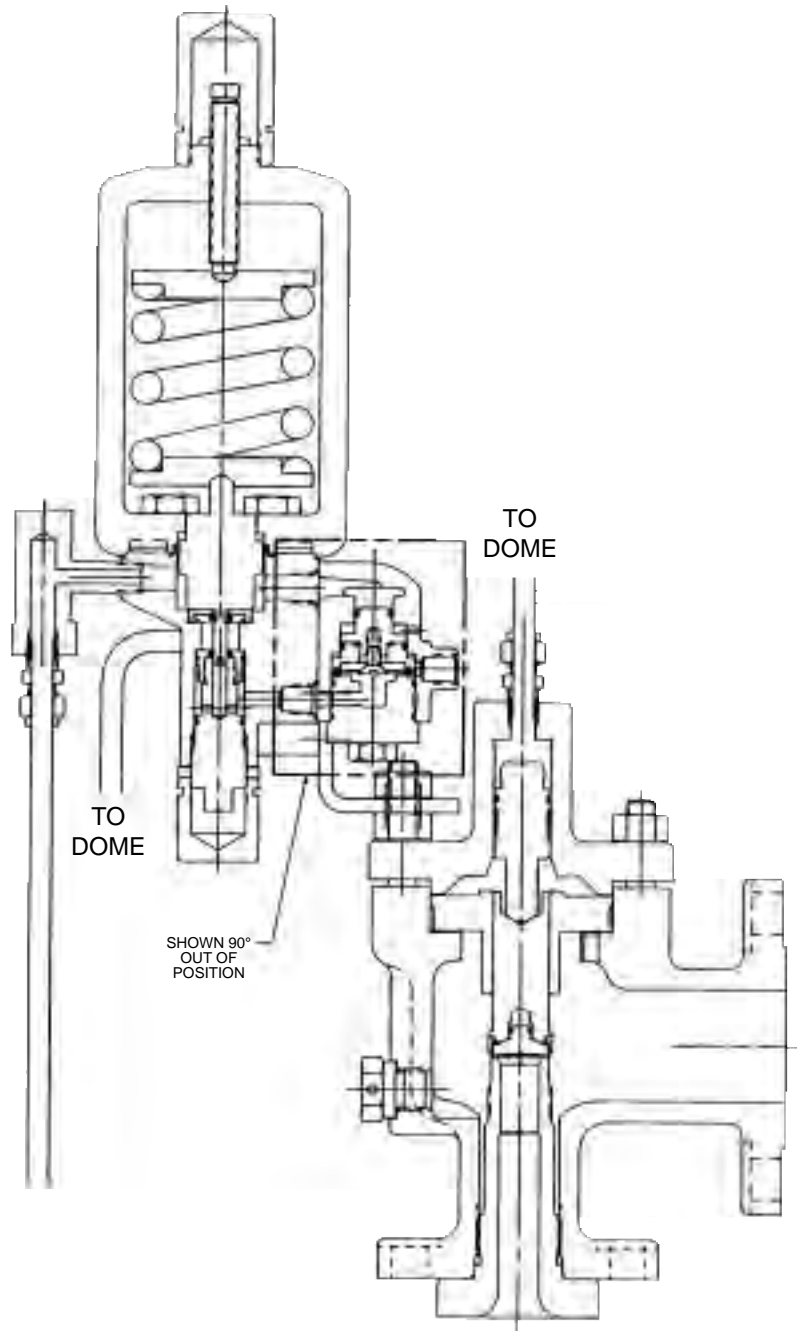


FIGURE 4

SECTION X.B Continued

MV VALVE MODULATING (Partial Relieving Position)

As inlet pressure increases, the pilot piston strokes and seals off the main valve inlet pressure from the dome pressure. The pilot simultaneously opens the vent seal to relieve the dome pressure to the bottom of the modulator piston. The modulator piston has a differential area with the smaller area being on top of the modulator piston. The top of this piston always sees the main valve inlet pressure. When the dome pressure is applied to the bottom of the modulator piston, there is a net upward force. This is due to both pressures being equal (at this point), and the lower area is larger than the upper area. The modulator relieves the pressure from the dome to the atmosphere until force from the inlet pressure on top of the modulator piston is sufficient to move it to the closed position. A certain amount of pressure remains in the dome. This pressure is controlled by the differential area in the modulator. Since the dome pressure has not been dropped to atmospheric pressure, the main valve only partially opens at the set point. The modulator piston will remain closed until the main valve disc is forced into higher lift by increasing inlet pressure. As this occurs, the modulator piston may relieve further pressure from the dome as necessary to achieve the required main disc lift within 10% overpressure.

MV FULLY OPEN (Full Relieving Position)

As the inlet pressure increases further, the net upward force on the main valve disc increases, allowing the main valve to relieve more pressure. The disc obtains full lift (full capacity) within 10% of set pressure.

When the discharging valve reduces the inlet pressure to the pre-set blow-down pressure of the pilot, the pilot piston closes the vent seal. Simultaneously, the inlet seal is reopened in the pilot. The main valve inlet pressure is again allowed to enter the dome above the main valve piston. As the dome pressure equalizes with the inlet pressure, the downward force created by the differential areas of the piston and disc closes the main valve.

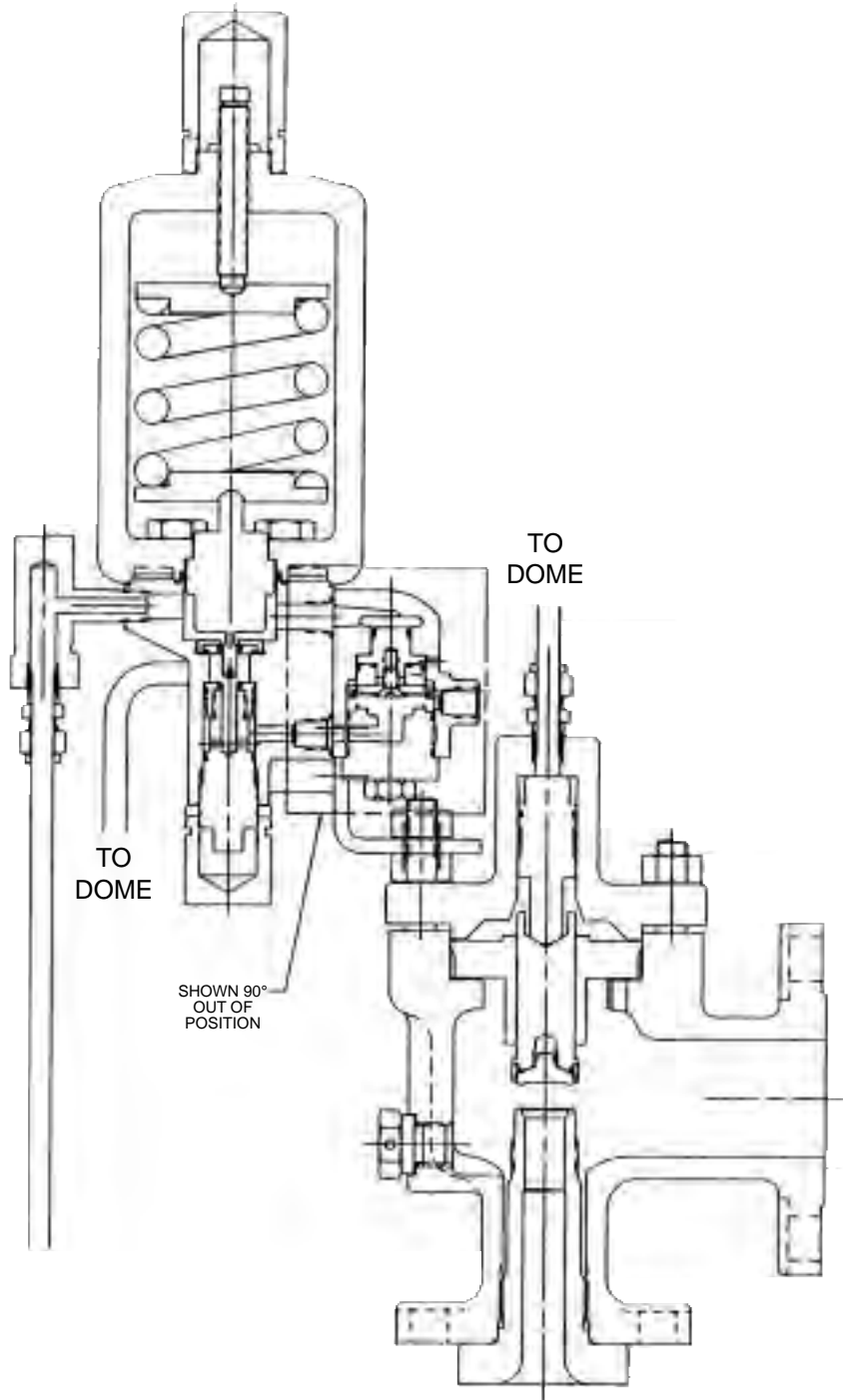
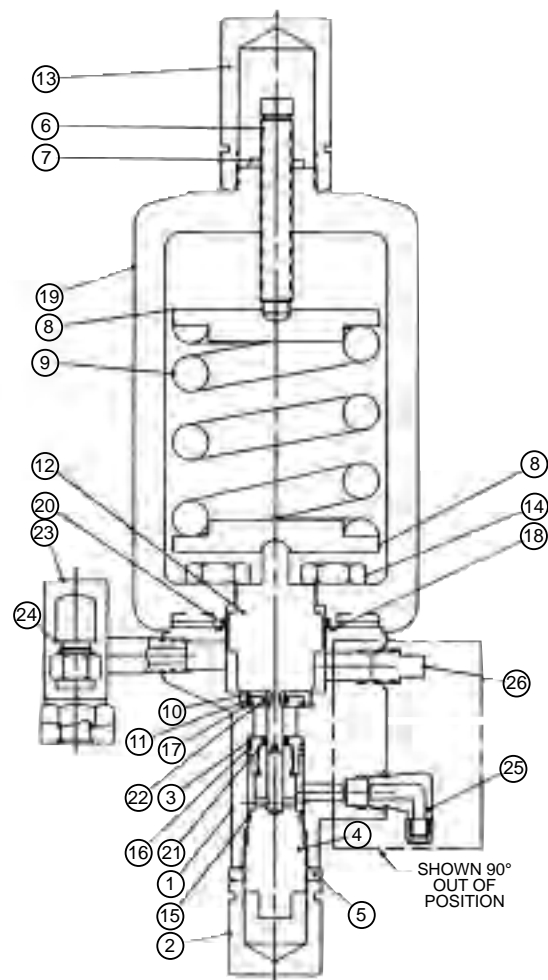
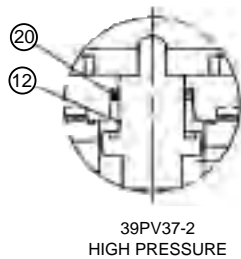


FIGURE 5

Section XI. Cross Sectional Drawings and Nomenclature

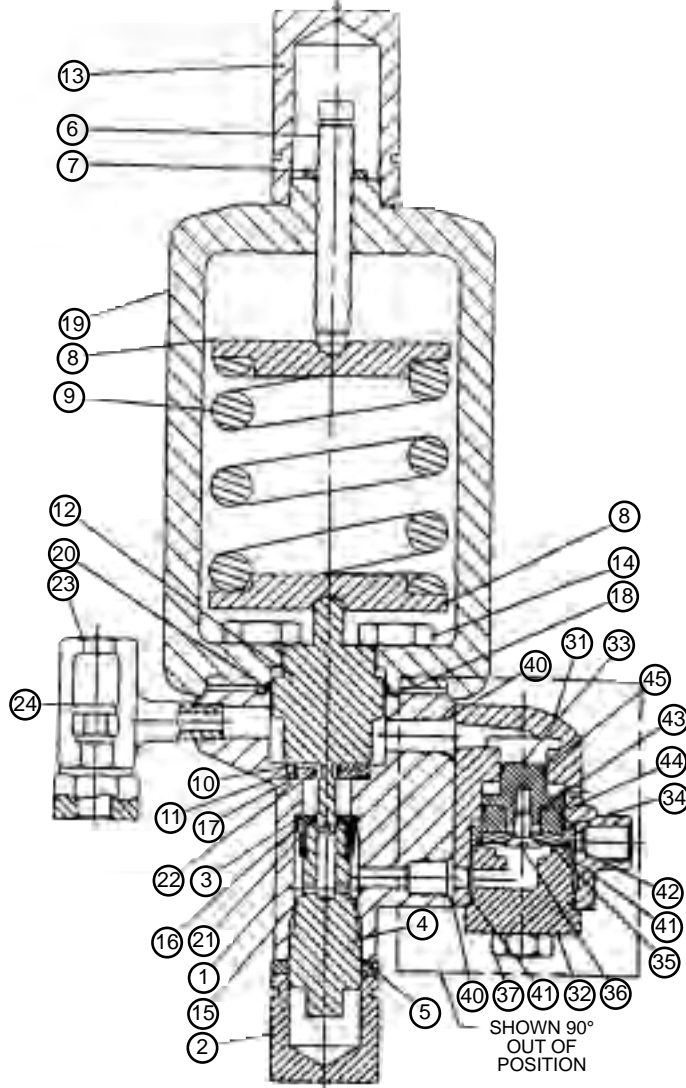
SECTION XI.A 39PV Pilot Valve Cross Sectional Drawings and Nomenclature

REF. NO.	NOMENCLATURE
1	MAIN BASE
2	ADJUSTER CAP
3	ADJUSTER TOP
4	ADJUSTER BOTTOM
5	ADJUSTER LOCK NUT
6	COMPRESSION SCREW
7	COMPRESSION SCREW LOCK NUT
8	SPRING WASHER
9	SPRING
10	INSERT TOP
11	INSERT BOTTOM
12	MAIN PISTON
13	CAP (COMPRESSION SCREW)
14	CAP SCREW (YOKE)
15	O-RING (ADJUSTER BOTTOM)
16	O-RING (ADJUSTER TOP)
17	O-RING (INSERT)
18	O-RING (MAIN BASE)
19	YOKE
20	SPRING SEAL (MAIN PISTON)
21	SPRING SEAL (ADJUSTER TOP)
22	SPRING SEAL (INSERT)
23	FIELD TEST CONNECTOR
24	BUG SCREEN
25	VENT ASSY.
26	PIPE PLUG (PILOT VALVE)

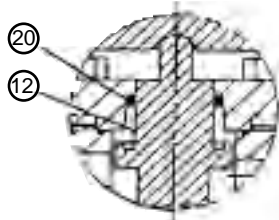


Section XI.B

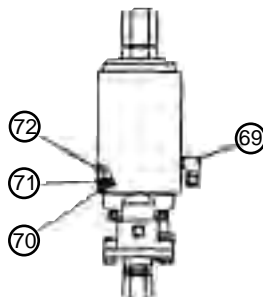
39MV Cross Sectional Drawing and Nomenclature



39MV07-2



**39MV37-2
HIGH PRESSURE**



BONNET OPTION

REF. NO.	NOMENCLATURE
1	MAIN BASE
2	ADJUSTER CAP
3	ADJUSTER TOP
4	ADJUSTER BOTTOM
5	ADJUSTER LOCK NUT
6	COMPRESSION SCREW
7	COMPRESSION SCREW LOCK NUT
8	SPRING WASHER
9	SPRING
10	INSERT TOP
11	INSERT BOTTOM
12	MAIN PISTON
13	CAP (COMPRESSION SCREW)
14	CAP SCREW (YOKE)
15	O-RING (ADJUSTER BOTTOM)
16	O-RING (ADJUSTER TOP)
17	O-RING (INSERT)
18	O-RING (MAIN BASE)
19	YOKE
20	SPRING SEAL (MAIN PISTON)
21	SPRING SEAL (ADJUSTER TOP)
22	SPRING SEAL (INSERT)
23	FIELD TEST CONNECTOR
24	BUG SCREEN
25	PLUG FILTER
31	MODULATOR BASE
32	MODULATOR STOP
33	MODULATOR PISTON TOP
34	MODULATOR PISTON BOTTOM
35	O-RING RETAINER
36	LOCK SCREW
37	CAP SCREW (MODULATOR)
40	O-RING (MODULATOR BASE)
41	O-RING (MODULATOR STOP)
42	O-RING (MODULATOR SEAT)
43	O-RING (MODULATOR PISTON BOTTOM)
44	SPRING SEAL (PISTON BOTTOM)
45	SPRING SEAL (PISTON TOP)
OPTIONS	
52	SPRING SHIELD (NOT SHOWN)
53	NEEDLE VALVE (MANUAL BLOWDOWN) (NOT SHOWN)
54	PILOT SUPPLY FILTER (NOT SHOWN)
55	CANISTER FILTER (NOT SHOWN)
56	CANISTER FILTER (NOT SHOWN) W/FLUSH VALVE (NOT SHOWN)
57	BACKFLOW PREVENTER (NOT SHOWN)
58	BACKFLOW PREVENTER LINE (NOT SHOWN)
69	VENT ASSY.
70	TOP PLATE
71	SET SCREW
72	BONNET

FIGURE 7

Section XI.C

39PV-Dirty Service Option

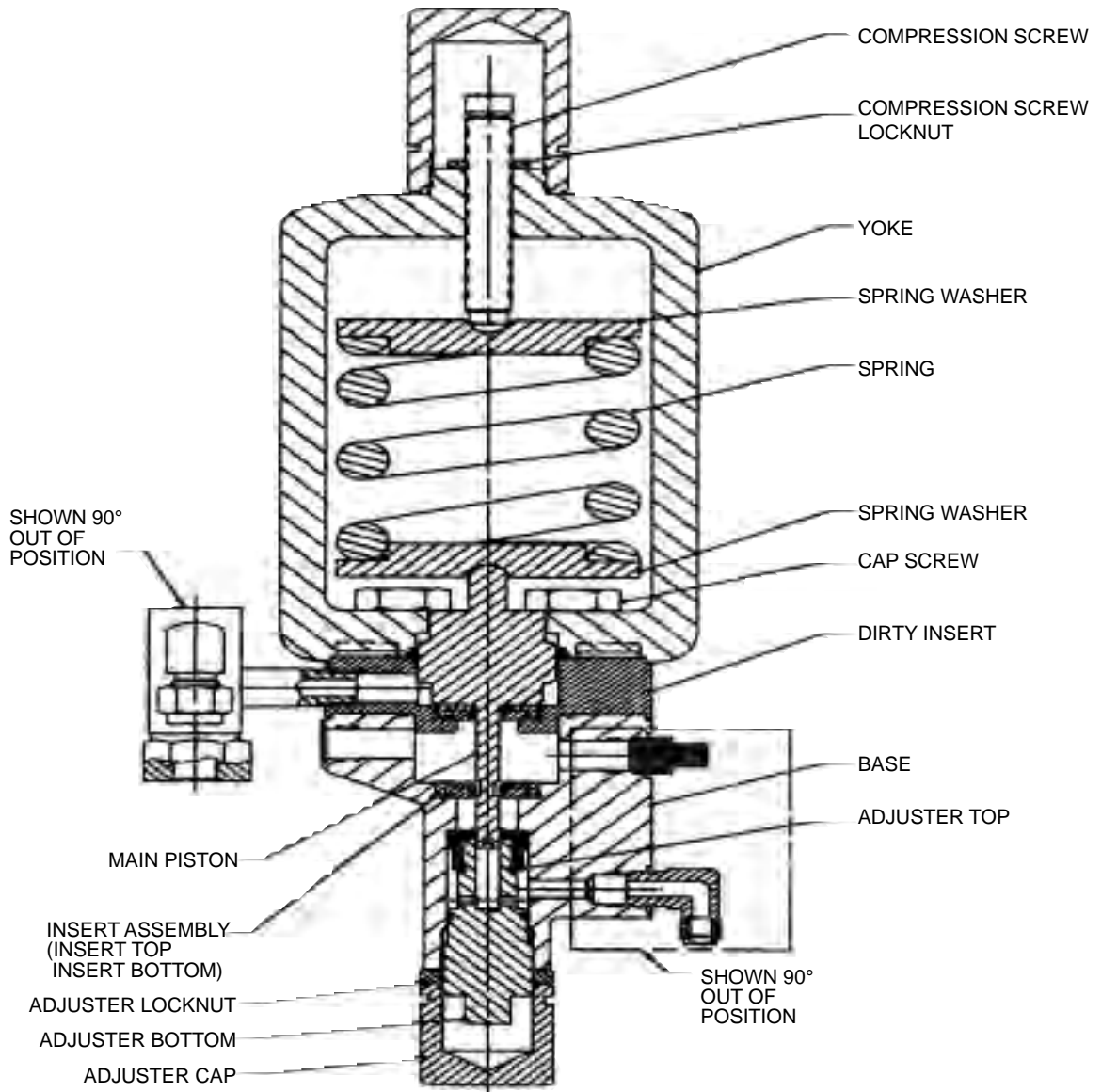


FIGURE 7A
DIRTY SERVICE OPTION

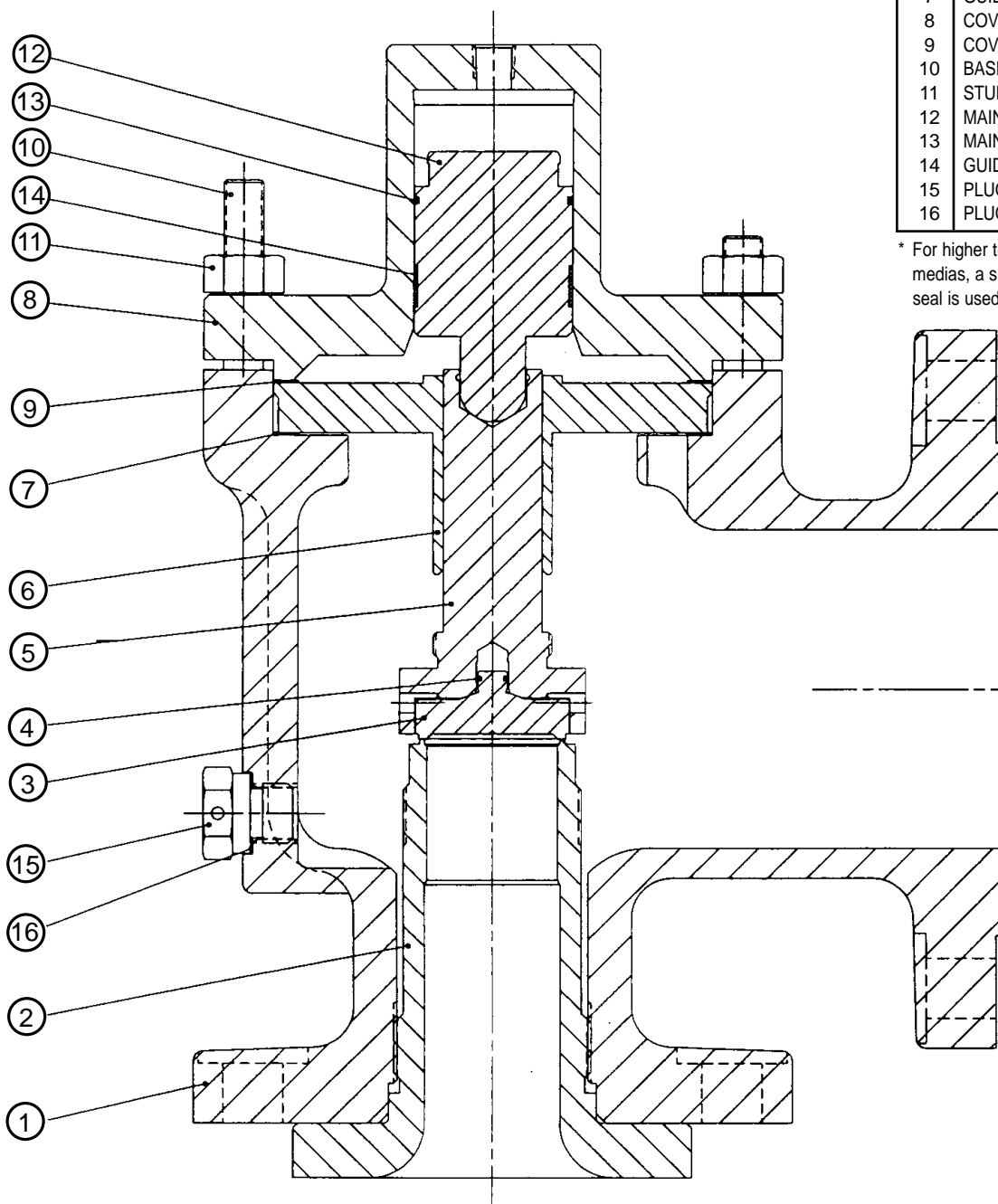
Note: Dirty Service Option can be applied to the following pilot valves: 39PV07, 39PV37, 39MV07 and 39MV37.

Section XI.D

2900 Main Valve Cross Section and Nomenclature

REF. NO.	NOMENCLATURE
1	BASE 1905-1916 1920-1926
1A	BASE PLUG (NOT SHOWN) 1905-1916 1920-1926
2	NOZZLE
3	DISC
4	DISC RETAINER
5	DISC HOLDER
6	GUIDE
7	GUIDE GASKET
8	COVER PLATE
9	COVER PLATE GASKET
10	BASE STUD
11	STUD NUT
12	MAIN VALVE PISTON
13	MAIN VALVE PISTON O-RING*
14	GUIDE RING
15	PLUG/ADAPTER
16	PLUG/ADAPTER GASKET

* For higher temperatures and specific medias, a spring energized Teflon® seal is used.



2900 MAIN VALVE
FIGURE 8

SECTION XII. Restoring Safety

Appropriate service and repair are important to safe, reliable operation of all valve products. Restoration to original quality and manufacturing specifications will accomplish the desired results. Procedures developed by Consolidated® as described in the applicable Installation and Maintenance Manual, when correctly applied, will be effective.

SECTION XIII. General Planning for Maintenance

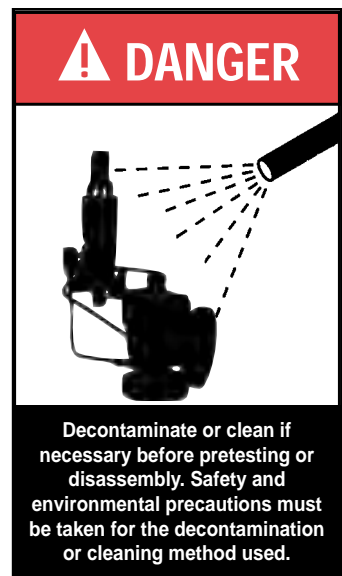
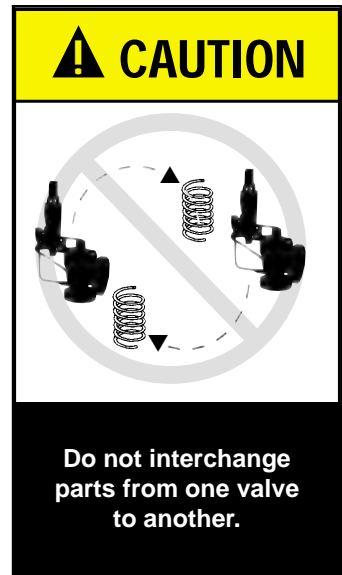
A 12 month maintenance interval is recommended for general service conditions. For severe service applications, a 3 to 6 month inspection and test interim may be more appropriate. The specific plant's operating and service history will better determine this frequency. Dresser encourages preventive maintenance.

The 2900 series Pilot Operated Safety Relief Valve (POSRV) is easily maintained. Normal maintenance usually involves:

- Removal of pilot valve from main valve
- Disassembly of both the pilot and main valve
- Cleaning
- Component Inspection
- Parts Replacement as Needed
- Reassembly
- Setting, Testing and Resealing the Valve

Occasionally, remachining the nozzle may be necessary to extend the service life of the valve. Keep all parts for each valve separated to ensure replacement in the same valve.

Note: Insure there is no pressure in the inlet of the valve before attempting to remove it from the piping system.



⚠ DANGER



Lower pressure and stand clear of discharge when working on valve to avoid severe personal injury or death.

⚠ CAUTION



Wear necessary protective equipment to prevent possible injury.

⚠ DANGER



Do not remove bolts if valve is under pressure, as this will result in severe personal injury or death.

**SECTION XIV.
Disassembly of the 2900 Pilot Operated Safety Relief Valve**

**SECTION XIV.A
Removal of Pilot Valve from Main Valve**

1. Make sure there is no media pressure in the vessel, in the valve inlet, in the main, or in the pilot valve.
2. Disconnect the Sensing Tube, Dome Tube and Discharge Line from the Pilot Valve.
3. All other external attachments should be removed to free the Pilot Valve for Disassembly.
4. Loosen and remove the two cap bolts holding the pilot valve to the mounting bracket.
5. Place parts in the order they are disassembled to facilitate reassembly.

⚠ WARNING



Know all valve exhaust/leakage points to avoid possible severe personal injury or death.

SECTION XIV.B

Disassembly of the Main Valve

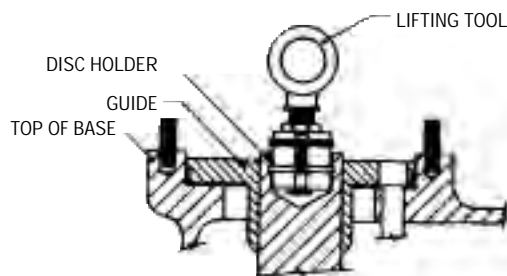
To disassemble the main valve, see Figure 8 for a cross sectional drawing and designated parts nomenclature. Follow these specific steps.

1. Loosen and remove the stud nuts or cap screws on the Cover Plate.
2. Lift off the Cover Plate.
3. Remove the piston from the Cover Plate using a dowel pressed through the center hole in the top of the Cover Plate.
4. Remove the Cover Plate Gasket.
5. Install the Disc Holder Removal tool in the top of the Disc Holder. Use the tool indicated in Table 2 and Figure 9. On "V" and "W" Orifice Valves Thread two 5/8-11 NC Standard Eye Bolts into the top of the Disc Holder as shown in Figure 10.

Disc Holder Removal Tool*	
Tool Number	For use on Orifice size
4464601	"D through G"
4464602	"H, K and L"
4464603	M and N
4464604	"P, Q, R and T"
Use Standard Eye Bolts Supplied 5/8-11NC	"V and W"

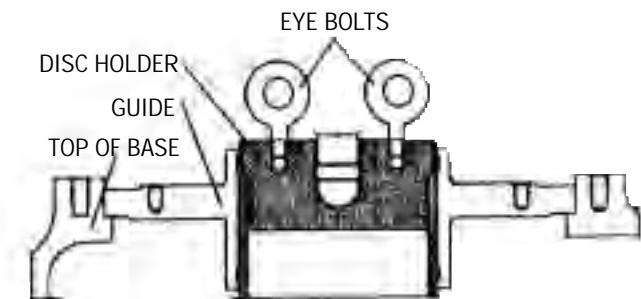
See Section XXVI for construction plans

TABLE 2



"D" THROUGH "T" ORIFICE VALVES
See Section XXVI

FIGURE 9



"V" AND "W" ORIFICE VALVES

FIGURE 10

6. Lift out and remove the Guide and Disc holder together.
7. Remove the Lifting tool or Eye Bolts from the top of the Disc holder.
8. Lift the Guide off the Disc Holder. If the valve has a bellows avoid damage to the gasket seating surfaces, and if present the convolutions or the flange section of the Bellows.
9. Using the Drift Pins as illustrated in Figure 11, remove the Disc from the Disc Holder. Use care to avoid scarring the bearing surface on the back of the Disc.

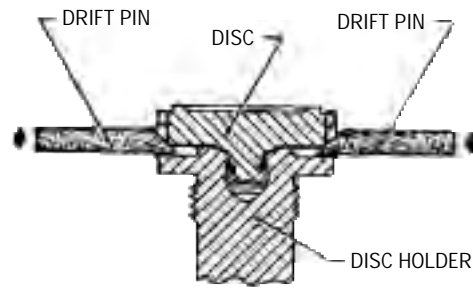


FIGURE 11

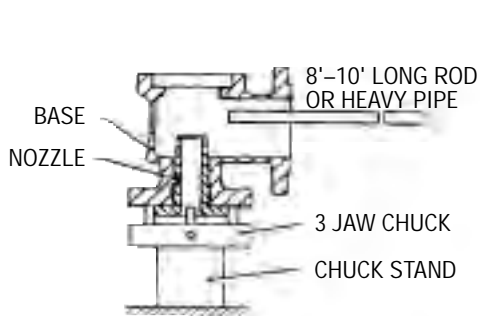


FIGURE 12

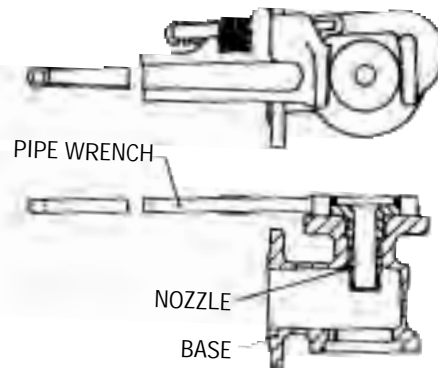


FIGURE 13

10. Remove the Nozzle from the Valve Base as suggested in Figure 12, or by using a Hex wrench or a pipe wrench on the flange as indicated in Figure 13.

Note: Exercise care not to damage the Nozzle when inserting a rod or pipe in the outlet to remove the Nozzle.

11. The Main valve is ready for cleaning, inspection and refurbishing.

SECTION XIV.C

Cleaning

Parts are to be free of any oil or grease except for lubrication as specified in this instruction.

Cleaning agents used should be such that effective cleaning is assured without injuring the surface finishes or material properties of the part.

Acceptable cleaning agents include demineralized water, non-phosphate detergent, acetone or isopropyl alcohol. Parts must be blown dry or wiped dry after cleaning.

If you are using cleaning solvents, take precautions to protect yourself from potential danger from breathing fumes, chemical burns, or explosion. See the solvent's Material Safety Data Sheet for safe handling recommendations and equipment.

It is not recommended to "sand blast" internal parts as it can reduce the dimensions of the parts. The base may be sand blasted with care not to erode internal surfaces, or damage machined surfaces.

SECTION XIV.D

Parts Inspection

See Figure 8 for a cross sectional drawing and designated parts nomenclature.

1. 2900, 2900-30 Nozzle Inspection Criteria

A Nozzle should be replaced if:

1. The seat width requires adjustment, and the Dimension from the seat to the first thread is less than "D" minimum on Table 5.
2. Thread sections are damaged from pitting and/or corrosion.
3. Top of the nozzle flange and intersecting surface are damaged from galling and/or tearing.
4. The nozzle flange thickness can change center to face Dimensions. The minimum dimension for orifices "D" through "P" is 43/64" (.672" or 16.5 mm) and "Q" through "W" orifices are 51/64 (.797" or 20.2 mm).

Note: See Table 5A or 5B for information concerning reestablishing the Seat width and other critical dimensions of the nozzle seat area.



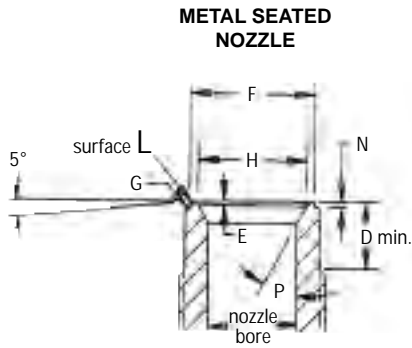


FIGURE 14A

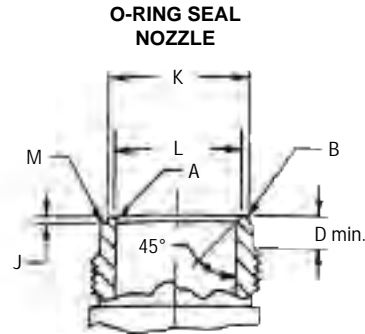


FIGURE 14B

TABLE 5A

ENGLISH UNITS, INCH											
Nozzle	Metal-To-Metal						P±1/2°	O-Ring Seat Seal			
	Orifice	D Min.	E± ^{.005} / _{.000}	F± ^{.000} / _{.002}	H± ^{.002} / _{.000}	N± ^{.005} / _{.000}		Radius B± ^{.002} / _{.000}	J± ^{.005}	K± ^{.000} / _{.007}	L Max.
D-1	13/32	.015	—	.518	—	30°	.015	.062	.573	+ ^{.000} / _{-.002}	.538
E-1	15/32	.020	.788	.686	.025	30°	.015	.060	.733	+ ^{.000} / _{-.002}	.688
D-2, E-2, F	5/16	.030	.955	.832	.035	30°	.015	.079	.868	+ ^{.000} / _{-.003}	.814
G	5/16	.035	1.094	.954	.035	30°	.021	.090	1.060	+ ^{.000} / _{-.003}	.999
H	1/4	.035	1.225	1.124	.035	45°	.021	.060	1.216	+ ^{.000} / _{-.003}	1.167
J	3/8	.035	1.546	1.436	.035	45°	.021	.074	1.534	+ ^{.000} / _{-.003}	1.481
K	7/16	.063	1.836	1.711	.063	45°	.021	.126	1.838	+ ^{.000} / _{-.004}	1.781
L	7/16	.063	2.257	2.132	.063	45°	.016	.126	2.208	+ ^{.000} / _{-.004}	2.158
M	7/16	.063	2.525	2.400	.063	45°	.021	.126	2.536	+ ^{.000} / _{-.004}	2.480
N	1/2	.063	2.777	2.627	.063	45°	.021	.101	2.708	+ ^{.000} / _{-.004}	2.652
P	5/8	.093	3.332	3.182	.093	45°	.021	.150	3.334	+ ^{.000} / _{-.004}	3.279
Q	7/8	.093	4.335	4.185	.093	45°	.021	.188	4.338	+ ^{.000} / _{-.006}	4.234
R	1	.093	5.110	4.960	.093	45°	.021	.215	5.095	+ ^{.000} / _{-.006}	5.036
T-3	3/4	—	6.234	6.040	.093	45°	.021	.142	6.237	+ ^{.000} / _{-.007}	6.174
T-4	3/4	.093	6.510	6.315	.093	30°	.021	.142	6.517	+ ^{.000} / _{-.007}	6.424
V	1-1/8	.250	8.816	8.336	.275	30°	.020	.275	9.130	+ ^{.000} / _{-.007}	8.341
W	1-5/8	.350	11.058	10.458	.348	30°	.020	.353	11.130	+ ^{.000} / _{-.007}	10.463

TABLE 5B

METRIC UNITS, MM											
Nozzle	Metal-To-Metal						P±1/2°	O-Ring Seat Seal			
	Orifice	D Min.	E± ^{.13} / _{.0}	F± ^{.0} / _{.05}	H± ^{.05} / _{.0}	N± ^{.13} / _{.0}		Radius B± ^{.05} / _{.0}	J± ^{.13}	K± ^{.000} / _{.007}	L Max.
D-1	10.3	.38	—	13.16	—	30°	.38	1.57	14.55	+ ^{.00} / _{-.05}	13.64
E-1	11.9	.51	20.01	17.43	.64	30°	.38	1.52	18.62	+ ^{.00} / _{-.05}	17.47
D-2, E-2, F	7.9	.76	24.26	21.13	.89	30°	.38	2.01	22.05	+ ^{.00} / _{-.08}	20.68
G	7.9	.89	27.79	24.24	.89	30°	.53	2.29	26.92	+ ^{.00} / _{-.08}	25.37
H	6.3	.89	31.12	28.55	.89	45°	.53	1.52	30.89	+ ^{.00} / _{-.08}	29.64
J	9.5	.89	39.27	36.47	.89	45°	.53	1.88	38.96	+ ^{.00} / _{-.08}	37.62
K	11.1	1.60	46.63	43.46	1.60	45°	.53	3.20	46.69	+ ^{.00} / _{-.10}	45.24
L	11.1	1.60	57.33	54.15	1.60	45°	.41	3.20	56.08	+ ^{.00} / _{-.10}	54.81
M	11.1	1.60	64.14	60.96	1.60	45°	.53	3.20	64.41	+ ^{.00} / _{-.10}	62.99
N	12.7	1.60	70.54	66.73	1.60	45°	.53	2.57	68.78	+ ^{.00} / _{-.10}	65.07
P	15.9	2.36	84.63	80.82	2.36	45°	.53	3.81	84.68	+ ^{.00} / _{-.10}	83.28
Q	22.2	2.36	110.11	106.30	2.36	45°	.53	4.78	110.19	+ ^{.00} / _{-.15}	107.54
R	25.4	2.36	129.79	125.98	2.36	45°	.53	5.46	129.41	+ ^{.00} / _{-.15}	127.92
T-3	19.0	—	158.34	153.41	2.36	45°	.53	3.60	158.42	+ ^{.00} / _{-.17}	156.82
T-4	19.0	2.36	165.35	160.40	2.36	30°	.53	3.60	165.53	+ ^{.00} / _{-.17}	163.17
V	28.6	6.35	223.92	211.73	6.98	30°	.508	6.99	231.90	+ ^{.00} / _{-.17}	211.86
W	41.2	8.89	280.87	265.63	.353	30°	.508	8.96	282.70	+ ^{.00} / _{-.17}	265.76

2. 2900, 2900-30 Standard Metal Seated Disc Inspection Areas

A Disc should be replaced if:

1. The disc has been machined or lapped to remove damage from seat surface "L" and the "N" dimension as indicated in Figure 14 measures less than "N" minimum as indicated in Table 3.
2. The "T" dimension (See Figure 15) is reduced by machining or lapping seat surface "L" and measures less than "T" minimum indicated in Table 3.

Note: See Section X for information concerning re-establishing the disc seating surface.

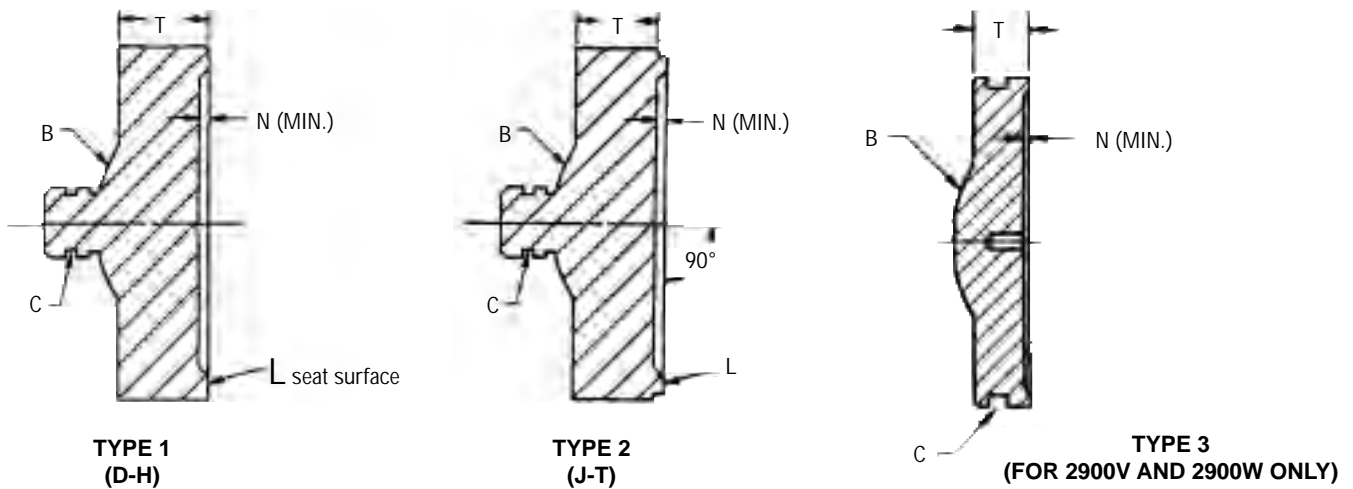


FIGURE 15

TABLE 3

DISC TYPE	ORIFICE SIZE	INCHES		MILLIMETERS	
		"T" Minimum	"N" Minimum	"T" Minimum in millimeters	"N" Minimum in millimeters
TYPE 1	D-1	.155	.005	3.94	.127
	E-1	.158	.005	4.01	.127
	F, D-2, E-2,	.174	.005	4.42	.127
	G	.174	.005	4.42	.127
	H	.335	.010	8.51	.254
TYPE 2	J	.359	.015	9.12	.381
	K	.417	.043	10.72	1.09
	L	.452	.043	11.61	1.09
	M	.452	.043	11.61	1.09
	N	.480	.043	12.57	1.09
	P	.605	.073	15.49	1.85
	Q	.605	.073	15.49	1.85
	R	.605	.073	15.49	1.85
T	.817	.073	20.88	1.85	
TYPE 3	V	1.230	.120	28.32	3.05
	W	1.855	.168	42.98	4.27

Minimum Allowable Dimensions after Machining of the Disc Seat

3. 2900 Series Thermodisc® Replacement Criteria

If seat defects and damage can not be lapped out without reducing the "A" dimension below that shown on Table 4, the Thermodisc® may not be machined and must be replaced.

Note: "A" dimension on D through H orifices is difficult to measure. If you cannot measure the .006 minimum thickness of the thermal lip, replace the Thermodisc®.

4. 2900, 2900-30 Disc Holder should be replaced if the sliding surface of the Holder is galled, pitted or scratched.
5. 2900, 2900-30 Guide should be replaced if the sliding surface is galled, pitted or scratched or the machined gasket surfaces are damaged.
6. Solid Metal Gaskets may be re-used unless they are corroded, pitted or crimped.
7. The Coverplate should be reused if:
 - a. The sliding surface in the dome area is not galled, scratched, corroded or pitted.
 - b. The Gasket surface is not scratched, corroded or pitted.
8. The Piston should be re-used if there is no indication of galling, scratched, corroded or pitted on any surface of the piston.

TABLE 4

ORIFICE SIZE	"A" MIN. DIMENSION (IN)	"A" MIN. DIMENSION (MM)
D, E, F, G, & H	.006	.153
J	.013	.331
K, L, M & N	.014	.356
P	.017	.432
Q & R	.015	.381
T	.025	.635
V & W	.035	.89

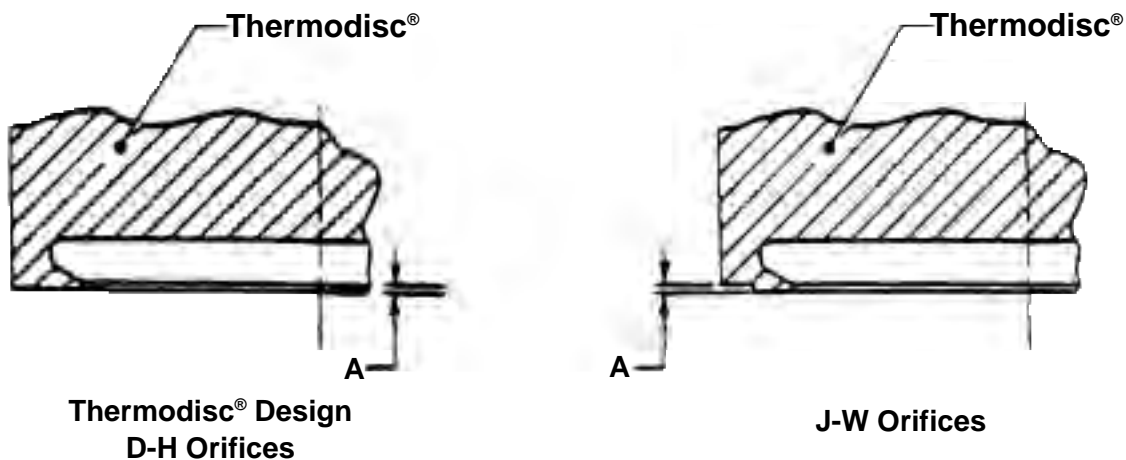


FIGURE 16

SECTION XV

Maintenance Instructions

A. General Maintenance Information

After the valve has been disassembled, a close inspection should be made of the seating surfaces. In a majority of cases, a simple lapping of seats is all that is necessary to put the valve in first class working order. If an inspection of the parts shows the valve seating surfaces to be badly damaged, machining will be required before lapping. O-Ring seat seal valve nozzles can only be reconditioned by machining, not lapping. (For specific information concerning the machining of nozzle and disc seating surfaces, see Paragraphs F and G which follow.)

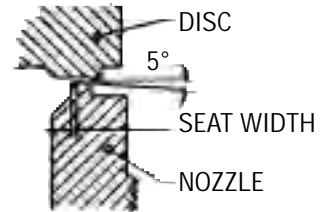


FIGURE 17

The seating surfaces of the metal seated Consolidated® Safety Relief Valve are flat. The nozzle seat is relieved by a 5° angle on the outside of the flat seat. The disc seat is wider than the nozzle seat; thus, the control of seat width is the nozzle seat (see Figure 17).

Reconditioning of the seating surfaces of the nozzle and disc is accomplished by lapping with a cast iron lap, and lapping compound.

Anytime the V or W orifice valve is disassembled, be sure to inspect the guide rings for wear. If worn, replace before reassembly.

NOTE:

In order to establish leak free valve seats, the nozzle seating surface and the disc seating surface must be lapped flat.

B. Nozzle Seat Widths-Lapped

A wide nozzle seat will induce leak, especially in the smaller orifice lower pressure valves. For this reason, the seat on non-O-Ring valves should be as narrow as practical. Since the seat must be wide enough to carry the bearing load imposed upon it by the piston and system pressure, the higher pressure valves must have wider seats than the lower pressure valves. The nozzle seat width should conform with those listed in Table 6 or 7.

The seat width can be measured by the use of a "Measuring Magnifier". Figure 18 shows its use to determine seat width. Measuring Magnifiers are available through Industrial/Machinists Supplies.

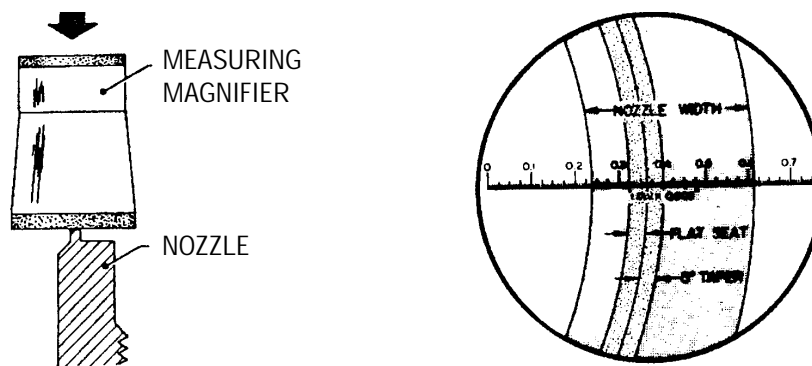


FIGURE 18

**STANDARD METAL SEAT DESIGNS
APPROXIMATE NOZZLE SEAT WIDTH**

VALVE	SET PRESSURE (PSIG)¹	LAPPED SEAT WIDTH (IN.)
2900 D - G	15 - 50	.012
	51 - 100	.018
	101 - 250	.025
	251 - 400	.032
	401 - 800	.038
	801 - UP	.038
2900 H - J	15 - 50	.019
	51 - 100	.025
	101 - 250	.029
	251 - 400	.032
	401 - 800	.038
	801 - UP	ADD .005 PER 100 LBS. ²
2900 K - N	15 - 50	.025
	51 - 100	.030
	101 - 250	.035
	251 - 400	.040
	401 - 800	.045
	801 - UP	ADD .005 PER 100 LBS. ²
2900 P -R	15 - 50	.030
	51 - 100	.037
	101 - 250	.045
	251 - 400	.052
	401 - 800	.059
	801 - UP	.064
2900 T	15 - 50	.040
	51 - 100	.045
	101 - 250	.053
	251 - 250	.060
2900 V	15 - 50	.075
	51 - 100	.095
	101 - 250	.115
	251 - 250	.130
2900 W	15 - 50	.100
	51 - 100	.120
	101 - 250	.140
	251 - 250	.160

²NOT TO EXCEED .070 ± .005 IN.

TABLE 6

**THERMODISC® DESIGN
APPROXIMATE NOZZLE SEAT WIDTH**

VALVE	SET PRESSURE (PSIG)¹	LAPPED SEAT WIDTH (IN.)
2900 D - F	15 - 100 101 - 300 301 - 800 801 - UP	.020 - .030 .035 - .045 .045 - .055 FULL WIDTH
2900 G - J	15 - 100 101 - 300 301 - 800 801 - UP	.020 - .030 .035 - .045 .045 - .055 FULL WIDTH
2900 K - N	15 - 100 101 - 300 301 - 800 801 - UP	.035 - .045 .045 - .055 .055 - .065 FULL WIDTH
2900 P - R	15 - 100 101 - 300 301 - 800 801 - UP	.040 - .050 .050 - .065 .060 - .070 FULL WIDTH
2900 T	15 - 100 101 - 300	.050 - .065 .060 - .075
2900 V	15 - 100 101 - 300	.075 - .100 .095 - .130
2900 W	15 - 100 101 - 300	.100 - .125 .120 - .160

TABLE 7

C. Precautions and Hints for Lapping Seats

The following precautions and hints will enable maintenance personnel to do a "professional" job of lapping sets:

1. Keep work materials clean.
2. Always use a fresh lap. If signs of wearing (out of flatness) are evident, recondition the lap.
3. Apply a very thin layer of compound to the lap. This will prevent rounding off the edges of the seat.
4. Keep the lap squarely on the flat surface, and avoid any tendency to rock the lap which causes rounding of the seat.

5. When lapping, keep a firm grip on the part to prevent the possibility of dropping it and damaging the seat.
6. Lap, using eccentric or figure-eight motion in all directions, at the same time applying uniform pressure and rotating the lap slowly. (See Paragraph G for further information.)
7. Replace the compound frequently after wiping off the old compound, and apply more pressure to speed the cutting action of the compound.
8. To check the seating surfaces, remove all compound from both the seat and the lap. Then, shine the seat with the same lap using the lapping motion described above. Low sections on the seating surface will show up as a shadow in contrast to the shiny portion. If shadows are present, further lapping is necessary and only laps known to be flat should now be used. Only a few minutes will be required to remove the shadows.
9. When the lapping is completed, any lines appearing as cross scratches can be removed by rotating the lap (which has been wiped clean of compound) on the seat about its own axis.
10. The seat should now be thoroughly cleaned using a lint-free cloth and a cleansing fluid.

D. Grinding O-Ring Metal Seating Surfaces

The contact surfaces of the nozzle and O-ring Retainer are to be lightly ground together during the assembly process to minimize leakage in the event of a O-ring failure. After assembling the reconditioned Nozzle in to the base according to instruction in Section XVI, place a small amount of 1000 grit lapping compound on the 45° angled surface. Then for the "D"-J" orifice fasten the o-ring retainer without installing the o-ring into Disc Holder and placing into the guide. Install the guide and Disc Holder together in the valve base and gently allow the Disc Holder and retainer to come in contact with the nozzle. Turn the Disc Holder within the Guide 15 to 20 rotations and remove, disassemble and clean lapping compound from the Nozzle, Disc Holder and O-ring Retainer. For orifices K and larger the process does not require assembling the nozzle in to the base and it does not require the use of the Disc Holder. Assemble the O-ring retainer into the O-ring Disc and placing a small amount of 1000 grit Lapping Compound on the 45° angled surface of the nozzle, place the disc and retainer on the nozzle lightly grind the o-ring retainer into the nozzle. About 15 to 20 rotations are recommended to establish full contact between the O-ring retainer and the nozzle.

Remove the retainer screw(s) and retainer, and thoroughly clean the retainer, retainer screws and disc holder or disc.

E. Reconditioning of Laps

Ring laps are reconditioned by lapping them on a flat lapping plate. The lapping should be done with a figure-eight motion as indicated in Figure 19. To assure the best results when lapping seats, the ring laps should be reconditioned after each usage and checked with an optical flat.

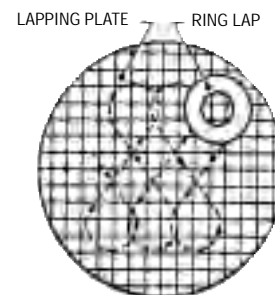


FIGURE 19

F. Machining Nozzle Seats

The nozzle should be removed from the valve to be machined (see Figure 20). See Nozzle Removal Instructions in Section XIV.B, and Figures 12 and 13. If it can not be removed from the base, it should be machined inside the base.

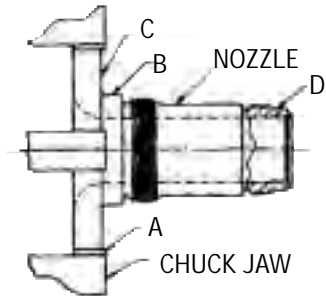


FIGURE 20

1. Lathe Set Up – Nozzle Removed

- a. Grip the nozzle in a four-jaw independent chuck, using a piece of soft material such as copper or fiber between the jaws and the nozzle as shown at A in Figure 20.
- b. True up the nozzle so that the surfaces marked B, C and D run true within .001" on indicator.

2. Machining Procedure: Metal to Metal Seat

See Figure 14A

- a. Take light cuts across the surface L at 5°, until the damaged areas are removed. (See Figure 15) Turn to the smoothest possible finish.
- b. Cut back the outside surface at G, until dimension N is obtained. The surface at G is common to all nozzles **except the D-1. Omit this step on the D-1 orifice nozzles.**
- c. Machine bore diameter H, until dimension E is obtained. Re-establish angle P.
- d. The nozzle is now ready for lapping.
- e. When the minimum dimension D is reached, the nozzle should be replaced.

3. Machining Procedure: O-Ring Seat Seal

See Figure 14B.

- a. Take light cuts across surface A (45°), until the damaged areas are removed. Turn to the smoothest possible finish.
- b. Cut back the outside surface M, until dimension J is obtained.
- c. Machine radius B.
- d. The nozzle is now ready for grinding.
- e. When the minimum dimension D is reached, the nozzle should be replaced.

G. Lapping Disc Seats

The disc seat may be lapped with a ring lap or a lapping plate. Lapping should be done in an eccentric or Figure-eight motion in all directions, applying uniform pressure and rotating the disc or lap slowly.

H. Machining the Disc Seat*

The standard disc seating surface L (see Figure 21) can easily be machined as follows:

1. Grip the disc in a four-jaw independent chuck (or collet, if appropriate), using a piece of soft material such as copper or fiber between the jaws and the disc as shown at A.
2. True up the disc so that the surface marked B and C run true within .001" (0.025 mm), TIR.
3. Take light cuts across the seating surface L until damaged areas are removed. Turn to smoothest possible finish.
4. The disc is now ready for lapping.
5. When the minimum dimension N or T (see Table 3) is reached the disc should be discarded. Do not re-establish surface C.

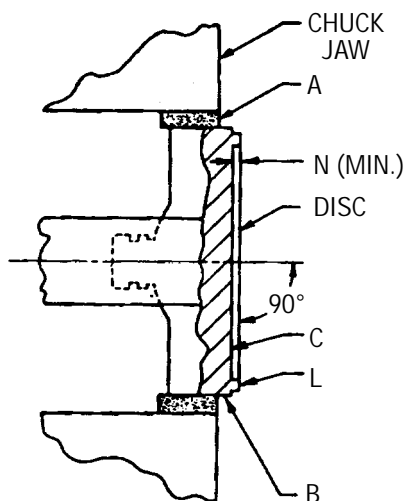


FIGURE 21

Note: *Thermodisc® and O-Ring discs are not to be machined.

If the involved valve has an O-Ring seat seal, refer to the tag plate mounted on the valve (see Figure 36) to determine O-Ring material and "as built" part number.

I. Coverplate

Beyond cleaning and inspection, no maintenance is required for the coverplate.

Note: Do not machine the inside of the coverplate dome.

J. Bearing Point

The bearing point on the piston should be ground into the piston pocket of the disc holder.

SECTION XVI.

Assembly of the 2900 Main Valve

A. Lubrication

Use a nickel based anti-seize lubricant on all threads, and bearing surfaces.

Note: All O-rings (except silicone) and energized seals should be lightly lubricated with silicone grease (supplied with o-ring kits).

B. Specific Steps

1. If the valve nozzle was removed, apply thread lubricant to the nozzle threads before reinstalling in the valve base. Insert it into the inlet flange of the base, and torque to the correct value listed in Table 8.
2. Assemble the disc/disc holder as follows:
 - a. Prior to assembly of the Disc into the Disc Holder, remove the spring clip from the back of the disc. Use 1000 grit grinding compound on the bearing surface to grind the disc into the disc holder to properly establish the bearing surface.
 - b. For all orifices, metal-to-metal discs, place the disc retainer into the groove in the disc. The disc with the retainer should “snap” into the disc holder pocket with moderate finger or hand force. **DO NOT USE EXCESSIVE FORCE TO ASSEMBLE THESE PARTS.** Be sure that the Disc is free to “wobble” after it is in place.

For V and W orifice discs, place Disc into Disc Holder and secure disc retaining bolts.
 - c. For O-Ring disc sizes K thru T, reassemble the disc using a new O-Ring, O-Ring retainer, and new screws. Assemble the disc into the disc holder as described in b. above.
 - d. For O-Ring disc sizes D thru J, reassemble the disc holder using a new O-Ring, O-Ring retainer, and new screw(s). These disc holders are ready for the next step.
3. For bellows valves “D” through “T”, place a new bellows gasket on the disc holder. Thread the bellows, finger-tight, down to the gasket on the disc holder. Use a pin spanner wrench, or special cable type wrench to turn the bellows ring down until a pressure tight joint is obtained.

For bellows valves V and W, place a new bellows gasket on the disc holder. Bolt down using proper torque as found in the assembly instructions.
4. Set the disc holder (disc side down), on the work surface. Place a small amount of 1000 grit grinding compound onto the ball end of the piston and place it in the disc holder pocket. Turn the piston clockwise, and then counter clockwise, to seat the piston. Clean all grinding compound from parts.
5. Place the guide over the disc holder. **(DO NOT DROP.)** If bellows is present, the weight of the guide will slightly compress the bellows.
6. Place the guide gasket in the base.

Nozzle Torque Values +10% - 0%		
Orifice	Required Torque ft.lbs.	Required Torque nm
D-1	95	129
D-2	165	224
E-1		
E-2		
F-1		
G	145	197
H	165	224
J	335	455
K	430	584
L	550	746
M	550	746
N	640	868
P	1020	1383
Q	1400	1898
R	1070	1451
T	1920	2604
V	2000	2712
W	2000	2712

TABLE 8

COVER PLATE NUT TORQUE (FT-LBS)

	2905	2906	2910	2912	2941	2916	2918	2920	2921	2922	2923	2924	2926	2928
D	55	55	55	60	60	60	120	55	—	55	—	60	60	115
E	55	55	55	60	60	60	120	55	—	55	—	60	60	115
F	55	55	55	60	70	70	115	55	—	55	—	70	70	115
G	55	55	55	60	70	70	75	55	—	60	—	70	70	75
H	90	90	60	75	65	65	—	60	—	60	—	75	85	—
J	60	60	75	100	100	100	—	75	—	75	—	100	100	—
K	65	65	60	60	135	145	—	60	—	60	—	60	140	—
L	75	75	90	90	140	140	—	90	—	90	—	140	140	—
M	95	95	110	95	95	—	—	90	—	95	—	95	—	—
N	105	105	130	85	85	—	—	130	—	85	—	85	—	—
P	120	120	145	125	125	—	—	145	—	—	125	125	—	—
Q	105	105	125	150	—	—	—	105	—	150	—	—	—	—
R	115	115	115	135	—	—	—	115	—	135	—	—	—	—
T	95	95	125	—	—	—	—	125	—	—	—	—	—	—
V	130	130	130	—	—	—	—	130	—	—	—	—	—	—
W	130	130	130	—	—	—	—	130	—	—	—	—	—	—

TABLE 9A

7. Install disc guide assembly. Use the same lifting tool (see Figure 9) as was used during disassembly, then carefully lower it into the valve base.

On V and W sizes, use the same lifting lugs as were used during disassembly.
8. Using a small amount of Silicone Grease supplied with soft goods replacement kit, rub a small amount on the seals and O-rings prior to assembly.
9. Take the piston and measure and cut diagonally the proper length of Guide Ring material to fit in the groove of the piston. Allow 1/16 of an inch gap between the ends for proper fit.
10. Install energized seal onto **(see note below)** piston with the exposed spring facing upwards. For o-ring seals, install the o-ring onto the piston. Locating it in the groove below the energized seal groove.

Note: Spring energized seal on piston is only for Teflon® o-ring material option. All other o-ring material options will include an o-ring for the piston. For valve sizes D, E, F, G, H, J, K, L, M, N, & P and set pressure below 50 psig, remove and discard the spring in the energize seal before installing.

11. Install the guide ring(s) onto the piston. If there is more than one guide ring, stagger the cut locations 180° apart.
12. To prevent seal damage during assembly, check the chamfer on the bottom of the coverplate for burrs. If any sharp edges exist, polish the chamfer.
13. Insert piston (energize seal/o-ring side first) into bottom of coverplate. Continue pushing piston into coverplate, being careful not to pinch the guide rings. Push piston in until bottom of piston is even with the bottom of the coverplate.
14. Install coverplate gasket. Place the coverplate on the main valve base and replace the stud nuts.

15. Torque to the values found in Table 9 using the torque patterns in Figure 22 and Table 10.
16. Once the Main Valve is assembled before any tubing is connected reach through the hole in the center of the Coverplate and force the Piston down until it contacts the Disc Holder. Failure to complete this procedure will prevent the main valve from loading and closing, when pressure is applied to the valve.
17. The Main Valve is ready to receive the pilot and finished assembly.

COVERPLATE NUT TORQUE (N-M) + 10% - 0%													
	2905	2910	2912	2914	2916	2918	2920	2921	2922	2923	2924	2926	2928
D-1	75	75	75	82	82	163	75	**	75	**	102	82	156
E-1	75	75	75	82	82	163	75	**	75	**	82	82	156
F	75	75	82	95	95	156	75	**	75	**	95	95	156
G	75	75	82	95	95	102	75	**	82	**	95	95	102
H	123	82	102	89	89	**	82	**	82	**	102	116	**
J	82	102	136	136	136	**	102	**	102	**	136	136	**
K	89	82	82	184	197	**	82	**	82	**	82	189	**
L	102	123	123	189	189	**	123	**	123	**	189	189	**
M	129	150	129	129	**	**	123	**	129	**	129	**	**
N	143	177	116	116	**	**	177	**	116	**	116	**	**
P	163	197	170	170	**	**	197	**	**	125	170	**	**
Q	143	170	204	**	**	**	143	**	**	**	**	**	**
R	156	156	184	**	**	**	156	**	204	**	**	**	**
T	129	**	**	**	**	**	170	**	184	**	**	**	**
-2T	**	170	**	**	**	**	**	170	**	**	**	**	**
V	177	177	**	**	**	**	177	**	**	**	**	**	**
W	177	177	**	**	**	**	177	**	**	**	**	**	**

TABLE 9B

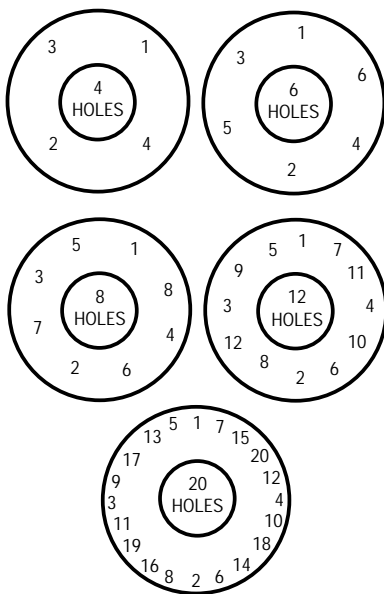


FIGURE 22

TABLE 10

Torque required for each round of pattern	
Round	Percentage of required torque
1	Wrench tight
2	25
3	60
4	100
5	100

SECTION XVII.

Disassembly of the 39MPV Pilot Valve

A. Removal and Disassembly of the Liquid or Gas Modulator

1. Remove the seal and seal wire.
2. Remove socket head cap screws holding the modulator to the main pilot.
3. Remove and discard the 2 O-Rings between the modulator and the main pilot.
4. Remove both cap screws from the bottom of modulator.
5. Remove modulator stop from modulator base. This can be done by rotating the modulator stop enough to be able to push against the ears on the modulator base to remove the modulator stop.
6. Remove both O-Rings from modulator stop and discard.
7. Remove modulator piston from the modulator base by hitting the base on a firm surface. Make sure surface is clean so that when the piston comes out, the seat does not hit any object that might damage it.
8. Disassemble the modulator piston by removing the lock screw.
9. Remove and discard both O-Rings. Be careful not to bend the lip enclosing medium modulator O-Ring (seat) during removal of the O-Ring.
10. Discard both Teflon[®] seals.

B. Disassembly of the 39MPV Pilot Valve

1. Remove the compression screw cap.
2. Measure and record compression screw height for later use when resetting.
3. Loosen compression screw locknut.
4. Turn compression screw counterclockwise to remove it from the yoke. The spring, spring washers, and spring cover (if present) can now be removed.
5. Remove the 4 cap screws holding the yoke to the base, and remove the yoke. Remove and discard the O-Ring (if present) and the Teflon[®] seal (if present) from the yoke.
 - 5A. If the Pilot Valve has a Bonnet instead of a Yoke, loosen the bonnet set screw, then remove the Bonnet counterclockwise using a wrench on the wrenching flats near the top of the Bonnet. Then remove the spring, spring washers and the four cap screws that hold the bonnet adapter to the pilot base. Remove and discard the O-ring and Teflon[®] seal from the Bonnet adapter.
 - 5B. For dirty service option, remove the yoke or bonnet, remove the dirty service insert and throw away the o-ring. Remove the insert assembly from the dirty insert using procedure in step 7.
6. Remove main piston from the base.

7. Remove Insert Assembly from the top of the main base with tool 4995401. See Section XXVI for construction drawing. Remove and discard the O-Ring on the bottom of the insert. Disassemble Insert Assembly by removing Insert Bottom from the Insert Top. Discard Teflon® seal.
8. Loosen the Adjuster Plug Lock Nut.
9. Turn the Adjuster Plug to the right and count the number of “Flats” until the Adjuster Plug stops against the Pilot Valve Base. Record the number of “flats” of adjustment for use when reassembling the pilot.
10. Remove Adjuster Plug Cap from the bottom of the base.
11. Loosen Adjuster Plug Lock Nut.
12. Remove Adjuster Assembly from the base. Remove both O-Rings from Adjuster Assembly and discard. Disassemble Adjuster Top from the Adjuster Bottom. Discard Teflon® seal.

C. Disassembly of the Field Test Connection

1. Remove Shuttle Plug from the Field Test Connector.
2. Remove and discard O-Rings, ball and filter.

D. Cleaning

Parts are to be free of any oil or grease except for lubrication as specified in this instruction.

Cleaning agents used shall be such that effective cleaning is assured without injuring the surface finishes or material properties of the part.

Acceptable cleaning agents include demineralized water, non phosphate detergent, acetone and isopropyl alcohol. Parts must be blown dry or wiped dry after cleaning.

If you are using cleaning solvents, take precautions to protect yourself from potential danger from breathing fumes, chemical burns, or explosion. See the solvent's [Material Safety Data Sheet](#) for safe handling recommendations and equipment.



SECTION XVIII. Inspection and Part Replacement

A. Pilot Valve Parts Inspection

After the pilot valve has been disassembled, all parts should be given a visual inspection. Some key areas to check with the boundaries for reworking parts are listed below.

1. Main Pilot Valve Piston – Galling or excessive wear on the small diameter end where it engages the seals or on the spherical bearing surface. Any corrosion or pitting. The part can be polished as long as the outside diameter of the stem remains at 0.243 +/- .001 inches. The stem itself must have a TIR of 0.001 inches along its length.

2. Insert Top – Galling or excessive wear on the inside diameter that guides the Main Piston. Check for any corrosion or pitting. Also, check for galling of threads.
3. Insert Bottom – Galling or excessive wear on the inside diameter that guides the Main Piston. Check for any corrosion or pitting.
4. Adjuster Top – Galling or excessive wear on the inside diameter that guides the Main Piston. Check for any corrosion or pitting. Also, check for galling of threads.
5. Adjuster Bottom – Galling or excessive wear on the inside diameter that guides the Main Piston. Check for any corrosion or pitting. Also check for galling of threads.
6. Yoke – Galling or excessive wear on the inside diameter that guides the Main Piston Assembly. Any corrosion or pitting. Check for any galling on the threads for the compression screw.
7. Compression Screw – Galling at the spherical bearing surface or in the thread. Check for any corrosion or pitting.
8. Spring Washers – Galling at the spherical bearing surface. Check for any corrosion or pitting.

B. Field Test Connection Parts Inspection

1. Field Test Connection Base – Galling or excessive wear in the threads.
2. Field Test Connection Plug – Galling or excessive wear in the threads.

C. Modulator Parts Inspection

1. Modulator Stop – Top seating surface for cuts or deformities. The surface can be lapped if the distance from the seat to the outside shoulder does not reduce to less than 0.086 inches.
2. O-Ring Retainer – Seating surface for cuts or deformities. The surface can be lapped if the overall height of the part does not reduce to less than 0.160 inches. Also, check the outside diameter for any scratches that might prevent the O-Ring from sealing.
3. Modulator Piston Bottom – Galling or excessive wear on the outside diameter that rubs against the modulator base. Make sure that the lip holding the O-Ring for the seat is not deformed. Also, check the outside diameter of the O-Ring groove for scratches that might cause the O-Ring not to seal. Check for any corrosion or pitting.
4. Modulator Piston Top – Galling or excessive wear on the outside diameter that rubs against the modulator base. Check for any corrosion or pitting.
5. Modulator Base – Galling or excessive wear on any inside diameter. Any corrosion or pitting.
6. If any damage listed above is present, the part should be replaced or repaired per instruction. Other valve parts may be acceptable with light corrosion, pitting, or minor damage of other types if it can be determined that it will not affect product performance. All O-Rings, and seals should be replaced each time the valve is disassembled.

Refer to Tables 14 through 28 for a list of Parts and O-Ring repair kits. Recommended spare parts are listed in Table 12.

SECTION XIX.

Pilot Valve Lubrication

1. Lightly lubricate all O-Rings except Silicone O-Rings, with Silicone Grease as provided in the kit.
2. Lubricate and Seal pipe threads with a Teflon® thread compound such as Dresser SP-364-AB pipe sealant or Teflon® tape.
3. Lubricate standard threads and bearing points with fluorolube (GR362) or equivalent.

SECTION XX. Assembly of 39MPV Pilot Valve and Components

Note: 39MV07 and 39MV37 are assembled identically to the 39PV except for the final addition of the modulator after the Pilot Valve is calibrated and tested.

A. Assembly of the 39PV Pilot Valve Adjuster Plug

1. Assemble the following parts
 - 1 Adjuster Bottom
 - 1 Adjuster Top
 - 1 Teflon® Seat Seal
 - 2 Small main O-rings
2. Install first small main O-Ring into groove in the Adjuster Top.
3. Install second O-Ring in to the groove on adjuster bottom. Install on the opposite end of the square wrenching flats.
4. Use the special seal insertion tool pictured in Figure 39 to correctly insert the vent seal into the Adjuster Top prior to assembly on the Adjuster Bottom.
 - a. Place the seal (with the energizer spring facing you), onto the smaller end of the Plunger Cylinder.
 - b. Place the male part of the Plunger through the seal and into the Plunger Cylinder.
 - c. Insert the small end of the Plunger/Seal/Plunger Cylinder assembly in to the larger opening of the Funnel Tube and press the seal through the funnel tube until it is about 1/4 of an inch (5 or 6 mm) from exiting the smaller end of the tube.
 - d. Remove the Plunger from the assembly leaving the seal and female part of the insertion assembly in the Funnel Tube.
 - e. Seat the seal, plunger and funnel into the end of the Adjuster Top.
 - f. Press the plunger to seat the seal in the recessed area in the Adjuster Top.
 - g. Remove the insertion tool leaving the seal in the Adjuster Top with the energizer spring oriented toward the four small holes in the Adjuster Top.

Note: Do not install adjuster assembly into main base with O-Rings installed without wrench tightening adjuster top and adjuster bottom together. Adjuster top can get stuck in base.

5. Cycle main piston through Teflon® seat seal in the Adjuster Plug top 10 times.
6. Lightly lubricate both O-Rings. Install assembly into base with the adjuster top going in first. Rotate the assembly at the same time as it is being inserted until the threads are engaged. This helps the O-Rings get by the chamfers and holes.
7. Continue to thread adjuster assembly into base until it stops. Do not tighten.
8. Thread adjuster lock nut on to adjuster plug.
9. Hand tighten Lock nut.
10. Thread adjuster cap onto adjuster assembly. Hand tighten.

NOTE: Make sure cap threads freely on adjuster bottom.

11. Making the insert assembly.
This assembly consists of:
 - 1 – Insert top
 - 1 – Insert bottom
 - 1 – Teflon® seat seal
 - 2 – Small main o-ring
12. Press Teflon® seat seal into groove on the insert bottom. Make sure spring is facing upwards.
13. Install insert top over insert bottom with the seal side going in first.
14. Lightly lubricate O-Ring groove now formed by the two insert parts. This lubrication is used to hold the O-Ring in place when it is being inserted into base.
15. Place small main O-Ring into groove.
16. Thread the insert assembly into base with T-handle groove wrench (part #4995401.) Tighten wrench tight. Make sure milled slot is facing up.
17. Cycle main piston through Teflon® seat seal 10 times.
 - 17A. For the Dirty Service option, (see Figure 7A), use steps 11 through 17 to build up the insert assembly for the dirty insert.
18. Place large O-Ring in groove on top of base.
 - 18A. For the Dirty Service option, install the o-ring in the groove on the dirty insert.
19. Install the Teflon® seal into yoke. The energizer spring should be facing you (down, toward the pressure) when installed.
20. Install main piston yoke with the spring washer bearing point going in first.
21. Install main piston and yoke assembly into base by inserting small diameter end of piston through insert assembly. Line up the yoke arms with the dome port and the inlet port.
 - 21A. For the dirty service option, install the dirty insert on to the main valve base with the dirty insert inlet port facing opposite the vent on the main pilot base.

- 21B. For the dirty service option, insert the small end of the piston into the insert assembly in the dirty insert and through to the pilot valve base.
22. Lubricate and insert the four cap screws through the yoke and thread into the main base. Tighten to 300 in-lbs +/- 30 in-lbs.
23. Lubricate and thread locknut onto compression screw.
24. Thread compression screw into top of yoke until the bearing point begins to protrude through yoke.
25. Place spring washers on the ends of the spring.
26. Place spring and spring washer assembly into the yoke and on top of main piston. Hold this assembly in place while turning compression screw down to the top spring washer.
27. Tighten compression screw and locknut hand tight.
28. The pilot valve is ready to be calibrated prior to assembly on the main valve.

B. Assembly of Field Test Connector

1. Install shuttle seat O-Ring into shuttle base.
2. Install tube filter into shuttle base.
3. Drop ball into tube filter.
4. Install shuttle new seat O-Ring into shuttle plug.
5. Install shuttle new plug O-Ring over threads on shuttle plug.
6. Place new tube filter and ball in shuttle base.
7. Lubricate and thread Shuttle Plug into Shuttle Base and tighten to 350 in-lbs +/- 35 in-lbs.
8. The field test connector is ready for test on 39MPV.

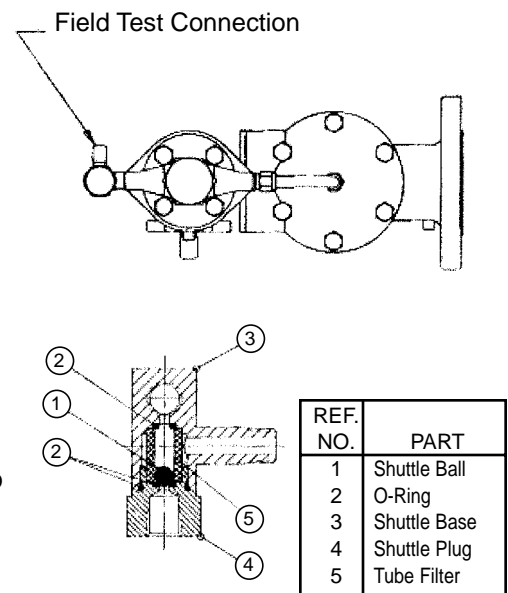


FIGURE 23

C. Gas or Liquid Modulator Assembly

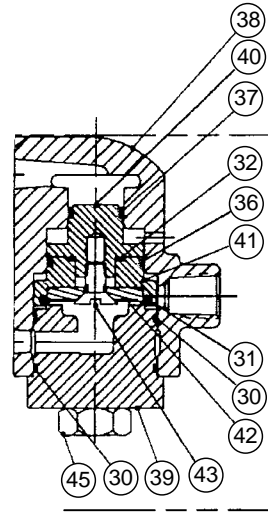
1. Making the modulator piston assembly.

This assembly consists of:

- 1 – Modulator piston top
- 1 – Modulator piston bottom
- 1 – O-Ring retainer
- 1 – Lock screw
- 1 – Small modulator O-Ring
- 1 – Teflon® inlet seal
- 1 – Teflon® balance seal
- 1 – Medium modulator O-Ring

2. Install Teflon® inlet seal into groove on modulator piston top. Be sure to have the spring in the seal facing up.

NOTE: Make sure that the proper service (gas or liquid) is stamped on the top of the modulator piston top. Steam service requires a liquid modulator.



REF. NO.	NOMENCLATURE
30	O-Ring (Modulator Stop)
31	O-Ring (Modulator Seat)
32	O-Ring (Modulator Piston)
36	Spring Seal (Piston Bottom)
37	Spring Seal (Piston Top)
38	Modulator Base
39	Modulator Stop
40	Modulator Piston Top
41	Modulator Piston Bottom
42	O-Ring Retainer
43	Lock Screw
45	Cap Screw (Modulator)

FIGURE 24

3. Install the piston seat O-Ring into groove on modulator piston bottom.
4. Turn modulator piston bottom over and place small modulator piston O-Ring into inner groove.
5. Install spring energized Teflon® seal onto modulator piston bottom in outer groove. Make sure spring opening is facing down.
6. Insert modulator piston top into modulator piston bottom through the side with the small modulator O-Ring and the Teflon® balance seal.
7. Turn assembly over and install O-Ring retainer. The chamfered outside diameter goes in first.
8. Lubricate and thread lock screw through O-Ring retainer into modulator piston top. Tighten 40 in.-lbs +/- 5 in.-lbs.
9. Lubricate Teflon® seals before inserting into modulator base.

NOTE: Make sure that the proper service is stamped on the top of the modulator base and it matches what is stamped on modulator piston top.

10. Insert modulator piston assembly into modulator base with the modulator piston top going in first. Push piston in with thumbs until it stops. There will be some resistance due to the Teflon® seals compressing to fit into the bore of the modulator base. If necessary for installation, insert the proper wrench into the lock screw. *Lightly* tapping the wrench with a hammer will force the piston into the modulator base.
11. Lubricate and install both large modulator O-Rings into grooves on modulator piston stop.

Insert modulator stop into modulator base with the seat going in first. Make sure the side hole in the modulator stop is facing towards the flat side of the modulator base.

12. Lubricate and thread the cap screws through the modulator stop into the pilot modulator. Tighten to 365 in.-lbs +/- 30 in.-lbs.

SECTION XXI.

Assembly of Pilot to the Main Valve

WITH STANDARD OPTIONS:

NOTE: Seal all pipe threads with a non-organic sealant or Teflon® tape.

1. Assemble the 1/2" NPT x 3/8" ferrule to the main valve cover plate. Tighten "wrench tight."
2. Assemble the pilot mounting bracket to the main valve using cover plate stud nuts. Torque nuts to the value listed in Table 9a or 9b.
3. Assemble the pilot to the mounting bracket using the two cap bolts (30) provided. Do not tighten.
4. Connect the dome sensing line (28) to the dome port of the pilot and the ferrule fitting in the main valve cover. Tighten "wrench tight."
5. Connect the inlet sensing line (27) to the pilot inlet port (23) and the inlet sensing fitting. Tighten "wrench tight."
6. Tighten the two pilot-to-bracket Allen (30) cap bolts "wrench tight."
7. Assemble remaining options. See Section XXIII.
8. Tighten all tubing connections wrench tight.
9. Connect the inlet sensing line (27), to the system pressure or to the sensing tube (38), if the sensing ring option (39), is used.

WITH SENSING RING OPTION:

Remote sensing is the standard pressure connection to the pilot valve used on the 2900 Pilot Operated Safety Relief Valve. However with the Sensing Ring Option, the pilot valve pressure can be picked up just before the inlet of the main valve.

The center to face dimensions for a 1900 valve being replaced or converted should be reviewed.

The 2900 "Center to Outlet" dimension remains the same as a 1900 valve. However the "Center to Inlet" dimension increases by 1-1/2 inches due to the Sensing ring and two inlet gaskets (to be supplied by the customer). The gaskets are to be inserted between the Valve Nozzle and the Sensing Ring and between the Sensing Ring and the system flange.



FIGURE 25

Note: #38 Sensing Tube must be used with #39 Sensing Ring if used on 2900 MPV valve.

SECTION XXII.

General Information

General Information on Testing Set Pressure and Blowdown on Pilot Operated Valves.

If testing is to be accomplished while the valve is installed on a pressurized system (in the field) it is possible to adjust the blowdown as well as the set pressure as indicated in the field testing Section XXII.B.

If the valve has been removed from the installation for servicing, an extra precaution should be taken to prevent an artificial indication of a long blowdown.

There is a maximum time delay of about .4 of a second as the plow of pressure from the dome flows through the tubing that connects the pilot and it to the Main Valve. The greater the dome volume the more time it takes for the evacuation of the dome.

Like wise the reverse is true when the valve is closing. It take time for the system pressure to flow through the sensing line to fill up the dome and close the valve. During this period of time the main valve is open and discharging pressure from the test vessel. The test vessel is still decreasing in pressure while Dome pressure builds up to close the valve. The pressure gauge measuring the pressure in the test vessel after the valve has closed shows an artificially long blowdown.

DO NOT ATTEMPT TO SET THE BLOWDOWN ON A 2900 SERIES POSRV IF THE PILOT VALVE DOME CONNECTION IS CONNECTED TO THE MAIN VALVE DOME AND THE VALVE IS TO BE TESTED ON A SHOP TEST STAND. ATTEMPTING TO REDUCE BLOWDOWN IN THIS TEST SITUATION WILL RESULT IN RAPID CYCLING OF THE MAIN VALVE UNDER NORMAL OPERATING CONDITIONS.

The 2900 Series Pilot Operated Pressure Relief Valve may be tested for set pressure as follows.

1. The first is to calibrate the Pilot Valve on a calibration stand prior to testing it on the main valve on a shop test facility. Blowdown may also be established using this method.
2. The complete valve (main and pilot) can be tested in the field through the use of the Field Test Connection and a pressure source that can attain set pressure. This method will also measure blowdown and will cause the Main Valve to Open and discharge media.

A. Pilot Valve Calibration/Strand

The pilot test stand should consist of the following equipment: (refer to Figure 26 for recommended set up.) All equipment must be rated for at least 4200 psi (264 kg/cm²) psig pressure.

1. Suitable pressure source with regulator.
2. 1/2 cubic foot (14 liter) inlet side accumulator.
3. 1/30 cubic foot (1 liter) dome simulator.
4. Inlet and dome pressure gauges.
5. Inlet supply throttle valve.
6. Inlet supply vent/throttle valve.
7. Inlet supply and dome simulator pressure gauges.

The inlet accumulator and dome simulator should be fitted with a drain valve at the lowest point in the vessel to allow draining moisture before testing.

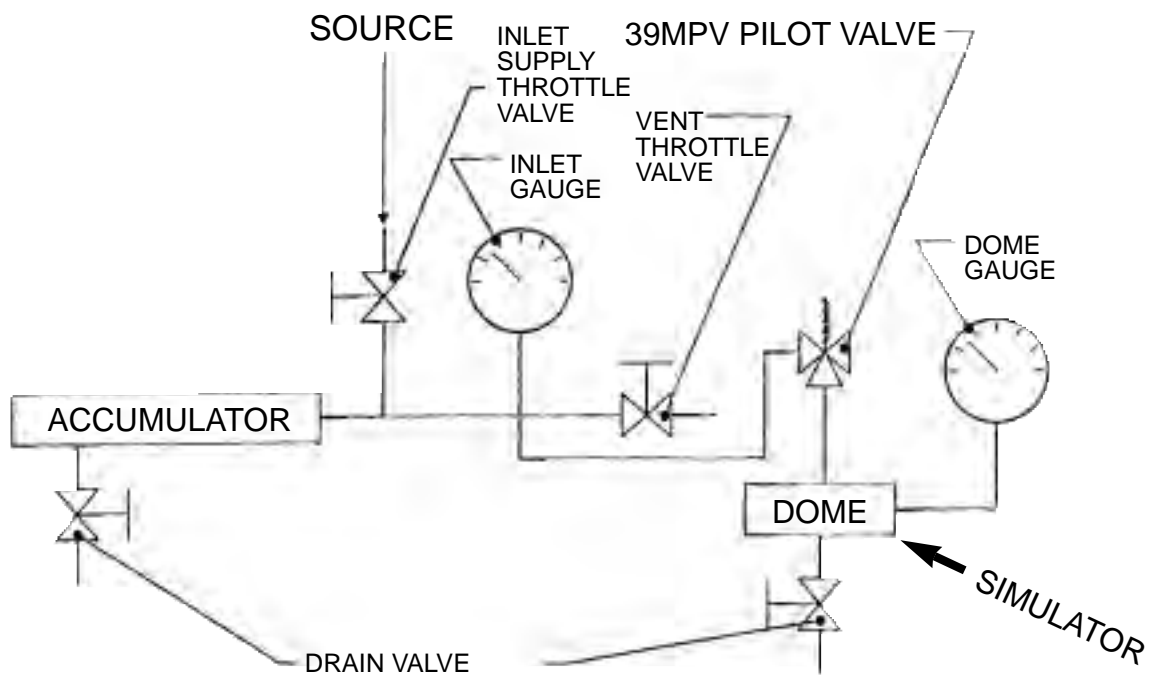


FIGURE 26

NOTE:

Do not attempt to adjust blowdown when testing the pilot/main assembly. The 39PV and 39MV can only be tested for set pressure and tightness when the pilot/main valve assembly is tested together.

NOTE:

The in-line accumulator must be at least 1/2 cubic foot (14 liters), in volume.

NOTE:

A suitable dome simulator may be made out of a short length of stainless steel tubing, tubing fittings and a suitable pressure gauge. The dome simulator will increase in pressure as the pilot valve inlet increases in pressure. Set pressure is indicated when the dome simulator pressure gauge drops off in pressure. As inlet pressure is decreased in the pilot valve to 95% of the set pressure or 3 psig (.21 kg/cm²) whichever is greater, the dome simulator should show an increase in pressure to match the inlet pressure.

A1. Pilot Calibration and Test Procedure

NOTE: The pilot should be adjusted for both set point and blowdown on a suitable test stand prior to mounting on a main valve.

1. Mount the pilot on the stand.
2. Connect dome chamber to pilot.
3. Connect sensing line to pilot inlet.

A2. Definitions

1. Set Point: Point where vent pressure is felt from port.
2. Closing Point: Point where dome pressure begins to reload.
3. Blowdown: Set point minus closing point.
4. Notch: Any peak or valley on bottom of main pilot which is used for adjustment.

A3. Specific Steps

1. Pre-setting the Blowdown: Remove Adjuster Cap and install NPT pipe plug into top hole on flat surface of pilot.
2. Turn Adjuster into base until it stops. Turn out 1 turn.
3. Adjust compression screw until dome pressure stops increasing between 75 and 125 psig. If set point is below 75 psig, use any dome pressure between 15 and 75 psig.

NOTE: If vent pressure is felt and dome pressure has not stopped, drop inlet pressure until it is not felt and raise adjuster clockwise 1 flat.

4. Raise inlet pressure 0.5 to 5 psig above pressure found in step 8.3.2. Keep in mind the blowdown that is required for the given set point.

NOTE: If pilot vents, continue with #5.

5. With finger over vent port, turn adjuster out slowly until the vent pressure is felt.

NOTE: If pressures become equal while adjusting, increase inlet pressure again until a differential pressure occurs. Continue.

6. Lower inlet pressure until it equals dome pressure.
7. Increase inlet pressure. Dome pressure should have started dropping with 1% or 1 psig over pressure, whichever is greater, of the point the vent pressure was felt.

NOTE: If dome pressure does not drop, adjuster has been turned out too far. Turn in (raise) 1 flat and repeat steps 3 through 7.

8. Check pilot for leakage at 10% or 5 psig, below set point, whichever is greater.

9. Final Setting of Seals

9a. Adjust compression screw to approximately +/-10% of set point of pilot. Final setting will be done later.

10. Make adjustments in 2 notches or less. Match any corner of the square on the bottom of the adjuster to a notch on the base. **Only turn adjuster when there is less than 125 psig in dome.**

11. Long Blowdown

Turn adjuster out.

12. Pilot flowing and dome not dropping at 1% or 1 psig over pressure, whichever is greater.

Turn adjuster in.

13. Adjusting Blowdown. Lower inlet pressure so that inlet and dome pressures are equal, approximately 90% of Set Pressure.

14. Slowly increase pressure to note the set point.

15. Increase inlet pressure to 1% or 1 psig above set point, whichever is greater, and hold for a couple of seconds to make sure dome pressure is dropping. If dome pressure is dropping, continue to increase to 10% over pressure or 3 psig, whichever is greater. Dome pressure should drop to 0 psig. If dome pressure is not dropping, adjust as noted in 16.

16. Slowly drop inlet pressure to note the closing point.

17. Use the following guidelines when setting blowdown.

18. For Gas Service:

S.P. is 15 to 75 psig: 0 to 1.5 psig blowdown

S.P. is 76 to 750 psig: 0% to 2% blowdown

S.P. is 751 to 3750 psig: 0% to 3% blowdown

For Liquid Service:

S.P. is 15 to 30 psig: 1 to 3 psig blowdown

S.P. is 31 to 75 psig: 2 to 4 psig blowdown

S.P. is 76 to 3750 psig: 3% to 6% blowdown.

19. If blowdown adjustments are necessary, increase inlet pressure to release dome pressure to less than 125 psig. Make adjustments as noted in #14 or #15 and retest beginning with #16.

20. If adjustments are not necessary, continue with 20.

21. Adjust compression screw for set pressure without modulator attached.

For 39PV

Set at 1% to 2% BELOW S.P. or 1 psig, whichever is greater.

For 39MV

Set at 0% to 1% BELOW S.P. or 1 psig, whichever is greater.

FOR EXAMPLE: S.P. = 150 psig

The following valves would be set at:

39PV01 & 39PV07 = 147.0 psig

Closing point = 144.1 psig

Pilot 0 BPM = 144 psig

Pilot <40 BPM = 165 psig

30 MV01 & 39MV07 = 148.5 psig
Closing point = 145.5 psig
Pilot 0 BPM = 144 psig
Pilot 0 BPM = 165 psig

S.P. = 1000 psig

The following valves would be set at:

39PV37 = 1000.0 psig
closing point = 970 psig
Pilot 0 BPM = 960 psig
Pilot 0 BPM = 1100 psig

22. After adjustments have been made, tighten locknut on compression screw and tighten adjuster cap to secure settings.
23. Re-Verify Settings:
24. Lower inlet pressure so that inlet and dome pressures are equal. Approximately 90% of set pressure.
25. Slowly increase pressure to verify that pilot is tight (0 Bubbles per minute) at 4% below set point, or 2 psig whichever is greater.
26. Increase inlet pressure to 1% or 1 psig above set point, whichever is greater, and hold for a couple of seconds to make sure dome pressure is dropping. If dome pressure is dropping, continue to increase to 10% over pressure or 3 psig, whichever is greater. Dome pressure should drop to 0 psig. If dome pressure is not dropping, adjust as noted in #15 or #16. Retest beginning with #24.
27. Check rate of leakage from pilot at 10% or 3 psig, whichever is greater, above set point. It should be less than 40 BPM.
28. Slowly drop inlet pressure to note the closing point.
29. Final Test of Modulator. Remove pipe plug on flat modulator surface of main base. Check to verify that no Teflon® tape has been left in vent port or the port above it.
30. Place two small modulator O-Rings into grooves on flat surface of main pilot.
31. Attach modulator to main base with two hollow head cap screws with 95 in-lbs. +/-10 in-lbs. of torque.
32. Re-pop pilot five times then check for the following:
33. Do not re-adjust compression screw or adjuster.
34. Pilot should be tight (0 Bubbles Per Minute) up to 4% below set pressure, or 2 psig, whichever is greater.
35. Pilot should be tight (0 Bubbles Per Minute) at 10% above set pressure, or 3 psig, whichever is greater.
36. When set pressure is above or equal to 75 psig, at 10% over pressure, or 3 psig, whichever is greater, the dome pressure should drop to the following level:

GAS: 45% to 60% of S.P.
LIQUID: 15% TO 35% OF S.P.
37. When set pressure is below 75 psig, at 10% over pressure the dome pressure should drop to the following level:

GAS: 0% to 60% of S.P.
LIQUID: 0% to 35% of S.P.

A.4 Final Set Pressure Adjustment

Once the pilot valve set pressure and blowdown are calibrated on the pilot valve calibration stand, and the pilot valve is installed on the main valve, increase the pressure on the main valve and check to see that set pressure is within the popping pressure tolerance allowed for the set pressure of the valve. The Compression Screw may be adjusted to fine tune the Set Pressure if necessary.

NOTE: The blowdown cannot be successfully adjusted in the shop when the pilot valve is installed on the main valve. The pilot valve must be set on the pilot valve calibration stand.

A.5 Seat Tightness and Leakage Test

After the set point and blowdown have been set, the valve must be checked for seat tightness. Pressurize the valve to 96% or within two psig of set pressure, whichever is greater. (Use a bubble cup filled with water to check for leakage.) Check all fittings and ports for leakage.

B. Testing on Installation

Field testing may be used to verify the valve opening point on repaired valves, or to periodically check the function of valves in service. A test set up similar to that shown in Figure 27 should be used.

The set pressure of the 2900 series POSRV is defined as the pressure at which the main valve opens. The following table indicates the allowable set pressure tolerances according to the ASME Boiler and Pressure Vessel Code.

Required Set Point	Tolerance
15-70 psig (1.05-4.92 kg/cm ²)	+/-2 psig (+/- .14 kg/cm ²)
71 psig and greater (4.99 kg/cm ²)	+/-3% of the set pressure



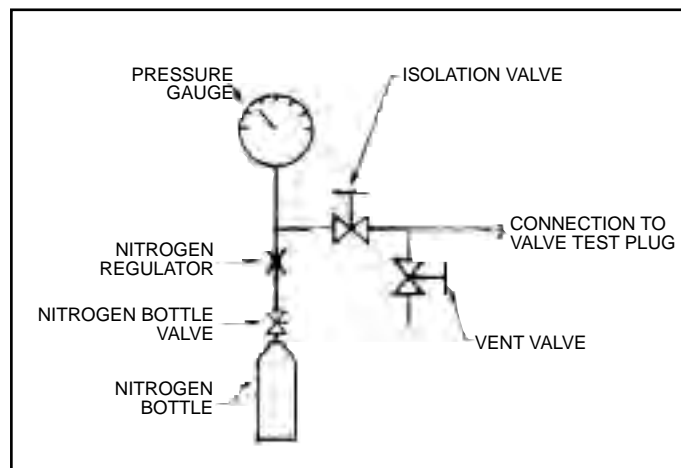
1. Loosen and remove the tubing connecting the pilot valve and the discharge flange.
2. Close the vent valve and isolation valve in Figure 27.
3. Connect the isolation valve to the pilot valve through the test port labeled "Test". **DO NOT REMOVE ANY OTHER PLUGS.**
4. Open the valve at the inlet neck of the nitrogen tank.
5. Turn the regulator control knob clockwise gradually until a pressure of 10 psi is indicated on the test gauge attached to the regulator.
6. Open the vent valve to purge the test system.
7. Close the vent valve.
8. Increase the test pressure by turning the control knob on the regulator clockwise until the pilot valve begins to vent.

9. Note the test gauge reading when the pilot valve vents. The pilot opening pressure should be within tolerances referenced in Section XXII.B.

NOTE: The main valve will open using field test connection.

10. After the set pressure is noted, turn the control knob counterclockwise to reduce the pressure in the pilot valve and close the main valve.
11. Confirm the pilot valve opening pressure by repeating the above test twice more for a total of three tests. All test results should be within the proper set pressure tolerance.

Testing on Installation



**TYPICAL FIELD
TEST ARRANGEMENT**

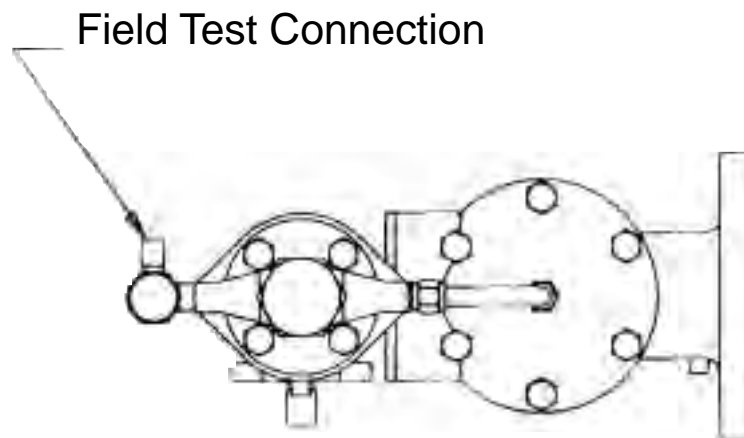


FIGURE 27

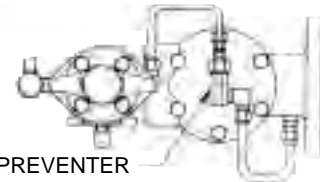
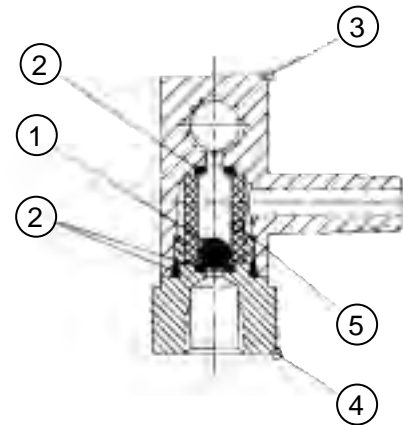
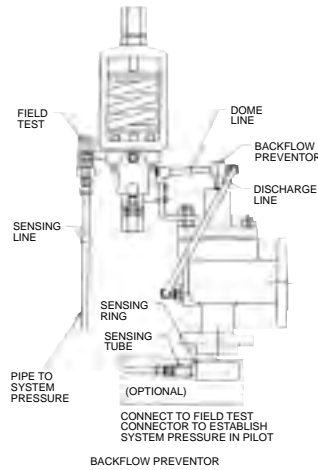
SECTION XXIII. 2900 Pilot Valve Options

A. Available Options

- Backflow preventer
- Auxiliary Canister Filter
- Manual Blowdown
- Dirty Service with Auxiliary Canister Filter
- Heat Exchanger used on Cryogenic Service
- Heat Exchanger used on Steam and Hot Service
- Optional Line Filter

B. Backflow Preventer

REF. NO.	PART
1	Shuttle Ball
2	O-Ring
3	Shuttle Base
4	Shuttle Plug
5	Tube Filter



Note: The backflow preventer is the same part as the field test connection.

FIGURE 28

When a pilot operated relief valve is not vented directly to atmosphere, it is possible to build up a back pressure in the discharge line. This is typical in applications where several valves manifold into a common discharge header. Should the discharge line back pressure exceed the valve inlet pressure, it could cause the main valve piston to lift and allow reverse flow through the main valve. This trouble can be avoided by use of the Backflow Preventer optional feature.

Backflow Preventer Maintenance

Backflow Preventer

DISASSEMBLY

Ref. Figure 28

Remove plug (located near the valve discharge flange) from body by unscrewing counterclockwise. Remove ball and filter.

MAINTENANCE AND REASSEMBLY

Remove and discard O-Rings.

Clean all parts and inspect for damage and wear.

Lubricate O-Rings with silicone grease or equivalent.

Reassemble with new O-Rings. Ref. Table VIII, O-Ring kit information.

WITH BACKFLOW PREVENTER:

Refer to Figure 28 for location of Backflow Preventer, Pilot Valve, Mounting Plate, Tubing, etc.

1. Insert bushing into cover plate and tighten.
2. Insert threaded end of backflow preventer into bushing and tighten. Make sure that the 1/4-FNPT threads are facing 90 degrees from pilot.
3. When viewed from the outlet of the valve, the right side is piped to the dome port of the pilot. The left side is piped to the outlet of the main valve.
4. Install the pilot valve and sensing lines as described above.
5. Install the sensing line between the main valve outlet and the backflow sensing port.

C. Auxiliary Canister Supply Filter:

The supply filter is an option available and is used to prevent foreign material from entering the pilot valve.

1. The filter is connected to the main valve. See Figure 29.
2. Connect and tighten the inlet sensing line to the inlet of the filter and the sensing fitting at the inlet of the main valve.
3. Connect and tighten the pilot sensing line to the outlet of the filter and the pilot valve inlet sensing port.

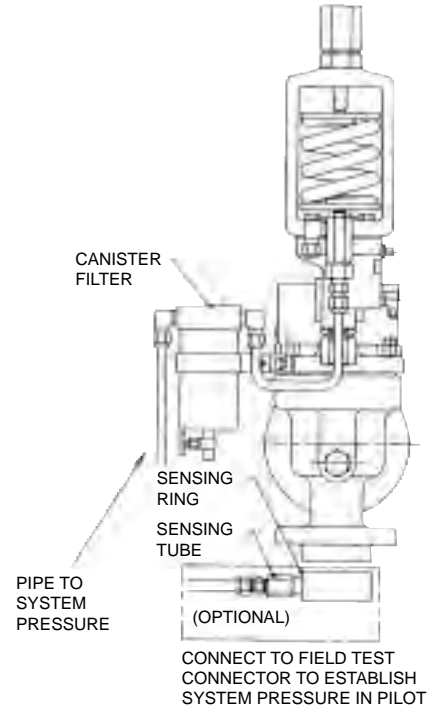
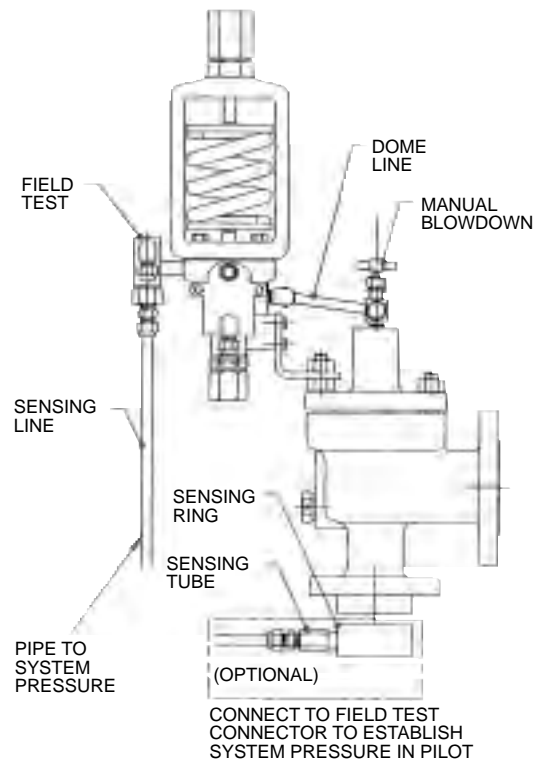
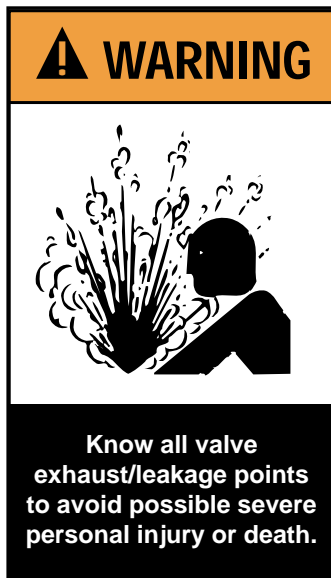


FIGURE 29

D. Manual Blowdown

Manual Blowdown

An optional manual blowdown valve is available for opening the main valve. See Figure 30. When open, the manual blowdown valve reduces the pressure above the main valve disc head, allowing the main valve to open.



MANUAL BLOWDOWN

FIGURE 30

E. Auxiliary Canister and Dirty Service Option

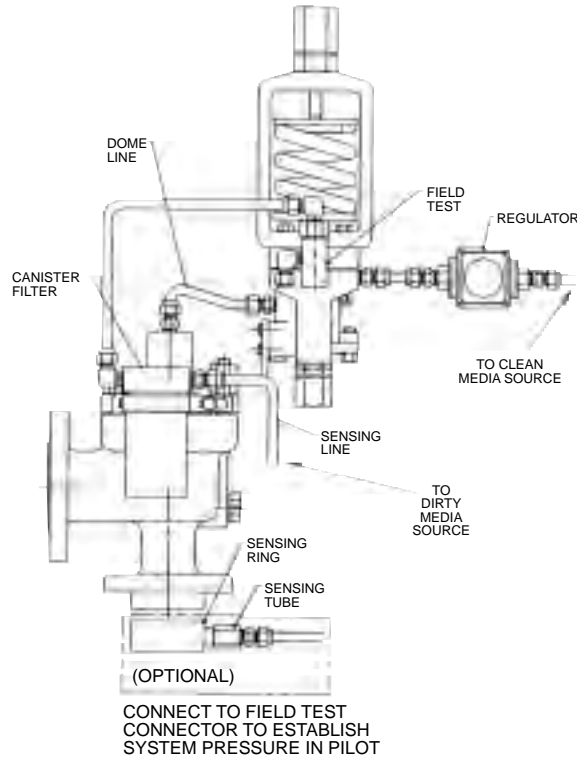


FIGURE 31

F. Heat Exchanger used on Cryogenic Service

Pilot valves are traditionally limited to the service ranges on its elastomers and Teflon® products.

The 2900 series valve, metal seat design is able to operate at a design temperature that is above 505°F and below 40°F with the use of an air cooled or air warmed Heat Exchanger. For temperatures 41°F and below as well as those 506°F and above consult the factory. The Heat exchanger located upstream of the pilot valve in order to condition the temperature of the process fluid within the acceptable range of the pilot valve and soft goods (see figure 7A). The Heat exchanger must be sized and selected to meet the service conditions for each application and valve size.

WARNING: Medium may freeze if ambient temperature drops below the freezing point of the media when a heat exchanger is installed.

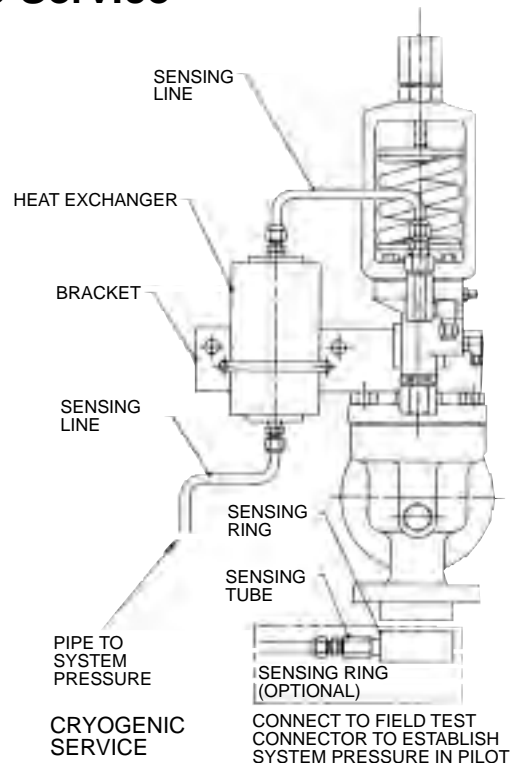


FIGURE 32

G. Heat Exchanger for Steam and Hot Service

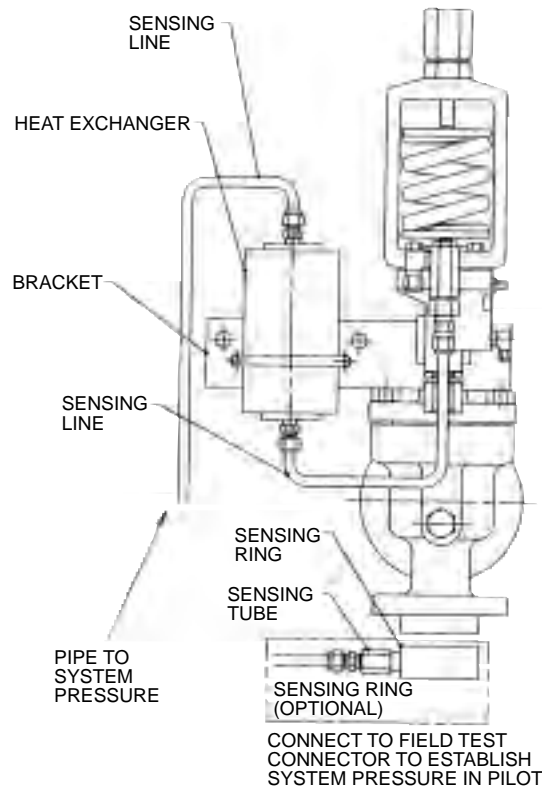


FIGURE 33

H. Optional Line Filter (Standard with Steam Option)

Filter

Additional protection for the standard, filtered pilot valve is provided by an optional sensing line pilot filter. See Fig. 34. Greater filter capacity will boost removal of unusual amounts of scale, deposits or foreign particles, which otherwise may obstruct the sensing line, causing malfunction of the pilot.

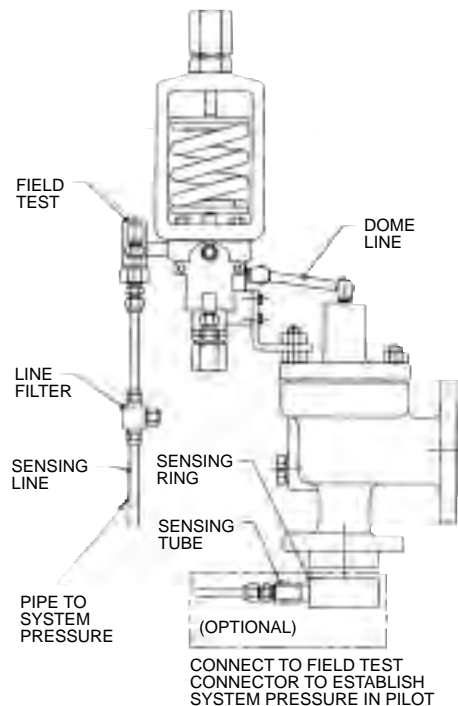


FIGURE 34

I. Assembly of Options and Alternative Piping

Additional information concerning the installation and appropriate piping designs is available in the Consolidated 2900 Series Pilot Operated Safety Relief Valve Catalog. Suggested References begin on page 2900.42 and continue through 2900.62

SECTION XXIV. Troubleshooting

Problem	Possible Cause	Corrective Action
Pilot valve is not open at set pressure and main valve will not open.	A. Wrong set Pressure.	A. Readjust the set pressure valve of the valve.
Main valve does not close upon start up, P2 chamber does not load with system.	A. Start-up procedures pressurize the valve too rapidly. B. Sensing tube is installed upside down. C. Closed filter.	A. Slowly increase the inlet pressure. B. Re-install the sensing tube correctly. C. Clear or replace.
Leakage through the Pilot Valve	A. Operating pressure too high. B. O-ring or seal degradation.	A. Adjust operating pressure. B. Disassemble and replace O-Ring or seals.
Main Valve opens and allows the discharge media to flow back into the pressure vessel.	A. Back pressure is greater than the set pressure and forces the main disc up, and the media flows backward into the vessel. B. Discharging into a closed container or not enough capacity in the discharge system.	A. Install backflow preventer. B. Install backflow preventer.
Blowdown incorrect	A. Incorrect Adjuster Plug Setting	A. Re-set Adjuster Plug (See Pilot Valve Settings)
Leakage around fittings	A. Fittings are not tightened or are cross threaded.	A. Re-install fittings correctly.
Leakage under the cover plate when valve is open.	A. Guide or coverplate gasket is damaged. B. Cap screws or stud nuts on coverplate are loose.	A. Disassemble valve and replace gasket. B. Tighten as required.
Main valve leaks through the seat.	A. Damaged seat O-Ring B. Damaged metal seat	A. Disassemble valve and replace O-Ring. B. Disassemble valve and replace seating surfacer.

TABLE 11

SECTION XXV. Replacement Parts Planning

A. Basic Guidelines

The following guidelines should be of assistance in developing a meaningful replacement parts plan.

A. The total number of valves in service should be classified by size, type and temperature class.

B. The parts inventory should be classified by the tendency to require replacement.

- Class I – Most frequently replaced
- Class II – Less frequently replaced but critical in an emergency

C. Parts for the valve types covered by this manual are classified on Table 12. “Qty. parts” is the number of parts or sets which is recommended to achieve a desired need-probability, as it relates to the total number of valves in service by size and type. For example, a “Qty. parts” of 1 for “Valves in service” of 5 means that 1 part should be stocked for each 5 valves of the same type and size in service.

D. When ordering replacement parts, please specify in accordance with applicable nomenclature (see Figures 6, 7 or 8). Be sure to state the size, type and serial number of the valve for which parts are required. When ordering pilot parts please state specific pilot type (39PV07, 37, etc.)

For ease of maintenance O-Ring kits are available for each main valve and pilot type. A stock of these kits should be kept on hand for maximum operating efficiency. See Section XXVII.

B. Identification and Ordering Essentials

Identification and Ordering Essentials

When ordering service parts, please furnish the following information to ensure receiving the correct replacement parts.

Identify valve by the following nameplate data:

- A. Size
- B. Type
- C. Pressure/Temperature Class Rating
- D. Serial Numbers from both main valve and pilot valve

Example:

POSRV IDENTIFICATION

NAMEPLATES (2) FOR MAIN VALVE


CONSOLIDATED			
CERTIFIED BY			ALEXANDRIA, LOUISIANA, USA
TYPE			
SIZE		SERIAL NO.	
SET PRESS.	PSI	CDTP	PSI
<input type="checkbox"/> BACK PRESS.	PSI	TEMP.	*F <input type="checkbox"/>
CAP.	LBS/HR. SAT. STEAM	STD. CU. FT. / MIN. AIR	
CAP.	GPM WATER	STD. CU. FT. / MIN. N.G.	
B/M			DATE

FIGURE 35

THIS VALVE CONTAINS TEFLON® SEALS AND AN	
<input type="checkbox"/>	O-RING
SEAT SEAL	
<input type="checkbox"/>	O-RING
PART NO.	

FIGURE 36

NAMEPLATE FOR PILOT VALVE


CONSOLIDATED			
		ALEXANDRIA, LOUISIANA, USA	
PILOT VALVE			
MODEL NO.			
SERIAL NO.			
O-RING		SET PRESS.	
B/M			DATE

FIGURE 37

How to verify materials of O-Rings and Seals

Kit coding indicates O-Ring and seals material.

Examples:

PSGK-38B018	B018 = Buna N 70 B008 = Buna N 90
PSGK-35V022	V022 = Viton® 75 V005 = Viton® 90 T006 = Teflon®
PSGK-32E019	E002 = Ethylene 90 Propylene E019 = Propylene 70

Note: For Kalrez material, contact factory

C. Positive Identification of Main Valve and Pilot Valve Combinations

POSRV's shipped direct from the factory to the end-user probably have main valves and pilot valves with identical serial numbers (S/N's). Those shipped unconnected to the Dresser Green Tag network may have main valves and pilot valves with different S/N's. During service and repair, the following inspection steps will ensure the proper match of main valves to pilot valves.

1. Record main valve and pilot valve S/N's of original POSRV's in plant records.
2. Inspect S/N's for agreement with Step 1, after any disassembly involving removal of pilot valve from main valve.
3. Make sure the set pressures of the main valve and pilot valve are identical.
4. Check O-Ring and Seals Kit material code to ensure they are the same for main valve and pilot valve.

Any discrepancies should be promptly report to the appropriate plant authority.

Specify parts required by:

1. Part Name (See Nomenclature. See Figures 1, 2 & 3)
2. Part Number (if known)
3. Quantity

Contact Parts Marketing: 1-318-640-2250

In addition, the main valve serial number is stamped on the top edge of the outlet flange. Be sure to include the one or two letters preceding the figures in the serial number. Typical valve nameplates are shown in Figures 35, 36 and 37.

D. Recommended Spare Parts

PILOT OPERATED SAFETY RELIEF VALVES (POSRV) FOR 2900-1 MAIN VALVE

	CLASS	PART NAME
Class 1 parts should be stocked at the rate of one (1) per valve. Maintaining this level of spare parts will provide replacement parts for 70% of possible maintenance requirements.	I	Guide Ring on Piston Disc Retainer Ring on Disc *O-Ring *Spring Energized Teflon® Seal Gasket (1) Gasket (2)
Class II parts should be stocked at the rate of one (1) part per each five (5) valves in the population. Class II parts will provide replacement parts of an additional 15% of possible maintenance requirements.	II	Stud (2) Nozzle Disc Holder

A combination of Class I and II parts will satisfy maintenance requirements 85% of the time.

****Note:** Depending on service, either an O-ring or Spring Energized Teflon® Seal is required.

TABLE 12

XXVI. Special Tools

A. Insert Installation Tool

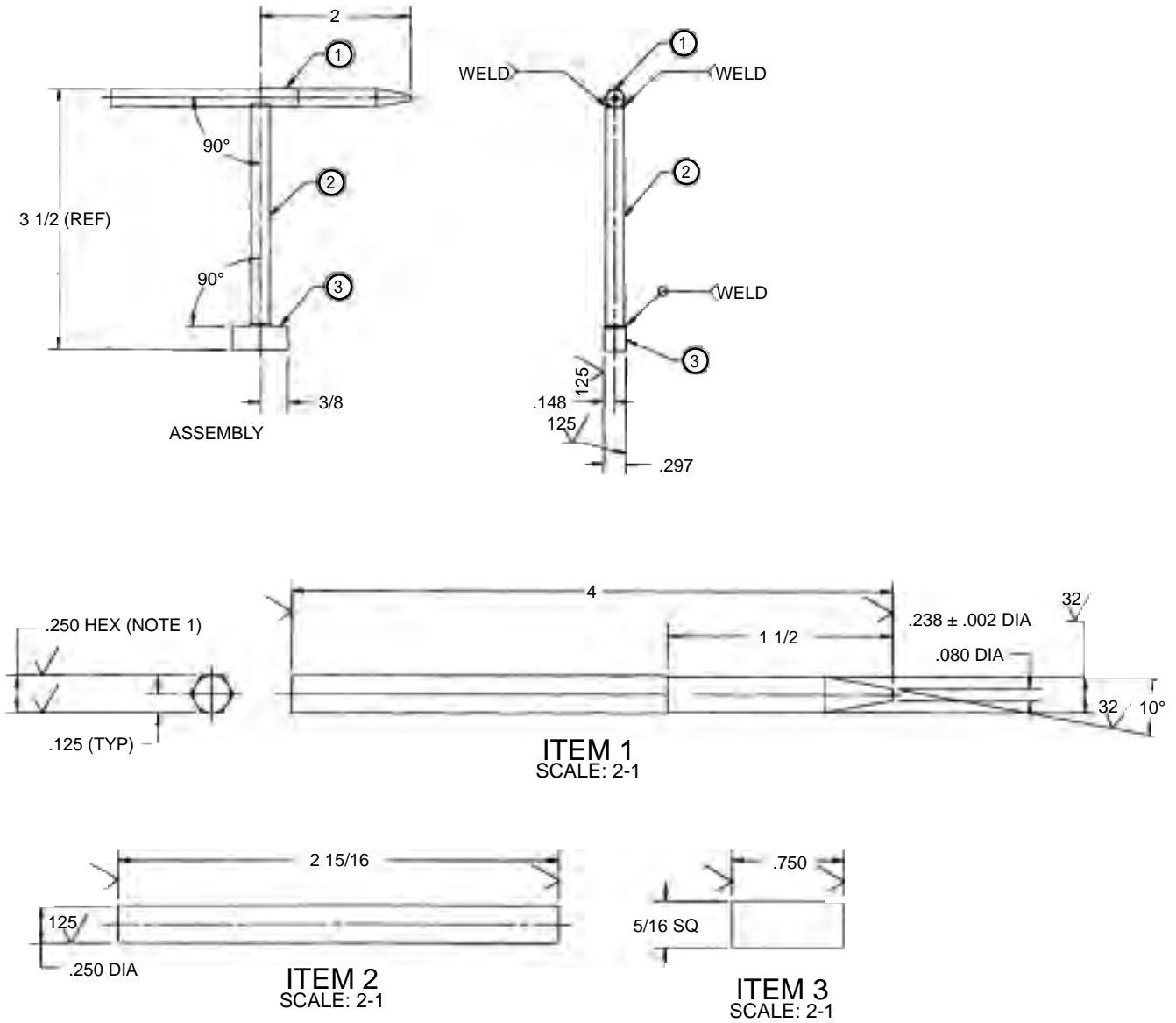


FIGURE 38

B. Adjuster Top Seal Insertion Tool

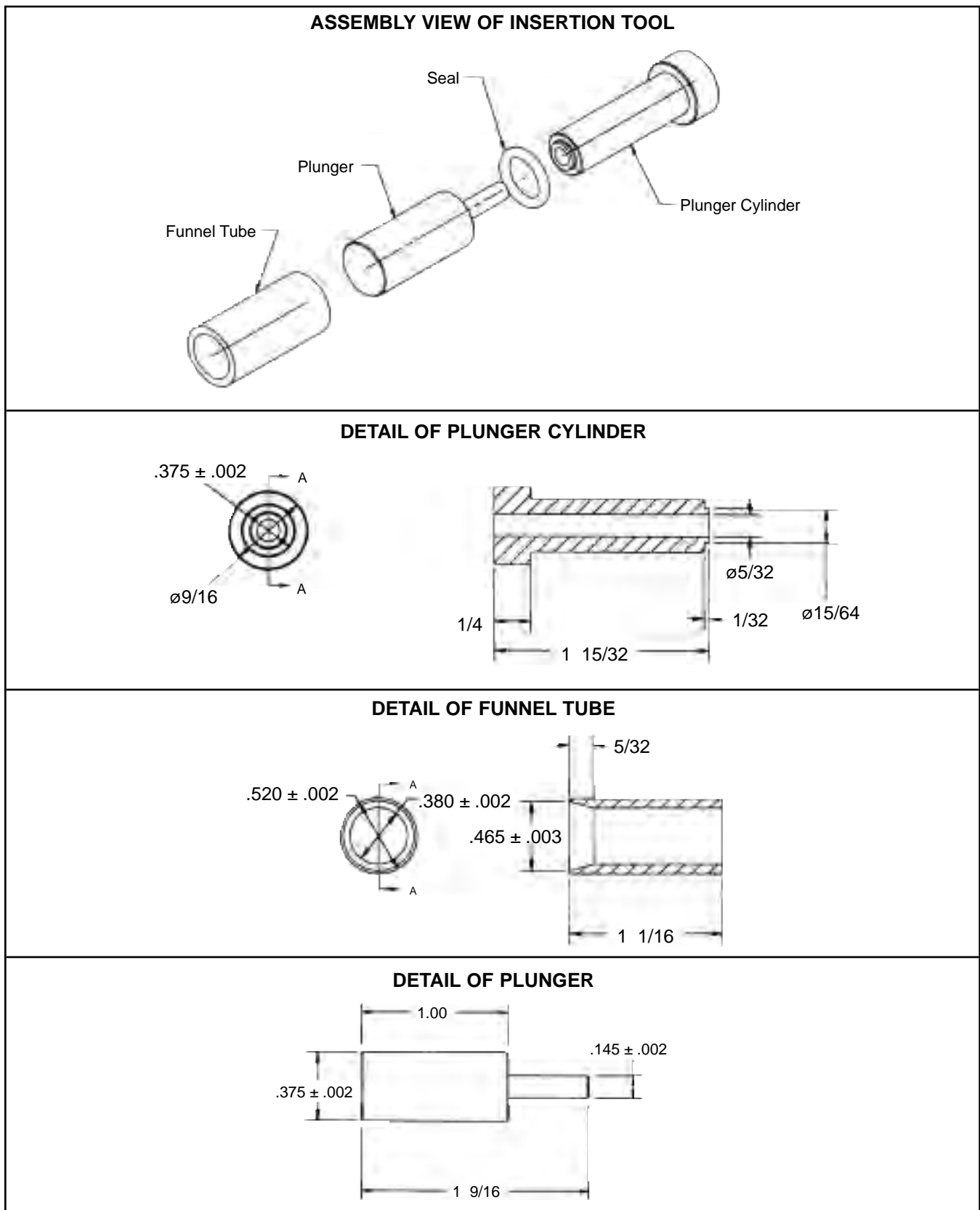


FIGURE 39

C. Disc Holder and Guide Removal and Assembly Tool

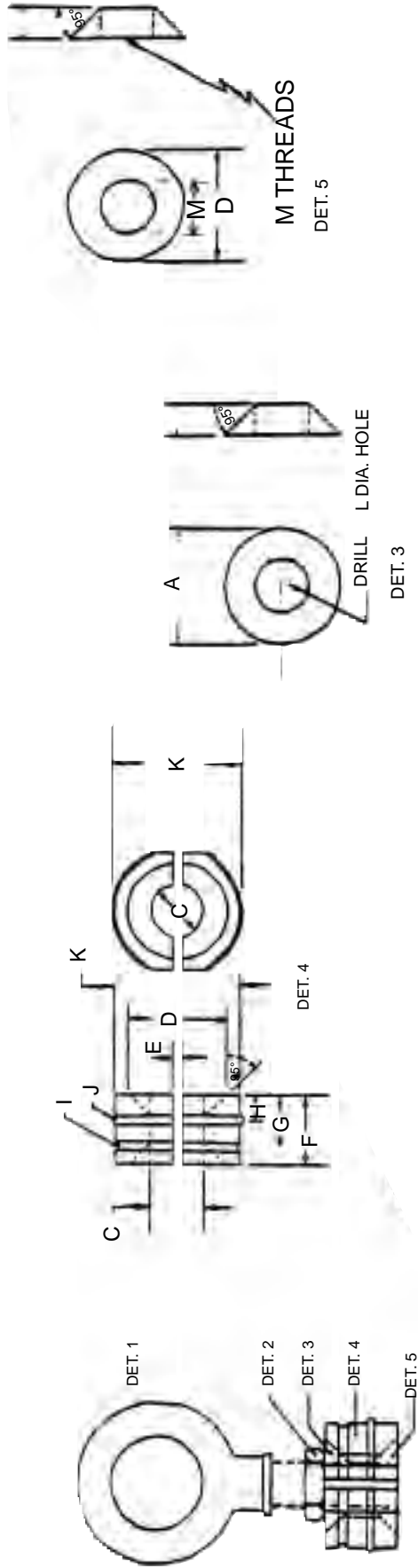


FIGURE 40

Disassembly Tool for Orifices Sizes	See Notes	Dia. "A"	Dia. "B"	Dia. "C"	Dia. "D"	Dia. "E"	Dia. "F"	Dia. "G"	Dia. "H"	Radius "I"	Radius "J"	Dia. "K"	Dia. "L"	Drill Size	NC Tap Size
D,E,F,G,H,J	#1	.703	.250	.437	.730	.094	.750	.406	.156	.047	.034	.798	.375	#7	1/4-20
K&L	#2	.828	.250	.437	.847	.125	.750	.438	.188	.062	.040	.927	.375	5/16	3/8-16
M&N	#3	.828	.250	.437	.828	.125	.750	.438	.188	.062	.047	1.126	.500	5/16	3/8-16
P,Q,R,T	#4	1.375	.376	.750	1.375	.125	1.000	.750	.375	.094	.055	1.834	.750	17/32	5/8-11

Notes:

- 1) Use a Standard Eye-Bolt – 1/4"-20 thd. x 3-1/2" Long
- 2) Use a Standard Eye-Bolt – 3/8"-16 thd. x 4-1/2" Long
- 3) Use a Standard Eye-Bolt – 3/8"-16 thd. x 4-1/2" Long
- 4) Use a Standard Eye-Bolt – 5/8"-11 thd. x 4-1/2" Long
- 5) Use a Standard Nut – 1/4"-20 thd.
- 6) Use a Standard Nut – 3/8"-16 thd.
- 7) Use a Standard Nut – 3/8"-16 thd.
- 8) Use a Standard Nut – 5/8"-11 thd.

Note: Use an appropriate sized O-ring in groove "I," to hold the parts together.

TABLE 13

SECTION XXVII Replacement Parts Kits

39PV-2 PILOT VALVE SEAL KITS Material Class "CC" per configuration

PILOT VALVE SEAL KITS		
PILOT	MATERIAL	PART NO.
39PV07-2 GS & LS	Buna N (Nitrile 70)	PSGK-38B018
39PV07-2 GS & LS	Viton® (Fluoro-Carbon 75)	PSGK-38V022
39PV07-2 GS & LS	E.P.R. (Ethylene Propylene 70)	PSGK-38E019
39PV07-2 GS, LS & SS	Teflon®	PSGK-38T006
39PV07-2 SS	E.P.R. (Ethylene Propylene 90)	PSGK-38E002
39PV37-2 GS & LS	Buna N (Nitrile 70)	PSGK-35B018
39PV37-2 GS & LS	Viton® (Fluoro-Carbon 75)	PSGK-35V022
39PV37-2 GS & LS	E.P.R. (Ethylene Propylene 70)	PSGK-35E019
39PV37-2 GS & LS	Teflon®	PSGK-35T006

Pilot valve seal kits consist of o-rings in materials shown above, spring energized Teflon® seals, one 9/32" ball, one tube filter, grease and instruction sheet.

TABLE 14

39MPV-2 PILOT VALVE MODULATOR

SERVICE	PART NO.
With Spring Energized Teflon® Seals and Buna N (Nitrile 70) O-rings	
Gas	4985001
Liquid	5040301
With Spring Energized Teflon® Seals and Viton® (Fluoro-Carbon 75) O-rings	
Gas	4985002
Liquid	5040302
With Spring Energized Teflon® Seals and E.P.R. (Ethylene Propylene 70) O-rings	
Gas	4985003
Liquid	5040303
With Spring Energized Teflon® Seals and Teflon® O-rings	
Gas	4985005
Liquid & Steam	5040306
With Spring Energized Teflon® Seals and E.P.R. (Ethylene Propylene 90) O-rings	
Steam	5040307

Note: For repair or replacement of 39MV, or conversion of Pop Pilot (39PV) to Modulating Pilot (39MV). The pilot valve modulator listed is a complete assembly including necessary mounting screws.

TABLE 15

39MPV-2 PILOT VALVE MODULATOR

**SEAL KITS FOR MODULATOR CONVERSION OR REPAIR KIT
CONTAINS SPRING ENERGIZED TEFLON® SEALS AND O-RINGS AS INDICATED.**

SERVICE	MATERIAL	PART NO.
Gas	Buna N (Nitrile 70)	PSGK-32B018
Liquid		PSGK-34B018
Gas	Viton® (Fluoro-Carbon 75)	PSGK-32V022
Liquid		PSGK-34V022
Gas	E.P.R. (Ethylene Propylene 70)	PSGK-32E019
Liquid		PSGK-34E019
Gas	Teflon®	PSGK-32T006
Liquid		PSGK-34T006
Steam		PSGK-34T006
Steam	E.P.R. (Ethylene Propylene 90)	PSGK-34E002

Note: A modulating valve requires both a pilot valve seal kit and a seal kit for modulator conversion or repair.

TABLE 16

II. d) 39MPV-2 PILOT VALVE MODULATOR BACKFLOW PREVENTER/FIELD TEST CONNECTION

39PV-2 BACKFLOW PREVENTER KIT		
MATERIAL	PART NO.	
Buna N (Nitrile 70)	PAP79B018	
E.P.R. (Ethylene Propylene 70)	PAP79E019	
Viton® (Fluoro-Carbon 75)	PAP79V022	
Teflon®	PAP79T006	
E.P.R. (Ethylene Propylene 90)	PAP79E002	
EACH KIT CONSISTS OF:		
DESCRIPTION	QTY.	PART NO.
Fitting	1	**6000609
Fitting	1	**6000608
Reducing Bushing	1	4941504

TABLE 17

AND ONE OF THE FOLLOWING SHUTTLE VALVE ASSEMBLIES:	
SEAL MATERIAL	PART NO.
Buna N (Nitrile 70)	5040101
Viton® (Fluoro-Carbon 75)	5040102
E.P.R. (Ethylene Propylene 70)	5040103
Teflon®	5040105
E.P.R. (Ethylene Propylene 90)	5040106

TABLE 18

39MV-2 BACKFLOW PREVENTER KIT	
Material Class "CC" per configuration	
MATERIAL	PART NO.
Buna N (Nitrile 70)	PAP79B018
Viton® (Fluoro-Carbon 75)	PAP79V022
E.P.R. (Ethylene Propylene 70)	PAP79E019
Teflon®	PAP79T006
E.P.R. (Ethylene Propylene 90)	PAP79E002
EACH KIT CONSISTS OF:	
DESCRIPTION	QTY.
*Fitting	1
*Fitting	1
Reducing Bushing	1
PART NO.	**6000622
**6000608	4941504

TABLE 19

AND ONE OF THE FOLLOWING SHUTTLE VALVE ASSEMBLIES:	
SEAL MATERIAL	PART NO.
Buna N (Nitrile 70)	5040101
Viton® (Fluoro-Carbon 75)	5040102
E.P.R. (Ethylene Propylene 70)	5040103
Teflon®	5040105
E.P.R. (Ethylene Propylene 90)	5040106

Note: Field Test Connector Consist of one of the Select Shuttle Valve Assemblies Shown Above.

- * Fittings are Swagelok – other brands available.
- ** SP561-Q replaced by 6000609
- SP561-R replaced by 6000608
- SP468-G replaced by 6000622

TABLE 20

39MV-2 PILOT VALVE MODULATOR

SEAL KITS FOR REPAIR OR CONVERSION OF BACKFLOW PREVENTER OR FIELD TEST CONNECTION

BACKFLOW PREVENTER SEAL KITS	
MATERIAL	PART NO.
Buna N (Nitrile 70)	PSGK-37B018
Viton® (Fluoro-Carbon 75)	PSGK-37V022
E.P.R. (Ethylene Propylene 70)	PSGK-37E019
Teflon®	PSGK-37T006
E.P.R. (Ethylene Propylene 90)	PSGK-37E002

TABLE 21

MANUAL BLOWDOWN

MANUAL BLOWDOWN VALVE ASSEMBLY	
Material Class "CC" per configuration	
PART NO.	
PAP72	

TABLE 22

Note: PAP72 is listed above, PAP75 shown in the 39MV bill of materials is identical to PAP72. PAP75 and PAP72 are interchangeable.

MANUAL BLOWDOWN VALVE ASSEMBLY CONSIST OF:		
DESCRIPTION	QTY.	PART NO.
Needle Valve	1	SP348-E
*Fitting	1	**62000622

*Fitting is Swagelok – other brands available.

** SP468-AE replaced by 6000622

TABLE 23

III. PILOT VALVE OPTIONS

Material Class “CC” per configuration

LINE FILTER

LINE FILTER ASSEMBLY	
SEAL MATERIAL	PART NO.
TEFLON®	SP540-J
LINE FILTER KIT (FOR REPAIR OF LINE FILTER ASSEMBLY)	
SEAL MATERIAL	PART NO.
TEFLON®	SP540-J Kit

Line filter kit consists of filter element and two Teflon® o-rings only

TABLE 24

HIGH CAPACITY FILTER

HIGH CAPACITY FILTER/CC	
SEAL MATERIAL	PART NO.
TEFLON®	9465-1851
HIGH CAPACITY FILTER/S4	
SEAL MATERIAL	PART NO.
TEFLON®	9465-18191

HIGH CAPACITY FILTER REPLACEMENT PARTS		
DESCRIPTION	PART NO.	NO. REQUIRED PER VALVE
FILTER ELEMENT	6027301	1
O-RINGS	31006131	2

TABLE 25

SPRING COVER

SPRING COVER	
MATERIAL	PART NO.
PEEK	4982901
BONNET METAL COVER KIT	9999742
BONNET	5039701
CLOTH SOCK TO GO OVER YOKE	9999740

TABLE 26

PILOT VALVE HARDWARE

MOUNTING BRACKET SCREWS		
DESCRIPTION	PART NO.	NO. REQUIRED PER VALVE
SS SCREW	2310166	2

TABLE 27

TUBING

TUBING	
DESCRIPTION	PART NO.
Low Pressure Tubing	S31607310004
High Pressure Tubing	S31607310124

Tubing is sold in 4 foot sections.

2916 requires high pressure tubing.

TABLE 28

SECTION XXVIII.

Manufacturer's Field Service, Repair and Training Program

A. Field Service

Utilities and Process Industries expect and demand service on a moment's notice. CONSOLIDATED® Field Service can be depended upon for prompt response, even in extreme off-hour emergency situations.

Dresser, Inc. maintains the largest and most competent field service staff in the Industry. Service Engineers are located at strategic points throughout the United State to respond to customer's requirements for service. Each Service Engineer is factory trained and long experienced in servicing Safety Valves. Dresser Service Engineers restore disc and nozzle critical dimensions which affect valve performance and are capable of modernizing valves in the field.

It is highly recommended that the professional talents of a Dresser, Inc. Field Service Engineer be employed to make final field adjustments during the initial setting of all CONSOLIDATED® POSRV's.

All Field Service Engineer's activities are coordinated from the Alexandria, Louisiana, Field Service Office. Upon receipt of a purchase order number authorizing the trip, the service engineer is dispatched.

Contact: Field Service Dept.,
Field Service Supervisor, (318) 640-6055

B. Factory Repair Facilities

The factory at Alexandria, Louisiana maintains a CONSOLIDATED® Repair Center. The Repair Department, in conjunction with the manufacturing facilities, is equipped to perform specialized repairs and product modifications, e.g. butt-weld, bushing replacements, code welding, pilot replacement, etc.

Contact: Repair Dept., Mgr. Valve Repair,
(318) 640-6057

Safety Relief Valve Maintenance Training

Rising costs of maintenance and repair in the Utility and Process Industries indicate the need for trained maintenance personnel. Dresser Flow Control conducts service seminars that can help your maintenance and engineering personnel to reduce these costs.

Seminars, conducted either at your site, or at our Alexandria, Louisiana manufacturing plant, provide participants with an introduction to the basics of preventive maintenance necessary to minimize downtime, reduce unplanned repairs and increase valve safety. While these seminars do not make "instant" experts, they do provide the participants with "Hands On" experience with CONSOLIDATED® Valves. The seminar also includes valve terminology, trouble shooting, setting and testing, with emphasis on the ASME Boiler and Pressure Vessel Code.

For further information, **Please contact the Product Training Manager by fax at (318) 640-6041, or telephone (318) 640-6054.**

SECTION XXIX.

Glossary

General

PRESSURE RELIEF DEVICE –

a device designed to prevent internal fluid pressure from rising above a predetermined maximum pressure in a pressure vessel exposed to emergency or abnormal conditions.

PILOT OPERATED PRESSURE RELIEF VALVE–

a pressure relief valve in which the major relieving device is combined with, and is controlled by, a self-actuated auxiliary pressure relief valve.

DISC–

the pressure containing movable element of a pressure relief valve which effects closure.

NOZZLE–

a pressure containing element which constitutes the inlet flow passage and includes the fixed portion of the seat closure.

SEAT–

the pressure containing contact between the fixed and moving portions of the pressure containing elements of a valve.

BORE AREA–

the minimum cross-sectional flow area of a nozzle.

LIFT–

the actual travel of the disc away from the closed position when a valve is relieving.

Operational Characteristics

SET PRESSURE–

the gauge pressure at the valve inlet for which the PRV has been adjusted to open under service conditions. In liquid service, set pressure is determined by the inlet pressure at which the valve starts to discharge a continuous stream of liquid. In gas or vapor service, the set pressure is determined by the inlet pressure at which the valve pops.

OPERATING PRESSURE–

the gauge pressure to which the vessel is normally subjected in service. A suitable margin is provided between operating pressure and maximum allowable working pressure. For assured safe operation, the operating pressure should be at least 10% under the maximum allowable working pressure or 5 psi (.34 bar), whichever is greater.

OPERATING AND SET PRESSURE DIFFERENTIAL–

valves in process service will generally give best results if the operating pressure does not exceed 90% of the set pressure.

On pump and compressor discharge lines, however, the differential required between the operating and set pressures may be greater because of pressure pulsations coming from a reciprocating piston. It is recommended that the valve be set as high above the operating pressure as possible.

MAXIMUM ALLOWABLE WORKING PRESSURE–

Maximum allowable working pressure is the maximum gauge pressure permissible in a vessel at a designated temperature. A vessel may not be operated above this pressure, or its equivalent, at any metal temperature other than that used in its design. Consequently, for that metal temperature, it is the highest pressure at which the primary pressure safety relief valve is set to open.

ACCUMULATION–

pressure increase over the maximum allowable working pressure of the vessel during discharge through the pressure relief valve, expressed as a percentage of that pressure, or pounds per square inch.

OVERPRESSURE–

Overpressure is a pressure increase over the set pressure of the primary relieving device. Overpressure is similar to accumulation when the relieving device is set at the maximum allowable working pressure of the vessel. Normally, overpressure is expressed as a percentage of set pressure.

RATED CAPACITY–

Rated capacity is the percentage of measured flow at an authorized percent overpressure permitted by the applicable code. Rated capacity is generally expressed in pounds per hour (lb/hr) for vapors; standard cubic feet per minute (SCFM) or m³/min for gases; and in gallons per minute (GPM) for liquids.

BLOWDOWN–

Blowdown is the difference between set pressure and reseating pressure of a pressure relief valve, expressed as a percentage of the set pressure, or actual pressure units.

BACK PRESSURE–

pressure on the discharge side of a pressure relief valve, distinguished as follows:

1. Superimposed Back Pressure which occurs prior to valve opening:
 - a. Constant–consistent back pressure on the outlet (e.g. 20 psig).
 - b. Variable–fluctuating back pressure (e.g. 0 to 35 psig).
2. Built-up back pressure which occurs as (or after) the valve opens (e.g. builds to 25 psig).

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