VC series BALANCED HYDRONIC VALVES 2-WAY AND 3-WAY

PRODUCT HANDBOOK



APPLICATION

The VC series balanced hydronic valves allow greater control of hot and/or cold water flow. The VC series balanced hydronic valves are designed for

both domestic boiler heating and domestic cooling applications.

	Contents
General	page
Description	2
Series overview	3
Technical	
Construction and operation	4
Specifications	6
Dimensions	8
Valve selection chart	9
Installation and operation	
Installation data	10
Adjustment and service data	12
Various	
Quality assurance statement	13
Approvals and standards	14
Ordering information	15
Standard product examples	16
Fitting for 1/2" and 15 mm valves	17
Fitting for 3/4" and 22 mm valves	19
Fitting for 1" and 28 mm valves	20

Accessories

21

DESCRIPTION

The VC series 2-position hydronic valves are used in domestic and small commercial applications to control the flow of hot and/or cold water. They consist of an actuator, valve and a cartridge assembly.

2-way valves are designed for ON-OFF "zone" control of domestic systems.

3-way valves can be piped for either diverting or mixing valve applications in domestic central heating and/or cooling systems. Both versions can be used to control individual fan coil, baseboard radiator or convector applications.

Depending on the model selected they can be controlled by a

low or line voltage SPST \longrightarrow or SPDT \longrightarrow controller, such as a room thermostat, aquastat or flow switch.

The VC series hydronic valves are designed to take avantage of sinusoidal valve actuator travel and therefore operate silently and without water hammer. Through internal logic the actuator only takes power while driving the valve to the commanded position.

The actuator head is removable without affecting the integrity of the water system. All actuator versions are interchangeable with any valve body, offering the highest flexibility for boiler production line assembly and maintenance.

The valve piston construction allows for port sealing that is independent of the differential pressure across the valve.

Flow through the 2-way valve can be in either direction, so the ports are not designated.

3-way valves are suitable for both diverting water from AB to A or to B and from A or B to AB.

FEATURES

- 2-way or 3-way body
- Wide variety of pipe connections including: ISO 7-1 (BSP. PI) BSP.T NPT
 - Sweat Compression Flare
- Control by a low or line voltage SPST or SPDT control
- 24 Vac, 100 ... 130 Vac or 200 ... 240 Vac actuators available
- SPDT auxiliary switch available
- · Quick connect electrical connections or 1000 mm leads
- Minimal actuator power consumption
- Double insulated actuator
- Pressure differential up to 4 bar
- 1 ... 95 °C fluid temperature
- 0 ... 65 °C ambient temperature
- · Quick and easy replacement of moving parts
- Actuator head installation does not require draining of the system.

CONSTRUCTION AND OPERATION

All moving and sealing parts of the valve are constructed in the cartridge assembly.

The ports are sealed with "O"-rings on the outer surface of the piston.

When the valve stem is driven down to open port A the water will flow through the hollow piston to the other port.

In case of a 3-way valve with the piston driven down port B is sealed, allowing flow between port AB and port A. With the stem up the flow is between port AB and port B.

The VC series hydronic valves offer a variety of versions of pipe connections to suit the different applications.

The valve pressure loss characteristic is dependent on the pipe connection/dimensions

For the actual valve rating please refer to the specification section.



Fig. 1.



Fig. 2.

2-way valve

2-way valve with an SPDT (3-wire) actuator

On a call for heat, the NO controller contacts close and the valve opens. When the valve is fully open, the cam closes switch SW_1 and opens switch SW_2 .

When the need for heat is satisfied the NC controller contacts close, energizing the valve through SW_1 and closing the valve.

When the valve is fully closed the cam closes SW_2 and opens SW_1 . The valve is ready for the next call for heat.

2-way valve with an SPST (2-wire and common) actuator

On a call for heat, the controller contacts close, $\rm RLY_1$ is energized making the NO contacts in switch $\rm SW_3$ causing the valve to open.

When the valve reaches the fully open position the cam closes switch SW_1 and opens the switch SW_2 . When the need for heat is satified, the controller contacts open, RLY1 is de-energized and the valve motor driven through SW_1 and the NC contacts of SW_3 .

When the valve reaches fully closed position, the cam closes SW_2 and opens SW_1 . The valve is ready for the next call for heat.

For both types of actuator a power failure will leave the valve at the position it was interrupted.

When power is restored, the valve will respond to controller demand.

3-way diverter valve

3-way diverter valve with an SPDT (3-wire) actuator

On a call for heat, the NO controller contacts close, the valve closes port B and opens port A.

When port A is in the fully open position, the cam closes limit switch SW_1 and opens limit switch SW_2 .

When the need for heat is satisfied the NC controller contacts close, energizing the valve through SW_1 causing port A to close.

When port A is fully closed the cam closes SW_2 and opens SW_1 . The valve is ready for the next call for heat.

3-way diverter valve with an SPST (2-wire and common) actuator

On a call for heat, the controller contacts close, RLY_1 is energized making the NO contacts in switch $SW_{3,}$ causing port B to close and port A to open.

When port A reaches the fully open position the cam closes switch SW_1 and opens the switch SW_2 .

When the need for heat is satified, the controller contacts open. RLY_1 is de-energized making the NC contacts in SW_3 and port A is driven closed through SW1 and the NC contacts of SW_3 .

When port A is in the fully closed position, the cam closes SW_2 and opens SW_1 . The valve is ready for the next call for heat.

For both types of actuator a power failure will leave the valve at the position it was when interrupted.

When power is restored, the valve will respond to controller demand.

Wiring

Fig. 3. and 4. show wiring connections for SPDT and SPST controllers on either 2-way valves or 3-way valves. Port A "open" and "closed" denotes valve open and closed for 2-way, and AB-B open and AB-B open for 3-way valves

respectively.

On a 2-way valve:

Port A open denotes valve open On a 3-way valve:

Port A open denotes flow through AB-A

Port A closed denotes flow through AB-B

For mixed low/line voltage, the cable assembly version recommended.



Fig. 3. Logic sequence diagram with 3 wire actuator for SPDT controller



Fig. 4. Logic sequence diagram with 2 wire + common actuator for SPST controller

SPECIFICATIONS

Voltage	Colour-coded label
24 V, 50/60 Hz	Blue
100 130 V, 50/60 Hz	Black
200 240 V, 50/60 Hz	Red

Power consumption

6 Watt maximum at nominal voltages (during valve position change only)

6 VA for transformer and wiring Maximum power time: 15%

End switch rating

2.2 A inductive from 5 ... 120 Vac 1.0 A inductive above 120 ... 277 Vac Minimum dc switching capbility: 0.05A 24 Vdc

Nominal timing

Valve opens in 6 seconds @ 60 Hz (20% longer @ 50 Hz)

Electrical termination

- MolexTM (header# 39-30-1060) Requires mating connector receptacle/housing
- Requires mating connector receptacle/housing # 39-01-2060 Contacts: Mini-Fit 5556 series
- With integral 1000 mm (39") leadwire cable

Pipe fitting sizes

See table 1.



Fig. 5. 3-way valve diverting flow characteristic at constant pressure on port AB

Table 1. Pipe fitting sizes

Pipe fitting sizes	3/8"	1/2"	3/4"	1"	15 mm	22 mm	28 mm	Note: N - not threaded
Flare	E	E	-	-	-	-	-	E - externally threaded
Inverted flare	-	I	-	-	-	-	-	,
Sweat	-	N	N	N	-	-	-	
BSPP	-	I	E, I	E, I	-	-	-	
BSPT	-	I	I	-	-	-	-	
NPT	-	-	I	I	-	-	-	
Compression fitting	-	-	-	-	I	E	E	

Terminal	Action	Wire colour
1	Com*	Orange
2	Neutral	Blue
3	Closed**	Brown
4	NO*	Grey
5	NC*	White
6	Open**	Black

 Terminals 1, 4 and 5 are only connected if an auxiliary switch is used. NO, NC refers to port A closed position

** Refers to port A (closed or open)

NOTE: For mixed voltages (low/line voltage) the cable assembly version is recommended



Molex [™] version



Lead wire cable



Actuator type	Connections		2-way valve	3-way valve
	Cable model	Molex TM model	movement	movement
3-wire (for SPDT controller)	Blue & brown energized Black de-energized	Pin #2 & 3 energized Pin #6 de -energized	Closes	A port closes
	Blue & black energized Brown de-energized	Pin #2 & 6 energized Pin #3 de -energized	Opens	B port closes
2-wire + common (for SPST controller)	Blue & brown energized Brown and black open	Pin #2 & 3 energized Pin #3 and 6 open	Closes	A port closes
	Blue & brown energized Brown and black closed	Pin #2 & 3 energized Pin #3 and 6 closed	Opens	B port closes

Table 2. Wiring connections and valve movements

Ambient temperature

0 ... 65 °C

Fluid temperature

1 ... 95 °C (120 °C short duration peak)

Shipping storage temperature

-40 ... 65 °C

Pressure rating

Static: 20 bar Burst: 100 bar

Maximum operating pressure differential 4 bar

Flow rating

Dependent upon body configuration (see fig. 5., 7. and 8.)

Flow rate **Q** m³/h to be calculated as:

 $Q = Kv \times \sqrt{\Delta} p(bar)$

Pressure loss Δp (bar) to be calculated as:

$$\Delta p = \left(\frac{Q}{Kv}\right)^2$$

Flow

2-way

Flow can be in either direction Valve is closed without the actuator mounted

3-way

Flow can be diverting (AB to A or B) or mixing (A or B to AB). Port A is closed without the actuator mounted

Valve material

Body: bronze Cartridge: RytonTM (polyphenylene sulphide) NoryITM (polyphenylene oxide) "O"-ring seals: EPDM rubber Stem: stainless steel Actuator cover: NoryITM (94V-0) Actuator base: RytonTM (94V-0)







Fig. 8. Valve pressure loss characteristic for 3-way valves

DIMENSIONS (NOMINAL)

Pipe fitting	2-way valve)		3-way valve		
	Dim. C mm	Dim. D mm	Nom. flow rating - Kv	Dim. C mm	Dim. E mm	Nom. flow rating - Kv
¹ / ₂ " Sweat	98	111	3.0	98	136	3.6
$^{1}/_{2}$ " BSPT (internal thread)	98	111	3.0	98	136	3.4
³ / ₈ " flare (no adapter)	98	111	2.1	98	136	2,6
¹ / ₂ " flare (no adapter)	98	111	2.9	98	136	3.4
¹ / ₂ " inverted flare (no adapter)	98	111	3.1	98	136	3.6
1/2" BSPP/15 mm (internal thread)	98	111	3.0	98	136	3.4
22 mm compression fitting*	112	113	5.3	112	140	7.1
³ / ₄ " BSPP (external thread)	94	113	5.3	94	130	6.9
³ / ₄ " BSPP (internal thread)	94	113	5.3	94	130	7.0
³ / ₄ " BSPT (internal thread)	94	113	5.3	94	130	7.0
³ / ₄ " NPT (internal thread)	94	113	5.4	94	130	7.4
³ / ₄ " Sweat	94	113	5.0	94	132	6.4
28 mm compression fitting*	116	113	6.0	116	147	7.7
1" BSPP (internal thread)	94	113	6.0	94	136	7.7
1" BSPP (external thread)	94	113	6.0	94	136	7.7
1" NPT (internal thread)	94	113	6.0	94	136	7.7
1" Sweat	94	113	6.0	94	136	7.7

* Includes compression nuts and olives









Fig. 9. Valve dimensions

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ÅΒ

С

В

"A" ACTUATORS		"B" BODY	•	'C" CARTRIDGE	CUSTOMER	PACKAGING
Description Nominal timing @ 50 Hz: 7 seconds	signation	Description	ation	(v Designation)	SPECIAL	Description Designation
		2-way valves		-way valves	00	
24 V (50 60 Hz)		L-way varyes	•		Standard	Unit pack
3 wire for SPDT stat.			₹ 0	3.0 2.0	Designation	(10 per overpack)
- with MalexTM connector	2010	1/2 BSP1 (Internal thread) At	ם מ	3.2 10		Egg crate (20) E
- with 1000 mm cable	2011	^{3/8"} Flare (no adapter) AC	ບ	2.1 10	01 99	(20 actuators per pack)
3 wire for SPDT stat.(w/SPDT aux. sw.)		1/2 Flare (no adapter) AL	יב	0L 5.3	Customer	(10 body/carridge(s)
- with MolexTM connector	2610	1/2" Inverted Flare (no adapter) At	ш І	3.1	special	per pack)
	1107	¹ /2" BSPP (internal thread)* AI	L	3.0 10	assigned hv	
	1107	22 mm Compression fitting** AC	G	5.3 10	Honeywell	Note:
2 WIRE + COM. TOT SPS1 STAT.		³ / ₄ " BSPP (external thread) AI	т	5.3 10		Order in multiples of 20
 with Molex^{1M} connector 	8010	³ / ₄ " BSPP (internal thread) A.	د ا	5.3 10		actuators 8. 20 valves
 with 1000 mm cable 	8011	³ /, BSPT (internal thread) A	×	5.3 10		for our orato pool
2 wire + com. for SPST stat. (w/SPDT aux. sw)		³ / ₇ " NPT (internal thread) A I		5.4 10		iol egg clate pack.
 with MolexTM connector 	8610	³ / ₄ " Sweat	5	5.0 10		
 with 1000 mm cable 	8611	28 mm Compression fitting** AI	z	6.0 10		
		1" RSPD (internal thread)	: 0			
100 130 V (50 60 Hz)		1. BOD (evternal thread)				
3 wire for SPDT stat.			3 0			
- with MolexTM connector	6010			0.0		
		1 Sweat	n	0.0 JU		
	1100	1" BSPT (internal thread) A	F.	6.0 10		
			•			
- with Molex ^{1,w} connector	6610	o-way valves	-	o-way valves		
 with 1000 mm cable 	6611	¹ /2" Sweat M/	<	3.6 60		
2 wire + com. for SPST stat.		^{3/8} " Flare (no adapter) ME	<u></u>	2,6 60		
 with MolexTM connector 	4010	¹ / ₂ " Flare (no adapter) MC	<u>၂</u>	3,4 60		
 with 1000 mm cable 	4011	¹ / ₂ " Inverted Flare (no adapter) MI	۵	3.6 60		
2 wire + com. for SPST stat. (w/SPDT aux. sw.)		^{1/2} " BSPP (internal thread)* ME	ш	3.4 60		
- with Molex TM connector	4610	22 mm Compression fitting** MI	ш	7.1 60		
- with 1000 mm cable	4611	³ / ₄ " BSPP (external thread) MC	G	6.9		
		³ / _a " BSPP (internal thread) MI	т	7.0 60		
200 240 V (50 60 Hz)		^{3/4} " BSPT (internal thread) M.	٦	7.0 60		
3 wire for SPDT stat.		^{3/4} " NPT (internal thread) MI	×	7,4 60		
 with MolexTM connector 	6012	³ / ₄ " Sweat MI	_	6.4 60		
 with 1000 mm cable 	6013	28 mm Compression fitting** MN	5	7.7 60		
3 wire for SPDT stat.(w/SPDT aux. sw.)		¹ / ₂ " BSPT (internal thread) MI	z	3.4 60		
 with MolexTM connector 	6612	1" BSPP (internal thread) MF	٩	7.7 60	<u>Example:</u>	
 with 1000 mm cable 	6613	1" BSPP (external thread) MC	a	7.7 60	A "VC 4612 MM	6000" valve has a
2 wire + com. for SPST stat.		1" NPT (internal MF	æ	7.7 60	200/240 V, 50/60	Hz, 6 second nominal
- with MolexTM connector	4012	1" Sweat MS	s	7.7 60	timing actuator (v	vith a SPDT auxiliary
- with 1000 mm cable	4013	1" BSPT (internal thread) M	F	7.7 60	switch) for opera	tion by a SPST
2 wire + com. for SPST stat. (w/SPDT aux. sw.)					thermostat suita	ble for Molex TM
- with Molex TM connector	4612				connection.	
- with 1000 mm cable	4613	 Ine valve end fittings are internally machined to accept 15 mm 			The valve has a	3-way body with 28 mm
		compression fittings.			compression mui	ngs rated at 7.7 KV & 60
		** Commencien fittinge included			Shinned in unit n	<u>×</u> 0
						ach.

VALVE SELECTION CHART