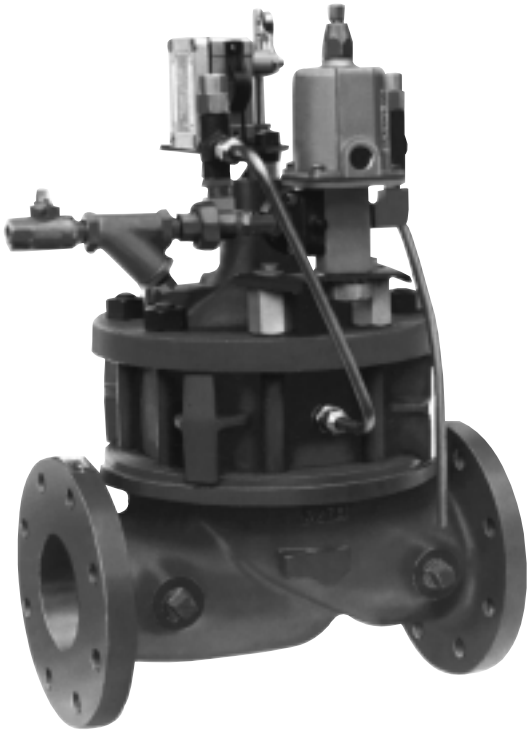
MODEL 61-02
661-02

Deep Well Pump Control Valve

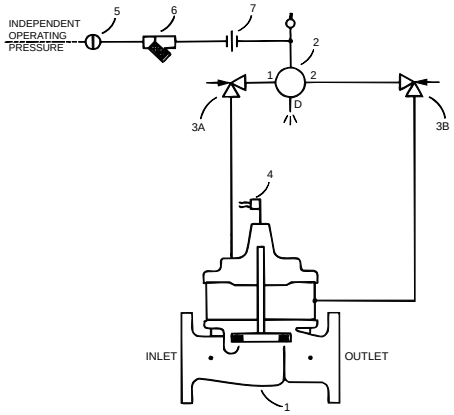


- **Prevent Surges in Pipelines**
- **Simple Hydraulic Operation**
- **Adjustable Opening & Closing Speeds**
- **Solenoid Control Can Be Operated Manually**
- **Proven Reliable Design**

The Cla-Val Model 61-02/661-02 Deep Well Pump Control Valve is designed to protect pipelines from surges caused by the starting and stopping of deep well pumps. This is a hydraulically operated diaphragm valve which is controlled by a solenoid pilot valve. Separate adjustable flow control valves in the pilot system regulate the opening and closing rates. A limit switch on the valve stem serves as an electrical interlock between the valve and the pump motor.

The operation of the valve is completely automatic and controlled by the solenoid valve. With the pump off, the valve is wide open. When the pump is started, the solenoid is energized and the valve begins to close slowly, discharging air and the initial rush of sand and water from the pump column to atmosphere. As the valve closes the pump output is gradually diverted into the main line preventing the development of a starting surge.

When it is time to shut off the pump the solenoid is de-energized. The pump continues to run while the pump control valve opens slowly diverting pump output to atmosphere. As pump pressure gradually decreases the main line check valve closes slowly, preventing shock or slam during the pump stopping cycle. When the pump control valve is wide open the limit switch assembly releases the pump starter and the pump stops.

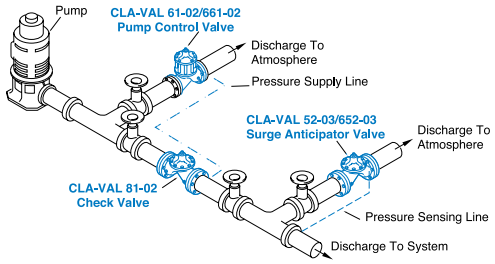


Schematic Diagram

Item	Description
1	Powertrol (Main Valve)
2	CSM11-A2-2 Solenoid Control
3	CV Flow Control
4	X105LOW Switch Assembly
5	CK Cock (Isolation Valve)
6	X43 "Y" Strainer
7	Union

Typical Installation

Install Model 61-02/661-02 valve as shown. Use a minimum of 1/2" tubing to connect operating pressure connection of the valve to the system side of check valve. Flexible conduit should be used for electrical connections to the solenoid control and the limit switch assembly. A Model 52-02/652-03 Surge Anticipator is recommended for power failure and surge protection.



Selecting The Valve

To be effective, this valve must be sized so it relieves to atmosphere that part of the pump discharge head which is in excess of the normal system static pressure. To do this, the valve is sized to permit the full pump discharge through the valve at a pressure low enough to keep the system check valve from opening. As the pump control valve closes, the pumping pressure exceeds the system pressure and gradually flows into the system.

We recommend selecting a valve size which will have a pressure loss that is at least 10 psi less than the system static pressure. Use the flow rate which is found on the pump's flow vs discharge pressure chart. Select the flow corresponding to the system static pressure, less 10 psi.

Determining Valve Size

1. Determine the system's static pressure (the pressure downstream of the check valve with the pump off); subtract 10 psi, this is the Design Pressure P.
2. From the pump's flow vs. discharge pressure curve, determine the flow (Q) at the Design Pressure P.
3. Using the formula, calculate the Cv.

   $Cv = \frac{Q}{\sqrt{P}}$
4. Select the valve size from the table which has a Cv that is equal to, or greater than, the calculated Cv in step 3 above.

Example:

1. System Static Pressure with the pump off = 70 psi.
2. Determine the Design Pressure P by subtracting 10 psi (70 psi - 10 psi = 60 psi Design Pressure)
3. From the pump curve we determine that the valve must allow a flow of 800 GPM at 60 psi.
4. Using the Formula:

   $Cv = \frac{Q}{\sqrt{P}}$ Where: Q = 800 GPM

   P = 60 psi (70 psi - 10 psi)

   Example $Cv = \frac{800}{\sqrt{60}} = 103$

Valve Selection Chart
Cv Values

Valve Size	Globe		Angle	
	61-02	661-02	61-02	661-02
2-1/2	85	–	101	–
3	115	62	139	–
4	200	136	240	135
6	460	229	541	233
8	770	480	990	545
10	1245	930	1575	–
12	1725	1458	2500	–
14	2300	–	3060	–
16	2940	2110	4200	–
20	–	3400	–	–
24	–	3500	–	–

5. From the table above the best valve choices are:
   3" 61-02 Globe Pattern
   4" 661-02 Globe Pattern
   4" 661-02 Angle Pattern

Drain Provisions

Each time the valve opens or closes, water is discharged from the solenoid exhaust port, the amount varying with the valve size. Provisions should be made for the disposal of this water. Exhaust tube must be free of any back pressure. Provide an air gap between the solenoid exhaust tube and drain facility.

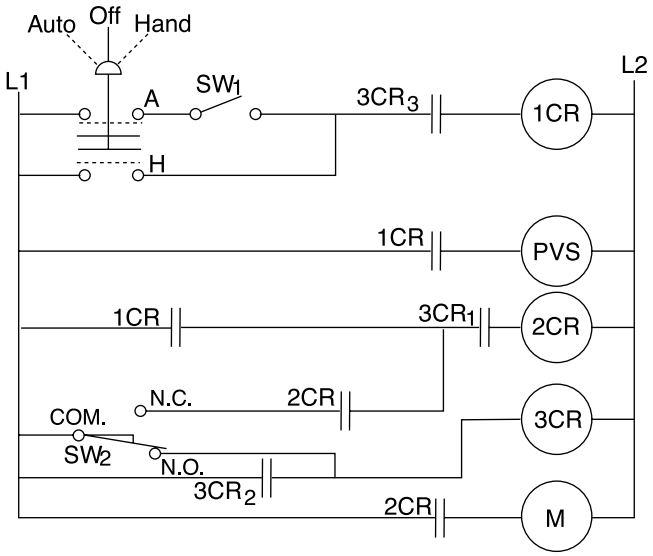
Wiring Diagram

Auto-Off-Hand	=	Selector Switch
1CR	=	Relay, DPST Normally Open
2CR	=	Relay, DPST Normally Open
3CR	=	Relay, TPST Normally Open
SW_1	=	Switch, Remote Start,Automatic
SW_2	=	Switch, SPDT, Valve Limit Switch Connect to N.C. Terminal
PVS	=	Pilot Valve Solenoid
M	=	Pump Motor Starter

Note:

SW_2 and PVS supplied by Cla-Val Co. PVS is the solenoid control mounted on the valve. SW_2 is included in the X105L switch assembly which is mounted on the pump control valve cover. All other electrical items supplied by customer.

On very deep wells where more than a few seconds are required for the water to reach the surface, or where it is desirable to delay closing the valve, a time delay relay should be installed in the circuit to the solenoid pilot valve.

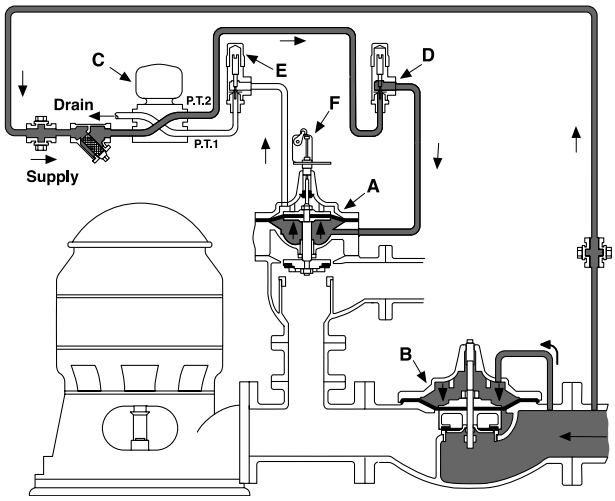


For simplified field wiring see Model PC-1 Pump Control Data Sheet.

Sequence Of Operation

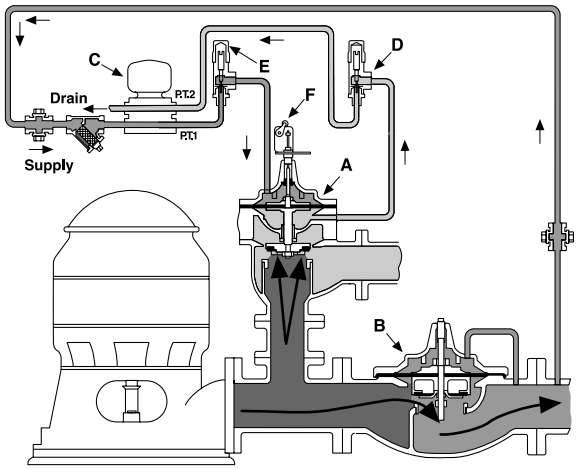
Pump Off...

With pump off, static line pressure holds the main line check valve “B” closed. Line pressure is transmitted through solenoid control “C” and speed control “D” to the lower chamber of valve “A”. Upper chamber of pump control valve “A” is vented to atmosphere so valve “A” is held wide open.



Starting Cycle...

Starting switch closes, pump starts, solenoid “C” energizes and shifts, allowing line pressure to flow into upper chamber of valve “A” through solenoid control “C” and opening speed control “E”. Closing speed of valve “A“ is controlled by speed control “D“ which limits the rate fluid is relieved from under the diaphragm. As valve “A” closes, pumping pressure opens main line check valve “B”, gradually permitting full flow.

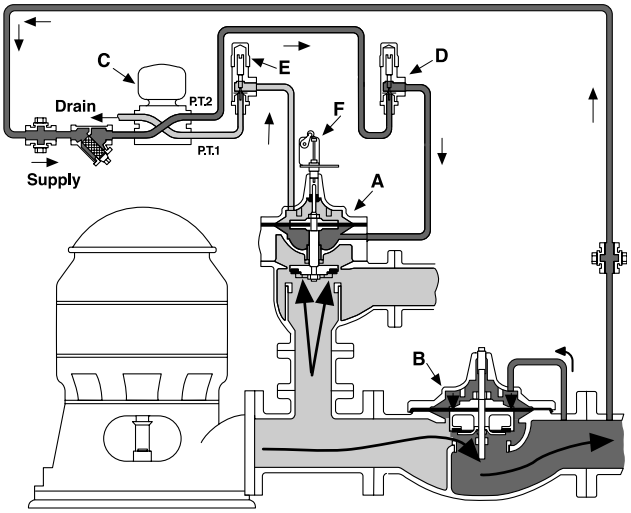


Stopping Cycle...

Starting switch opens, solenoid “C” de-energizes and shifts, as pump continues to run, pump pressure flows into lower chamber of valve “A” through solenoid “C” and opening speed control “D”.

Pressure in upper chamber of valve “A” is relieved to atmosphere through opening speed control “E” and solenoid control “C”.

As valve “A” opens, flow through main line check valve “B” gradually lessens until valve “A” is wide open and the limit switch “F” shuts off the pump.



Model 61-02 (Uses Basic Valve Model 100-02)

Specifications

Available Sizes

Pattern	Screwed	Flanged
Globe	2½" - 3"	2½" - 24"
Angle	2½" - 3"	2½" - 16"

Operating Temp. Range

Fluids
-40° to 180° F

Cover Capacity

Liquid Volume Displaced from Diaphragm Chamber When Valve Opens or Closes			
Valve Size	Displacement	Valve Size	Displacement
2 ½"	.043 gal	8"	1.260 gal
3"	.080 gal	10"	2.51 gal
4"	.169 gal	12"	4.00 gal
6"	.531 gal	14"	6.50 gal
		16"	9.57 gal
		24"	9.57 gal

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover			Pressure Class				
			Flanged				Screwed
Grade	Material	ANSI Standards*	125 lb.	250 lb.	150 lb.	300 lb.	End** Details
ASTM A536	Ductile Iron	B16.42	—	—	250	400	400
ASTM A216-WCB	Cast Steel	B16.5	—	—	285	400	400
ASTM B62	Bronze	B16.24	—	—	225	400	400
ASTM A743	Stainless Steel	B16.5	—	—	285	400	400
356-T6	Aluminum	B16.1	—	—	275	—	—

Note: *ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
**End Details machined to ANSI B2.1 Specifications

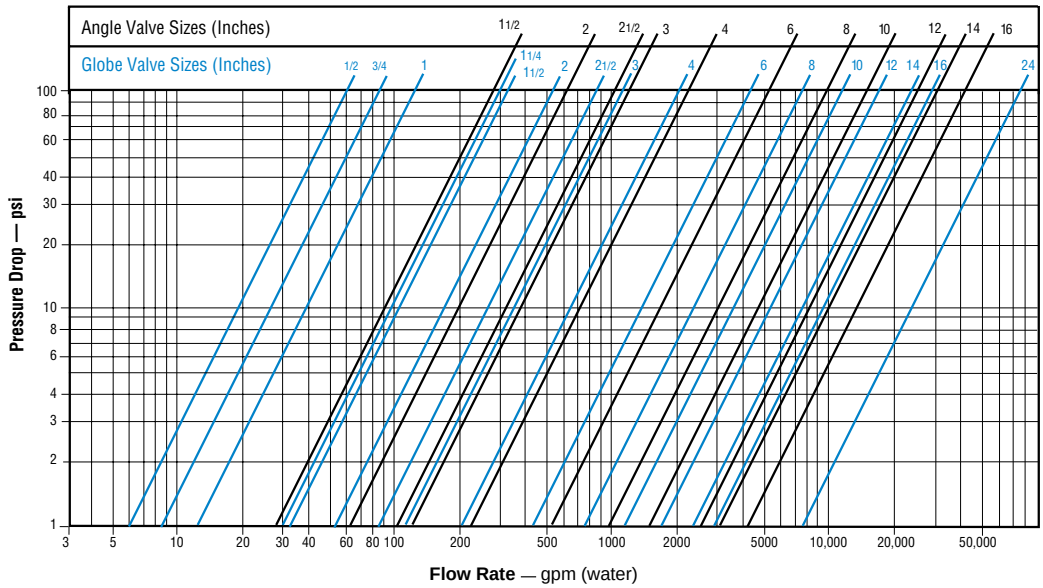
2 1/2" Globe, Screwed

Materials

Component	Material Options				
Body, Cover & Power Unit Body	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Available Sizes	2½" - 24"	2½"- 24"	2½" - 16"	2½" - 16"	2½" - 16"
Disc Retainer & Diaphragm Washers	Cast Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Trim: Disc Guide, Seat, Cover Bearing & Stem Bearing	Bronze is standard. Stainless Steel is optional.			Stainless Steel is standard.	
Disc	Buna-N® Rubber				
Diaphragm	Nylon Reinforced Buna-N® Rubber				
Stem, Nut	Stainless Steel				

4" Angle, Flanged

Model 61-02 Flow Chart (Based on normal flow through a wide open valve.)



Model 661-02 (Uses Basic Valve Model 100-21)

Specifications

Available Sizes

Pattern	Flanged
Globe	3" - 30"
Angle	4" - 8"

Operating Temp. Range

Fluids
-40° to 180° F

Pressure Ratings (Recommended Maximum Pressure - psi)

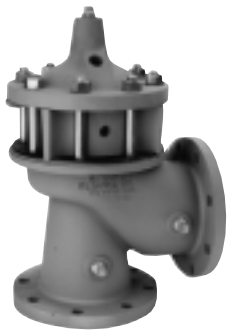
Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 lb.	300 lb.
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
ASTM B62	Bronze	B16.24	225	400
ASTM A743	Stainless Steel	B16.5	285	400
356-T6	Aluminum	B16.1	275	—

Note: *ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.

Cover Capacity

Liquid Volume Displaced from Diaphragm Chamber When Valve Opens or Closes			
Valve Size	Displacement	Valve Size	Displacement
3"	.032 gal	12"	2.51 gal
4"	.080 gal	16"	4.00 gal
6"	.169 gal	20"	9.57 gal
8"	.531 gal	24"	9.57 gal
10"	1.26 gal	30"	29.00 gal

4" Globe, Flanged

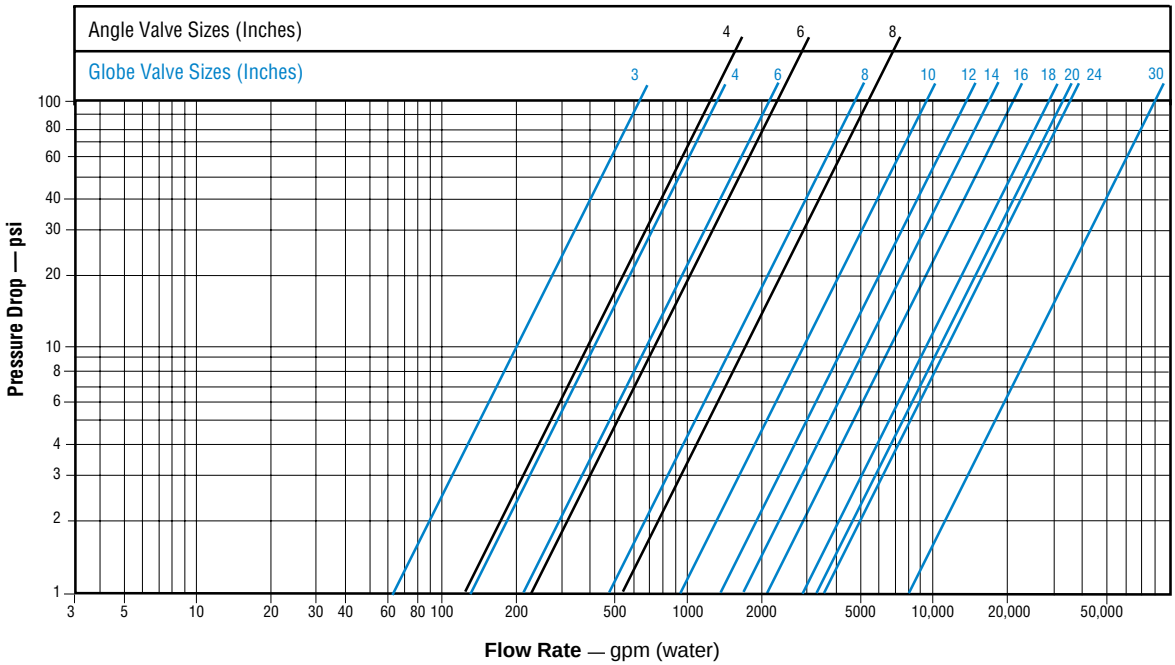


6" Angle, Flanged

Materials

Component	Material Options				
Body Cover & Power Unit Body	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Available Sizes	3" - 30"	3" - 30"	3" - 16"	3" - 16"	3" - 16"
Disc Retainer & Diaphragm Washers	Cast Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Trim: Disc Guide, Seat Cover Bearing & Stem Bearing	Bronze is standard. Stainless Steel is optional.			Stainless Steel is standard.	
Disc	Buna-N® Rubber				
Diaphragm	Nylon Reinforced Buna-N® Rubber				
Stem, Nut	Stainless Steel				

Model 661-02 Flow Chart (Based on normal flow through a wide open valve.)



Valve Selection

			These Symbols and Indicate Available Sizes												
		Inches	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30
		mm	65	80	100	150	200	250	300	350	400	450	500	600	750
		End Detail	Screwed & Flanged		Flanged										
Model 61-02	Basic Valve 100-02	Globe	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
		Angle	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
	Suggested Flow (GPM)	Max. Continuous	300	460	800	1800	3100	4900	7000	8400	11000			25000	
		Max. Intermittent	370	580	990	2250	3900	6150	8720	10540	13700			31300	
	Suggested Flow (Liters/sec)	Max. Continuous	19	29	50	113	195	309	441	529	693			1575	
		Max. Intermittent	23	37	62	142	246	387	549	664	863			1972	
Model 661-02	Basic Valve 100-21	Globe		✓*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Angle			✓	✓	✓								
	Suggested Flow (GPM)	Max. Continuous		260	580	1025	2300	4100	6400	9230	9230	16500	16500	16500	28000
	Suggested Flow (Liters/sec)	Max. Continuous		16	37	65	145	258	403	581	581	1040	1040	1040	1764

× **661-02 is the reduced internal port size version of the 61-02.**

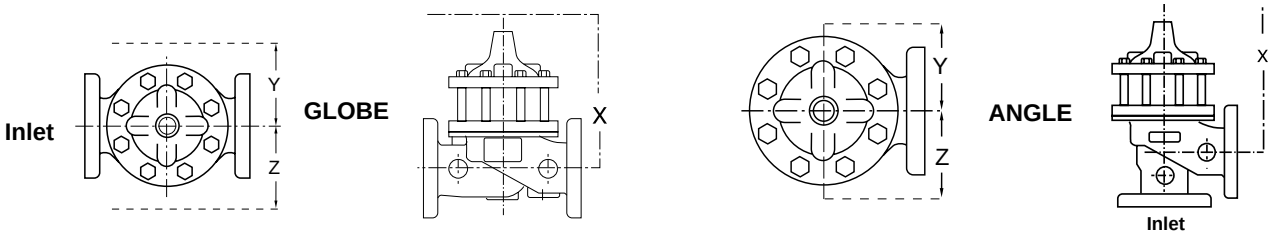
*Flanged End Detail Only

For 100-02 basic valves suggested flow calculations were based on flow through Schedule 40 Pipe. Maximum continuous flow is approx. 20 ft/sec (6.1 meters/sec) & maximum intermittent is approx. 25 ft /sec (7.6 meters/sec). For 100-21 basic valves suggested flow calculations were based on flow through the valve seat. Approx. 26 ft/sec (7.9 meters/sec) is used for maximum continuous flow. Maximum continuous flow through the valve seat for the valve seat for the 30" 100-21 is approx. 20 ft/sec (6.1 meters/sec).

Pilot System Dimensions (In Inches)

We recommend providing adequate space around valve for maintenance work

VALVE SIZE		1¼" & 1½"	2"	2½"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"
X	Max.	—	—	16.75	17.75	20.00	23.75	26.75	33.50	39.00	42.25	46.00	46.00	50.25	50.25	50.25
Y	Max.	—	—	4.50	5.00	6.00	8.00	10.25	12.00	14.25	16.75	18.00	18.00	18.00	18.00	18.00
Z	Max.	—	—	9.50	10.00	11.00	13.00	15.00	17.00	19.00	22.00	23.00	23.00	23.00	23.00	23.00



Pilot System Specifications

Temperature Range

Water to 180°F Max

Materials

Standard Pilot System Materials

Pilot Control: Bronze ASTM B62
Trim: Stainless Steel Type 303
Rubber: Buna-N® Synthetic Rubber

Optional Pilot System Materials

Pilot Systems are available with optional Aluminum, Stainless Steel or Monel materials at extra cost.

Solenoid Control Specifications

Enclosure	General purpose NEMA Type 3; Aluminum Note: For other enclosures and NEMA Types, consult factory
Housing	Body — Aluminum Trim — Stainless Steel
Operating Pressure	300 psi AC or DC
Coil Insulation	Class A (molded)
AC voltage	15.4 watts
DC voltage	16.8 watts

Power Consumption

Volts (DC)	Amperes Holding	Amperes Pull In	Volts (AC 60 Hz)	Amperes Holding	Amperes Inrush	Coil Resistance (ohms)
24	.603	24	24	2.88	25.4	0.5
28	.629	15.6	120	.575	5.1	14.1
32	.500	18.6	208	.330	2.93	40
48	.293	10.8	240	.288	2.54	58
115	.122	4.42	440	.156	1.38	174
125	.119	4.44	480	.143	1.27	233
250	.072	2.45				

Volts (AC 50 Hz)	Amperes Holding	Amperes Inrush	Coil Resistance (ohms)
110	.48	4.6	15.7
220	.24	2.3	66
240	.22	2.1	88

When Ordering, Please Specify

1. Catalog No. 61-02 or No. 661-02
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Screwed or Flanged
6. Trim Material
7. Solenoid Voltage
8. Desired Options
9. When Vertically Installed

Note: For main valve option descriptions, refer to 100-02 (61-02) or 100-21 (661-02) Technical Data Sheets.

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E-61-02/661-02 (R-11/01)

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