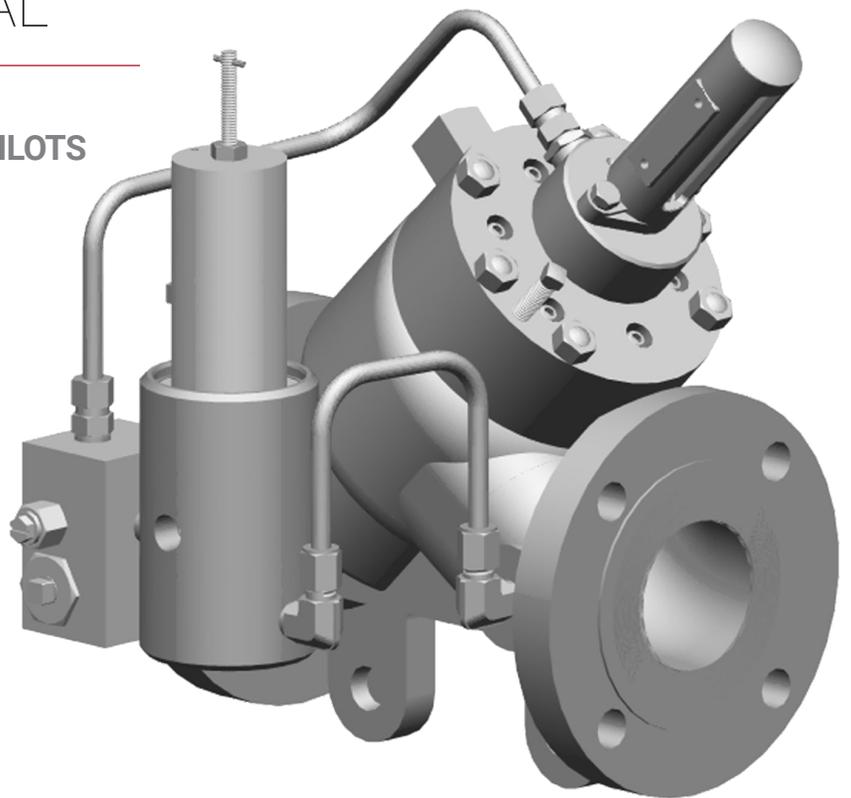


DANIEL[®]
**DOWNSTREAM PRESSURE
REDUCING VALVE**
USER MANUAL

MODEL 750
MODELS 1750 AND 2750 PILOTS



DANIEL[®]

OCTOBER 2022

Signal words and symbols

Pay special attention to the following signal words, safety alert symbols and statements:



Safety alert symbol

This is a safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER!

Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING!

Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION!

Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Notice is used to address safety messages or practices not related to personal injury.

Important

Important is a statement the user needs to know and consider.

Tip

Tip provides information or suggestions for improved efficiency or best results.

Note

Note is “general by-the-way” content not essential to the main flow of information.

Important safety instructions

Daniel Measurement and Control, Inc. (Daniel) designs, manufactures and tests products to function within specific conditions. Because these products are sophisticated technical instruments, it is important that the owner and operation personnel must strictly adhere both to the information printed on the product and to all instructions provided in this manual prior to installation, operation, and maintenance.

Daniel also urges you to integrate this manual into your training and safety program.

BE SURE ALL PERSONNEL READ AND FOLLOW THE INSTRUCTIONS IN THIS MANUAL AND ALL NOTICES AND PRODUCT WARNINGS.

WARNING!

Failure to follow the installation, operation or maintenance instructions for a Daniel product could lead to serious injury or death from explosion or exposure to dangerous substances.

To reduce the risk:

- **Comply with all information on the product, in this manual, and in any local and national codes that apply to this product.**
- **Do not allow untrained personnel to work with this product.**
- **Use Daniel parts and work procedures specified in this manual.**

Product owners (Purchasers):

- Use the correct product for the environment and pressures present. See technical data or product specifications for limitations. If you are unsure, discuss your needs with your Daniel representative.
- Inform and train all personnel in the proper installation, operation, and maintenance of this product.
- To ensure safe and proper performance, only informed and trained personnel should install, operate, repair and maintain this product.
- Verify that this is the correct instruction manual for your Daniel product. If this is not the correct documentation, contact Daniel at 1-346-509-3700 . You may also download the correct manual from: <http://www.Daniel.com>.
- Save this instruction manual for future reference.
- If you resell or transfer this product, it is your responsibility to forward this instruction manual along with the product to the new owner or transferee.
- ALWAYS READ AND FOLLOW THE INSTALLATION, OPERATIONS, MAINTENANCE AND TROUBLESHOOTING MANUAL(S) AND ALL PRODUCT WARNINGS AND INSTRUCTIONS.
- Do not use this equipment for any purpose other than its intended service. This may result in property damage and/or serious personal injury or death.

Product operation (Personnel):

- To prevent personal injury, personnel must follow all instructions of this manual prior to and during operation of the product.
- Follow all warnings, cautions, and notices marked on, and supplied with, this product.
- Verify that this is the correct instruction manual for your Daniel product. If this is not the correct documentation, contact Daniel at 1-713-827-6314. You may also download the correct manual from: <http://www.daniel.com>.
- Read and understand all instructions and operating procedures for this product.
- If you do not understand an instruction, or do not feel comfortable following the instructions, contact your Daniel representative for clarification or assistance.
- Install this product as specified in the INSTALLATION section of this manual per applicable local and national codes.
- Follow all instructions during the installation, operation, and maintenance of this product.
- Connect the product to the appropriate pressure and electrical sources when and where applicable.
- Ensure that all connections to pressure and electrical sources are secure prior to and during equipment operation.
- Use only replacement parts specified by Daniel. Unauthorized parts and procedures can affect this product's performance, safety, and invalidate the warranty. "Look-a-like" substitutions may result in deadly fire, explosion, release of toxic substances or improper operation.
- Save this instruction manual for future reference.

Notice

THE CONTENTS OF THIS PUBLICATION ARE PRESENTED FOR INFORMATIONAL PURPOSES ONLY, AND WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE THEIR ACCURACY, THEY ARE NOT TO BE CONSTRUED AS WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED, REGARDING THE PRODUCTS OR SERVICES DESCRIBED HEREIN OR THEIR USE OR APPLICABILITY. ALL SALES ARE GOVERNED BY DANIEL'S TERMS AND CONDITIONS, WHICH ARE AVAILABLE UPON REQUEST. WE RESERVE THE RIGHT TO MODIFY OR IMPROVE THE DESIGNS OR SPECIFICATIONS OF SUCH PRODUCTS AT ANY TIME.

DANIEL DOES NOT ASSUME RESPONSIBILITY FOR THE SELECTION, USE OR MAINTENANCE OF ANY PRODUCT. RESPONSIBILITY FOR PROPER SELECTION, USE AND MAINTENANCE OF ANY DANIEL PRODUCT REMAINS SOLELY WITH THE PURCHASER AND END-USER.

TO THE BEST OF DANIEL'S KNOWLEDGE THE INFORMATION HEREIN IS COMPLETE AND ACCURATE. DANIEL MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THIS MANUAL AND, IN NO EVENT, SHALL DANIEL BE LIABLE FOR ANY INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PRODUCTION, LOSS OF PROFITS, LOSS OF REVENUE OR USE AND COSTS INCURRED INCLUDING WITHOUT LIMITATION FOR CAPITAL, FUEL AND POWER, AND CLAIMS OF THIRD PARTIES.

PRODUCT NAMES USED HEREIN ARE FOR MANUFACTURER OR SUPPLIER IDENTIFICATION ONLY AND MAY BE TRADEMARKS/ REGISTERED TRADEMARKS OF THESE COMPANIES.

Warranty and Limitations

1. LIMITED WARRANTY: Subject to the limitations contained in Section 2 herein, Daniel Measurement & Control, Inc. ("Daniel") warrants that the licensed firmware embodied in the Goods will execute the programming instructions provided by Daniel, and that the Goods manufactured by Daniel will be free from defects in materials or workmanship under normal use and care and Services will be performed by trained personnel using proper equipment and instrumentation for the particular Service provided. The foregoing warranties will apply until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Daniel, whichever period expires first. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services. Products purchased by Daniel from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Daniel has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If Buyer discovers any warranty defects and notifies Daniel thereof in writing during the applicable warranty period, Daniel shall, at its option, correct any errors that are found by Daniel in the firmware or Services or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Daniel to be defective, or refund the purchase price of the defective portion of the Goods/Services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, use of unauthorized replacement parts, storage or handling, or any other cause not the fault of Daniel are not covered by this limited warranty, and shall be at Buyer's expense. Daniel shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by Daniel. All costs of dismantling, reinstallation and freight and the time and expenses of Daniel's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Daniel. Goods repaired and parts replaced by Daniel during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Daniel and can be amended only in a writing signed by Daniel. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES. Buyer acknowledges and agrees that corrosion or erosion of materials is not covered by this warranty.

2. LIMITATION OF REMEDY AND LIABILITY: Daniel shall not be liable for damages caused by delay in performance. The remedies of Buyer set forth in this agreement are exclusive. In no event, regardless of the form of the claim or cause of action (whether based in contract, infringement, negligence, strict liability, other tort or otherwise), shall Daniel's liability to Buyer and/or its customers exceed the price to Buyer of the specific goods manufactured or services provided by Daniel giving rise to the claim or cause of action. Buyer agrees that in no event shall Daniel's liability to Buyer and/or its customers extend to include incidental, consequential or punitive damages. The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, revenue or use and costs incurred including without limitation for capital, fuel and power, and claims of Buyer's customers.

Contents

Part I Plan

Chapter 1	Introduction	3
1.1	Purpose of this manual	3
1.2	Description of the Model 750 control valve	3
1.2.1	Control valve general features	3
1.2.2	Control valve applications	3
1.2.3	Operation overview of the control valve	4
1.2.4	Parts lists for the downstream pressure reducing valve	8
1.3	Agency certifications for the Model 750 Control Valves	25
Chapter 2	Operating conditions and specifications	27
2.1	Operating conditions for the Model 750	27
2.1.1	Design considerations	28
2.1.2	Environmental conditions	29
2.2	Specifications for the control valve	30
2.2.1	Interface requirements	30
2.2.2	Requirements and limitations for installation	31
2.3	Pilot spring selection	34
2.3.1	Pilot spring selection table	34
2.3.2	Table usage	37

Part II Install

Chapter 3	Installation prerequisites	41
3.1	Model 750 pre-start checks	41
3.2	Model 750 installation procedure	42

Part III Operate

Chapter 4	Operation start up	47
4.1	Model 750 adjustment and startup	47

Part IV Maintain

Chapter 5	Planned maintenance	51
5.1	Maintenance considerations	51
5.2	Pilot disassembly (1750)	52
5.3	Pilot disassembly (2750)	53
5.4	Pilot assembly	54
Chapter 6	Spare parts	55
6.1	Recommended spare parts	55
6.2	Order spare parts	55

Appendices and reference

Appendix A	Combination needle valve and strainer	57
A.1	Disassembly and assembly	57
A.2	Needle valve and strainer combination	58
A.3	Order spare parts	60
Appendix B	Testing Daniel Model 1750 or 2750 Pressure reducing pilot set point in the field	61
B.1	Testing models 1750 or 2750	61

Part I

Plan

Chapters covered in this part:

- *Introduction*
- *Operating conditions and specifications*

1 Introduction

Topics covered in this chapter:

- *Purpose of this manual*
- *Description of the Model 750 control valve*
- *Agency certifications for the Model 750 Control Valves*

1.1 Purpose of this manual

Daniel Measurement and Control Inc. designed this manual to guide owners and personnel in the installation, operation and maintenance of the *Daniel™ Downstream Pressure Reducing Valve 750 and Models 1750 and 2750 Pilots Manual, 3-9008-561*. It is imperative that product owners and operation personnel read and follow the information contained in this manual to ensure that the control valve is installed correctly and is operating according to the design certifications and safety considerations.

NOTICE

Use this manual along with the Series 700B Control Valves manual.

1.2 Description of the Model 750 control valve

1.2.1 Control valve general features

The Model 750 Daniel™ Downstream Pressure Reducing Valve is designed to regulate downstream pressure within ± 13.79 kPa (2 psi) or closer, regardless of fluctuations in flow rate or upstream pressure. The pilots are balanced, single seated valves with large ports and are not affected by variations in upstream pressure.

1.2.2 Control valve applications

- Downstream pressure regulation
- Petroleum distribution systems
- Pipelines (surge control)
- Makeup control
- Meter over-pressurization protection

1.2.3 Operation overview of the control valve

The Model 750 Daniel™ Downstream Pressure Reducing Valve operates on a balanced-piston principle. When pressures on both sides of the piston are equalized, a spring located on top of the piston acts as a differential force and closes the piston. When the pressure against the bottom of the piston exceeds the pressure plus the force of the spring exerted against the top of the piston, spring tension is overcome, and the valve opens.

It is from this principle of operation that all variations of control with the use of pilot valves and accessories are made. Pressure reducing pilots control pressure applied to the spring side of the main valve piston, acting as a variable orifice, which in turn allows the main valve to regulate downstream pressure.

A pressure reducing valve is normally open and throttles toward a closed position for increasing outlet pressure. It is a regulating or positioning type valve that does not require any outside power source to operate.

The pilot control is normally open. It is an adjustable spring loaded variable orifice in the Z-port. The pilot is piston operated, spring biased (loaded) with a pressure sensing chamber connected on the downstream (P2) side.

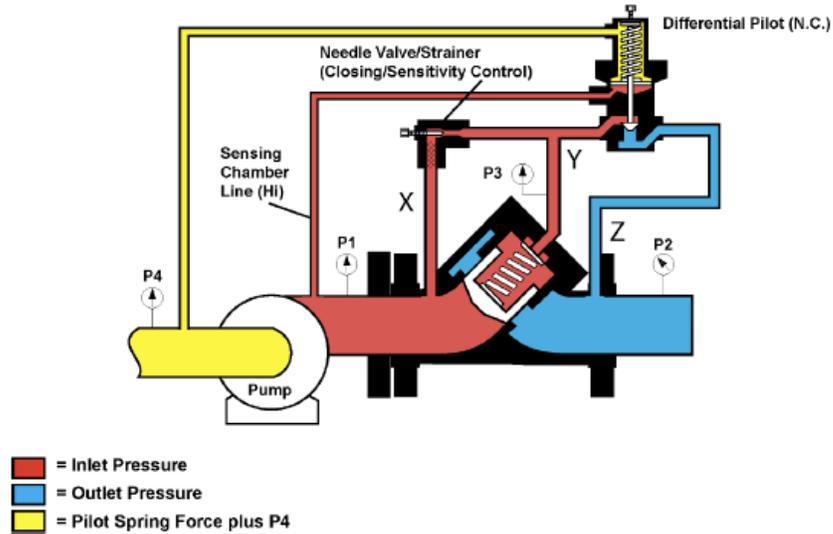
Pressure reducing valves are used for:

- Precise pressure control in process streams
- Over-pressure protection of meters, pipe line manifold systems, etc.

Closed position

Figure 1-1 illustrates the closed valve. Outlet pressure (P2) exceeded the pilot spring setting, indicating the main line downstream (P2) is closed. Y-port (P3) to Z-port (P2) is closed. X-port (P1) and Y-port (P3) pressures become balanced. The main valve spring, being the differential force, closes the piston and keeps it seated.

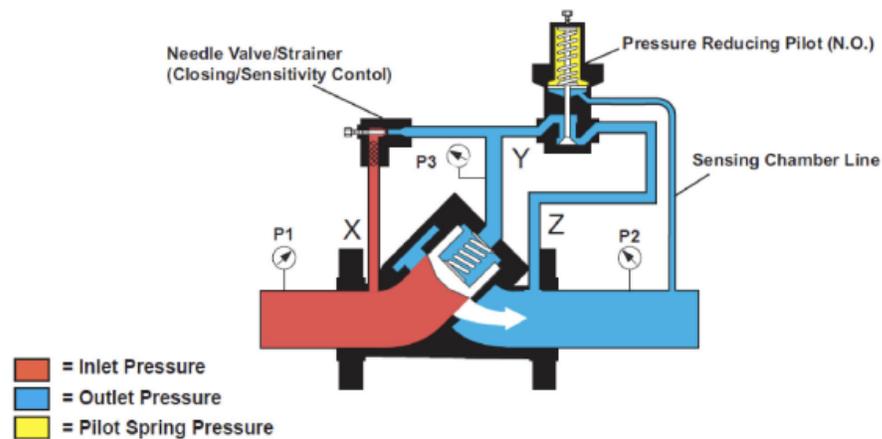
Figure 1-1: Closed position



Open controlled position

In *Figure 1-2* the valve is partially open. Outlet pressure has slightly exceeded the pilot spring setting. Z-port (P2) is being squeezed off by the throttling of the pilot, placing higher pressure on Y-port (P3). The increasing pressure at Y-port (P3) plus the main valve spring force positions the valve piston so that it balances outlet pressure equal to the pilot setting (plus or minus 2 psi).

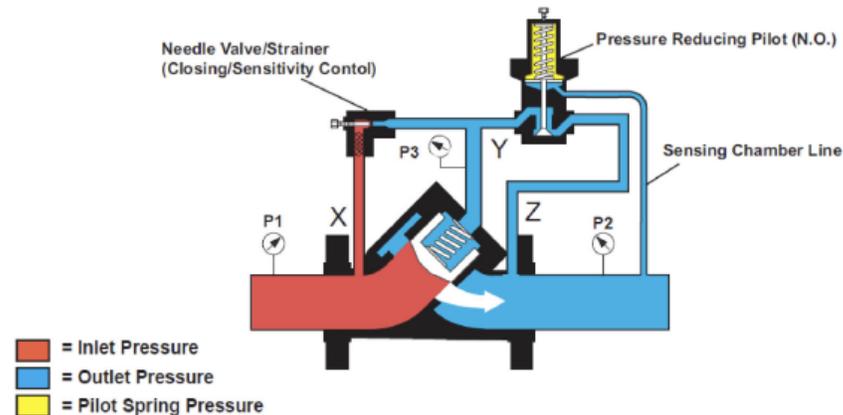
Figure 1-2: Open controlled position



Fully open - no control

Figure 1-3 illustrates the fully open valve. Outlet pressure (P2) is less than the pilot setting. Y-port (P3) is open to Z-port (P2). The valve is floating in the stream and is not required to control.

Figure 1-3: Fully open - no control position



The Model 750 valves are controlled by a pressure reducing pilot that senses line pressure downstream of the valve and throttles the valve to sustain a desired maximum pressure at that point. If line pressure at the sense point begins to exceed the setting of the pilot, the pilot throttles the valve closed to maintain the required maximum pressure.

Conversely, if line pressure at the sense point attempts to fall below the setting of the pilot, the pilot throttles the valve open to maintain the desired pressure. The pilot will completely seat the valve and stop all flow if liquid movement is blocked downstream of the valve and downstream pressure attempts to rise above the set point.

In the static condition, the pilot is open, and the valve conducts flow as soon as the pump is activated. Therefore, the initial pressure developed at the valve inlet is bypassed through the pilot to the downstream side of the valve, thus creating a pressure differential between the top and bottom of the valve piston, keeping the valve open.

Once a continuous flow is established, however, downstream pressure is monitored and compared by the pilot with its set point. The pilot then modulates the valve accordingly. If downstream pressure attempts to exceed the set point, the pilot bypasses less pressure and applies more force to the top of the valve piston. This action throttles the valve closed, subsequently limiting flow through the valve and lowering downstream pressure. The valve will limit flow in this manner to maintain a maximum downstream pressure which is equal to the set point of the pilot. If downstream pressure is less than the set point of the pilot, the pilot then vents additional pressure downstream, and throttles open to conduct increased flow and pressure.

Figure 1-4 illustrates the most common use of the pressure reducing control valve. The Model 750 externally sensed to any point downstream, provides a sensitive control for regulation of pressure within 13.8 kPa (± 2 psi). The Model 761 downstream pressure relief valve, protects the system if excessive pressure or surge occurs.

Figure 1-4: Model 750 downstream pressure reducing valve and Model 761 as relief valve

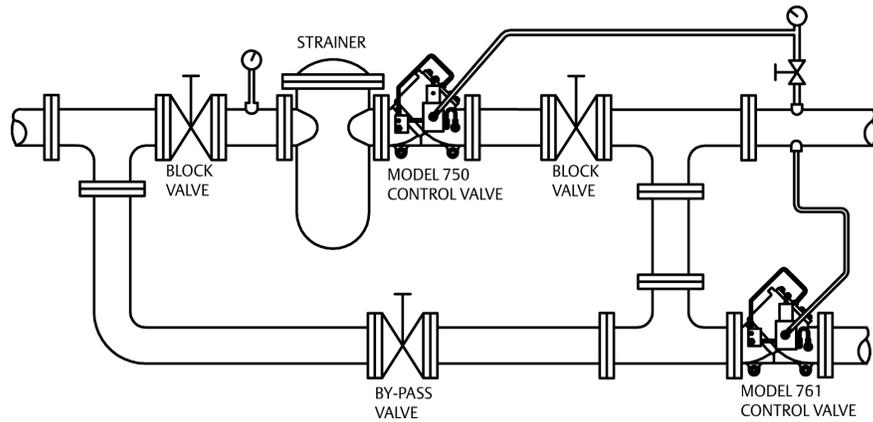


Figure 1-5: In this application the Model 750 pressure reducing valve lowers main pipeline pressure to a level that is within the acceptable rating of the metering equipment. The Daniel pressure reducing valve will control a maximum reduced pressure drop of 6895 kPa (1000 psi).

Figure 1-5: Model 750 pressure reducing valve

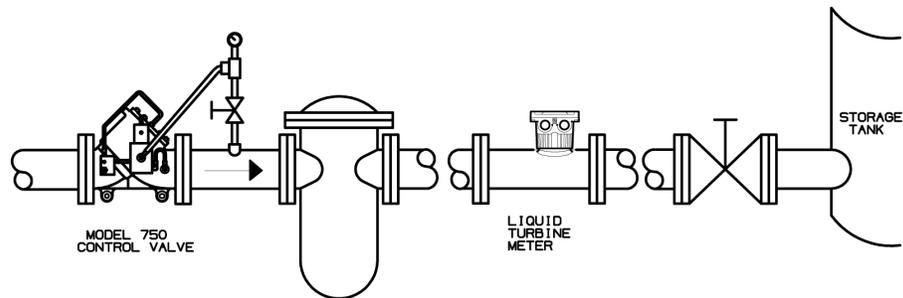
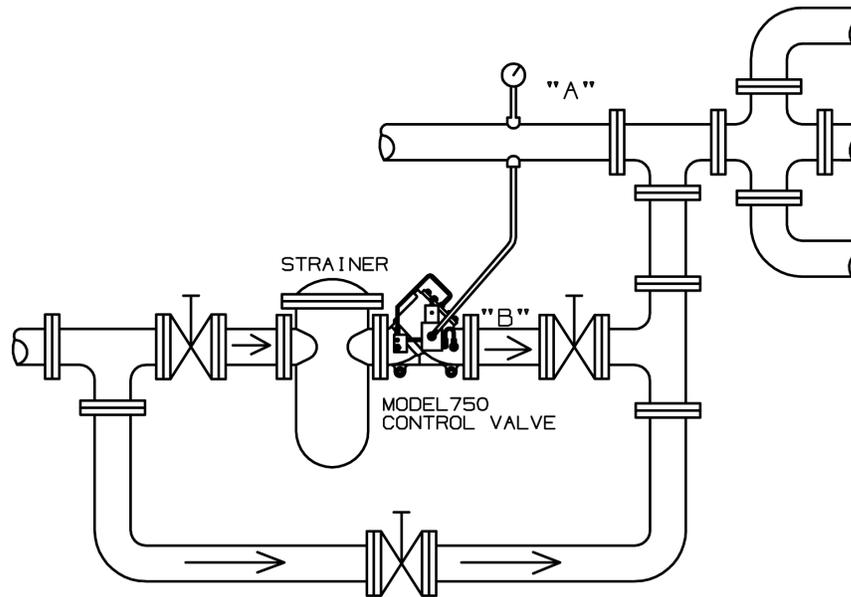


Figure 1-6: Pipeline "A" normally provides all product for distribution unless the pressure drops below a required minimum. At this time the Model 750 installed in an auxiliary line "B" and sensed to the main line "A", opens to maintain pressure and flow until normal main line pressure is restored.

Figure 1-6: Model 750 pipeline "A" and auxilliary line "B"



1.2.4 Parts lists for the downstream pressure reducing valve

This section includes the necessary parts required to make up any standard unit covered in this manual.

For spring/piston combinations go to *Section 2.3.1*

Table 1-1: Pilot selection guide 1

1750 Pilot Assembly	Spring range (Spring)
453600-X1E	0-20 psi (460223)
453600-X2E	0-40 psi (460022)
453600-X3E	30-80 psi (460023)
453600-X4E	70-180 psi (460024)
456600-X3E	150-350 psi (460023)
456600-X4E	150-350 psi (460024)

Table 1-2: Pilot selection guide 2

2750 Pilot Assembly	Spring range (Spring)
475000-X1E	5-100 psi (460223)
475000-X2E	50-250 psi (460022)

Table 1-2: Pilot selection guide 2 (continued)

2750 Pilot Assembly	Spring range (Spring)
475000-X3E	200-400 psi (460023)
475000-X4E	350-650 psi (460024)
465000-X4E	600-950 psi (460024)
465000-X5E	900-1500 psi (460024)

Pilot body material

X = (5) Steel

X = (6) Stainless steel

Elastomers

E = (0) NBR

E = (7) EPR

E = (5) FFKM

E = (4) NBR (Low swell)

E = (3) CR

E = (2) FKM

E = (G) FKM GFLT

E = (M) FKM V1289

E = (9) Viton for LPG Service

Important

Item numbers reference actual engineering drawings and are not meant to be consecutively numbered.

Figure 1-7: Part Identification for Model 1750 (453600) 0-180 psi range

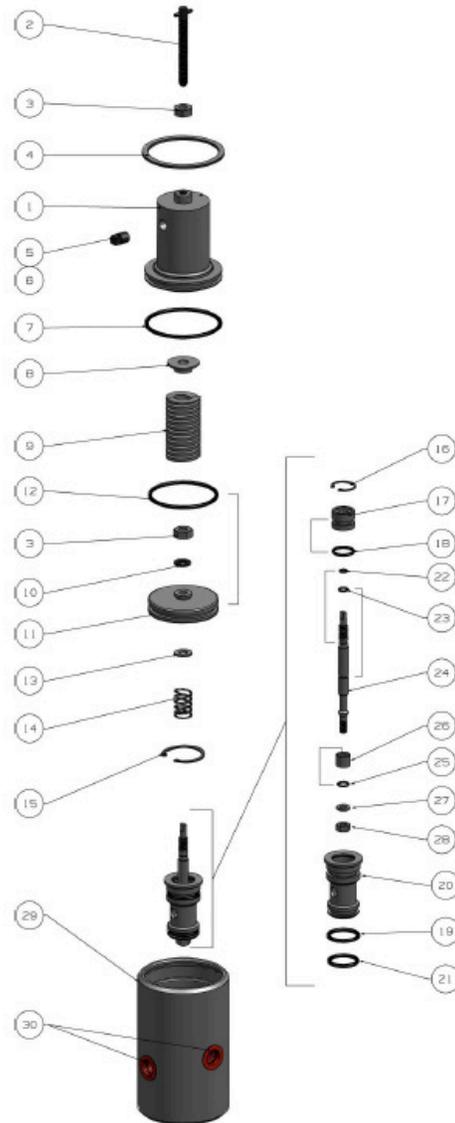


Table 1-3: Part description for Model 1750 (453600) 0-180 psi range

Item Number	Part Number	Description	Quantity
1	460006-600	Cover	1
2	150687-024	Screw Set, Square Head	1

Table 1-3: Part description for Model 1750 (453600) 0-180 psi range (continued)

Item Number	Part Number	Description	Quantity
3	151543-019	Nut, Hex	2
4	156465	Retaining Ring, Internal	1
5	460019	Felt Filler	1
6	460014-500M	Vent Plug	1
7	157011	O-ring, NBR	1
	157011-005	O-ring, EPR	1
	157011-075	O-ring, FFKM	1
	157011-120	O-ring, NBR (Low-swell)	1
	157011-116	O-ring, CR	1
	157011-022	O-ring, FKM	1
	157011-027	O-ring, FKM GFLT	1
	157011-029	O-ring, FKM V1289	1
8	460017	Spring Guide	1
9	460021	Spring, 0-20 lbs.	1
	460022	Spring, 0-40 lbs.	1
	460023	Spring, 30-80 lbs.	1
	460024	Spring, 70-180 lbs.	1
10	152267	Lockwasher	1
11	460016	Piston	1
12	152073	O-ring, NBR	1
	157023-005	O-ring, EPR	1
	157023-075	O-ring, FFKM	1
	157023-120	O-ring, NBR (Low-swell)	1
	157023-116	O-ring, CR	1
	157023-022	O-ring, FKM	1
	157023-027	O-ring, FKM GFLT	1
	157023-029	O-ring, FKM V1289	1
13	460013	Thrust Washer	1
14	460021	Spring	1
15	156466	Retainer Ring	1
16	156467	Retainer Ring	1
17	460008	Guide Bushing	1
18	152090	O-ring, NBR	1

Table 1-3: Part description for Model 1750 (453600) 0-180 psi range (continued)

Item Number	Part Number	Description	Quantity
	152090-005	O-ring, EPR	1
	152090-075	O-ring, FFKM	1
	152090-120	O-ring, NBR (Low-swell)	1
	152090-116	O-ring, CR	1
	152090-022	O-ring, FKM	1
	152090-027	O-ring, FKM GFLT	1
	152090-029	O-ring, FKM V1289	1
19	157010	O-ring, NBR	1
	157010-005	O-ring, EPR	1
	157010-075	O-ring, FFKM	1
	157010-120	O-ring, NBR (Low-swell)	1
	157010-116	O-ring, CR	1
	157010-022	O-ring, FKM	1
	157010-027	O-ring, FKM GFLT	1
	157010-029	O-ring, FKM V1289	1
20	460007	Pilot Valve Cage	1
21	157009	O-ring, NBR	1
	157009-005	O-ring, EPR	1
	157009-075	O-ring, FFKM	1
	157009-120	O-ring, NBR (Low-swell)	1
	157009-116	O-ring, CR	1
	157009-022	O-ring, FKM	1
	157009-027	O-ring, FKM GFLT	1
	157009-029	O-ring, FKM V1289	1
22	152064	O-ring, NBR	1
	152064-005	O-ring, EPR	1
	152064-075	O-ring, FFKM	1
	152064-120	O-ring, NBR (Low-swell)	1
	152064-116	O-ring, CR	1
	152064-022	O-ring, FKM	1
	152064-027	O-ring, FKM GFLT	1
	152064-029	O-ring, FKM V1289	1
23	152066	O-ring, NBR	2

Table 1-3: Part description for Model 1750 (453600) 0-180 psi range (continued)

Item Number	Part Number	Description	Quantity
	152066-005	O-ring, EPR	2
	152066-075	O-ring, FFKM	2
	152066-120	O-ring, NBR (Low-swell)	2
	152066-116	O-ring, CR	2
	152066-022	O-ring, FKM	2
	152066-027	O-ring, FKM GFLT	2
	152066-029	O-ring, FKM V1289	2
24	460011	Poppet Shaft	1
25	152067	O-ring, NBR	1
	152067-005	O-ring, EPR	1
	152067-075	O-ring, FFKM	1
	152067-120	O-ring, NBR (Low-swell)	1
	152067-116	O-ring, CR	1
	152067-022	O-ring, FKM	1
	152067-027	O-ring, FKM GFLT	1
	152067-029	O-ring, FKM V1289	1
26	460012	Retainer Ring	1
27	152119	Lockwasher	1
28	151544-019	Nut	1
29	453301-500M	Pilot Body (CS)	1
	453301-600M	Pilot Body (SS)	1
30	154769	PLUG CAP	3

Figure 1-8: Part Identification for Model 1750 (456600) 150-650 psi range

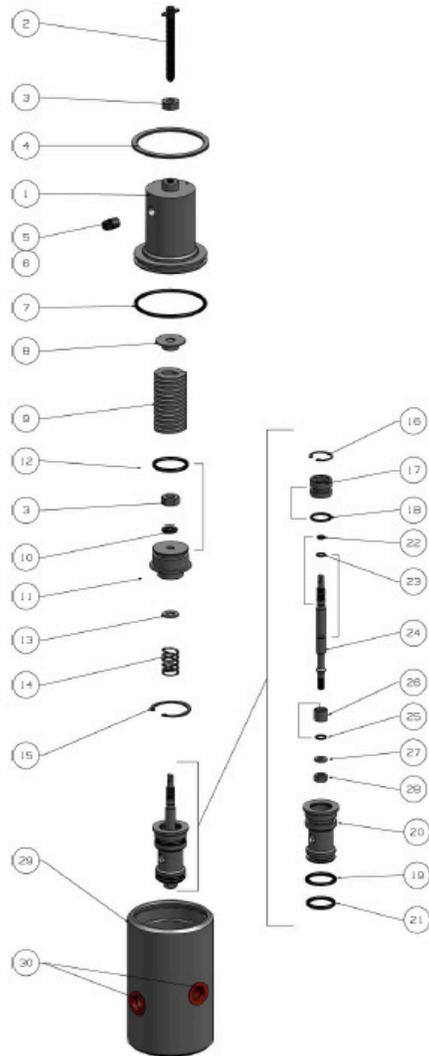


Table 1-4: Part description for Model 1750 (456600) 150-650 psi range

Item Number	Part Number	Description	Quantity
1	460006-600	Cover	1
2	150687-024	Screw Set, Square Head	1
3	151543-019	Nut, Hex	2

Table 1-4: Part description for Model 1750 (456600) 150-650 psi range (continued)

Item Number	Part Number	Description	Quantity
4	156465	Retaining Ring, Internal	1
5	460019	Felt Filler	1
6	460014-500M	Vent Plug	1
7	157011	O-ring, NBR	1
	157011-005	O-ring, EPR	1
	157011-075	O-ring, FFKM	1
	157011-120	O-ring, NBR (Low-swell)	1
	157011-116	O-ring, CR	1
	157011-022	O-ring, FKM	1
	157011-027	O-ring, FKM GFLT	1
	157011-029	O-ring, FKM V1289	1
8	460017	Spring Guide	1
9	460023	Spring, 150-350 lbs.	1
	460024	Spring, 350-650 lbs.	1
10	152267	Lockwasher	1
11	463016	Piston	1
12	152091	O-ring, NBR	1
	157091-005	O-ring, EPR	1
	152091-075	O-ring, FFKM	1
	152091-120	O-ring, NBR (Low-swell)	1
	152091-116	O-ring, CR	1
	152091-022	O-ring, FKM	1
	152091-027	O-ring, FKM GFLT	1
	152091-029	O-ring, FKM V1289	1
13	460013	Thrust Washer	1
14	460021	Spring	1
15	156466	Retainer Ring	1
16	156467	Retainer Ring	1
17	460008	Guide Bushing	1
18	152090	O-ring, NBR	1
	152090-005	O-ring, EPR	1
	152090-075	O-ring, FFKM	1
	152090-120	O-ring, NBR (Low-swell)	1

Table 1-4: Part description for Model 1750 (456600) 150-650 psi range (continued)

Item Number	Part Number	Description	Quantity
	152090-116	O-ring, CR	1
	152090-022	O-ring, FKM	1
	152090-027	O-ring, FKM GFLT	1
	152090-029	O-ring, FKM V1289	1
19	157010	O-ring, NBR	1
	157010-005	O-ring, EPR	1
	157010-075	O-ring, FFKM	1
	157010-120	O-ring, NBR (Low-swell)	1
	157010-116	O-ring, CR	1
	157010-022	O-ring, FKM	1
	157010-027	O-ring, FKM GFLT	1
	157010-029	O-ring, FKM V1289	1
20	460007	Pilot Valve Cage	1
21	157009	O-ring, NBR	1
	157009-005	O-ring, EPR	1
	157009-075	O-ring, FFKM	1
	157009-120	O-ring, NBR (Low-swell)	1
	157009-116	O-ring, CR	1
	157009-022	O-ring, FKM	1
	157009-027	O-ring, FKM GFLT	1
	157009-029	O-ring, FKM V1289	1
22	152064	O-ring, NBR	1
	152064-005	O-ring, EPR	1
	152064-075	O-ring, FFKM	1
	152064-120	O-ring, NBR (Low-swell)	1
	152064-116	O-ring, CR	1
	152064-022	O-ring, FKM	1
	152064-027	O-ring, FKM GFLT	1
	152064-029	O-ring, FKM V1289	1
23	152066	O-ring, NBR	2
	152066-005	O-ring, EPR	2
	152066-075	O-ring, FFKM	2
	152066-120	O-ring, NBR (Low-swell)	2

Table 1-4: Part description for Model 1750 (456600) 150-650 psi range (continued)

Item Number	Part Number	Description	Quantity
	152066-116	O-ring, CR	2
	152066-022	O-ring, FKM	2
	152066-027	O-ring, FKM GFLT	2
	152066-029	O-ring, FKM V1289	2
24	460011	Poppet Shaft	1
25	152067	O-ring, NBR	1
	152067-005	O-ring, EPR	1
	152067-075	O-ring, FFKM	1
	152067-120	O-ring, NBR (Low-swell)	1
	152067-116	O-ring, CR	1
	152067-022	O-ring, FKM	1
	152067-027	O-ring, FKM GFLT	1
	152067-029	O-ring, FKM V1289	1
26	460012	Retainer Ring	1
27	152119	Lockwasher	1
28	151544-019	Nut	1
29	453301-500M	Pilot Body (CS)	1
	453301-600M	Pilot Body (SS)	1
30	154769	PLUG CAP	3

Figure 1-9: Part Identification for Model 2750 (465000) 600-1500 psi range

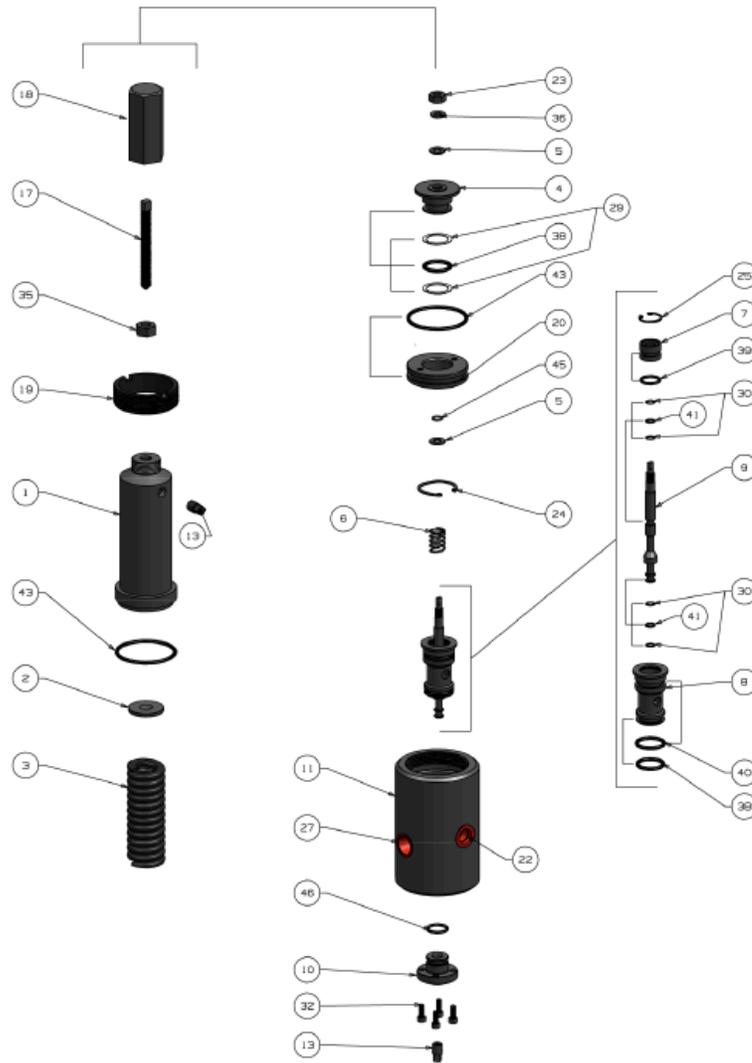


Table 1-5: Part description for Model 2750 (465000) 600-1500 psi range

Item Number	Part Number	Description	Quantity
1	466006	Pilot Valve Cover	1
2	460017	Spring Guide (Stainless Steel)	1
3	466023	Spring, 600-950 lbs.	1

Table 1-5: Part description for Model 2750 (465000) 600-1500 psi range (continued)

Item Number	Part Number	Description	Quantity
	466024	Spring, 900-1500 lbs.	1
4	466016	Piston ST STL	1
5	460013	Trust Washer ST S	2
6	460021	Damper Spring	1
7	460008	Guide Bushing	1
8	466007	Pilot Valve Cage	1
9	466011	Poppet Shaft Assembly	1
10	466004	Bushing	1
11	465001	Valve Body CS	1
	465001-600M	Valve Body SS	1
13	460015-500	Vent Plug Assembly	2
17	466008	Adjustment Screw	1
18	466003	Cap	1
19	466207	Cover Retainer	1
20	466002	Cylinder	1
22	154774	Plug Cap #9	2
23	151543-019	Nut Hex	1
24	156466	Retaining Ring, Internal	1
25	156467	Retaining Ring, Internal	1
27	154769	Plug Cap #6-X	1
29	157213	Back- Up Ring Teflon	2
30	157212	Back- Up Ring Teflon	4
32	151001-019M	Screw hex Socket H	4
35	151627	Nut Jam	1
36	152267	Washer SS Lock, SP	1
38	157009	O-ring, NBR	2
	157009-005	O-ring, EPR	
	157009-075	O-ring, FFKM	
	157009-120	O-ring, NBR (Low-swell)	
	157009-116	O-ring, CR	
	157009-022	O-ring, FKM	
	157009-027	O-ring, FKM GFLT	
	157009-029	O-ring, FKM V1289	

Table 1-5: Part description for Model 2750 (465000) 600-1500 psi range (continued)

Item Number	Part Number	Description	Quantity
39	152090	O-ring, NBR	1
	152090-005	O-ring, EPR	
	152090-075	O-ring, FFKM	
	152090-120	O-ring, NBR (Low-swell)	
	152090-116	O-ring, CR	
	152090-022	O-ring, FKM	
	152090-027	O-ring, FKM GFLT	
	152090-029	O-ring, FKM V1289	
40	157010	O-ring, NBR	1
	157010-005	O-ring, EPR	
	157010-075	O-ring, FFKM	
	157010-120	O-ring, NBR (Low-swell)	
	157010-116	O-ring, CR	
	157010-022	O-ring, FKM	
	157010-027	O-ring, FKM GFLT	
	157010-029	O-ring, FKM V1289	
41	152066	O-ring, NBR	2
	152066-005	O-ring, EPR	
	152066-075	O-ring, FFKM	
	152066-120	O-ring, NBR (Low-swell)	
	152066-116	O-ring, CR	
	152066-022	O-ring, FKM	
	152066-027	O-ring, FKM GFLT	
	152066-029	O-ring, FKM V1289	
43	157061	O-ring, NBR	2
	157061-005	O-ring, EPR	
	157061-075	O-ring, FFKM	
	157061-120	O-ring, NBR (Low-swell)	
	157061-116	O-ring, CR	
	157061-022	O-ring, FKM	
	157061-027	O-ring, FKM GFLT	
	157061-029	O-ring, FKM V1289	
45	152067	O-ring, NBR	1

Table 1-5: Part description for Model 2750 (465000) 600-1500 psi range (continued)

Item Number	Part Number	Description	Quantity
	152067-005	O-ring, EPR	
	152067-075	O-ring, FFKM	
	152067-120	O-ring, NBR (Low-swell)	
	152067-116	O-ring, CR	
	152067-022	O-ring, FKM	
	152067-027	O-ring, FKM GFLT	
	152067-029	O-ring, FKM V1289	
46	157024	O-ring, NBR	1
	157024-005	O-ring, EPR	
	157024-075	O-ring, FFKM	
	157024-120	O-ring, NBR (Low-swell)	
	157024-116	O-ring, CR	
	157024-022	O-ring, FKM	
	157024-027	O-ring, FKM GFLT	
	157024-029	O-ring, FKM V1289	

Figure 1-10: Part Identification for Model 2750 (475000) 5-650 psi range

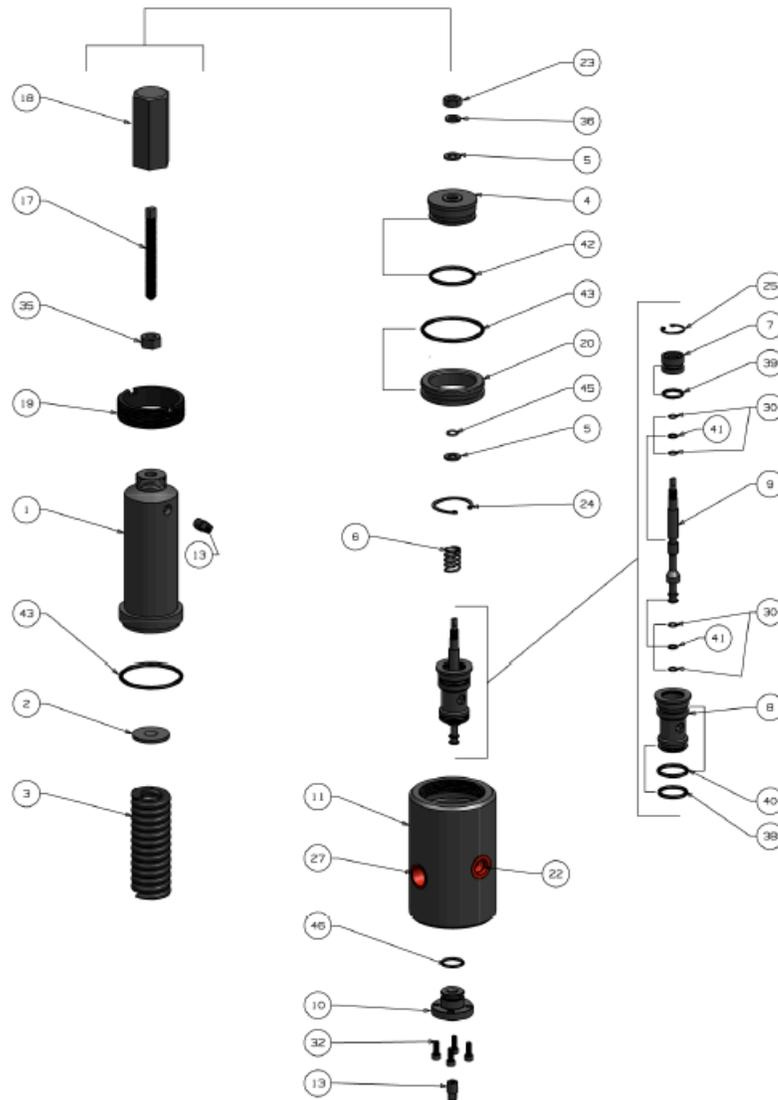


Table 1-6: Part description for Model 2750 (475000) 5-650 psi range

Item Number	Part Number	Description	Quantity
1	466006	Pilot Valve Cover	1
2	460017	Spring Guide (Stainless Steel)	1
3	466223	Spring, 5-100 lbs.	1

Table 1-6: Part description for Model 2750 (475000) 5-650 psi range (continued)

Item Number	Part Number	Description	Quantity
	466022	Spring, 50-250 lbs.	1
	466023	Spring, 200-400 lbs.	1
	466024	Spring, 350-650 lbs.	1
4	466116	Piston ST STL	1
5	460013	Trust Washer ST S	2
6	460021	Damper Spring	1
7	460008	Guide Bushing	1
8	466007	Pilot Valve Cage	1
9	466011	Poppet Shaft Assembly	1
10	466004	Bushing	1
11	465001	Valve Body CS	1
	465001-600M	Valve Body SS	1
13	460015-500	Vent Plug Assembly	2
17	466008	Adjustment Screw	1
18	466003	Cap	1
19	466207	Cover Retainer	1
20	466102	Cylinder	1
22	154774	Plug Cap #9	2
23	151543-019	Nut Hex	1
24	156466	Retaining Ring, Internal	1
25	156467	Retaining Ring, Internal	1
27	154769	Plug Cap #6-X	1
30	157212	Back- Up Ring Teflon	4
32	151001-019M	Screw hex Socket H	4
35	151627	Nut Jam	1
36	152267	Washer SS Lock, SP	1
38	157009	O-ring, NBR	1
	157009-005	O-ring, EPR	
	157009-075	O-ring, FFKM	
	157009-120	O-ring, NBR (Low-swell)	
	157009-116	O-ring, CR	
	157009-022	O-ring, FKM	
	157009-027	O-ring, FKM GFLT	

Table 1-6: Part description for Model 2750 (475000) 5-650 psi range (continued)

Item Number	Part Number	Description	Quantity
	157009-029	O-ring, FKM V1289	
39	152090	O-ring, NBR	1
	152090-005	O-ring, EPR	
	152090-075	O-ring, FFKM	
	152090-120	O-ring, NBR (Low-swell)	
	152090-116	O-ring, CR	
	152090-022	O-ring, FKM	
	152090-027	O-ring, FKM GFLT	
	152090-029	O-ring, FKM V1289	
40	157010	O-ring, NBR	1
	157010-005	O-ring, EPR	
	157010-075	O-ring, FFKM	
	157010-120	O-ring, NBR (Low-swell)	
	157010-116	O-ring, CR	
	157010-022	O-ring, FKM	
	157010-027	O-ring, FKM GFLT	
	157010-029	O-ring, FKM V1289	
41	152066	O-ring, NBR	2
	152066-005	O-ring, EPR	
	152066-075	O-ring, FFKM	
	152066-120	O-ring, NBR (Low-swell)	
	152066-116	O-ring, CR	
	152066-022	O-ring, FKM	
	152066-027	O-ring, FKM GFLT	
	152066-029	O-ring, FKM V1289	
42	152092	O-ring, NBR	1
	152092-005	O-ring, EPR	
	152092-075	O-ring, FFKM	
	152092-120	O-ring, NBR (Low-swell)	
	152092-116	O-ring, CR	
	152092-022	O-ring, FKM	
	152092-027	O-ring, FKM GFLT	
	152092-029	O-ring, FKM V1289	

Table 1-6: Part description for Model 2750 (475000) 5-650 psi range (continued)

Item Number	Part Number	Description	Quantity
43	157061	O-ring, NBR	2
	157061-005	O-ring, EPR	
	157061-075	O-ring, FFKM	
	157061-120	O-ring, NBR (Low-swell)	
	157061-116	O-ring, CR	
	157061-022	O-ring, FKM	
	157061-027	O-ring, FKM GFLT	
	157061-029	O-ring, FKM V1289	
45	152067	O-ring, NBR	1
	152067-005	O-ring, EPR	
	152067-075	O-ring, FFKM	
	152067-120	O-ring, NBR (Low-swell)	
	152067-116	O-ring, CR	
	152067-022	O-ring, FKM	
	152067-027	O-ring, FKM GFLT	
	152067-029	O-ring, FKM V1289	
46	157024	O-ring, NBR	1
	157024-005	O-ring, EPR	
	157024-075	O-ring, FFKM	
	157024-120	O-ring, NBR (Low-swell)	
	157024-116	O-ring, CR	
	157024-022	O-ring, FKM	
	157024-027	O-ring, FKM GFLT	
	157024-029	O-ring, FKM V1289	

1.3 Agency certifications for the Model 750 Control Valves

The following product agency certifications are applicable to the Daniel Control Valves.

Table 1-7: Agency certifications for control valves

Certification type		Description
Pressure equipment		PED
Process temperature	Standard temperature	-29 °C to 66 °C (-20 °F to 150 °F)
	Optional temperature	-46 °C to 204 °C (-50 °F to 400 °F)

2 Operating conditions and specifications

Topics covered in this chapter:

- *Operating conditions for the Model 750*
- *Specifications for the control valve*
- *Pilot spring selection*

2.1 Operating conditions for the Model 750

Table 2-1: Operating conditions for the Model 750 control valve

Condition type	Description
Fluid phase	Liquid
Process temperature	-29 °C to 66 °C (-20 °F to 150 °F)
Optional process temperature	-46 °C to 204 °C (-50 °F to 400 °F)
Fluid velocity	Operational recommended flow velocity up to 30 ft/sec. Beyond this point a high pressure drop and increased wear will result.
Fluid(s) controlled	<ul style="list-style-type: none"> • Low/Medium viscosity crude oils and condensates • Refined products and intermediates (e.g.: <i>gasoline, diesel, kerosene, light fuel oils, jet fuel, LPG, butanes, naphtha, alkylate, reformate, straight run gasoline, cat-cracked gasoline</i>) • Petrochemicals (e.g.: <i>benzene, toluene, xylenes, cumene, olefins, pyrolysis gasoline</i>) • Natural gas liquids
Differential pressure	The maximum allowable differential pressure of a control valve is 6894 kPa (1,000 psi). Consult factory for location of first shut-down valve.
Atmospheric pressure	Absolute
Sizes (NPS)	2, 3, 4, 6, 8, 10, 12, 16
Pressure class (ANSI)	150, 300, 600
Maximum safe working temperature range	<ul style="list-style-type: none"> • -26 °C to 204 °C (-15 °F to 400 °F) • Using FKM O-rings • Temperature range is dependent on O-ring T_{min} and T_{max} • Consult the factory for other safe working temperatures

Table 2-1: Operating conditions for the Model 750 control valve (continued)

Condition type	Description			
Maximum safe working pressure	Flange connections/Ratings (DIN) for valve sizes DN50 and DN400: <ul style="list-style-type: none"> • DIN PN16 MWP at 120 °C: 16 bar • DIN PN25 MWP at 120 °C: 25 bar • DIN PN40 MWP at 120 °C: 40 bar • DIN PN64 (class 300) MWP at 120 °C: 51 bar • DIN PN64 (class 600) MWP at 120 °C: 64 bar • DIN PN100 MWP at 120 °C: 100 bar Flange connections/Ratings (ANSI) for valve sizes 2"-16": <ul style="list-style-type: none"> • Class 150 MWP at 100 °F: 285 psi • Class 300 MWP at 100 °F: 740 psi • Class 600 MWP at 100 °F: 1480 psi * MWP: Maximum Working Pressure			
Materials of construction	O-Rings: <ul style="list-style-type: none"> • Standard: FKM • Optional: Neoprene™, EPR, FKM V1289, Nitrile, FFKM, FKM GLT • For other material contact the factory External hook up: <ul style="list-style-type: none"> • Class 150 and 300: <ul style="list-style-type: none"> - NPS 2-6: Carbon steel/Stainless steel 10 mm (0.372") - NPS 8-16 Carbon steel/Stainless steel 13 mm (0.5") • Class 600: <ul style="list-style-type: none"> - NPS 2-6: Stainless steel 13 mm (0.5") - Can be furnished in metric sizes Other internal parts: Stainless steel			
Pilot spring ranges	Class 150-300		Class 600	
	(kPa)	(PSI)	(kPa)	(PSI)
	0-138	0-20	345-690	5-100
	0-276	0-40	345-1724	50-250
	207-552	30-80	1379-2758	200-400
	485-1241	70-180	2413-4482	350-650
	1034-2413	150-350	4137-6550	600-950
	2413-4482	350-650	6205-10342	900-1500
	Spring selection based on control pressure set point. Refer to <i>Section 2.3</i> Pilot spring selection for details.			

2.1.1 Design considerations

Some conditions to consider:

- Service operating pressure

- Service testing pressures
- Service process temperature and ambient site temperatures
- Chemical composition and toxicity of fluid in operating conditions
- Traffic, wind and earthquake at loading site
- Adverse force or stress caused by inadequate supports, attachments, piping, etc.
- Corrosion, erosion, fatigue, etc.
- Decomposition of unstable fluids in operating and test conditions
- Possible damage from external fire
- Mass fluid in process and test conditions

⚠ WARNING!

FUNCTIONAL AND ENVIRONMENTAL HAZARD

Evaluate the functional and environmental conditions prior to installing a control valve. Install the control valve in a well-designed piping system.

Failure to comply may result in death or serious injury from pipe failure.

2.1.2 Environmental conditions

⚠ WARNING!

EQUIPMENT HAZARD

Never use this equipment for any purpose other than its intended use.

Failure to comply may result in death, serious personal injury and/or property damage.

Table 2-2: Environmental conditions

Parameter type	Description
Severe service conditions	Ensure that piping or other attachments connected to the valve are not under stress. The design of the control valve has not been assessed for the effects of wind, earthquake loading and severe weather conditions.
Additional severe service conditions	The valves are designed to be used on liquid applications for crude oil and refined products. The use of aggressive additives or oxygenates requires the use of the Aggressive Products (AP) option. The AP option valve cylinder incorporates cup-seals (PTFE Bal Seals) and an O-ring made from appropriate materials for severe conditions. Materials for pilots such as Low Swell NBR (main valve static O-rings) and FFKM or PTFE are available.

Table 2-2: Environmental conditions (continued)

Parameter type	Description
Corrosive service	Select the material compatible with the specific processes and atmospheric environments. Implement a periodic inspection and maintenance program to ensure that pressure retaining components are free from corrosion and erosion. The valve is not designed with corrosion allowance. Inspect the valve's metal parts periodically for corrosion and erosion, and inspect the seals and O-rings for wear and chemical deterioration.
Low and freezing temperatures	Specific gravities and viscosities at low or freezing temperature will reduce the flow range of the valve. Refer to <i>Section 1.2.3</i> for more information.
Populated areas	For new installations, locate the control valve to an area that has fewer than 10 buildings intended for human occupancy within an area that extends 200 meters (220 yards) radially from the control valve. (Reference: Class 1 Location: U.S. DOT, CFR Title 49: Part 192.5)
Closed, poorly ventilated areas	Install the control valve in a well ventilated area, not less than one meter (approximately three feet) from source of ignition or source of heat which might damage the unit.
Elevation	No limit
Humidity	No limit
Proximity to open flame	Provide fire prevention measures and equipment per local regulations.
Proximity to vehicular traffic	The design of the control valve has not been assessed for the effects of traffic.

2.2 Specifications for the control valve

2.2.1 Interface requirements

⚠ WARNING!

EXCEEDING REQUIREMENTS HAZARD

Control valve requirements are defined to ensure safe equipment operation. Do not exceed published specifications.

Failure to comply may result in death, serious injury and/or damage to the equipment.

Table 2-3: Interface requirements

Requirements	Description
Hydraulic lines	External hook up: <ul style="list-style-type: none"> • ANSI class 150 and 300: <ul style="list-style-type: none"> - NPS 2-6: Carbon steel/Stainless steel 10 mm (0.375") - NPS 8-16 Carbon steel/Stainless steel 13 mm (0.5") - Can be furnished in metric sizes • ANSI class 600: <ul style="list-style-type: none"> - NPS 2-16: Stainless steel 13 mm (0.5") - Can be furnished in metric sizes
Flange type	The mechanical connections for Model 750 control valves are standard class 150, 300 and 600 ANSI R.F. flanges which are available only in stainless steel. Daniel also offers other types of flange connections which are available per customer request. For other ANSI ratings or flanges consult the factory engineers. For maximum working pressures at intermediate temperatures refer to ANSI B16.5.
<p>⚠ WARNING!</p> <p>FLANGE SIZE HAZARD Customers must choose the appropriate size material of the flange for their piping requirements. Choosing an incorrect flange may cause a pressure leak, resulting in death or serious injury.</p>	

2.2.2 Requirements and limitations for installation

NOTICE

Comply with local government regulations and company requirements.

See *Figure 2-1* for flow direction.

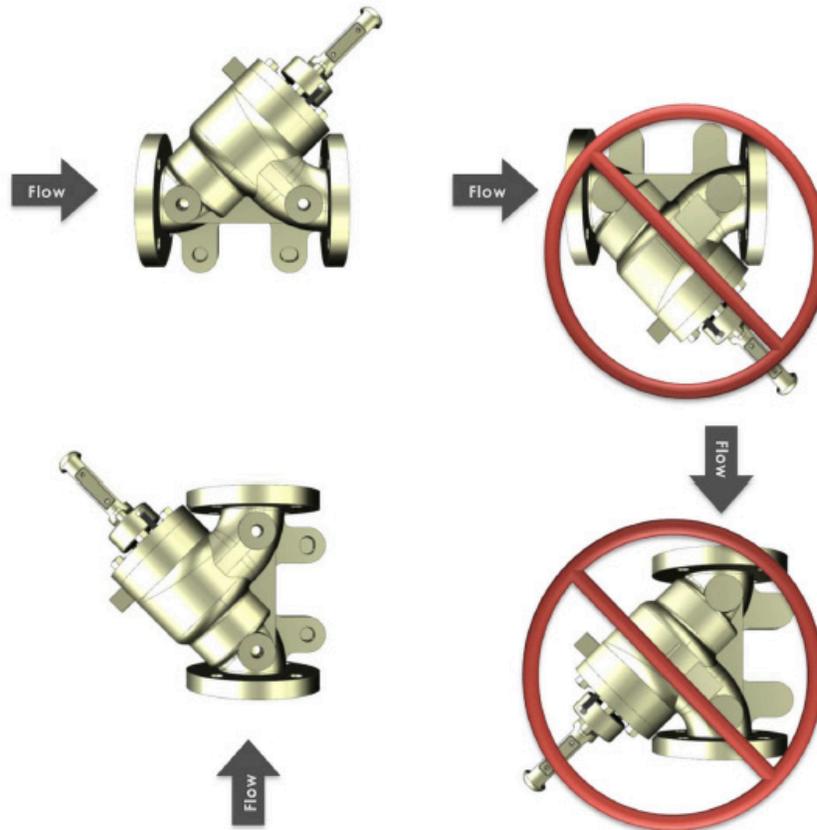
NOTICE

Flush lines to remove welding bead, pipe scale, etc.

NOTICE

Install the valve in a horizontal line with the cylinder head at the top.

Figure 2-1: Valve orientation



⚠ WARNING!

EQUIPMENT HAZARD

Never use this equipment for any purpose other than its intended use.

Failure to comply may result in death, serious personal injury and/or property damage.

Minimum clearances for installation, operation and maintenance

For certified prints, consult the factory.

Figure 2-2: Flange connection/Ratings (DIN)

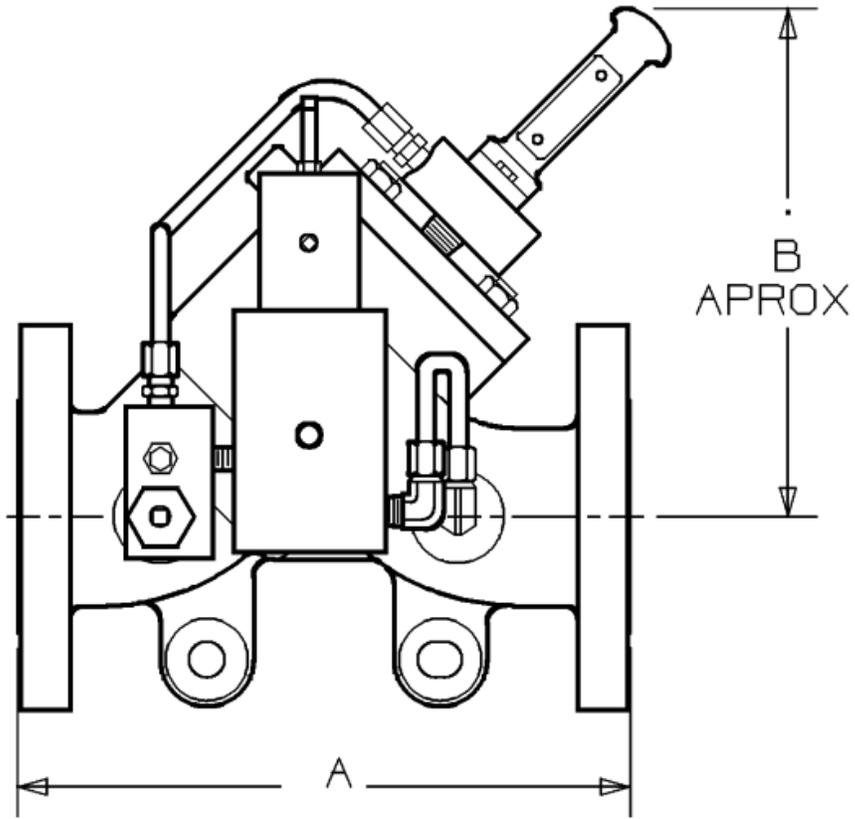


Table 2-4: Flange connections (DIN)

Valve size	A						B			
	Class 150		Class 300		Class 600		Class 150-300		Class 600	
	inches	cm	inches	cm	inches	cm	inches	cm	inches	cm
2	10 1/4	26	10 1/2	27	11 1/2	29	10 7/8	28	10 7/8	28
3	11	28	13 1/8	33	14	36	10 7/8	28	11 1/4	29
4	13	33	14 1/2	37	17	43	10 7/8	28	11 1/2	29
6	17	43	17 7/8	45	22	56	13 5/8	35	13 5/8	35
8	22 1/4	57	23 1/4	59	26	66	17 1/4	44	17 3/4	45
10	26 1/2	67	27 7/8	71	31	79	17 5/8	45	20 5/8	52
12	30 1/2	77	33 5/8	85	36 1/2	93	22 7/8	58	22 7/8	57
16	41 3/8	105	43 1/3	110	46	117	30	76	30	76

Table 2-5: Approximate shipping weights and cube

Valve size	Approximate shipping weight						Approximate shipping cube			
	Model 750						Model 750			
	Class 150		Class 300		Class 600		Class 150-300		Class 600	
	lbs.	kilos	lbs.	kilos	lbs.	kilos	cubic feet	cubic meters	cubic feet	cubic meters
2	55	21	60	22	100	37	1.66	0.047	1.79	0.051
3	95	35	105	39	150	56	2.36	0.067	2.50	0.071
4	115	43	140	52	205	77	2.51	0.071	3.13	0.089
6	210	78	250	93	400	149	4.84	0.137	6.07	0.172
8	400	149	465	174	725	271	8.94	0.253	9.98	0.283
10	640	239	700	261	1170	437	12.08	0.342	15.13	0.428
12	1040	388	1215	454	1820	679	20.25	0.573	21.94	0.621
16	CF	CF	CF	CF	CF	CF	39.53	1.119	42.17	1.194

CF=consult factory

2.3 Pilot spring selection

2.3.1 Pilot spring selection table

The following Pilot spring selections table is a complete listing of regulating pilot valve figure numbers, part numbers, pilot springs, spring part numbers, and piston diameters.

The application of pilot springs is significant and often misunderstood. The pressure range of a specific pilot spring relates directly to the area of the pilot piston exposed to fluid sensing ($FORCE = PRESSURE \times AREA$). In other words, the control range of a spring will vary with the outside diameter of the pilot's piston. In effect, a light spring combined with various piston diameters increases pilot sensitivity, whereas a heavier spring used without changing the piston size decreases sensitivity and accuracy of set point. The use of various sizes assures the most compact and flexible pilot available and is a key to the accurate set point control found in Daniel valves.

The table outlines the standard and optional springs, spring ranges and piston diameters for all integral and external piston operated pilots for Series 700 control valves.

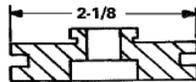
Figure 2-3: Conversion factors

$$psi \times 0.07030695 = kg / cm^2$$

$$psi \times 6.894757 = kPa$$

Figure 2-4: Pilot spring selections

Model No.	Description	Pilot Assy Part No.
1750	Pressure Reducing	435600
1754	Pressure Differential	453700
1760	Back Pressure	453200
1761	Pressure Relief	456200
1770	Pressure Differential	453500

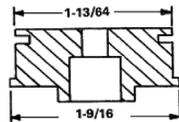


Available Spring Ranges (Psi)	Part number	Color Code
0-20	460223	Unpainted
0-40	460022	Blue
30-80	460023	Black or Red
70-180	460024	Bronze

Large piston

Class	Max Range
150-300	180 psi

Model No.	Description	Pilot Assy Part No.
1750	Pressure Reducing	456600
1754	Pressure Differential	456700
1760	Back Pressure	456100
1770	Pressure Differential	456500

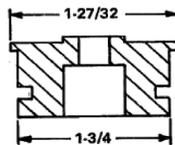


Available Spring Ranges (Psi)	Part number	Color Code
150-350	460023	Black or Red
350-650	460024	Bronze

Small piston

Class	Max Range
150-300	650 psi

Model No.	Description	Pilot Assy Part No.
2750	Pressure Reducing	475000
2754	Pressure Differential	475600
2760	Back Pressure	475100
2770	Pressure Differential	475500

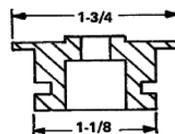


Available Spring Ranges (Psi)	Part number	Color Code
5-100	466223	Unpainted
50-250	466022	Blue
200-400	466023	Black or Red
350-650	466024	Bronze

Large piston

Class	Max Range
600	650 psi

Model No.	Description	Pilot Assy Part No.
2750	Pressure Reducing	465000
2754	Pressure Differential	465600
2760	Back Pressure	465100
2770	Pressure Differential	465500



Available Spring Ranges (Psi)	Part number	Color Code
600-950	466023	Black or Red
900-1,500	466024	Bronze

Small piston

Class	Max Range
600	1,500 psi

2.3.2 Table usage

Example: A customer has an ANSI 300 lb. Model 750 Pressure Reducing Valve with a 207-552 kPa (30-80 psi) pilot spring set for 483 kPa (70 psi) control. Due to change in the system, he desires to control a 300 psi 2068 kPa (300 psi) downstream pressure. For a spring range of 1034-2413 kPa (150-350 psi) the table lists a 460023 spring. But the existing spring range of 207-552 kPa (30-80 psi) also requires a 460023 spring.

Conclusion: Changing the spring will not solve this customer's problem. The pilot piston must be changed.

Proper use of the pilot spring selection table should eliminate any difficulty associated with changing a pilot spring. If any two facts are known about a pilot, other tabulated data can be determined. For example:

- Knowledge of piston diameter and spring color indicates the spring range of the pilot.
- Knowledge of the model number and piston diameter indicates the pilot part number.
- Knowledge of the pilot part number and spring color indicates the spring range.

Part II

Install

3 Installation prerequisites

Topics covered in this chapter:

- *Model 750 pre-start checks*
- *Model 750 installation procedure*

3.1 Model 750 pre-start checks

⚠ CAUTION!

EQUIPMENT HAZARD

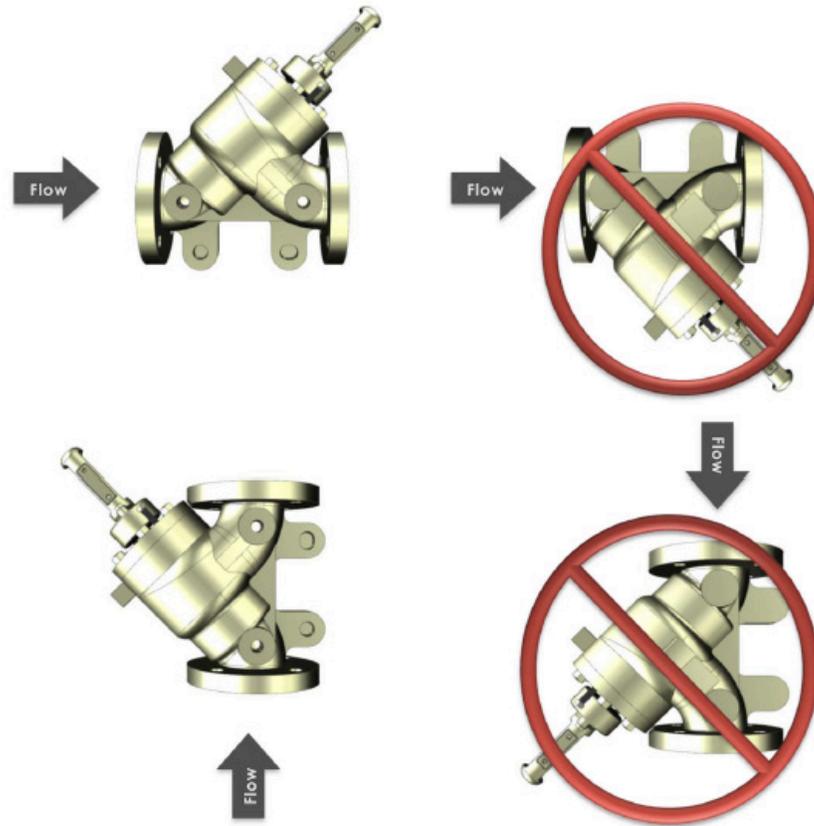
Observe all precautionary signs posted on the equipment.

Failure to do so may result in injury to personnel or cause damage to the equipment.

Important

The Daniel valve may be installed with a flow direction horizontal or vertical up but should never be installed with flow direction vertical down. When installed in a horizontal line, the valve should be installed so that the cylinder head is at the top of the valve and not the bottom.

Figure 3-1: Valve orientation



3.2 Model 750 installation procedure

Prerequisites

The following instructions are intended as a guide for installing the Model 750 and should be carefully complied with if the valve is to operate as designed.

⚠ WARNING!

EQUIPMENT HAZARD

Never use this equipment for any purpose other than its intended use.

Failure to comply may result in death, serious personal injury and/or property damage.

Procedure

1. If possible, install the control valve within 7.6 M (25 feet) of the point at which downstream line pressure is to be controlled. This distance limitation is due to the sense line which must be run to the pilot (unless it is configured for internal sensing). Consult the factory if sense lines of greater length are required.

Important

It is recommended that the control valve be installed between isolating valves. This will permit the system to remain operational while maintenance is being performed on the valve.

2. Ensure that the line is completely free of all foreign material before the valve is bolted into the line.
 - a. If it is impractical to flush the line before installing the valve, bolt in spool piece or the valve body. Remove the cylinder assembly by following the disassembly instructions on the basic valve and seal the opening with a temporary cover.
 - b. Disconnect or isolate the sense line if it is connected to the pilot. This will eliminate the possibility of foreign material flowing into the sensing chamber of the pilot. (Flushing the line will not be necessary if the product line and liquid are positively known to be clean.)
3. One 3/8" (1750) or 1/2" (2750) sense line is required between the pilot and the downstream sensing point unless the pilot is configured for internal sensing. This size line is a minimum requirement, based on a maximum product viscosity of 500 SSU. Use a larger size sense line if the viscosity of the product is in excess of 500 SSU. The sense line is mated with the lower connection of the pilot.
4. Including a pressure gauge in the valve circuit is recommended. This gauge monitors the downstream pressure when installed at the location indicated on the valve schematic. It is very important that the gauge be installed downstream in order to monitor and properly adjust the valve. The gauge is not furnished by Daniel.
5. Verify that the 1750 or 2750 pilots set point is correct as ordered. A paper tag is attached to the pilot with the factory set point. The set point can be changed in the field to any set point within the pilot spring range.

Part III

Operate

4 Operation start up

4.1 Model 750 adjustment and startup

Prerequisites

Adjust the valve as outlined below. All isolation valves (A1, A2 and A3) must be closed before adjustment can begin. See *Figure 4-1* and *Figure 4-2*.

Procedure

1. Bleed all air from the system. Start the pump (if a static head of 5-10 psi is not present), and open isolation valve A1. For external sensed pilots loosen the sense line connection at the pilot and the pilot supply line on the valve cylinder to allow air release. For internal sensed pilots loosen only the pilot supply line connection on the valve cylinder. When all the air has been expelled from the system, retighten the sense line connection, close isolating valve A1, and deactivate the pump.
2. Turn the sensitivity adjustment screw (B) counterclockwise $\frac{1}{2}$ turn from closed if the adjustment is for a needle valve only, or three turns from closed if it is a needle valve and strainer combination. Turn the pilot adjustment stem (D) counterclockwise until all spring tension is relieved. The valve is now closed and will remain closed until the adjustment stem is readjusted.
3. Fully open isolating valve A1 and partially open isolating valve A3. (Valve A2 is never opened under normal operating conditions. It is included in the circuit only to bypass the control valve when it is being repaired or maintained.) Start the pump and slowly turn the adjustment stem (D) of the pilot clockwise to open the valve. The opening of the valve will be indicated on the pressure gauge (G). For optimum performance, upstream pressure must be at least 10 psi greater than downstream pressure.
4. Fully open isolating valve A3 and observe the pressure gauge (G) to determine at what pressure the valve is controlling. If the pressure is incorrect, turn the pilot adjustment screw (D) clockwise to increase pressure. It may be necessary to partially close isolating valve A3 in order to build up sufficient pressure for setting the pilot.
5. If pulsation occurs in the control valve, it may be eliminated by turning the sensitivity, adjustment (B) clockwise.

⚠ CAUTION!

EQUIPMENT DAMAGE POSSIBLE

Never completely close the sensitivity adjustment. It should remain at least $\frac{1}{4}$ turn open.

If the sensitivity adjustment is fully closed, the valve will not operate properly.

Figure 4-1: Externally sensed pilot

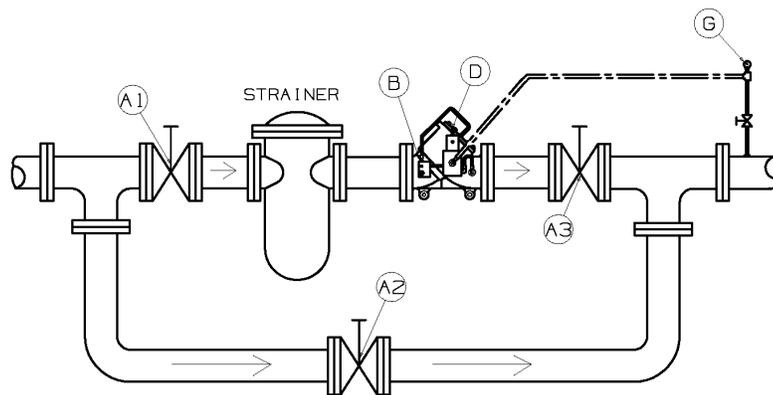
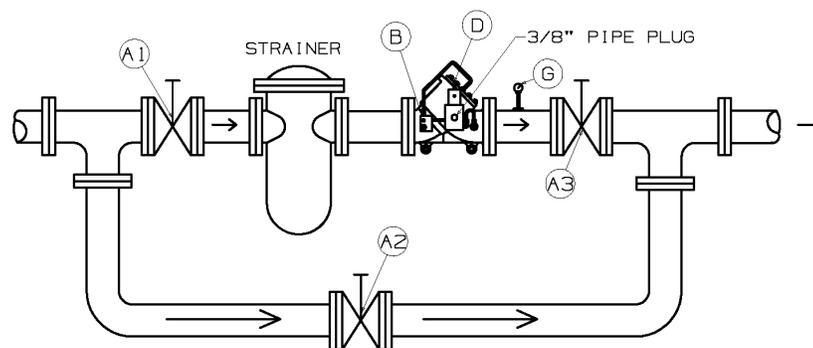


Figure 4-2: Internally sensed pilot



Part IV

Maintain

Chapters covered in this part:

- *Planned maintenance*
- *Spare parts*

5 Planned maintenance

Topics covered in this chapter:

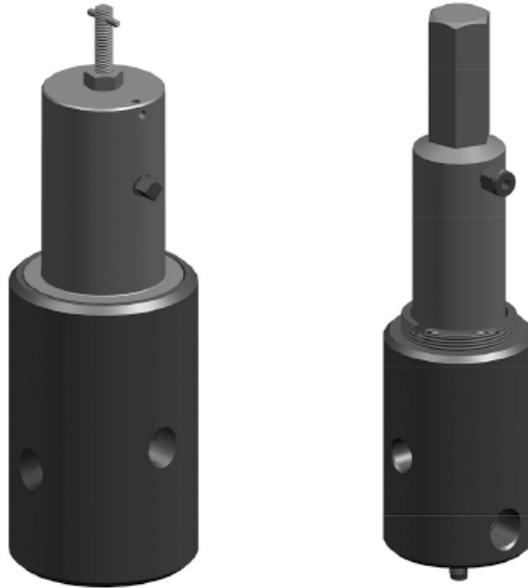
- *Maintenance considerations*
- *Pilot disassembly (1750)*
- *Pilot disassembly (2750)*
- *Pilot assembly*

5.1 Maintenance considerations

Inspect and clean all pilots and their parts at regularly scheduled intervals. All O-rings should be checked for nicks, cuts and wear. Any defective or doubtful O-rings should be replaced.

1. Remove the strainer (combination valve and strainer unit) by removing the strainer cap.
2. All parts associated with the adjustment stem are removable when the strainer is removed. The adjustment stem must be removed by turning counterclockwise.
3. Reassemble by reversing disassembly order. Be careful not to cut O-rings when assembling parts and assemblies. Be sure spring under the sensing piston is in place.
 - Retaining ring pliers
 - Ratchet wrench
 - Pin removal tool
 - Needle nose pliers

Figure 5-1: Model 1750 Back Pressure Pilot and 2750 Back Pressure Pilot



5.2 Pilot disassembly (1750)

1. Isolate and remove all pressure and drain before maintenance.
2. Remove the pilot from the valve by disconnecting the external tubing.
3. Turn pressure adjustment screw counter-clockwise until tension is relieved on the spring. Push in on the pilot cover and remove by extracting the retaining ring.
4. Disengage the poppet shaft from the sensing piston by holding the shaft and removing the nut and lock washer.
5. Remove sensing piston.
6. Remove poppet shaft and cage as a unit after removing retainer ring. Remove poppet shaft and guide bushing after removing retainer ring. Remove poppet shaft from the guide bushing.
7. Using a 3/32" punch, drive pin from poppet shaft, remove the retainer sleeve and O-ring from the shaft.

▲ CAUTION!

EQUIPMENT HAZARD

Observe all precautionary signs posted on the equipment.

Failure to comply may result in injury to personnel or cause damage to the equipment

⚠ CAUTION!**BENT SHAFT HAZARD**

Be careful to avoid bending the shaft when using the punch.

The shaft can be easily bent when using the punch incorrectly.

Failure to comply may result in injury to personnel or cause damage to equipment.

8. Remove and inspect all O-rings.

5.3 Pilot disassembly (2750)

1. Isolate and remove all pressure and drain before maintenance.
2. Remove the pilot from the valve by disconnecting the external tubing.
3. Turn pressure adjustment screw counter-clockwise until tension is relieved on the spring. Push in on the pilot cover and remove by extracting cover retainer. Unscrew counter-clockwise.
4. Disengage the poppet shaft assembly from the sensing piston by holding the shaft and removing the nut and lock washer.
5. Remove sensing piston.
6. Remove the poppet shaft and cage as a unit after removing the retainer ring. Remove the poppet shaft and remove the nut, the lock washer and the retainer sleeve. Remove the guide bushing by removing the retainer ring.
7. Remove and inspect all O-rings.

⚠ CAUTION!**EQUIPMENT HAZARD**

Observe all precautionary signs posted on the equipment.

Failure to do so may result in injury to personnel or cause damage to the equipment.

⚠ CAUTION!**BENT SHAFT HAZARD**

Be careful to avoid bending the shaft when using the punch.

The shaft can be easily bent when using the punch incorrectly.

Failure to comply may result in injury to personnel or cause damage to equipment.

5.4 Pilot assembly

1. Apply oil or grease to all O-rings to prevent cutting and to facilitate assembly.
2. Reassemble by reversing disassembly order. BE CAREFUL not to cut O-rings when assembling parts and assemblies. Be sure spring under sensing piston is in place.

Important

This pilot was designed without corrosion allowance. Periodically inspect the valve's metal parts for corrosion and erosion.

Inspect the seals and O-rings for wear and chemical deterioration.

Important

Ensure that piping or other attachments connected to the control valve are not under stress.

Important

Provide fire prevention measures and equipment per local regulations.

6 Spare parts

Topics covered in this chapter:

- *Recommended spare parts*
- *Order spare parts*

6.1 Recommended spare parts

Table 6-1: Recommended spare parts for the Control Valves

Description	Part Number	Quantity
O-ring	152064	1
Roll pin	153511	1
Retainer ring	Order 460110	1
O-ring	152067	1
O-ring	157009	1
O-ring	157010	1
O-ring	152090	1
O-ring	152066	1
Poppet shaft	Order 460110	1
O-ring	152073	1
O-ring	152091	1
Piston (0-180 psi)	460116	1
Piston (150-650 psi)	463016	1
O-ring	157011	1
O-ring FFKM	W453600-505	1
O-ring FFKM/NBR	W453600-508	1
O-ring FKM/NBR	W453600-511	1
O-ring FKM	W453600-512	1

6.2 Order spare parts

Provide the following information when ordering replacement parts:

- Valve serial number
- Part number
- Part description

- Quantity required
- Size
- Product, product viscosity, product specific gravity
- Minimum and maximum operating temperatures
- Minimum and maximum flow rates
- Minimum, normal and maximum operating pressure
- Control functions to be performed
- Flange connections
- O-ring material
- Control pilot materials
- Tubing material
- Main valve piston material

Appendix A

Combination needle valve and strainer

Topics covered in this appendix:

- *Disassembly and assembly*
- *Needle valve and strainer combination*
- *Order spare parts*

A.1 Disassembly and assembly

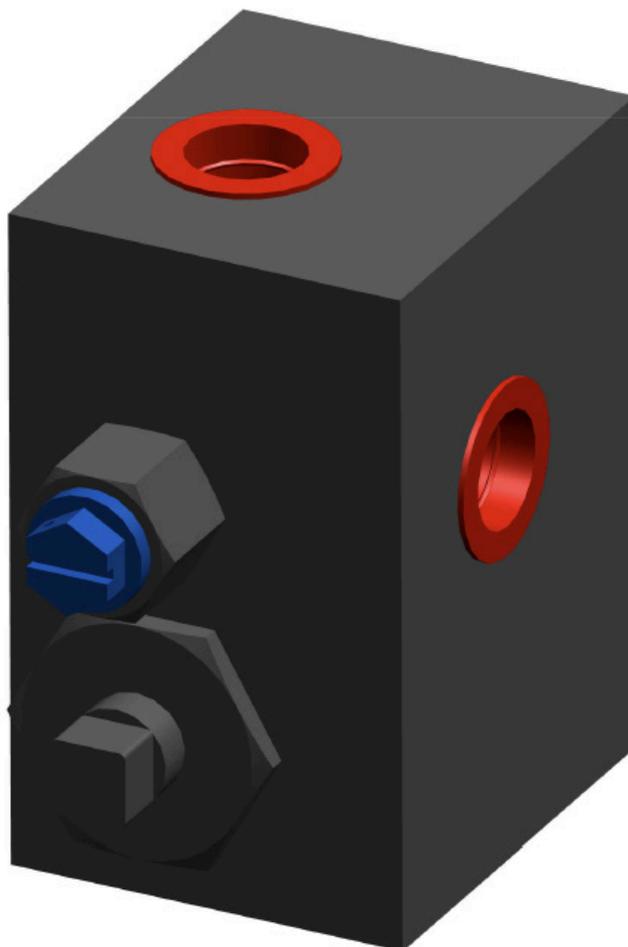
Procedure

1. Isolate and remove all pressure and drain before maintenance.
2. Remove strainer (combination valve and strainer unit) by removing the strainer cap.
3. All parts associated with the adjustment stem are removable when the retainer is removed. Remove the adjustment stem by turning it counterclockwise.
4. For pilots used on crude oil, gasoline, diesel fuel or other general liquid hydrocarbon service, apply a light oil or general purpose grease to all O-rings to prevent cutting and to facilitate assembly. Use a light oil only for Butane and Propane service.

Tools required:

- Retaining ring pliers
- Ratchet wrench
- Pin removal tool
- Needle nose pliers

Figure A-1: Combination needle valve and strainer



A.2 Needle valve and strainer combination

- Part number 460710

Figure A-2: Needle valve and strainer combination

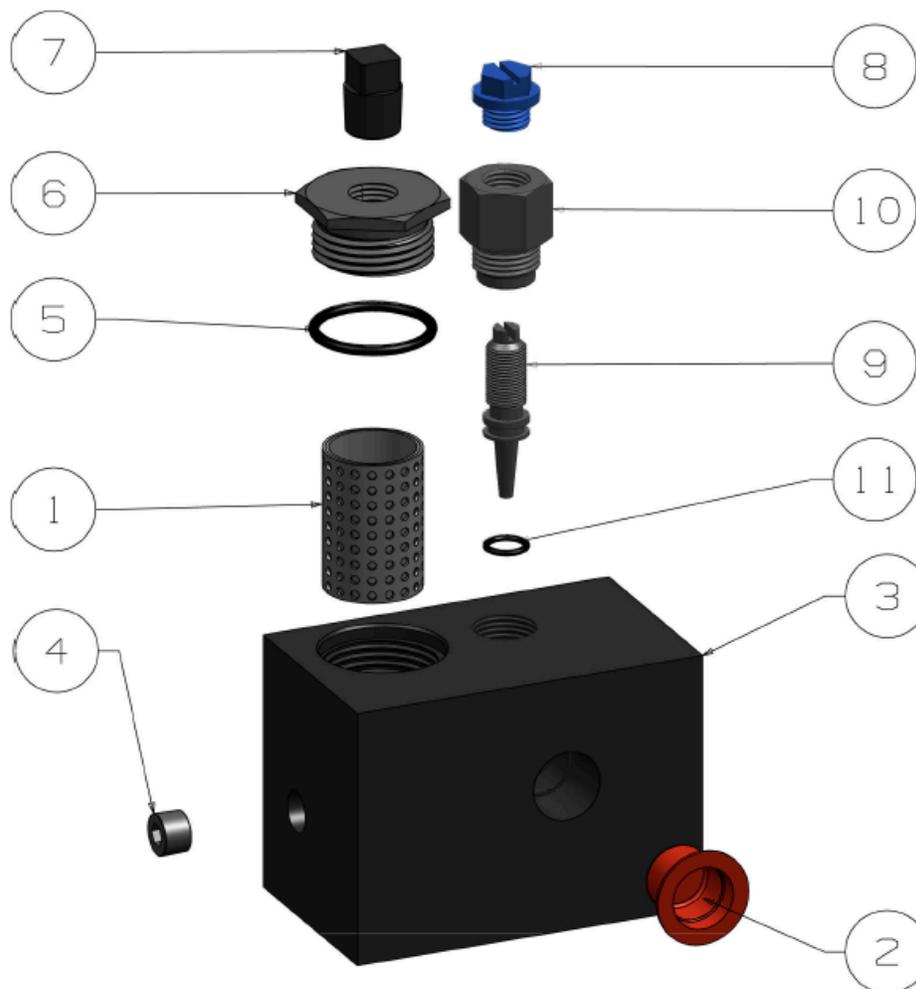


Table A-1: Part description for needle valve and strainer combination

Item	Description	Part number	Quantity required
1	Strainer assembly	460665	1
3	Needle body carbon steel	460688-500M	1
	Needle body stainless steel	460688-600M	1
4	Plug pipe	154772-019M	1

Table A-1: Part description for needle valve and strainer combination (continued)

Item	Description	Part number	Quantity required
5	O-ring, Buna-A	152042	1
	O-ring, EPR	152042-005	1
	O-ring, Kalrez	152042-075	1
	O-ring, low-swell Nitrile	152042-120	1
	O-ring, Neoprene	152042-116	1
	O-ring, FKM	152042-022	1
	O-ring, FKM V1289-75	152042-027	1
	6	Strainer cap	460682M
7	Plug pipe square hd	154783M	1
8	Retainer cap	460686	1
9	Adjustment stem	460683-001M	1
10	Retainer	460684M	1
11	O-ring, Buna-A	152067	1
	O-ring, EPR	152067-005	1
	O-ring, Kalrez	152067-075	1
	O-ring, low-swell Nitrile	152067-120	1
	O-ring, Neoprene	152067-116	1
	O-ring, FKM	152067-022	1
	O-ring, FKM V1289-75	152067-027	1

A.3 Order spare parts

Provide the following information when ordering parts:

- Valve serial number
- Part number
- Part description
- Quantity

Appendix B

Testing Daniel Model 1750 or 2750 Pressure reducing pilot set point in the field

B.1 Testing models 1750 or 2750

Important

The test described below confirms pilot set point setting and main valve functionality. The open pilot signals the main valve to open. In order for the main valve to open there must be a minimum of 5 psi differential pressure from valve inlet to valve outlet and there must be flow available in the pipeline. The Daniel pilot operated valve will not open if there is another valve closed on the downstream side.

Prerequisites

Refer to drawings attached (*Figure B-1*) for external Sense line installed by customer or (*Figure B-2*) for the Factory installed sense line.

Procedure

1. Install (A), (B) and (C) in pilot sense line.
 - Note:** Sense lines can be fitted at the factory or installed in the field by the customer.
2. Normal operation
 - a. (A) Valve OPEN
 - b. (B) Valve OPEN
 - c. (C) Tee CLOSED (Plugged)
3. Testing set point with external pressure source
 - a. (A) Valve CLOSED
 - b. (B) Valve OPEN
 - c. (C) Tee - Remove plug, drain and attach pressure source with pressure gauge. Gradually apply pressure until set point is reached and valve begins to open. Set point may be raised or lowered by adjusting the set screw on top of the pilot clockwise (to increase), counterclockwise (to decrease). Verify with pressure gauge on external pressure bottle. At the conclusion of test remove pressure source, return pipe plug to (C), open block valve (A) and return valve to normal operation.
4. Install (A), (B) and (C) in pilot sense line.
 - Note:** Sense lines can be fitted at the factory or installed in the field by the customer.
5. Normal operation
 - a. (A) Valve OPEN

- b. (B) Valve OPEN
- c. (C) Tee CLOSED (Plugged)
- 6. Testing set point with external pressure source
 - a. (D) Valve CLOSED
 - b. (E) Valve OPEN
 - c. (F) Tee - Remove plug, drain and attach pressure bottle with pressure gauge. Gradually apply pressure until set point is reached and valve begins to open. Set point may be raised or lowered by adjusting the set screw on top of the pilot clockwise (to increase), counterclockwise (to decrease). Verify with pressure gauge on external pressure bottle.

Figure B-1: External sense line by customer testing

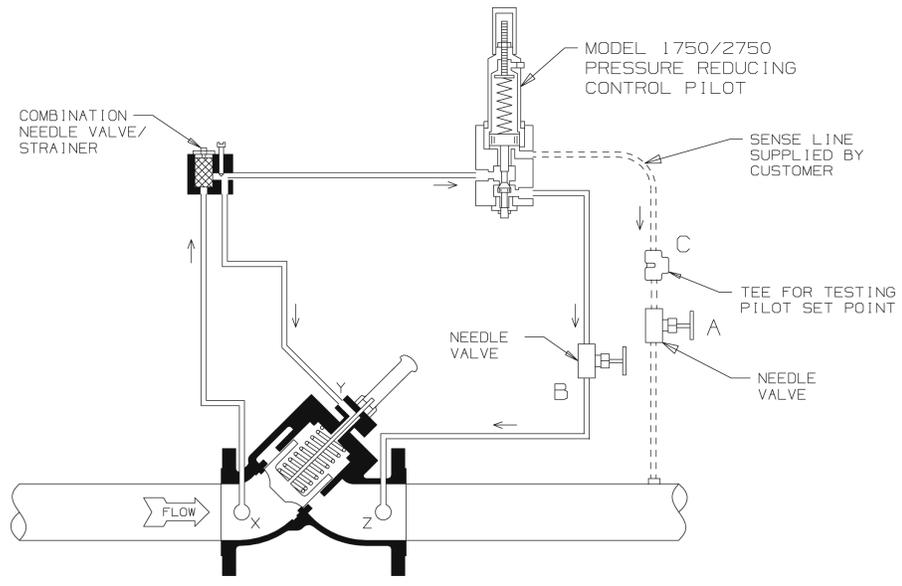
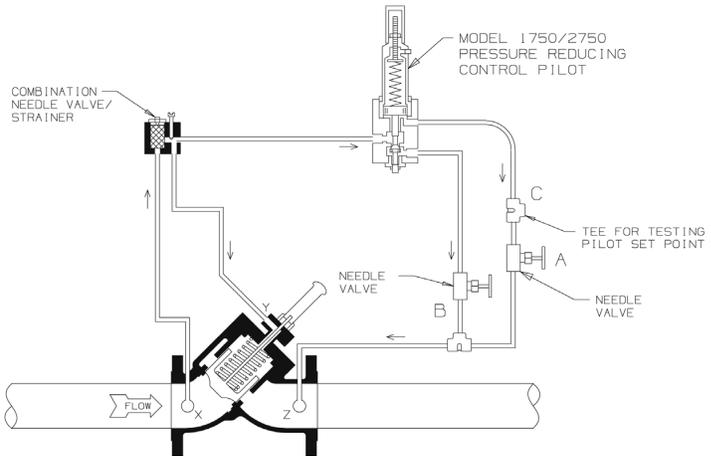


Figure B-2: Factory installed sense line testing



With over 90 years of experience, Daniel is the only manufacturer that has the knowledge and experience to engineer and offer superior products that are trusted to provide the most reliable and accurate measurements in the global oil and gas industry.

Contact Us

Email: Sales@Daniel.com
Phone: +1 (346)-509-3700



www.Daniel.com