VCR Series

2-Way & 3-Way Capacitor–Return Characterized Ball Valves

Features and Benefits

Characterized Constricted Channel

- Establishes a flow coefficient (Cv) similar to globe valves, eliminating the need for pipe size correction tables when sizing valves
- Provides superior rangeability and equal percentage flow characteristics

Low Torque

- Facilitates the use of smaller, less expensive direct-mount rotary-motion actuators
- Extends valve and actuator service life

Fail-Safe Characteristic

- Auto return to original closed or open position on power interruption

Proportional Models Only

- Field selectable DA or RA setting
- Input signal interruption protection - returns valve to full closed position in DA setting and full open position in RA setting when there is no input signal
- Field selectable 0-10/2-10 VDC or 0-20/4-20 mA input signal
- 0-10 VDC feedback signal

Other Characteristics

- With bi-directional brushed DC motor, efficient, compact, electronically controlled, relatively inexpensive and long life cycle
- Microcomputer for valve stroke self calibration
- Detachable actuator and body, easy to install and to maintain
- With manual operating lever and position indicator

General

The VCR Series capacitor-return electric rotary-motion actuator-driven characterized ball valves are designed specifically for the HVAC market and are ideal for all automatic temperature control applications using chilled or hot water.

These high-quality actuator-driven ball valves combine the performance of globe valves with the economy of ball valves - providing the best of both worlds. The VCR Series ball valves are equipped with a characterized constricted channel at the valve inlet in which choked flow is used to control the flow rate of water. This characterized constricted channel design provides very high rangeability and excellent equal percentage flow characteristics.

The VCR Series ball valves are equipped with capacitor-return electric rotary-motion actuators of 2-wire on-off, 3-wire floating or 2-wire proportional control actions. The 2-wire on-off actuators are available with 230 V 50/60 Hz power supply only and 3-wire floating and 2-wire proportional actuators with 24 V 50/60 Hz power supply only.

A built-in capacitor in the actuator is charged up when power is turned on. The capacitor will discharge and return the actuator to its original position, either fully-closed or fully-open depending on its DA or RA setting, when power is interrupted.

The electric rotary actuators feature simplified mounting of the actuator to a direct-coupled bracket. The result is a very low profile unit with flexibility of mounting as well as fast and easy maintenance. All actuators include a manual override lever for manually positioning the valve when the actuator is not powered.

Proportional Models Only

Feedback Signal

The proportional valves are provided with 0-10 VDC position feedback signal.

JP1 Switch Setting for Direct Action (DA) or Reverse Action (RA)

DA is set for counter-clockwise (CCW) rotation when input signal increases and for clockwise (CW) rotation when input signal decreases. The rotation is vice versa for RA setting.

JP1 Switch Settings for Different Input Control Signals

Choice of 0-10 VDC, 2-10 VDC, 0-20 mA or 4-20 mA input signal can be achieved by setting switches 1 and 3 of the JP1 DIP switches.

Input Signal Interruption Protection

When there is no input signal or input signal is open-circuited, the valve will return to its full closed or full open position, depending on whether the actuator is set for DA or RA action. The switch “2” setting of the JP1 DIP switches determines the DA or RA action. While full closed position (0º) is for DA setting, full open position (90º) is for RA setting. The factory setting is DA.

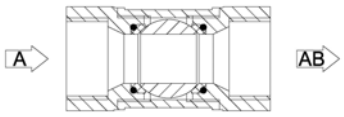
Specifications

Product model numbers	Refer to Tables 1 and 2	
Valve body pressure rating	25 bar (360 PSI), meets or exceeds pressure and temperature ratings of PN25, equivalent to ANSI Class 250	
Body sizes	15 to 100 mm (1/2” to 4”)	
End connections	Female BSP tapered for 15 through 50 mm sizes	
	DIN standard flanges for 65 through 100 mm sizes (ANSI standard optional)	
Fluid temperature limits	2º to 94ºC (36º to 200ºF) at 360 PSI	
Service	Chilled and Hot Water, up to 50% glycol solutions	
Flow characteristic	Equal percentage (Linear on bypass port of 3-way valve)	
Seat leakage	0.01% of Kv, meets ANSI Class IV	
Stroke	90º	
Maximum close-off pressures	Refer to Tables in Page 4	
Construction materials	Threaded body	Cast 304 stainless steel
	Flanged body	Cast Iron HT250
	Ball	304 stainless steel
	Stem	304 stainless steel
	O-rings	NBR
	Seat	PTFE with 5% graphite
Capacitor-return rotary-motion actuators	Actuator size	03CR for DN15 to DN25 valves
		04CR for DN32 to DN50 valves
		05CR for DN65 to DN100 valves
	Power supply	230 V 50/60 Hz only for 2-wire on-off models
		24 V 50/60 Hz only for 3-wire floating and 2-wire proportional models
	Power consumption	8.5 VA, 4.5 W maximum for 04CR and 04CR actuators
		24 VA, 15 W maximum for 05CR actuators
	Input signals	For 2-wire proportional models:
		Field selectable 0-10 VDC, 2-10 VDC, 0-20 mA or 4-20 mA
	Input impedances	For 2-wire proportional models:
		200,000 Ω for 0-10/2-10 VDC input
		500 Ω for 0-20/4-20 mA input
	Feedback signal	Proportional models only: 0-10 VDC for 90º span, maximum 1 mA
	Factory settings	Proportional models only: 0-10 VDC input signal and DA
	Torque	5 Nm for 03CR and 04CR actuators; 25 Nm for 05CR actuators
	Running times	For 03CR and 04CR actuators
		Initialization: 30 s; Stroke: 60 s; Return: 60 s
		For 05CR actuators
		Initialization: 120 s; Stroke: 70 s; Return: 95 s
	Angle of rotation	Adjustable 90° to 95°
	Noise level	≤40 dB for 03CR and 04CR actuators and ≤55dB for 05CR actuators
	Materials	Housing: Fire-retardant ABS
		Chassis: Fire-retardant reinforced nylon PAS-110 for 03CR and 04CR actuators; Die-casting aluminum alloy for 05CR actuators
		Gears: Polyoxymethylene + brass HPb59-1 + iron-base powder for 03CR and 04CR actuators; Polyoxymethylene + steel for 05CR actuators
	Protection class	IP54
	Agency approval	CE Mark compliant pending
	Ambient conditions	Operating: -5 to 50ºC (23 to 122ºF); 0-95% RH, non-condensing
		Storage: -30 to 70ºC (-22 to 158ºF); 0-95% RH, non-condensing

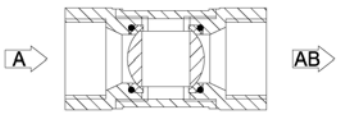
The performance specifications above are nominal and subject to tolerances and application variables of generally acceptable industry standards. The manufacturer shall not be liable for damages resulting from misapplication or misuse of its products.

Flow Directions

2-way Threaded Valves

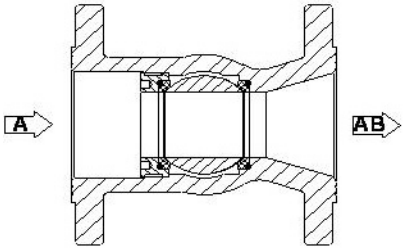


A to AB Open

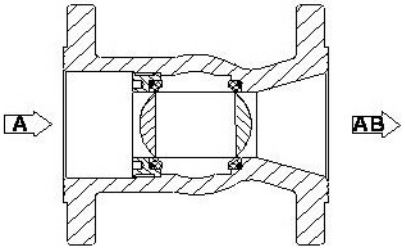


A to AB Closed

2-way Flanged Valves



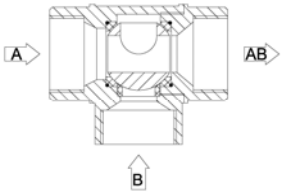
A to AB Open



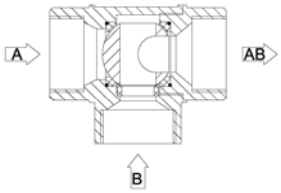
A to AB Closed

Note: 2-way valve must be installed on return side of coil.

3-way Threaded Valves

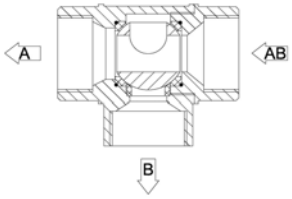


A to AB Open

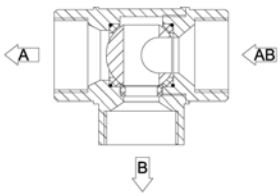


A to AB Closed

Mixing Application



A to AB Open



A to AB Closed

Diverting Application

All 3-way valves are assembled with ball ports labeled as A, B and AB and shipped as standard with

<u>For 2-Wire On-Off or 3-Wire Floating Actuator</u>
A closed to AB at 0º clockwise or rotate counter-clockwise to open.

<u>For 2-Wire 0(2)-10 VDC/4(0)-20 mA Actuator with DA Setting</u>
A closed to AB at 0 (2) VDC or 4 (0) mA.

<u>Mixing Applications:</u>
Fluid enters through two inlets (A, B) and exits through one outlet (AB).

A is service port.
B is bypass port.

<u>Diverting Applications:</u>
Fluid enters through one inlet (AB) and exits through two outlets (A, B).
Bypass port Kv: 49% of Port A for full-port valve and 70% of Port A for characterized valve.

A is service port.
B is bypass port.

Table 1 - Threaded Characterized Ball Valve Selection Table (2-Way and 3-Way)

Connection		Valve Body	Connection	Pipe	Ball	Options	Actuator	Flow Coefficient		Close-off ΔP	
Inches	mm	Model Number		Threads	Material		Model Number	Cv	Kv	PSI	kPa
1/2	15	VCRx015004B2y	x: 2 = 2-way 3 = 3-way	B = BSP tapered is standard	2 = Stainless steel is standard	y: Omitted = No options N = with NPT Connections	SBAwwCRxyz Where SBA = SBA Series capacitor-return ball valve actuators Actuator Size (ww) 03 for DN15 to DN25 04 for DN32 to DN50 Input Signal Type (x) 2 = 2-wire on-off, with 230 VAC only 3 = 3-Wire floating. with 24 VAC only 4 = Proportional, with 24 VAC only Supply Voltage (y) A = 24 VAC U = 230 VAC Options (z) Omitted = none	4.7	4.0	85	600
		●VCRx015004B2F						14.0	12.0		
3/4	20	VCRx020007B2y						7.4	6.3		
		●VCRx020007B2F						17.5	15.0		
1	25	VCRx025011B2y						11.7	10.0		
		●VCRx025011B2F						25.7	22.0		
1-1/4	32	VCRx032018B2y						18.7	16.0		
		●VCRx032018B2F						36.3	31.0		
1-1/2	40	VCRx040029B2y						29.3	25.0		
		●VCRx040029B2F						38.6	33.0		
2	50	VCRx050046B2y						46.8	40.0		
		●VCRx050046B2F						58.5	50		

● Full port without characterized opening

Table 2 - Flanged Ball Valve Selection Table (2-Way only)

Connection		Valve Body	Pipe	Ball	Options	Actuator	Flow Coefficient		Close-off ΔP	
Inches	mm	Model Number*	Flanges	Material		Model Number	Cv	Kv	PSI	kPa
2-1/2	65	VCR2065075D2y	D = DIN flanges are standard	2 = Stainless steel is standard	y: Omitted = No options A = with ANSI flanges	SBAwwCRxyz Where SBA = SBA Series capacitor-return ball valve actuators Actuator Size (ww) 05 for DN65 to DN100 Input Signal Type (x) 2 = 2-wire on-off, with 230 VAC only 3 = 3-Wire floating. with 24 VAC only 4 = Proportional, with 24 VAC only Supply Voltage (y) A = 24 VAC U = 230 VAC Options (z) Omitted = none	75	64	85	600
		●VCR2065075D2F					149	128		
3	80	VCR2080119D2y					119	102		
		●VCR2080119D2F					159	136		
4	100	VCR2100190D2y					190	163		
		●VCR2100190D2F					255	218		

* 3-way configuration not available in flanged valves

● Full port without characterized opening

Valve Selection Examples:

Example 1: 1” valve, 2-way, Cv=11.7, BSP threads, stainless steel ball, 2-wire on-off, 230 VAC
= VCR2025011B20 + SBA03CR2U0

Example 2: 2” Valve, 3-way, Cv=46.8, BSP threads, stainless steel ball, proportional, 24 VAC
= VCR3050046B20 + SBA04CR4A0

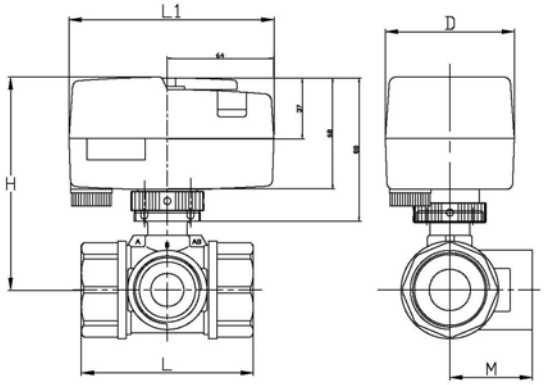
Example 3: 3” valve, 2-way, Cv=119, DIN flanged, stainless steel ball, 3-wire floating, 24 VAC
= VCR2080119D20 + SBA05CR3A0

Dimensions and Weights

THREADED BALL VALVES

Connection		Max. Pipe Thread Size mm	H		L				M		L1		D		Weight*			
					2-way		3-way								2-way		3-way	
Inches	mm		Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Lb.	kg	Lb.	kg
1/2	15	13	4-17/32	115	2-11/16	68	2-11/16	68	1-5/16	33	3-5/8	92	3-1/32	77	1.82	0.83	1.96	0.89
3/4	20	13	4-17/32	115	2-11/16	68	2-11/16	68	1-3/8	35	3-5/8	92	3-1/32	77	1.86	0.86	2.18	0.99
1	25	17	4-23/32	120	3-5/16	84	3-5/16	84	1-23/32	44	3-5/8	92	3-1/32	77	2.42	1.1	2.73	1.24
1-1/4	32	19	5-5/32	131	3-7/8	98	4-3/32	98	2	49	4-27/32	123	3-1/16	78	2.64	1.2	4.14	1.88
1-1/2	40	19	5-5/32	131	4-1/8	105	4-3/8	105	2	49	4-27/32	123	3-1/16	78	4.02	1.83	4.62	2.1
2	49	29	5-5/16	135	4-13/16	122	5-27/32	123	2-7/16	62	4-27/32	123	3-1/16	78	4.99	2.27	7.41	3.37

* Weight includes mounting bracket and actuator

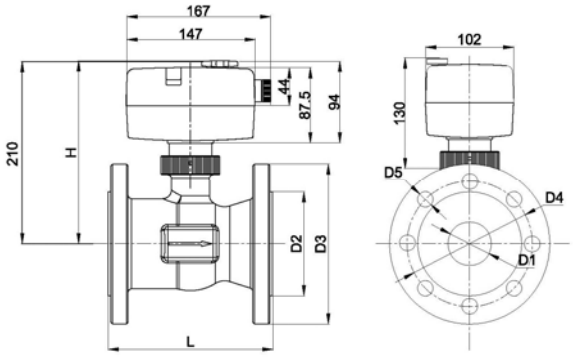


15 to 50 mm Ball Valves

FLANGED BALL VALVES

Connection		L		H		D1		D2		D3		D4		Bolt		No. of Bolt Holes	Weight*	
Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Thread	Φ (D5) mm		Lb.	kg
2-1/2	65	7-1/2	190	3-7/8	98	3-1/4	82	4-3/4	120	7-1/4	185	5-3/4	145	M16	18	8	32.55	14.5
3	80	7-1/2	190	3-7/8	98	3-1/4	82	5-3/8	136	7-7/8	200	6-1/4	160	M16	18	8	34.97	15.9
4	100	9	230	4-1/4	108	4	102	6-3/8	162	9-1/4	235	7-15/32	190	M20	23	8	47.55	21.6

* Weight includes mounting bracket and actuator

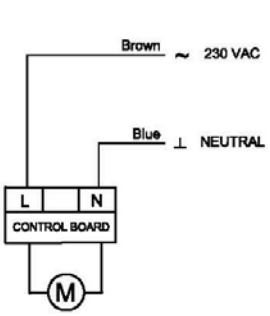


65 to 100 mm Ball Valves

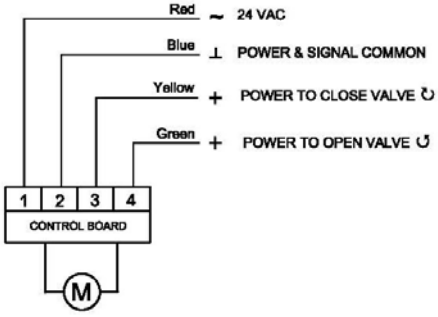
Wiring Diagrams

DN15 to DN50 Ball Valves

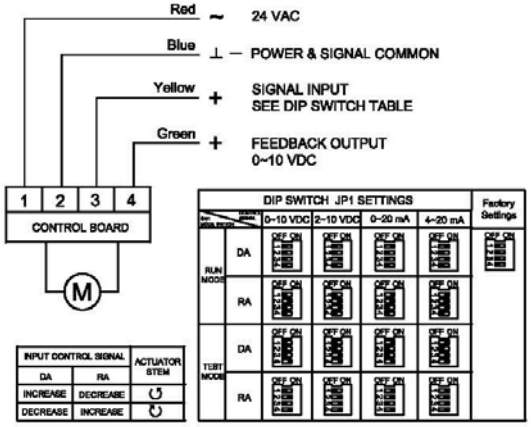
For 2-Wire On-Off Actuators



For 3-Wire Floating Actuators

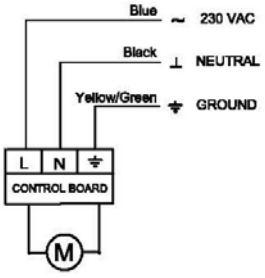


For 2-Wire Proportional Actuators

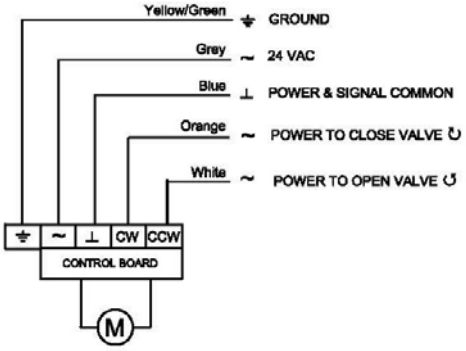


DN65 to DN100 Ball Valves

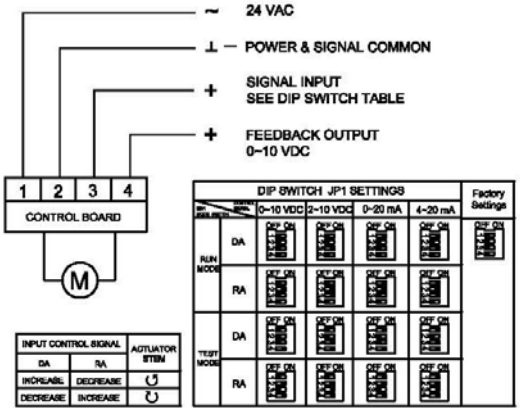
For 2-Wire On-Off Actuators



For 3-Wire Floating Actuators



For 2-Wire Proportional Actuators



Valve Stroke Self Calibration

Test Mode
After power is turned on, set all dip switches of JP1 according to the above table. Firstly, set switch 4 of JP1 to "ON" position. Press STUDY/REPOSITION momentary switch SW1 once and power LED will start flickering. Actuator stem starts rotating until reaching its maximum stroke. When the gear chain is blocked, the actuator stem will start reversing its rotation until reaching its initial position. The power LED becomes steady indicating that the test mode is finished and over. The valve stroke calibration data will be kept in the actuator's microcomputer memory and no further recalibration is required when power is turned on again.

After the test, place switch 4 to "OFF" position to put the actuator back into run mode. Note that if the switch 4 is not placed back to its "OFF" position after the test mode, the valve assembly will still operate normally but the actuator will have to go through the test mode every time when power is turned on.

Run Mode
Every time when power is turned on, the actuator will rotate to the fully closed position and the power LED lights up steadily indicating that the actuator is now ready to act in accordance with the input signal.

Change of Operating Mode
If operating mode needs to be changed, change the dip switch positions of JP1 as desired and new settings will be confirmed after the STUDY/REPOSITION switch SW1 is pressed once. There is no need to turn the power off for this process to take place.