Series V48

3-Way Pressure Actuated Modulating Valves

Product Bulletin

These Water Valves are especially designed for condensing units cooled either by atmospheric or forced draft cooling towers. They may be used on single, or multiple condenser hook-ups to the tower.

The Type V48 Valve senses the compressor head pressure and allows cooling water to flow to the condenser, to by-pass the condenser, or to allow waterflow to both condenser and by-pass line in order to maintain correct refrigerant head pressure.

A further advantage of this system is that the 3-way valve permits a continuous water flow to the tower so the tower can operate efficiently with a minimum of maintenance on nozzles and wetting surfaces.

The valves can be used in non-corrosive refrigerant systems. Ammonia power elements and valves designed for saltwater applications are available.

The valves have a quick opening characteristic.

Features

- **Pressure balanced design**
  The valve setpoint and performance are independent of liquid inlet pressure. Valve can withstand severe hydraulic shock-waves without damage.
- **Free movement of all parts**
  Provides smooth pressure modulation.
- **Easy manual flushing**
  Does not affect valve adjustment.
- **High Kv values**
  Small dimensions with very high capacity
- **Pressure actuated**
  Direct and fast response to pressure variations
- **Can be used as mixing or diverting valve**
  Reduces stock. One type for different applications.

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Note: All Series V48 Water Regulating Valves are designed for use only as operating devices. Where system closure, improper flow or loss of pressure due to valve failure can result in personal injury and/or loss of property, the user must add a separate safety device.

Description

A pressure-balanced design employing rubber sealing diaphragms correctly proportioned to the valve port area, balances valve against both gradual and sudden water pressure changes, and seals water away from range spring, guides, and sliding parts so these are not submerged in water where they would be subject to sedimentation and corrosion.

Adjustments

The pressure at which the valve starts to open (= opening point port 1 to port 2) can be adjusted by the adjusting screw located at the top of the range spring housing. Valves may be adjusted with standard service valve wrenches or screwdrivers.
(Valves are not factory set at a certain value.)

Manual Flushing

Valves may be manually flushed by lifting the lower spring guide with screwdrivers at two sides of the pressure plate to open valve. This does not affect valve adjustment.

Installation

At a certain (adjustable) pressure, port 1 to port 2 starts to open, while port 1 to port 3 starts to close. This so called “opening point” is adjustable with the screw on the top of the spring housing and results in an equal amount change in both condenser and by-pass settings.

Valve Size Selection

The valve size is determined by three data:

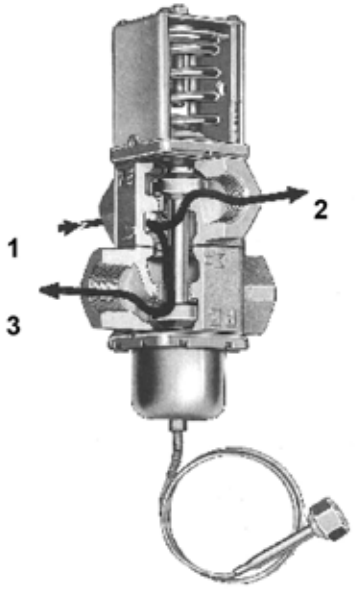
- The required maximum flow (quantity of liquid = Q) that must pass the valve (in m^3/h).
- The maximum allowed pressure drop (= Δ P) across the valve (in bar).
- The head pressure rise (= HPR) which is the difference between the pressure where the valve starts to open and the condenser operating pressure.

Note: At a certain pressure the valve starts to open. If the pressure decreases, the valve will close again at a ≈ 0,5 bar lower pressure than the pressure where the valve starts to open.

The valve size can be selected by the use of:

- The diagram *(see Page 4 and 5)*.
- Kv factors and calculation formulae *(see Page 3)*. This can only be used when the allowed head pressure rise is ≥ 2 bar for 1.5/7.5 bar range valves and ≥ 3 bar for 4/16, 4/20 and 6/20 bar range valves. At lower head pressure rises the diagram has to be used.

Cut-away Section



1. From Cooling System
2. To condenser
3. By-pass

Figure 1

Valve Size Selection by the use of the Diagrams (Pages 4 and 5)

Q The quantity of water (m^3/h) is indicated on the left side of the upper diagram *(= Scale A)*.

Δ P The curves for the pressure drop across the valve are indicated in the lower diagram (0,25 up to 1 bar, *see Scale C*).

HPR The head pressure rise above the valve opening point is indicated in the lower part of the diagrams on pages 4 and 5 *(see Scale B)*.

Note: On *Page 4* there are two vertical head pressure rise scales. The left side for low range (1.5/7.5 bar) valves and the right side for high range (4/16 bar) valves. On *Page 5* for range 4/20 and 6/20 bar valves.

Valve Size

The valve size can be read from the right side of the diagram on Page 4.

Valve Size Selection Example *(see Page 4)*

Q	6,5 m^3/h
HPR	2,7 bar
ΔP	0,5 bar
Refrigerant	R22
Valve Range	4/16 bar

a. Draw a horizontal line through the 5.1 m^3/h point of scale A *(see A)*.

b. Draw a horizontal line through the 3.2 bar of Scale B *(see B)*. The intersection of this horizontal line with the delta P curve of 0.5 bar is used to draw a vertical line from this intersection point up to the horizontal line in Scale A *(see C)*.

c. The intersection point of this vertical line with the horizontal line in Scale A indicates the valve size. If the point falls on a size curve, this is the valve size needed. If it is between two sizes always take the largest valve size. In this example it is between size 3/4" and 1". The selected valve is 1".

Of course the same diagram can be used to read the pressure drop across a valve or to find the maximum capacity of a valve.

E.g. Pressure drop.

Q needed is 6 m^3/h.
HPR is 2,5 bar.
The valve size available is 1".
What will be the pressure drop?

Solution:

a. Draw a horizontal line through 6 m^3/h *(Scale A)* and determine the intersection of this line with the 1" valve curve.

b. Draw a vertical line from this intersection point to the 2.5 bar HPR line.

c. The found part is between the 0.5 and 0.75 bar pressure drop curves. Interpolate the point which gives 0.7 bar.

If this is acceptable the valve can be used.

E.g. Maximum flow.

Valve size is 1"
HPR = 3 bar
Maximum Δ P = 2 bar
What is maximum Q?

Solution:

a. Draw a horizontal line at 3 bar HPR *(Scale B)* till intersection with 0.25 bar delta P curve.

b. Draw a vertical line from this intersection point to the 1" valve curve.

c. Draw from this point a horizontal line to the water flow *Scale A*.
You find 4.0 m^3/h

Valve Size Selection by the use of the K_V Factors and Calculation Formulae

For Water:

The following K_V values can be used:

$$K_v = \frac{Q}{\sqrt{\Delta p}}$$

$$\Delta P = \left(\frac{Q}{K_v}\right)^2$$

$$Q = K_v \cdot \sqrt{\Delta p}$$

Valve Size	K_V Value
1/2"	2.3
3/4"	4.7
1"	8.0
1¼"	10.2
1½"	16.5

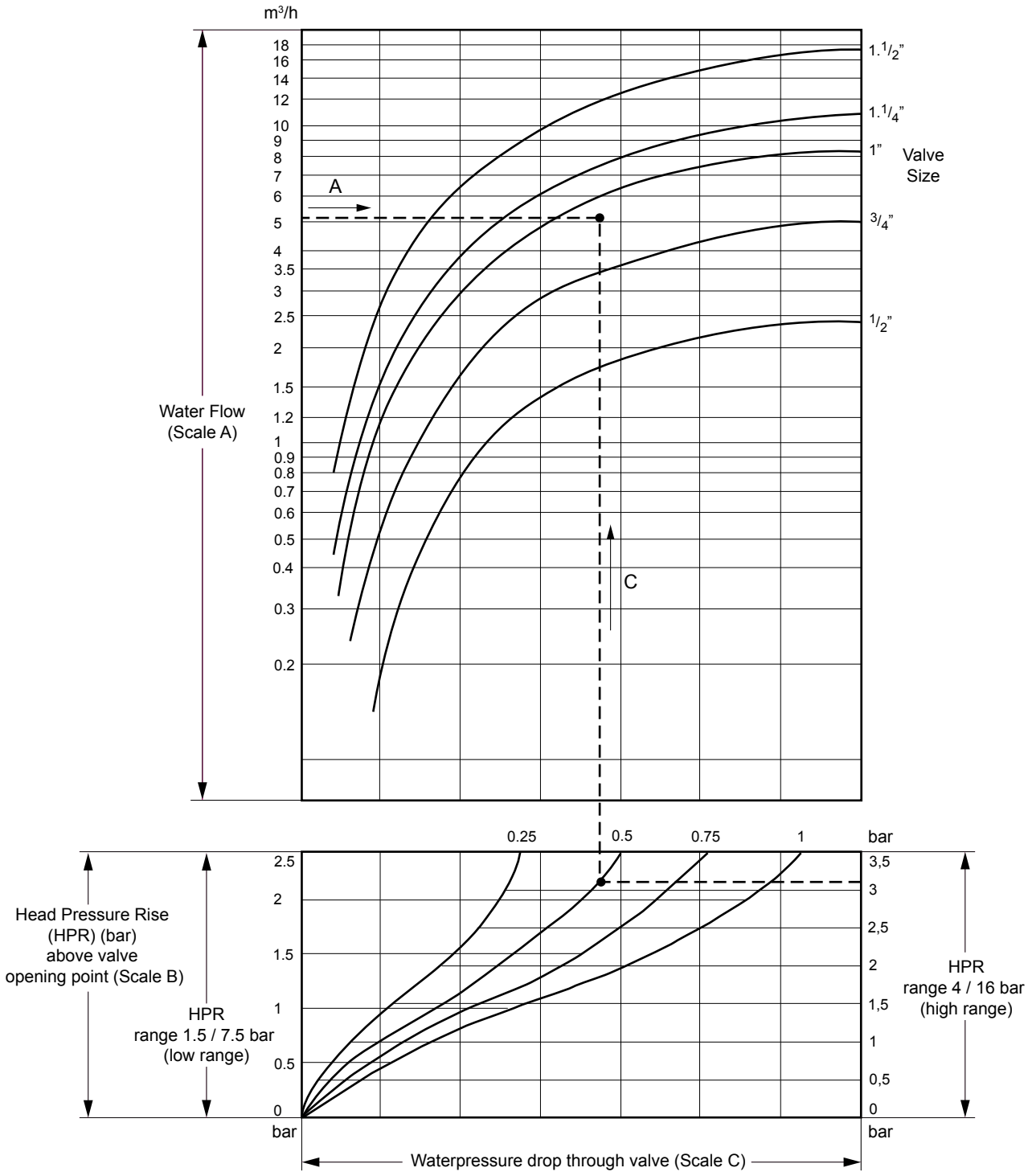
Q Quantity of liquid (in m^3/h)

ΔP Pressure drop across valve (in bar)

K_V Valve flow coefficient

The K_V factor is the quantity of 20°C water that will pass through the valve at one bar pressure drop (port 1 to port 2) and a valve opening which belongs by 2.2 bar (for low range valves) or 3 bar (for high range valves) head pressure rise (HPR) above the valve opening point.

Diagram for Selecting the Valve Size Corresponding *(with Information on Page 2 and 3)*



Note:

1 dm^3/s = 3.6 m^3/h = 15.8 U.S. gal./min. = 13.2 U.K. gal./min.
1 bar = 100 kPa = 0.1 MPa ≈ 1.02 kp/cm^2 = 1.02 at ≈ 14.5 psi.

Figure 2a

Diagram for Selecting the Valve Size Corresponding *(with Information on Page 2 and 3)*

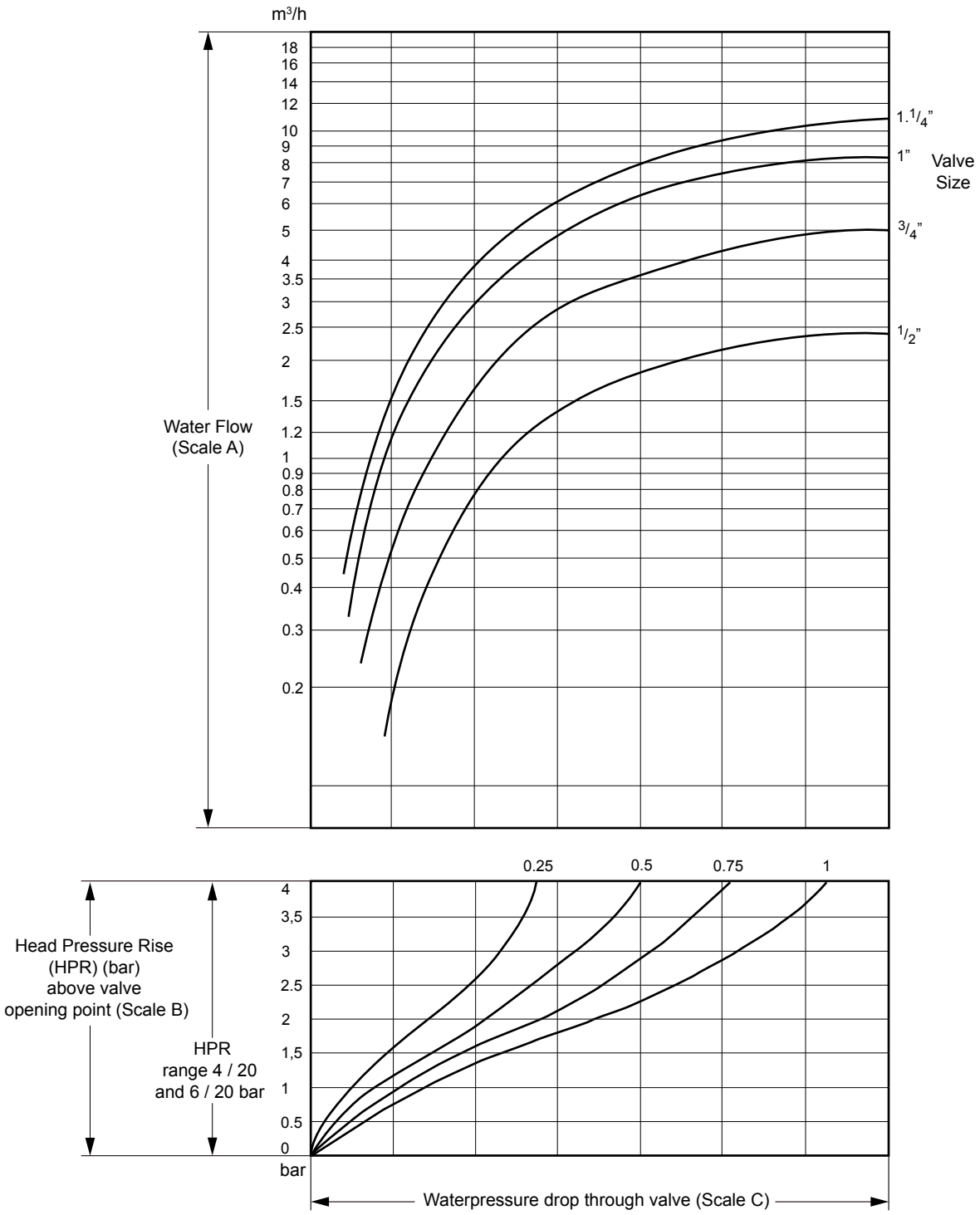


Figure 2b

Ammonia (NH_3) Applications

For all larger valve types an ammonia element is available. These elements have Style 15 pressure connection and consist of a stainless steel bellow in a steel cup (coated). The existing element can be replaced by this ammonia element. The pressure range does not change.

For the high range valves the spring inside the power element has to be placed in the ammonia element. If low-pressure range is needed this spring can be removed. For low quantities you have to order the selected valve and separate ammonia replacement power element (*see "Valve Type Selection Table"*).

For quantity orders a special valve type can be set up. Then please contact the JC sales office in your region.

Repair and Replacement

Diaphragm kits can be ordered for all valves. Also the complete power element can be replaced. For a total revision of the valve a renewal kit can be ordered. For type numbers of replacement power elements, renewal kits and diaphragm kits see valve selection table.

If a replacement is ordered a “repair parts and service instruction” sheet will be included in which a step by step description is given to disassemble/assemble the valve.

Renewal KITs

Note: Each KIT contains parts as indicated in the table below.
The complete KIT must be ordered that contains part required.

Valve Type	KIT Number	Disc Cup	Valve Disc	Valve Spacer	Seat Guide	Disc Stud	Valve Stem	Valve Seat	Diaphragms	Gasket Guide Plate	Valve seat Wrench	Screw	Seal Ring	O-ring	Lock-washer
V48AB	**STT15A-605R**	2	2	-	1	2	1	2	4	1	1	-	1	1	-
V48AC	**STT16A-604R**	2	2	-	1	2	1	2	4	1	1	-	1	1	-
V48AD	**STT17A-616R**	2	2	-	1	2	1	2	5	1	1	-	1	1	-
V48AE	**STT17A-617R**	2	2	-	1	2	1	2	5	1	1	-	1	1	-
V48AF	**STT17A-604R**	-	1	2	-	-	-	2	6	1	-	1	1	2	1
V48BC	**STT16A-605R**	2	2	-	1	2	1	2	4	1	1	-	1	1	-

Type Number Selection Table and Replacement Parts

Commercial Types

Item	Size *(inch)*	Range bar	Refriger. Connection	Capillary Length	Connection Thread	Weight Single Pack *(kg)*	Quantity per Box	Weight per Box *(kg)*
V48AB-9510	1/2	4 / 20	Style 50	0.75	ISO 228 - G½	2.3	1	2.3
V48AB-9600	1/2	4 / 16	Style 13	0.75	ISO 228 - G½	2.3	1	2.3
V48AC-9510	3/4	4 / 20	Style 50	0.75	ISO 228 – G¾	3.0	1	3.0
V48AC-9600	3/4	4 / 16	Style 13	0.75	ISO 228 – G¾	3.0	1	3.0
V48AD-9510	1	6 / 20	Style 50	0.75	ISO 7 – Rc1	5.5	1	5.5
V48AD-9600	1	4 / 16	Style 13	0.75	ISO 7 – Rc1	5.5	1	5.5
V48AD-9602	1	4 / 16	Style 13	0.75	ISO 7 – Rc1	5.5	1	5.5
V48AE-9510	1¼	6 / 20	Style 50	0.75	ISO 7 – Rc1¼	7.5	1	7.5
V48AE-9600	1¼	4 / 16	Style 13	0.75	ISO 7 – Rc1¼	7.5	1	7.5
V48AF-9300	1½	6 / 14	Style 5	-	ISO 7 – Rc1½	11.5	1	11.5

Item	Replacements			Ammonia Element Type
	Power Element	Renewal Kit	Diaphragm Kit	
V48AB-9510	Not available	STT15A-605R	DPM15A-605R	Not available
V48AB-9600	246-824R	STT15A-605R	DPM15A-605R	Not available
V48AC-9510	Not available	STT16A-604R	DPM16A-604R	Not available
V48AC-9600	246-825R	STT16A-604R	DPM16A-604R	Not available
V48AD-9510	Not available	STT17A-616R	DPM17A-616R	246-667R
V48AD-9600	246-925R	STT17A-616R	DPM17A-616R	246-667R
V48AD-9602	246-925R	STT17A-616R	DPM17A-616R	246-667R
V48AE-9510	Not available	STT17A-617R	DPM17A-609R	246-667R
V48AE-9600	246-925R	STT17A-617R	DPM17A-609R	246-667R
V48AF-9300	246-758R	STT17A-604R	DPM17A-604R	246-781R

Sea-Water Types

Item	Size *(inch)*	Range bar	Refriger. Connection	Capillary Length	Connection Thread	Weight Single Pack *(kg)*	Quantity per Box	Weight per box *(kg)*
V48BC-9600	3/4	4 / 16	13	0.75	ISO 228 – G3/4	3.0	1	3.0

Item	Replacements			Ammonia Element Type
	Power Element	Renewal Kit	Diaphragm Kit	
V48BC-9600	246-825R	STT16A-605R	DPM16A-604R	Not available

Pressure Connections

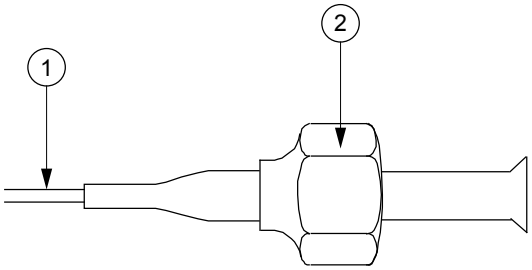


Figure 3
Style 13
(Excl. Valve Depressor)

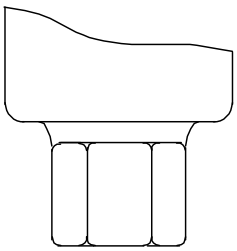


Figure 5
Style 15
1/4-18NPT (Female)

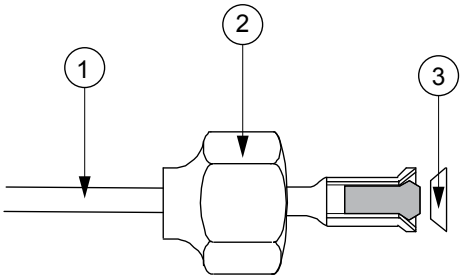


Figure 4
Style 50
(Incl. Valve Depressor Mounted into Machined Flare)

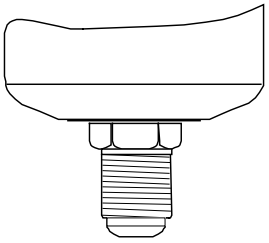


Figure 6
Style 5
7/16-20 UNF

1. 75 cm Capillary
2. 7/16 - 20 UNF Flare Nut
3. Copper Sealring

Dimensions *(in mm)*

For Valve Type see Technical Specifications on Page 11

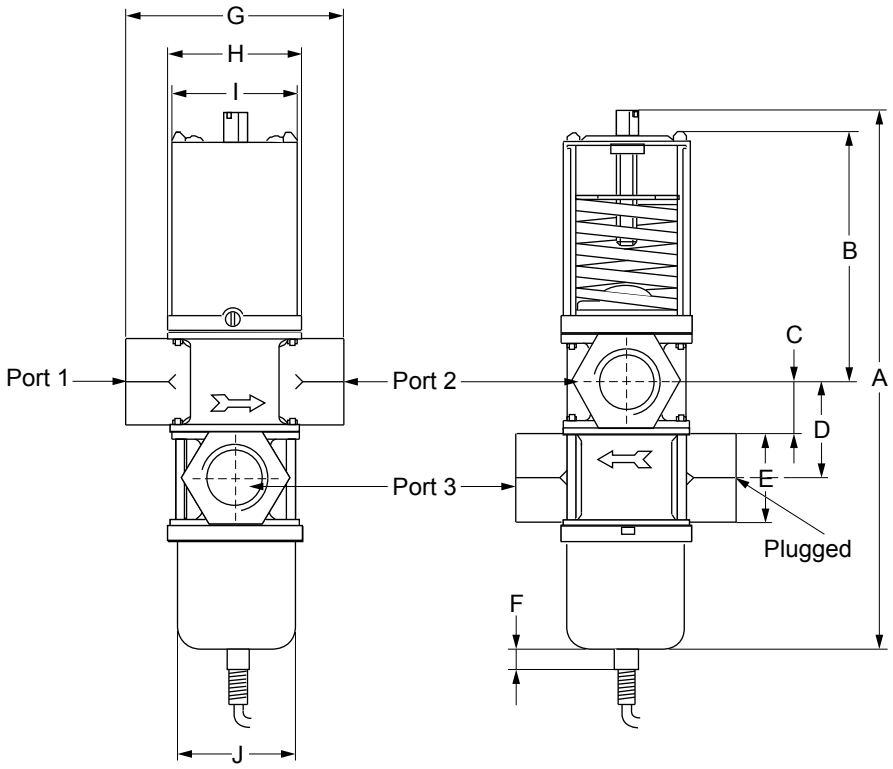


Figure 7

Size 1/2" - 1¼"

Commercial Types

Valve Type	Valve Size	Dimensions in mm									
		A	B	C	D	E	F	G	H	I	J
V48AB	1/2"	201	86	24	38	29	8	81	51	47	45
V48AC	3/4"	218	96	27	45	35	8	86	55	52	48
V48AD	1"	296	138	29	51	48	8	124	71	67	59
V48AE	1¼"	315	144	32	60	57	8	126	71	67	59

Sea-Water Types

Valve Type	Valve Size	Dimensions in mm									
		A	B	C	D	E	F	G	H	I	J
V48BC	3/4"	218	96	27	45	35	8	86	55	52	48

Dimensions *(in mm)*

For Valve Type see Technical Specifications on Page 11

V48AF

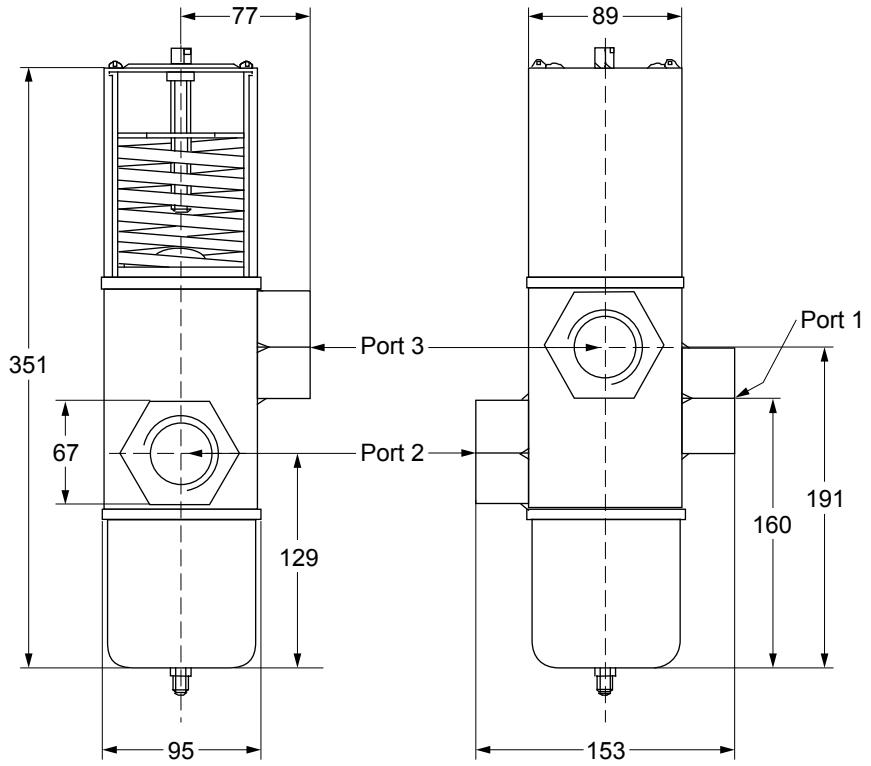


Figure 8

Size 1½"

Technical Specification

	Commercial			Sea-Water
Size	1/2" - 3/4"	1" - 1 1/4"	1 1/2"	3/4"
Operating Range *(Bar)*	4 - 16	4 - 16	6 - 14	4 - 16
	4 - 20	6 - 20		
Max. Refrigeration Overrun Pressure *(Bar)*	28			
Max. Water Supply Press. *(Bar)*	10			
Max. Water Supply Temperature	90 °C			
Min. Water Supply Temperature*	-20 °C			
Valve Hysteresis *(Bar)*	~ 0,5			
Pipe Connection**				
Thread ISO 228:	•	-	-	•
Thread ISO 7 - Rc:	-	•	•	-
Material				
Body:	Brass	Cast Iron***		Bronze
Disc Stud / Disc Cup:	Brass			Monel
Seat:	Alum. Bronze			Monel
Diaphragms:	BUNA-N			
Bellows:	Ph. Bronze		Monel	Ph. Bronze
Stem / Spacers:	Brass			Monel
Disc:	BUNA-N		Alum. Bronze	BUNA-N
Pressure Connection Style	*See "Type Number Selection Table"*			
Capillary Length	*See "Type Number Selection Table"*			
Ammonia Element Style 15 Press. Connection	Stainless Steel Bellows in Steel Cup			
Shipping Weights	*See "Type Number Selection Table"*			

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Note

* Care should be taken the valve does not freeze up.
** Thread ISO 7 - Rc = DIN2999-RC thread/ISO 228 = DIN259-Rp thread
*** Cast iron bodies are executed with rust resisting finish

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