

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 linear for constant 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)	For Characterized A-port 20 psi for typical applications 30 psi max for quiet service For full flow versions only (no A-Disc) On/Off control 150 psi
C _v rating	A port as stated in chart B port is 70% of A port value
Leakage	0% for A to AB 0.5% to 2.0% B to AB



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



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



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

* Models without characterizing discs.
See [pg 11](#) for corrected C_vs with piping reduction factor.

Options	TR24-3-T US TR24-SR-T US
3-foot cable	TR24-3 US, TR24-SR US <input type="checkbox"/> Pg 20/22/24/26
10-foot cable	TR.../300 US <input type="checkbox"/> Pg 20/22/24/26
16-foot cable	TR.../500 US <input type="checkbox"/> Pg 20/22/24/26

See Belimo's flexible product range on page 168 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

B2...B Two-way Characterized Control Valve, Chrome Plated Brass Ball and Stem TR Actuators, On-Off/Floating Point



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)	For Characterized A-port 20 psi for typical applications 30 psi max for quiet service
	For full flow versions only (no A-disc) On/Off control 150 psi
Leakage	0%
Cv 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 to fit in compact areas where on/off or floating point control is required using 24VAC.

Actuator Specifications

<input type="checkbox"/> TR24-3-T US	
Control	On-off/floating point
Input Impedance	.36 kΩ
Nominal voltage	24 VAC 50/60 Hz
Nominal voltage range	19.2...28.8 VAC
Power Consumption	1 W
Transformer Sizing	1VA (Class 2 power source)
Electrical Connection	Screw Terminals accessible after removal of small cover (3 ft, 10 ft, 16 ft cables optional)
Angle of Rotation	90°
Position Indication	Integrated into handle
Manual override:	Push down handle
Running Time	90 seconds @ 60 hz, 108 seconds @ 50 hz
Humidity	5 to 95% non-condensing
Ambient Temperature	19°F to 122°F (-7°C to +50°C)
Storage Temperature	-40°F to 176°F (-40°C to +80°C)
Housing	NEMA 1
Housing Rating	UL94-5V(B)
Agency Listing	CE, UL 60730-1
EMC	CE according to 89/336/EEC
Mode of Operation	Type 1 to UL 60730-1
Noise Level	Max. 35 db (A)
Quality Standard	ISO 9001

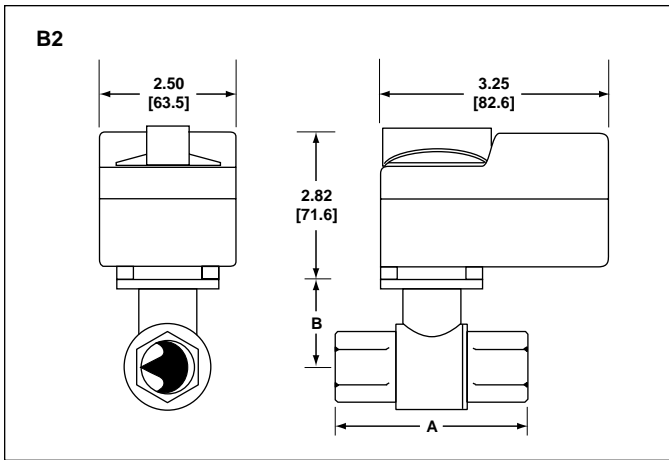
Additional Models

TR24-3 US	TR24-3-T US with 3 ft plenum rated cable
TR24-3/300 US	TR24-3-T US with 10 ft plenum rated cable
TR24-3/500 US	TR24-3-T US with 16 ft plenum rated cable



120621 - 03/06 - IG-Subject to change. © Belimo Aircontrols (USA), Inc.

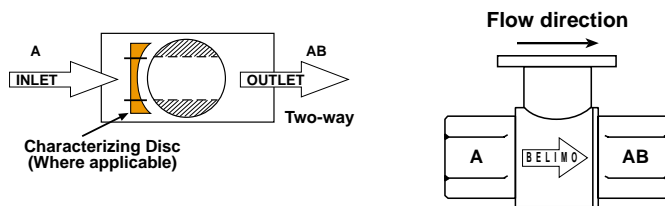
Dimensions



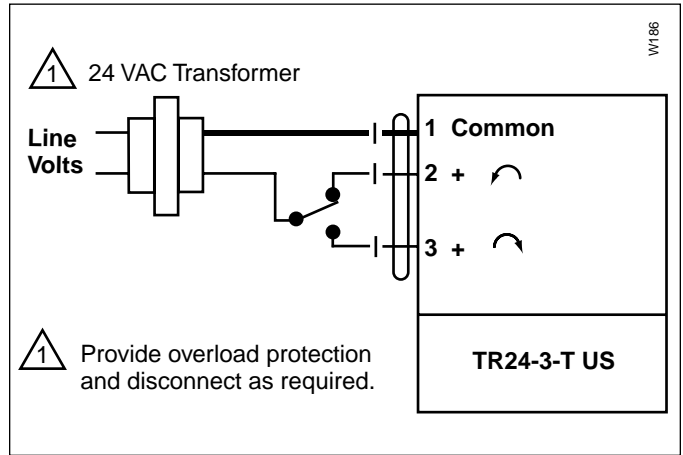
D069

Valve Body	Nominal Valve Size		Dimensions	
	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

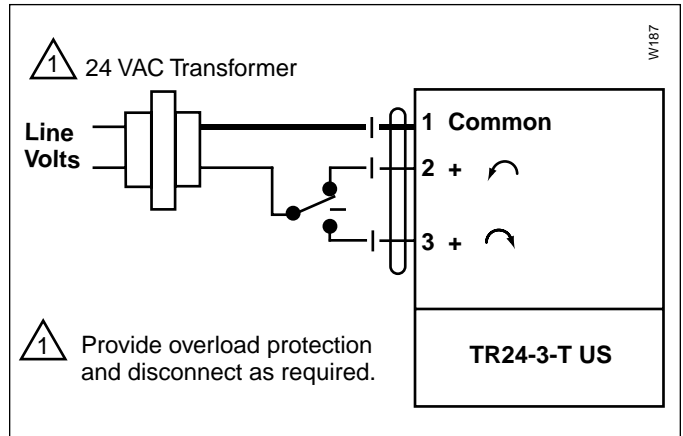


Wiring



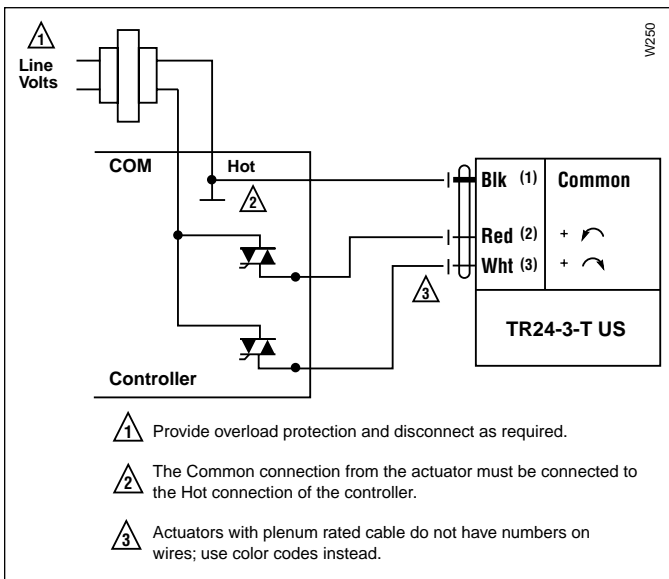
W186

On/Off Control of TR24-3-T US. You may not use one wire control.



W187

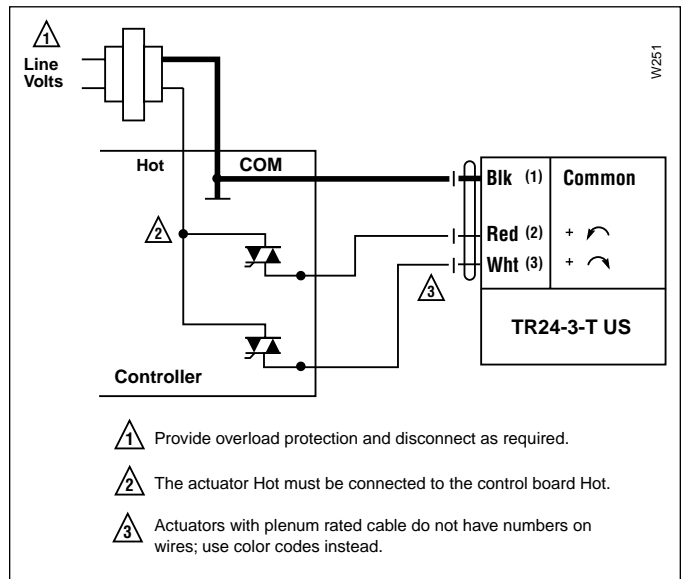
Floating Control of TR24-3-T US



W250

- ⚠ Provide overload protection and disconnect as required.
- ⚠ The Common connection from the actuator must be connected to the Hot connection of the controller.
- ⚠ Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

Triac Sink



W251

- ⚠ Provide overload protection and disconnect as required.
- ⚠ The actuator Hot must be connected to the control board Hot.
- ⚠ Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

Triac Source

Note: TR24-3-T US cannot be wired in parallel with themselves or any other actuator.

Default Set-Up:

	Two-way valve (Default)	Two-way valve (specify upon ordering)	Three-way valve (Default)	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-SR, LRX24-MFT, ARB24-3, ARB24-MFT Power to pin 2 will drive valve CCW Power to pin 3 will drive valve CW	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 CCW Power to pin 3 will drive valve CW	NO: Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch).
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 (-3), 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

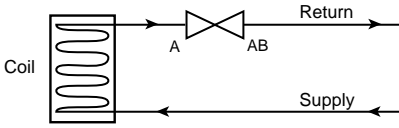
CAUTION: It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these 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

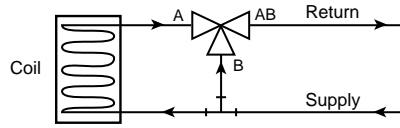
Correct Piping:

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.

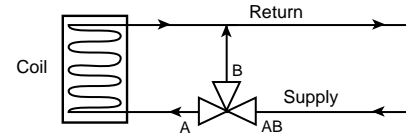
Two-Way Valve Piping Diagram
(1 Input, 1 Output)



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.

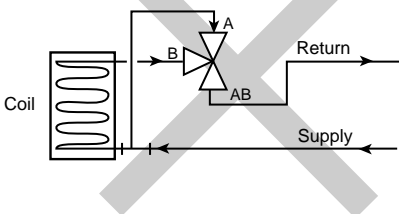
The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A port. These diagrams are for typical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

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

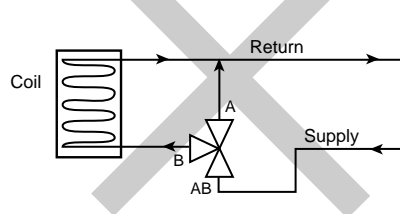
The B port restricts flow by 30% of A port value.

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.

