

B2/B3 Series Characterized Control Valve,™ Non-Spring Return Actuator



Two-way and Three-way Valves with **Chrome Plated Brass Ball and Brass Stem**, NPT Female Ends

Service:	chilled or hot water, 60% glycol
Flow characteristic:	A-port equal percentage B-port modified for constant common port flow.
Media Temp Range:	0°F to 212°F [-18°C to 100°C]
Ambient Temp Range:	-22°F to 122°F [-30°C to 50°C]
Maximum Differential Pressure (ΔP)	20 psi for typical applications
C _v Rating	A-port as stated in chart B-port is 70% of A-port
Leakage	0% for A to AB < 2.0% B to AB of full rated C _v (valve with no disc)



TR...



TR...

B2...B Two-way Characterized Control Valve, Chrome Plated Brass Ball and Brass Stem



Model # CCV Valve	C _v Rating	Valve		Close-Off psi	Non-Spring Return Actuator			
		Nominal Size Inches	DN mm		On/Off, Floating	On/Off, Floating	Proportional	Proportional
					TR24-3-T US	LRB24-3-T	TR24-SR-T US	LRB24-SR-T
B207B	0.3	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B208B	0.46	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B209B	0.8	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B210B	1.2	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B211B	1.9	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B212B	3.0	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B213B	4.7	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B214B	7.4	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B215B*	10	1/2"	15	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B217B	4.7	3/4"	20	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B218B	7.4	3/4"	20	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B219B	10	3/4"	20	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
B220B*	24	3/4"	20	200	<input type="checkbox"/> Pg 20	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 22	<input type="checkbox"/> Pg 30
Electrical Connection					Covered Terminal Strip	Covered Terminal Strip	Covered Terminal Strip	Covered Terminal Strip

* Models without characterizing discs.

See [pg 11](#) for corrected C_vs with piping reduction factor.

B3...B Three-way Characterized Control Valve, Chrome Plated Brass Ball and Brass Stem



Model # CCV Valve	C _v Rating	Valve		Close-Off psi	Non-Spring Return Actuator			
		Nominal Size Inches	DN mm		On/Off, Floating	On/Off, Floating	Proportional	Proportional
					TR24-3-T US	LRB24-3-T	TR24-SR-T US	LRB24-SR-T
B307B	0.3	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B308B	0.46	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B309B	0.8	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B310B	1.2	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B311B	1.9	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B312B	3.0	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B313B	4.7	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B315B*	10	1/2"	15	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B317B	4.7	3/4"	20	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B318B	7.4	3/4"	20	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
B320B*	24	3/4"	20	200	<input type="checkbox"/> Pg 24	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 26	<input type="checkbox"/> Pg 46
Electrical Connection					Covered Terminal Strip	Covered Terminal Strip	Covered Terminal Strip	Covered Terminal Strip

* Models without characterizing discs.

See [pg 11](#) for corrected C_vs with piping reduction factor.

Options (add to above list price)	TR24-3 US	TR24-SR US	TR24-.../300 US	TR24-.../500 US	LRB24...	LRX24...
3-foot cable	<input type="checkbox"/> Pg 20, 22, 24, 26	<input type="checkbox"/> Pg 20, 22, 24, 26			<input type="checkbox"/> Pg 28, 30, 34, 44, 46	<input type="checkbox"/> Pg 32, 40, 48, 58, 60, 62
10-foot cable			<input type="checkbox"/> Pg 20, 22, 24, 26			<input type="checkbox"/> Pg
16-foot cable				<input type="checkbox"/> Pg 20, 22, 24, 26		<input type="checkbox"/> Pg
120 VAC power supply					<input type="checkbox"/> Pg 36, 50, 52	<input type="checkbox"/> Pg 38, 42, 50, 56

See Belimo's flexible product range on page 224 for a complete list of configurable actuators and options. Note: For TF/TR actuators, no weather shield available at this time. Call 800-543-9038

Technical Data/Submittal



Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage
Action	max 95° rotation
Sizes	1/2", 3/4"
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	chrome plated brass
Stem	brass
Seats	PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi
Media temp. range	0°F to 212°F [-18°C to 100°C]
Close off pressure	200 psi
Maximum differential pressure (ΔP)	20 psi for typical applications
Leakage	0%
C _v rating	A-port: see product chart for values

Tefzel® is a registered trademark of DuPont

Application

This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow. This valve is designed for modulating control using 2...10 vdc or 4...20 mA. (for 4...20 mA control input a 500Ω resistor is required).

The valve is designed to fit in compact areas where proportional control is required using 24 VAC/VDC.

Actuator Specifications

<input type="checkbox"/> LRB24-SR	<input type="checkbox"/> LRB24-SR-T w/Terminal Block
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running: 1.5 W holding: 0.4 W
Transformer sizing	3 VA (class 2 power source)
Electrical connection	3 ft, 18 GA plenum rated cable 1/2" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20 mA
Input impedance	100kΩ (0.1 mA), 500Ω
Angle of rotation	max. 95°, adjust. with mechanical stop
Direction of rotation	reversible with protected switch
Position indication	handle
Manual override	external push button
Running time	95 seconds, constant independent of load
Humidity	5 to 95% RH non condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE acc. to 89/336/EEC
Noise level	<35dB(A)
Quality standard	ISO 9001

LRB24-SR-T

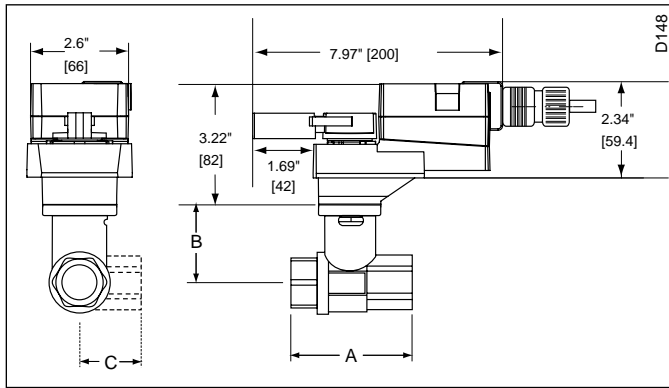
Electrical connection	screw terminal (for 26 to 14 GA wire) <input type="checkbox"/> protected (NEMA 2/IP20)
-----------------------	---

† Rated impulse voltage 800V, Control pollution degree 3, Type of action 1 (1.B for -S models)

J20730 - 01/07 - Subject to change.

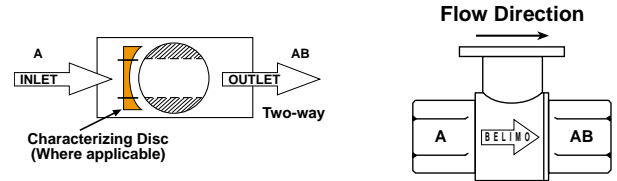


Dimensions



Valve Body	Nominal Valve Size		Dimensions in Inches [mm]	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06" [52.2]	1.39" [35.3]
B212B-B215B	1/2"	15	2.38" [60.5]	1.63" [41.4]
B217B-B220B	3/4"	20	2.63" [66.8]	1.75" [44.5]

Flow Pattern



Wiring Diagrams

CAUTION

- 2 Equipment damage!
Actuators may be connected in parallel. Power consumption must be observed and input impedance must be observed.

INSTALLATION NOTES

- 3 Actuators may also be powered by 24 VDC.
- 5 Only connect common to neg. (—) leg of control circuits.

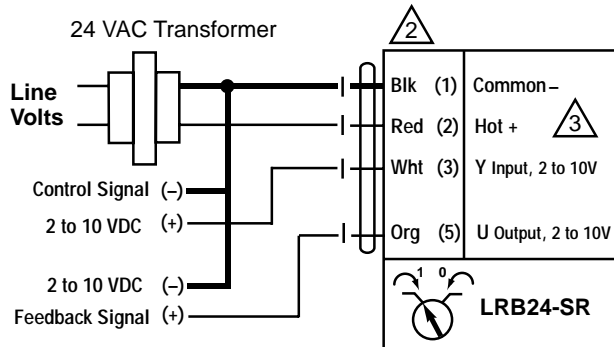
APPLICATION NOTES

- ◆ The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

WARNING

Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

W265

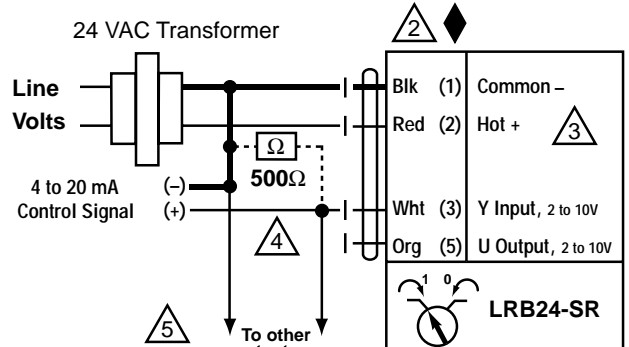


2 to 10 VDC control of LRB24-SR

WARNING

Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

W265



4 to 20 mA control of LRB24-SR

Default Set-Up:

	Two-way Valve (Specify upon ordering)	Two-way Valve (Specify upon ordering)	Three-way Valve (Specify upon ordering)	Three-way Valve (Specify upon ordering)
Non-Spring Return - Stays in Last Position	TR24-3-T US	Power to pin 2 will drive valve CCW. Power to pin 3 will drive valve CW.		Power to pin 2 will drive valve CCW. Power to pin 3 will drive valve CW.
	TR24-SR-T US	NC: Closed A to AB, will open as voltage increases.	NO: Open A to AB, will close as voltage increases. (Can be chosen with switch inside terminal block of actuator).	NC: Closed A to AB, will open as voltage increases. NO: Open A to AB, will close as voltage increases. (Can be chosen with switch inside terminal block of actuator).
	LRB24-3, LRB24-MFT LRB24-SR, LRX24-MFT, ARB24-3, ARB24-SR ARB24-MFT	Power to pin 2 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "1" position, to reverse select the "0" position.	NO: Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch).	Power to pin 2 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "1" position, to reverse select the "0" position.
Spring Return - Note Fail Position	TFX24 US LF24 US AF24 US	NO/FO Valve: Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss.	NC/FC Valve: Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.	NO/FO Valve: Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss. NC/FC Valve: Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.
	TF (-3), MFT, SR LF (-3), MFT, SR AF, MFT, SR Floating or proportional type actuators	NC/FO Valve: Closed A to AB will drive open. Spring Action: Will spring open A to AB upon power loss.	NC/FC or NO/FC Valve: Closed A to AB or Open A to AB (Can be chosen with CW/CCW switch). Spring Action: Will spring closed A to AB upon power loss. NO/FO Valve: Open A to AB Spring Action: Will spring open A to AB upon power loss. (NO action can be chosen with CW/CCW switch).	NC/FO Valve: Closed A to AB will drive open Spring Action: Will spring open A to AB upon power loss. NC/FC or NO/FC Valve: Closed A to AB or Open A to AB (Can be chosen with CW/CCW switch). Spring Action: Will spring closed A to AB upon power loss. NO/FO Valve: Open A to AB Spring Action: Will spring open A to AB upon power loss. (NO action can be chosen with CW/CCW switch).

General Wiring Instructions

WARNING The wiring technician must be trained and experienced with electronic circuits. Disconnect power supply before attempting any wiring connections or changes. Make all connections in accordance with wiring diagrams and follow all applicable local and national codes. Provide disconnect and overload protection as required. Use copper, twisted pair, conductors only. If using electrical conduit, the attachment to the actuator must be made with flexible conduit.

Always read the controller manufacturer's installation literature carefully before making any connections. Follow all instructions in this literature. If you have any questions, contact the controller manufacturer and/or Belimo.

Transformer(s)

Belimo actuators require a 24 VAC class 2 transformer and draws a maximum of 10 VA per actuator. The actuator

enclosure cannot be opened in the field, there are no parts or components to be replaced or repaired.

- EMC directive: 89/336/EEC
- Software class A: Mode of operation type 1
- Low voltage directive: 73/23/EEC

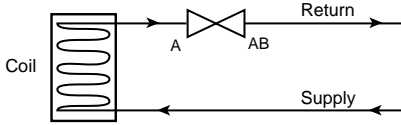
CAUTION: It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these two different types of power supplies are connected to the same power transformer and the DC commons are connected together, a short circuit is created across one of the diodes in the full wave power supply, damaging the controller. Only use a single power transformer to power the controller and actuator if you know the controller power supply uses half wave rectification.

Operation/Installation

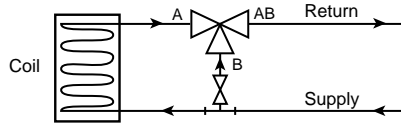
Correct Piping:

2-way valves should be installed with the disc upstream. If installed with disc downstream, flow curve will be deeper. If installed “backwards” it is NOT necessary to remove and change. No damage or control problems will occur.

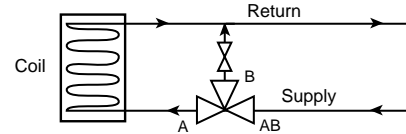
Two-Way Valve Piping Diagram
(1 Input, 1 Output)



Three-Way Mixing Valve Piping Diagram
(2 Inputs, 1 Output)



Three-Way Diverting Valve Piping Diagram
(1 Input, 2 Outputs)



3-way valves must be piped correctly. They can be mixing or diverting. Mixing is the preferred piping arrangement.

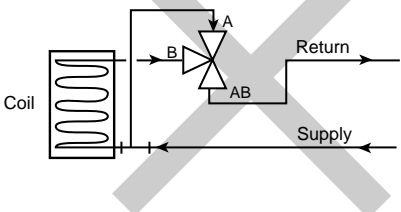
The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A port. These diagrams are for typical applications only. Consult engineering specification and drawings for particular circumstances.

The A port must be piped to the coil to maintain proper control.

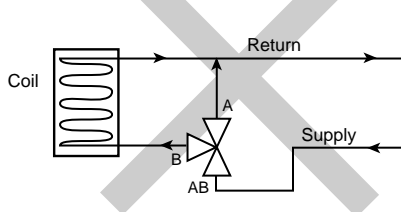
The B port restricts flow by 30% of A port value.

Incorrect Piping:

Three-Way Mixing Valve Piping Diagram
(2 Inputs, 1 Output)



Three-Way Diverting Valve Piping Diagram
(1 Input, 2 Outputs)



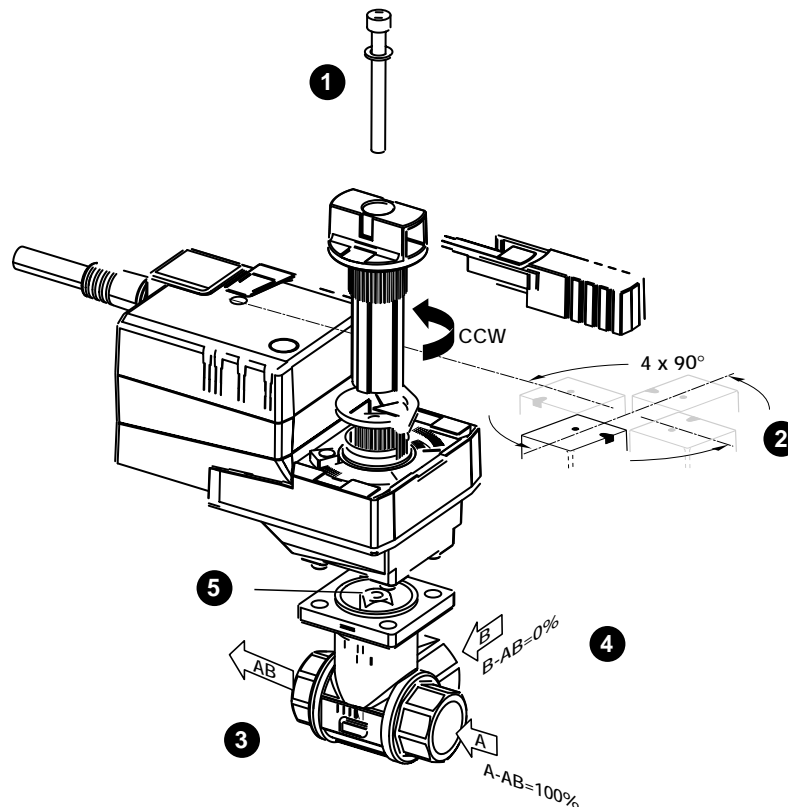
WARNING! Do Not Pipe in this manner! Note Valve Porting! The A port must be piped to the coil! Not the B port!

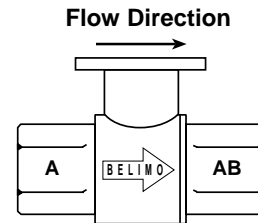
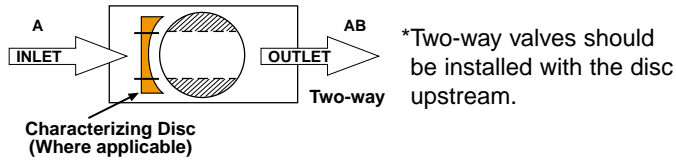
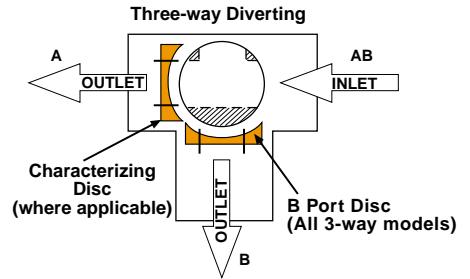
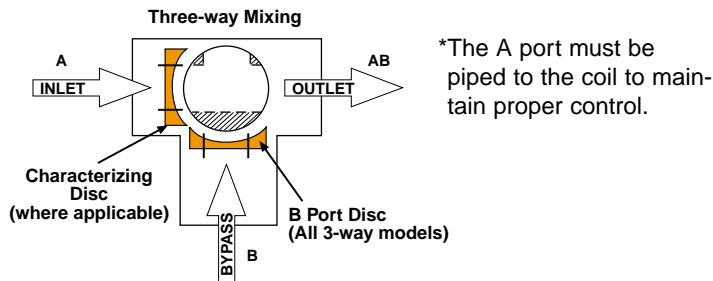
Flow is not possible from A to B. If AB port is not piped as the common port, the valve must be re-piped. It is good practice to install a balancing valve in the bypass line. These valves are intended for closed loop systems. Do not install in an open loop system or in an application that is open to atmospheric pressure.

Assembly:

- 1 One screw attaches actuator to valve
- 2 Four actuator mounting positions
- 3 2-way flow pattern
- 4 3-way flow pattern (mixing shown)
- 5 Top of valve stem indicates direction of flow (Flow A to AB shown)

Note: For diverting flow, flow enters in AB and diverts to A and B ports.

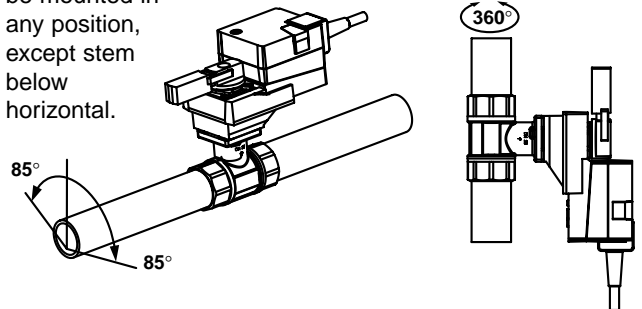


Flow Pattern
Two-way Characterized Control Valves™ (Belimo B2 Series) (Belimo B6 Series)

Three-way Characterized Control Valves™ (Belimo B3 Series)


“B” Port must be piped to the by-pass line.

Mounting:

The valves can be mounted in any position, except stem below horizontal.



D164