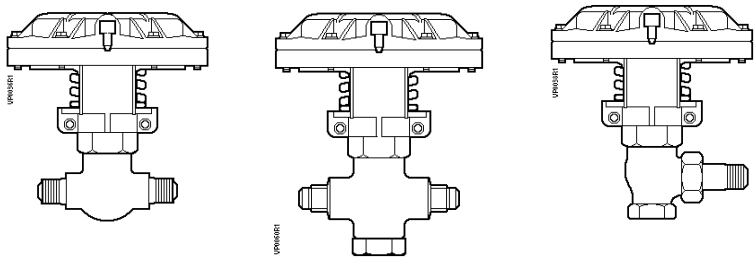
SIEMENS

Technical Instructions
Document No. 155-310P25
VP 658-5
May 16, 2005

Powers™ Controls

Powertop Two-Way Valves Normally Open/Normally Closed



Description

The VP 658 normally open and normally closed flared valves are pneumatically operated valves designed to control the flow of both water and steam.

Features

- Stainless steel valve stem for smooth operation and durability
- Large diaphragm area for control accuracy and tight close-off
- Equal percentage plugs and long stroke for controllability
- Removable actuator for ease of servicing

Application

The VP 658 flared valves are recommended for control of hot or chilled water and steam for terminal units such as unit ventilators, reheat coils, fan coil units, induction units, and duct coils.

They are particularly suited to the minimum profile and low space requirements of schools, hospitals, office buildings and factories.

Product Numbers

See Tables 1 and 2.

Table 1. Normally Open.

Valve Size Inch (mm)	Spring Range PSI (kPa)	Cv (Kvs)	Product Number
.50 (15)	2 to 6 (12 to 41)	1.0 (0.85)	658-0004
			658-0007
		2.5 (2.14)	658-0005
			658-0008
.75 (20)		6.3 (5.4)	658-0010
1.0 (25)		10 (8.6)	658-0012
1.25 (32)		16 (13.7)	658-0014
.50 (15)	10 to 14 (69 to 97)	1.0 (0.85)	658-0062
			658-0064
		2.5 (2.14)	658-0063
			658-0065
.75 (20)		6.3 (5.4)	658-0067
1.0 (25)		10 (8.6)	658-0069
1.25 (32)		16 (13.7)	658-0071

Table 2. Normally Closed.

Valve Size Inch (mm)	Spring Range PSI (kPa)	Cv (Kvs)	Product Number
.50 (15)	10 to 14 (69 to 97)	1.0 (0.85)	658-0085
		2.5 (2.14)	658-0043

Specifications

	Line sizes	Inches (mm) .50 (15) .75 (20) 1.0 (25) 1.25 (32)
	Capacity	See Tables 3 through 6
	Body styles	Globe-flared, Angle Union Outlet
	Body connections	Glob-flared, Angle Union Outlet
	Action	Normally Open (NO) Normally Closed (NC)
	Stem travel	.50-inch (15 mm)
	Valve body rating	ANSI 250 See Table 7
Material	Body and seat	Bronze
	Stem	Stainless steel
	Packing	EP rubber
Operating	Controlled medium	Water, steam, ethylene glycol solution
	Maximum medium temperature	250°F (121°C)
	Maximum medium inlet pressure	
	Water	See Table 7
	Steam	15 psig (103 kPa)
	Maximum recommended differential pressure for modulating service	
	Water	20 psig (138 kPa)
	Steam	15 psig (103 kPa)
	Close-off	
	Normally Open	See Figure 1
	Normally Closed	See Figure 1
	Flow characteristic	Equal percentage
Actuator	Nominal spring range	
	NO	See Table 1
	NC	10 psi to 14 psi (69 kPa to 97 kPa) See Table 2
	Diaphragm	
	Effective area	11-inch^2 (71 cm^2)
	Ambient temperature range	35°F to 140°F (2°C to 60°C)
	Maximum air supply to the diaphragm	30 psig (207 kPa)
	Material	Silicone rubber

Miscellaneous	Dimensions	See Figures 6, 7 and 8
	Weight	
	NO	3 lb (1.4 kg)
	NC	4 lb (1.8 kg)

Service Kits

Diaphragm replacement kit (package of 5)	658-166
Repack kit (for 10 valves)	658-167
Shut off disc kit (package of 10)	657-800
Actuator assembly	
NO (2 to 6 psi)	658-067
NO/NC (10 to 14 psi)	658-068

Valve body assembly Normally Open:

Cv (Kvs)	Part Number
1.0 (0.85)	658-312
2.5 (2.14)	658-323
6.3 (5.4)	658-317
10 (8.6)	658-319
16 (13.7)	658-321

Valve body assembly Normally Closed:

Cv (Kvs)	Part Number
1.0 (0.85)	658-383
2.5 (2.14)	658-384

Complete top replacement, Normally Open,
2 to 6 psi (12 to 41 kPa) only:

Valve	Top Assembly
658-0004	658-379
658-0005	658-070
658-0007	658-379
658-0008	658-070
658-0010	658-071
658-0012	658-072
658-0014	658-074

Table 3. Maximum Water Capacity - U.S. Gallons per Minute.

Valve Size Inches	Pressure Differential - psi															
	Cv\1	2	3	4	5	6	8	10	15	20	25	30	40	50	60	75
.50	1.0	1.4	1.7	2.0	2.2	2.5	2.8	3.2	3.9	4.5	5.0	5.5	6.3	7.1	7.8	8.7
	2.5	3.5	4.3	5.0	5.6	6.1	7.1	7.9	9.7	11.2	12.5	13.7	15.8	17.7	19.4	22
.75	6.3	9.0	11	13	14	15	18	20	24	28	32	35	40	45	49	55
1.0	10	14	17	20	22	25	28	32	39	45	51	55	63	71	78	87
1.25	16	23	28	32	36	40	45	51	62	72	81	88	101	114	125	139

Table 4. Maximum Water Capacity - Cubic Meters per Hour (m3/h).

Valve Size in mm	Pressure Differential - kPa													
	1	10	20	30	40	50	60	80	Kvs/ 100	150	200	300	400	500
15	0.09	0.27	0.38	0.47	0.54	0.60	0.66	0.76	0.85	1.0	1.2	1.5	1.7	1.9
	0.21	0.68	0.96	1.17	1.35	1.51	1.66	1.91	2.14	2.6	3.0	3.7	4.3	4.8
20	0.51	1.7	2.4	3.0	3.4	3.8	4.2	4.9	5.4	6.7	7.7	9.4	10.9	12.1
25	0.9	2.7	3.8	4.7	5.4	6.1	6.7	7.7	8.6	10.5	12.2	14.9	17.2	19.2
32	1.4	4.4	6.2	7.6	8.7	9.8	10.7	12.3	13.7	16.9	19.5	23.9	27.6	30.9

Table 5. Maximum Steam Capacity - Pounds per Hour.

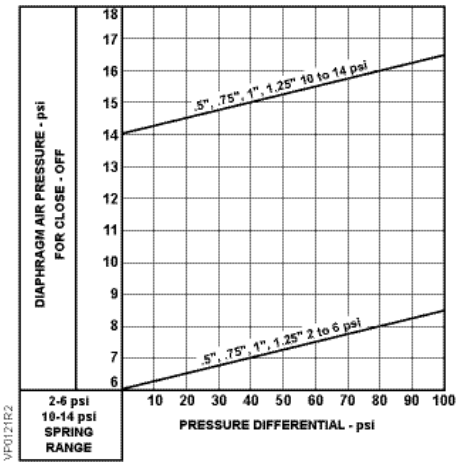
Valve Size in Inches	Inlet Pressure - psig																
		2		5					10					15			
		Pressure Differential - psi															
	Cv/1	1	2	1	2	3	4	5	2	4	6	8	10	6	9	12	15
.50	1.0	12.0	16.6	13.0	18.2	22	25	28	20	28	34	38	42	38	45	50	54
	2.5	30	42	33	45	55	62	69	51	71	85	96	104	94	112	125	135
.75	6.3	72	140	83	120	140	160	180	120	180	210	240	260	240	280	320	340
1.0	10	120	170	130	180	220	250	280	210	280	340	380	420	380	450	500	550
1.25	16	190	270	210	290	350	400	440	330	460	550	600	670	600	720	810	870

Table 6. Steam Capacity - Kilograms per Hour.

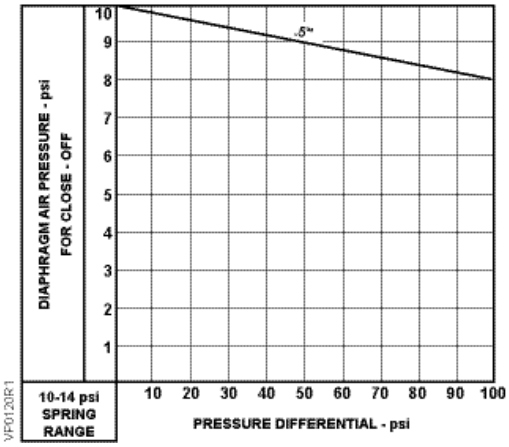
Valve Size in mm	Inlet Pressure - kPa					
		50		100		
	Pressure Differential – kPa					
	Kvs	10	25	10	20	50
15	0.85	4.3	6.8	6.04	8.54	14
	2.15	10.7	17	15	21	34
20	5.4	27.1	42.8	38	54	85
25	8.6	43	68	60	85	135
32	13.7	68.8	109	97	137	216

Table 7. Body Temperature-Pressure Rating.

Temperature	Pressure psig (Kvs)
°F (°C)	ANSI Class 250
-20 to 150 (-30 to 66)	400 (2758)
200 (93)	385 (2655)
250 (121)	365 (2586)



Normally Open



Normally Closed

Figure 1. Nominal Close-off Ratings.

Warning/Caution Notations

WARNING:		Personal injury/loss of life may occur if you do not perform a procedure as specified.
CAUTION:		Equipment damage may occur if you do not follow procedure as specified.

Operation

The actuator spring provides the necessary force to hold the stem in the raised or normal position.

An increase in control pressure overcomes the spring pressure and moves the stem downward. In a normally closed valve, this increases the flow of fluid through the valve. In a normally open valve, an increase in pressure decreases the flow of fluid though the valve.

With the loss of control pressure, the spring returns the valve to its normal position.

Sizing

The sizing of a valve is important for correct system operation. An undersized valve will not have sufficient capacity at maximum load. An oversized valve can initiate cycling, and the seat and throttling plug can be damaged because of the restricted opening. Correct sizing of the control valve for *actual expected conditions* is essential for good control.

Some variables that must be determined are:

- The medium to be controlled: water, etc.
- The maximum inlet temperature and pressure of the medium at the valve.
- The pressure differential that will exist across the valve under maximum load demand.
- The maximum capacity the valve must deliver.
- The maximum line pressure differential the valve actuator must close against.

See Tables 3 through 6 for valve capacities.

Installation

NOTE: Install the valve in any position except upside down. The preferred installation position is upright.

In concealed installations, allow three-inches (75 mm) from the top of the actuator to remove the upper housing for valve servicing.

CAUTION:
Never use the valve housing as a lever arm to tighten the body when taking up on a thread.

Install the valve so that the flow follows the direction arrow cast on the valve body.

Install hand valves on supply and return piping to allow for servicing.

Service

Diaphragm replacement

Instructions for replacement are included in the kit.

Stem packing

Instructions for repacking the valve stem are included in the kit.

Valve disc replacement

Instructions for replacing the valve disc are included in the kit.

Actuator replacement

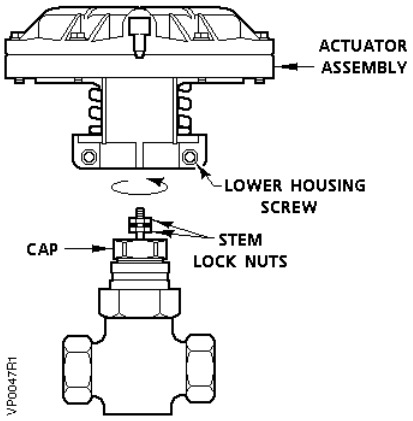


Figure 2. Actuator Replacement.

1. Loosen the two lower housing screws that clamp it to the bonnet.
2. Loosen the stem lock nuts using two 7/16-inch open-end wrenches.
3. Unscrew the actuator assembly from the stem as shown in Figure 2.
4. Push the stem all the way down before installing the new actuator assembly. There must be at least 1/16-inch (2 mm) clearance between the lower stem lock nut and the valve cap.
5. Pull the stem back up and install the new actuator assembly.
6. Screw the stem into the actuator piston plate and tighten the lock nuts with a wrench.
7. Tighten the lower housing screws. Do not over tighte these screws.

Parts of the Valve Assembly

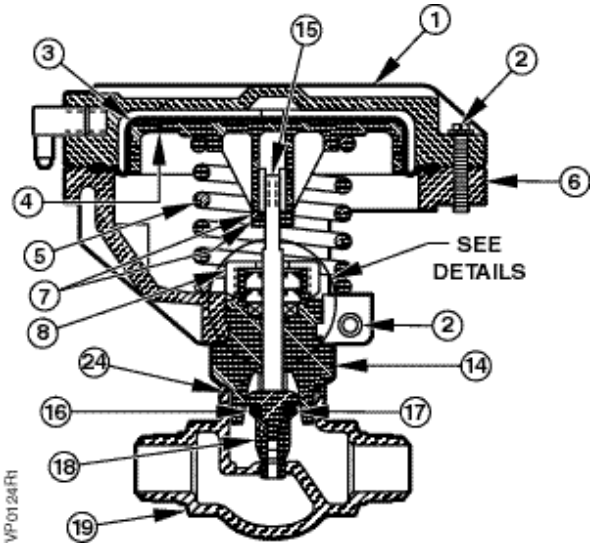


Figure 3. Normally Open.

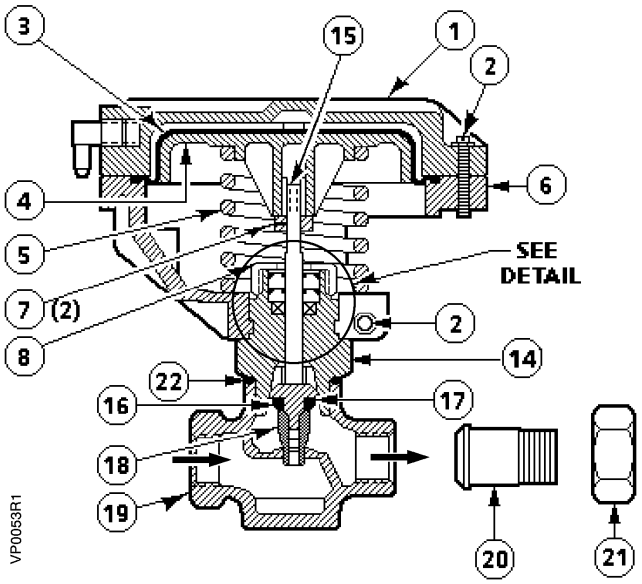
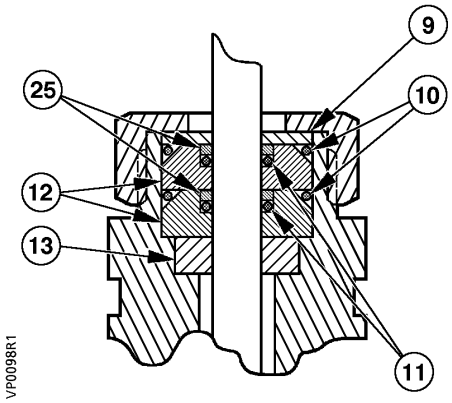


Figure 4. Angle Union Outlet, Normally Open.



Insert Detail

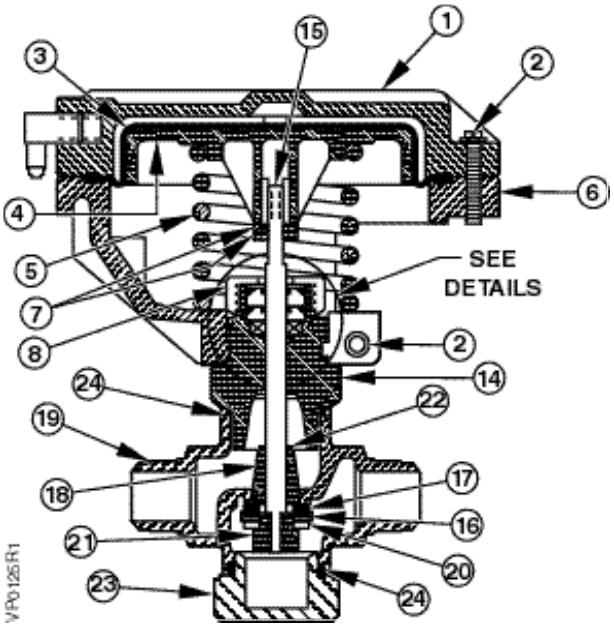


Figure 5. Normally Closed.

Table 8. Valve Assembly Parts and Service Kits. See Figures 3, 4 and 5.

Item	Description	Qty	Normally Open						Normally Closed		Material
			Cv 0.5	Cv 1	Cv 2.5	6.3	10	16	Cv 1	Cv 2.5	
1	Actuator housing-upper	1	Item 29 Kit								Nylon
2	Thread forming screw	8	Items 26 and 29 Kits								Steel
3	Diaphragm	1									EP rubber
4	Piston plate	1	Item 29 Kit								Aluminum
5	Actuator compression spring	1									Cad. pl. steel
6	Actuator housing-lower	1									Nylon
7	Stem lock nut	2	—	—	—	—	—	—	—	—	Steel
8	Cap	1	—	—	—	—	—	—	—	—	Brass
9	Packing washer	1	Item 27 Kit								Copper
10	Stem packing large o-ring	2									EP rubber
11	Stem packing small o-ring	2									EP rubber
12	O-ring retainer	2									Brass
13	Packing ring	1									Teflon®
14	Bonnet	1	—	—	—	—	—	—	—	—	Brass
15	Stem	1	—	—	—	—	—	—	—	—	Stainless Steel
16	Disc holder	1	—	—	—	—	—	—	—	—	Phos. Bronze
17	Shut-off disc	1	Item 28 Kit								EP rubber
18	Throttle plug	1	—	—	—	—	—	—	—	—	Brass
19	Valve body and seat	1	—	—	—	—	—	—	—	—	Stainless Steel
20	(Figure 3) Tail piece, Angle Union Outlet only	1	657-276	657-276	657-276	657-115	413-003	657-121	—	—	Brass or Bronze
20	(Figure 4) Washer NC only	1	—	—	—	—	—	—	—	—	Brass
21	(Figure 3) Union Nut, Union Outlet only	1	657-094	657-094	657-094	230-117	657-100	609-004	—	—	Brass or Bronze
21	(Figure 4) Retaining nut NC only	1	—	—	—	—	—	—	—	—	Brass
22	(Figure 3) O-ring		Refer to Items 25 or 26 Kits								EP Rubber
22	(Figure 4) Shoulder washer NC only	1	—	—	—	—	—	—	—	—	Bronze
23	Valve cap	1	—	—	—	—	—	—	—	—	Brass
24	O-ring	1	Item 27 and 28 Kits								EP rubber
25	Back-up ring	2	Item 27 Kit								Teflon
26	Diaphragm kit	—	658-166								—
27	Stem packing kit	—	658-167								—
28	Shut-off disc kit	—	657-800								—
29	Actuator assembly 2 to 6 psi (12 to 41 kPa)	—	658-067						—		—
	Actuator assembly 10 to 14 psi (60 to 97 kPa)	—	658-068						658-068		—
—	Valve body assembly	—	658-373	658-312	658-313	658-324	658-312	658-325	658-383	358-384	—

Dimensions

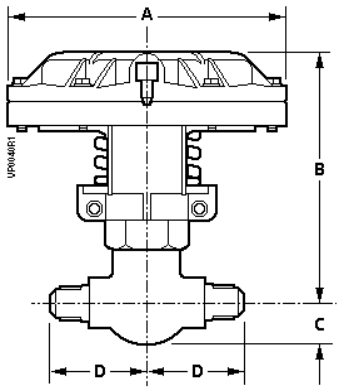


Figure 6. Normally Open.

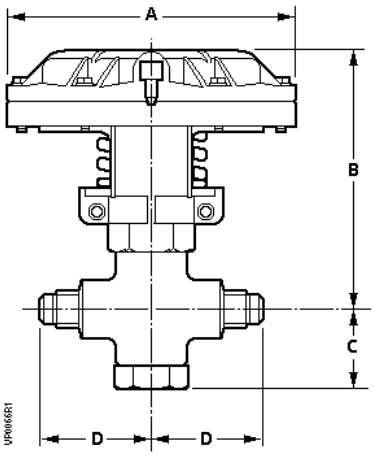


Figure 7. Normally Closed.

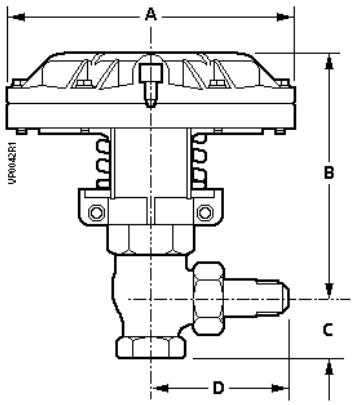


Figure 8. Angle Union Outlet, Normally Open.

Table 9. Dimensions in Inches (Millimeters).

Valve Body	Valve Size Inch (mm)	A	B	C	D
Normally Open	.50 (15)	5.50 (140)	5.25 (133)	1.00 (25)	2.00 (51)
Normally Closed	.50 (15)	5.50 (140)	5.25 (133)	1.94 (33)	2.00 (51)
Angle Union Outlet	.50 (15)	5.50 (140)	5.00 (127)	1.25 (32)	2.75 (70)
	.75 (20)	5.50 (140)	4.94 (125)	1.25 (32)	2.88 (73)
	1.00 (25)	5.50 (140)	4.94 (125)	1.75 (44)	3.13 (79)
	1.25 (32)	5.50 (140)	5.50 (140)	2.00 (51)	4.38 (111)