



V48 Series Three-Way Water Regulating Valves for Cooling Tower Systems Product/Technical Bulletin

LIT-121705 Part No. 3155 Rev. H

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Application

WARNING

Risk

This product consists of copper alloy and contains lead. Do not use the product on drinking water.

- **Important:** The V48 Series Water Regulating Valve is intended to control water flow under normal operating conditions. Where failure or malfunction of the V48 Valve could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the V48 Valve.

Use V48 three-way pressure actuated water regulating valves for condensing units that atmospheric or forced draft cooling towers cool. You can use V48 valves on single or multiple condenser hookups to the tower to provide the most economical and efficient use.

Low refrigerant head pressure, which may be the result of low tower water temperature, causes the cooling ability of the refrigeration system to fall off rapidly. The three-way valve senses the compressor head pressure and facilitates cooling water to flow to the condenser, to bypass the condenser, or to flow to both the condenser and bypass line to provide correct refrigerant head pressures. When you choose the correct valve size and adequate pump capacity, the valve provides refrigerant condensing temperatures between 90°F (32°C) and 105°F (41°C) with cooling tower water temperatures of 85°F (29°C) and 40°F (4°C). For valve size instructions, see [Selecting a valve size](#).

The three-way valve permits water flow to the tower through the bypass line, even though the condenser does not require cooling. This provides an adequate head of water at the tower at all times so the tower can operate efficiently with minimal maintenance on nozzles and wetting surfaces.

Figure 1: V48 three-way valves

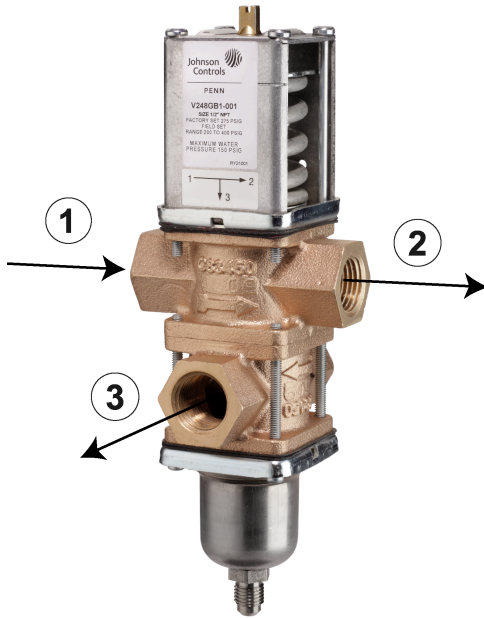


Features

- No close-fitting sliding parts in water.
- Range spring does not come in contact with the cooling water.
- Easy manual flushing, if required.
- Valves do not chatter.
- Free movement of all parts provides accurate pressure modulation.
- Water pressure variations do not affect adjustment.
- Withstands high hydraulic shock without damage.
- Reduces problems of water distribution on multiple unit applications.

General description

Figure 2: Water flow of 1/2 in. to 1 1/4 in. valves



Port	Description
1	From tower
2	To condenser
3	Bypass

The V48 valves come in 1/2 in., 3/4 in., 1 in., 1-1/4 in., and 1-1/2 in. sizes for noncorrosive refrigerants as specified. The range spring and sliding parts do not immerse in water where sedimentation and corrosion occur. Only three internal parts come in contact with the water, and each of these parts, the valve disc holder, the valve seat, and extension sleeve, consist of corrosion-resistant aluminum bronze.

The valves are factory-adjusted for the settings in the [Factory settings](#). The installer can adjust the setting to raise or lower the opening point. This results in a change to both the condensing and bypass adjustment.

You can lift the range spring follower with screwdrivers at the two sides of the lower spring cap to manually flush the V48. This does not affect the valve adjustment.

Optional constructions

Capillary tubing length

Standard length 30 in. (762 mm). Optional 48 in. (1219 mm) capillary furnished at additional cost, when you specify, quantity orders only.

Temperature actuated valves

Contact customer service.

Selecting a valve size

Use the chart in [Flow chart](#) to select a water valve. To select the valve size, complete the following steps.

- Determine the maximum water flow that you need through the condenser.
 - Check the condenser manufacturer's requirements for water flow, or determine the required condenser water temperature rise with the following calculation:

$$\text{gal/min/ton} = \frac{30}{(\text{water outlet temperature} - \text{water inlet temperature})}$$

The normal flow through a condenser used with a cooling tower is 3 gal/min/ton.

- Calculate the total flow in gallons per minute. Gal/min = tons of refrigeration x gal/min/ton.
- Draw a horizontal line across the upper half of the flow chart through the calculated flow that you need.
 - Determine the refrigerant head pressure rise above the valve opening point.

For most applications, adjust the refrigerant head pressure rise above the opening point 45 psig (310 kPa) with the R-22 because it is good practice in most applications to provide a condensing temperature between 90°F (32°C) and 105°F (41°C). This corresponds to a pressure range of 170 psig to 215 psig (1172 kPa to 1482 kPa) on R-22. Some manufacturers require a slightly higher head pressure range.

- Draw a horizontal line across the lower half of the flow chart through the value in the previous step.

① **Note:** There are two vertical pressure scales in the lower half of the flow chart. Ensure that you use the R-22 scale.
- Determine the allowable water pressure drop through the valve. The pumping head must include the pressure drop through the valve.
 - 7 psig (48 kPa) = 16 ft,
 - 10 psig (69 kPa) = 23 ft,
 - 15 psig (103 kPa) = 35 ft.
- On the lower half of the curve, mark the point on the horizontal head pressure line where it intersects the allowable water pressure drop curve.
- From this point, draw a line vertically upward until it intersects the water flow line in the upper half of the flow chart.

If the intersection falls on a valve size, this is the correct size. If the intersection falls between two curves, the required valve size is the larger of the two.

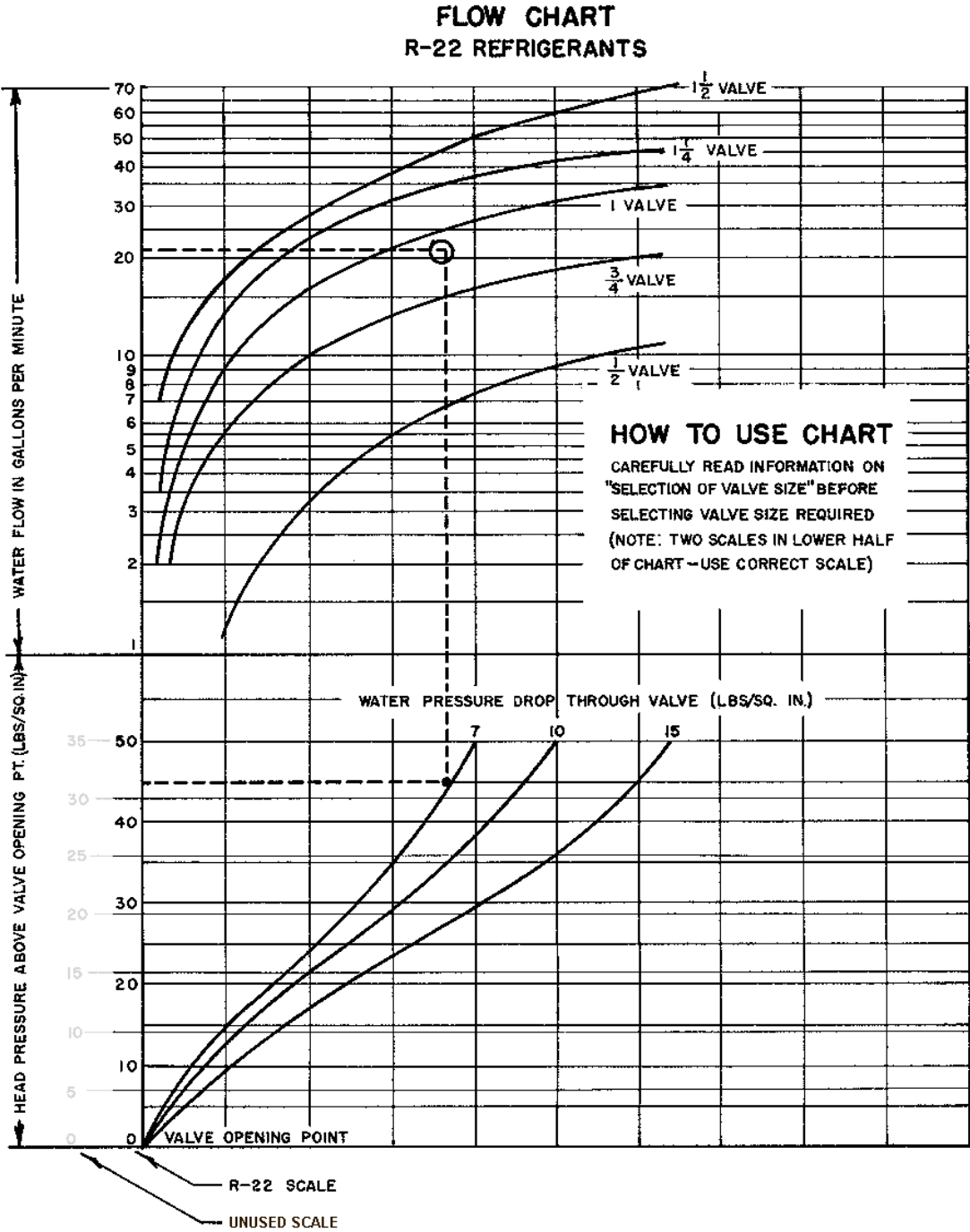
Example:

The following is an example of selecting a valve size.

1. The required flow for an R-22 system in this example is 21 gpm. The installer wants to operate at a condensing temperature between 90°F (32°C) and 105°F (41°C). Head pressure is between 170 psig and 215 psig (1172 kPa and 1482 kPa). The allowable water pressure drop is 7 psig (48 kPa).
2. Draw a line through 21 gpm. See the dotted line on the upper half of the flow chart.
3. Draw a line through the head pressure rise of 45 psig (310 kPa). See the dotted line on the lower half of the flow chart.
4. At the intersection of the lower horizontal line and the pressure drop of 7 psig (48 kPa), draw a vertical line upward from this point to the flow line – the circle on the flow chart marks this intersection.
5. This intersection falls between the curves for 3/4 in. and 1 in. valves. The installer needs a 1 in. valve.

Flow chart

Figure 3: R-22 refrigerant flow cart



Selection chart

Table 1: V48 product number selection

Valve size, NPT	Product number	Pressure connections
1/2 in.	V48AB-2	30 in. (762 mm) capillary with 1/4 in. flare nut
3/4 in.	V48AC-2	
1 in.	V48AD-2	
1 1/4 in.	V48AE-2	
1 1/2 in.	V48AF-2	1/4 in. SAE male flare

Ordering information

To order V48 valves, specify the product number. For information on selecting the valve size, see [Selecting a valve size](#). For the product number, see [Selection chart](#).

Repairs and replacement

Do not make field repairs except for replacement of the sensing element, internal parts, and the rubber diaphragms. For a replacement valve or a complete renewal seat kit, contact the nearest Johnson Controls® wholesaler. For replacement part kit numbers, see [Replacement parts](#).

Replacement parts

In the following table, if a replacement power element includes SEP91A and SEC37A, the SEP91A element features a 1/4 in. male SAE connector and the SEC37A capillary kit features two flare nuts. Use parts only on the specified valves.

Renewal part kits include all the internal parts and diaphragms that you require to recondition valves.

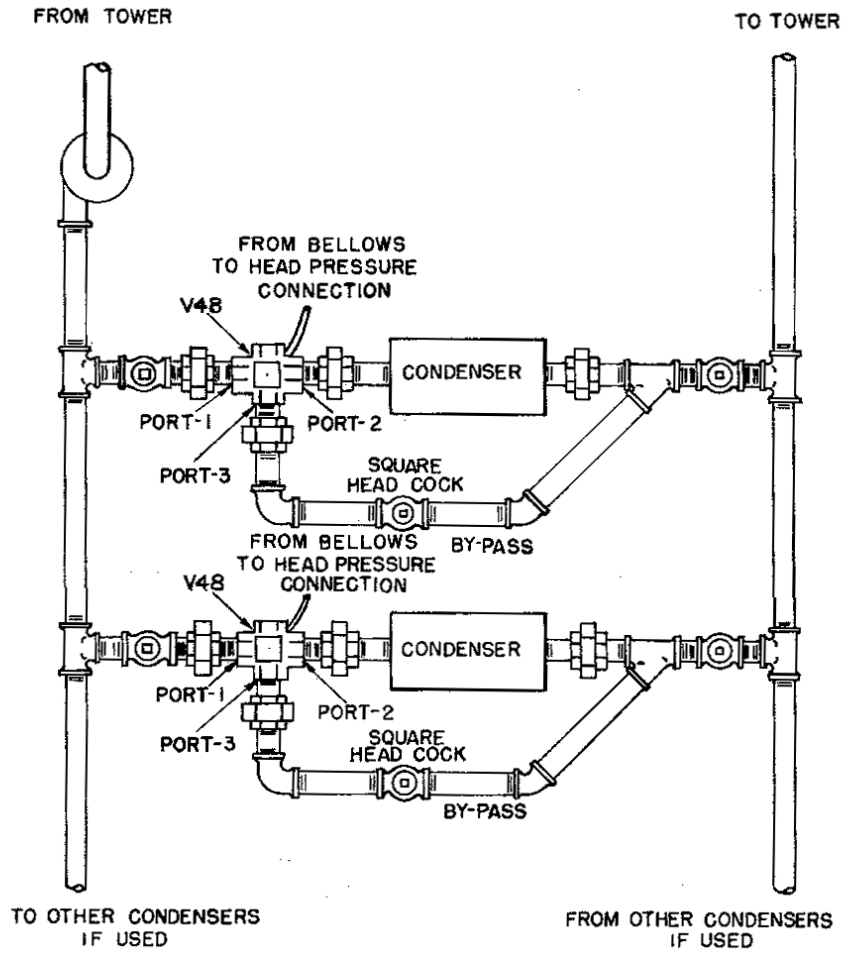
Table 2: Replacement parts

Product code	Replacement power element	Renewal parts kit
V48AB-2	SEP91A-602R and SEC37A-602R	STT15A-605R
V48AC-2	SEP91A-601R and SEC37A-602R	STT16A-604R
V48AD-2	SEP91A-603R and SEC37A-600R	STT17A-616R
V48AE-2		STT17A-617R
V48AF-2	SEP81A-601R	STT17A-604R

Installing the V48 valve

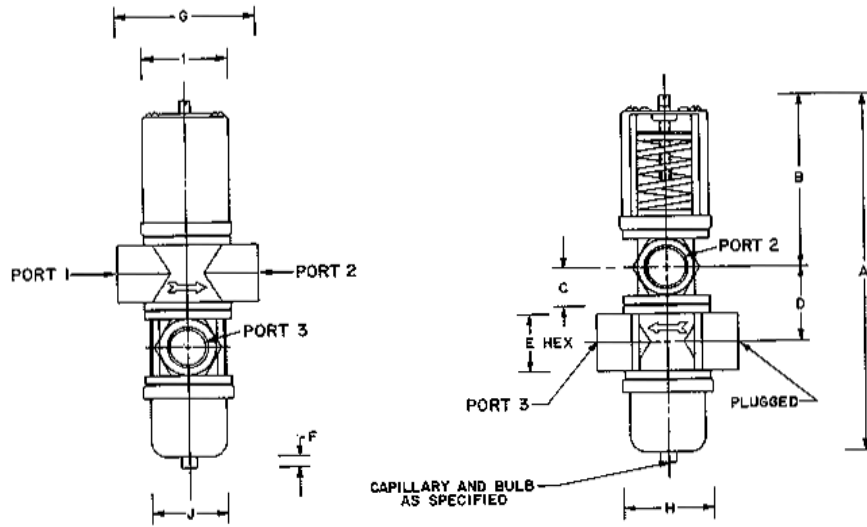
- Use Figure 4 to install the three-way water valve. Port 1 is for the connection from the tower. Port 2 is for the connection to the condenser inlet. Port 3 is the bypass connection.
- Operate the tower pump and ensure that the compressors are shut down. Maintain this state for the rest of the steps.
- Manually flush each valve by lifting the range spring follower with screwdrivers at two sides of the lower spring cap. This does not affect valve adjustment.
- Make the following adjustments:
 - If the valve is in a single condenser system, adjust the square head cock in the bypass with the compressor shut down and the tower pump in operation. Adjust the cock so that the amount of water through the bypass is just sufficient to provide the minimum required nozzle pressure.
 - If the valve is in a multiple condenser system, adjust the square head cocks in the bypasses evenly with the compressors shut down and the tower pump in operation. Adjust the cocks so that the total flow through all the bypasses is just sufficient to provide the minimum required nozzle pressure.
- The R-22 valves are factory-set to start flow to the condenser at 165 psig (1138 kPa) and be fully open at 215 psig (1482 kPa). To increase or decrease the opening point, turn the adjustment screw counter-clockwise or clockwise. Any increase or decrease in the opening point results in a similar increase or decrease in the pressure at which the valve is fully open to the condenser.

Figure 4: Required piping arrangement



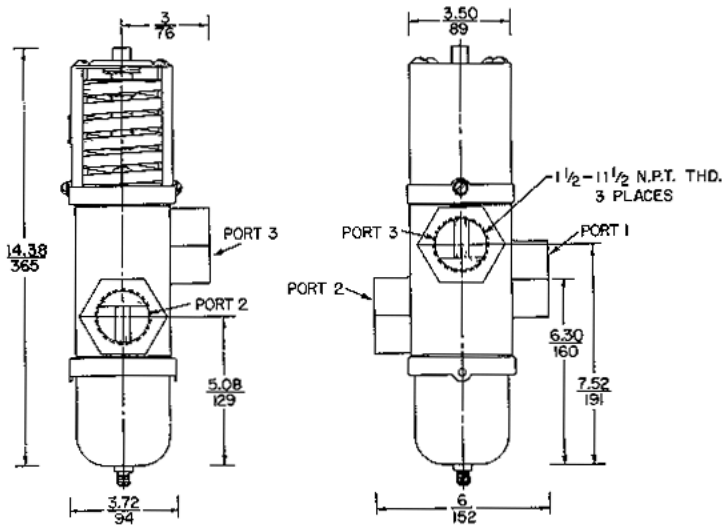
Dimensions

Figure 5: Dimensions of the 1/2 in. to 1 1/4 in. valves



Dimension, in. (mm)	A	B	C	D	E	F	G	H	I	J	
Valve size	1/2 in.	7.88 (200)	3.75 (95)	0.77 (20)	1.53 (39)	1.13 (29)	0.28 (7)	3.13 (80)	2.16 (55)	1.84 (47)	1.75 (44)
	3/4 in.	8.56 (217)	4.16 (106)	0.89 (23)	1.78 (45)	1.38 (35)	0.28 (7)	3.38 (86)	2.16 (55)	2.03 (52)	1.91 (49)
	1 in.	11.91 (303)	5.94 (151)	1.02 (26)	2.03 (52)	2.00 (51)	0.28 (7)	4.84 (123)	2.78 (71)	2.63 (67)	2.31 (59)
	1 1/4 in.	12.66 (322)	6.13 (156)	1.20 (30)	1.41 (36)	2.38 (60)	0.28 (7)	4.88 (124)	2.78 (71)	2.63 (67)	2.31 (59)

Figure 6: Dimensions of the 1 1/2 in. three-way valve



Factory settings

The opening pressure from Port 1 to Port 2, to the condenser, is 165 psig (1138 kPa).

The closing pressure from Port 1 to Port 3, to the bypass, is 215 psig (1482 kPa).

See Figure 2 and for port arrangements.

Technical specifications

Table 3: V48 technical specifications

Specification		Description
Type number	V48AB	1/2 in. NPT
	V48AC	3/4 in. NPT
	V48AD	1 in. NPT
	V48AE	1 1/4 in. NPT
	V48AF	1 1/2 in. NPT
Range The range is the opening point of the normally closed side.	R-22	145 psig to 190 psig (1000 kPa to 1310 kPa)
Maximum permissible pressure	R-22	320 psig (2206 kPa)
Water supply pressure		150 psig (1034 kPa) maximum
Water supply temperature		170°F (77°C) maximum
Material	Body	1/2 in. and 3/4 in. sizes: Cast brass 1 in. and 1 1/4 in. sizes: Cast iron with corrosion resistant finish 1 1/2 in. sizes: One piece cast iron body with corrosion resistant finish
	Disc holder, seat, extension sleeve	Aluminum bronze
Factory settings		See Factory settings .
Sensing element		Brass bellow in brass cup
Set point adjustment		Square adjustment shaft. Use a standard refrigeration service valve wrench.
Packaging		Individual pack

Table 4: Shipping weights

Size	Individually packed, lb (kg)	Overpack of 10 units per carton, lb (kg)
1/2 in.	5 (2.3)	52 (23.6)
3/4 in.	6 1/2 (2.9)	67 (30.4)
1 in.	12 (5.4)	—
1 1/4 in.	16 (7.3)	—
1 1/2 in.	25 (11.3)	—

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Contact information

Contact your local branch office:

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