

Service:	Chilled or Hot Water, 60% glycol
Flow Characteristic:	A port equal percentage B port 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



Model # CCV Valve	C _v Rating	Valve		Close-Off psi	Spring Return Actuator		
		Nominal Size			On/Off	Floating	Proportional
		Inches	DN mm		TFX24 US	TF24-3 US	TF24-SR US
B207B	0.3	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B208B	0.46	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B209B	0.8	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B210B	1.2	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B211B	1.9	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B212B	3.0	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B213B	4.7	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B214B	7.4	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B215B*	10	1/2"	15	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B217B	4.7	3/4"	20	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B218B	7.4	3/4"	20	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B219B	10	3/4"	20	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
B220B*	24	3/4"	20	200	<input type="checkbox"/> Pg 28	<input type="checkbox"/> Pg 30	<input type="checkbox"/> Pg 32
Electrical Connection					3 ft cable, 1/2" conduit fitting	3 ft cable, 1/2" conduit fitting	3 ft cable, 1/2" conduit fitting

* 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	Spring Return Actuator		
		Nominal Size			On/Off	Floating	Proportional
		Inches	DN mm		TFX24 US	TF24-3 US	TF24-SR US
B307B	0.3	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B308B	0.46	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B309B	0.8	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B310B	1.2	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B311B	1.9	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B312B	3.0	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B313B	4.7	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B315B*	10	1/2"	15	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B317B	4.7	3/4"	20	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B318B	7.4	3/4"	20	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
B320B*	24	3/4"	20	200	<input type="checkbox"/> Pg 34	<input type="checkbox"/> Pg 36	<input type="checkbox"/> Pg 38
Electrical Connection					3 ft cable, 1/2" conduit fitting	3 ft cable, 1/2" conduit fitting	3 ft cable, 1/2" conduit fitting

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

Options	TFX24 US	TF24-3 US	TF24-SR US
10-foot cable	TF.../300 US	<input type="checkbox"/> Pg 28/34	<input type="checkbox"/> Pg 30/36
16-foot cable	TF.../500 US	<input type="checkbox"/> Pg 28/34	<input type="checkbox"/> Pg 30/36
built-in aux. switch ...-S US		<input type="checkbox"/> Pg 28/34	<input type="checkbox"/> Pg 30/36
120 VAC power supply	TFX..120...	<input type="checkbox"/> Pg 28/34	<input type="checkbox"/> Pg 32/38

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 TF Actuators, 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" to 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
Ambient temp. range	-22°F to 122°F [-30°C to 50°C]
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

Additional Models

TF24-3(-S)/300 US	TF24-3(-S) US with 10 ft plenum rated cable
TF24-3(-S)/500 US	TF24-3(-S) US with 16 ft plenum rated cable

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 and VAV Box re-heat coils. This valve is suitable for use in a hydronic system with variable flow.

This valve is designed for floating point control using 24VAC/DC where fail safe is required.

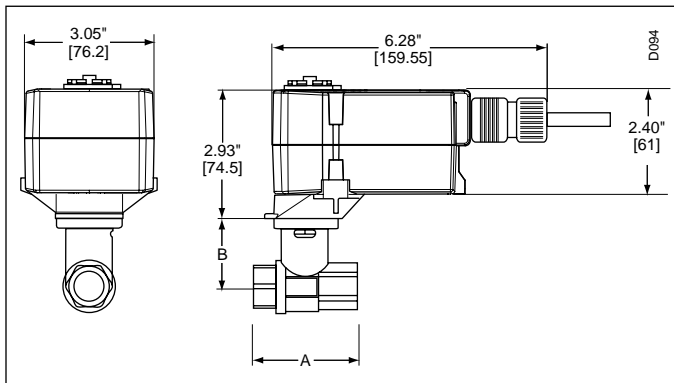
Actuator Specifications

<input type="checkbox"/> TF24-3 US	
<input type="checkbox"/> TF24-3-S US	
Control	Floating
Power supply	24VAC ± 20%, 50/60Hz
Power consumption:	running: 2.5 W holding: 1.0 W
Transformer sizing	4 VA (class 2 power source)
Electrical connection	TF24-3 US 3 ft, 18 GA plenum rated cable TF24-3-S US 3 ft, 18 GA appl. cables (2) (6 ft, 10 ft cables optional) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Input impedance	1000 Ω (0.6w) control inputs
Angle of rotation	90°, adjust. with mechanical stop
Direction of rotation	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication	visual indicator, 0° to 95° (0° spring return position)
Auxiliary switch (-S models)	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time	motor: 1s / for 90° independent of load spring: < 25 sec @-4°F to +122°F [-20°C to +50°C] < 60 sec @-22°F [-30°C]
Humidity	5 to 95% RH non-condensing
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 type 2 / IP42
Housing material	UL94 - 5VA
Agency listings	cULus listed acc. to UL 60730-1/-2-14 and CAN/CSA C22.2 No.24, CE according to 73 / 23 / EEC
Noise level	max: running < 35 db (A) spring return 62 dB (A)
Quality standard	ISO 9001

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

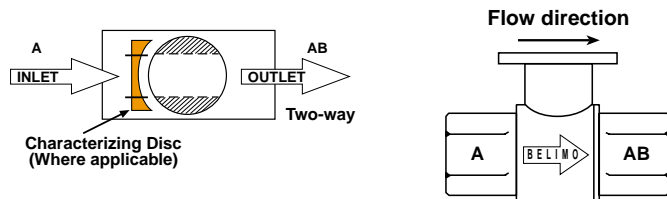


Dimensions

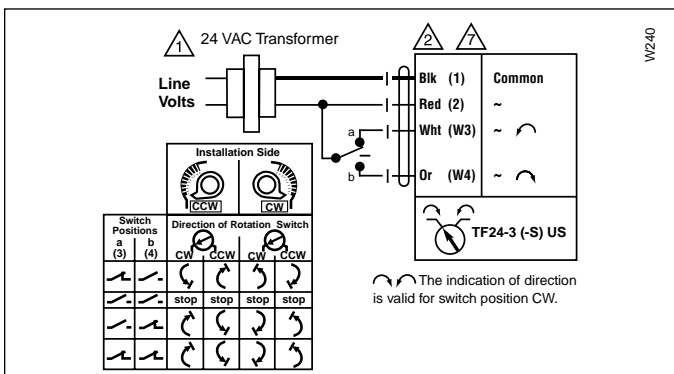


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217B-B220B	3/4"	20	2.63 [66.8]	1.75 [44.5]

Flow Pattern

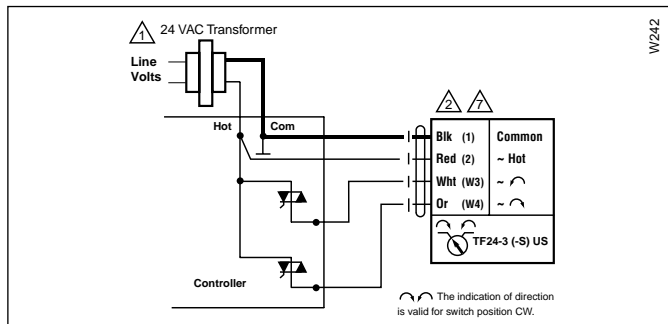


Wiring

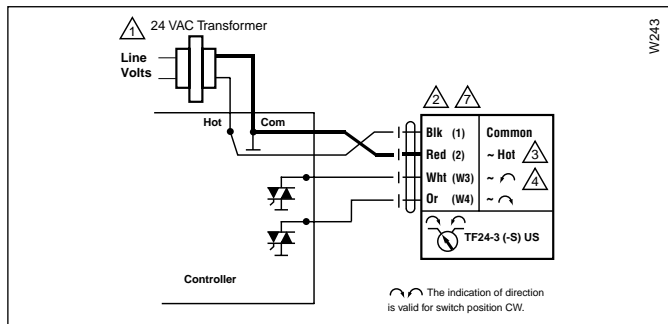


Floating point control of TF24-3 (-S) US

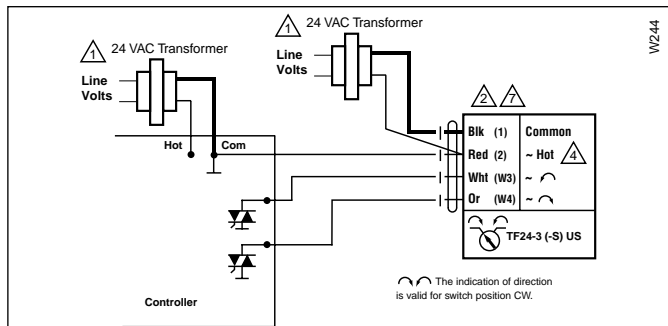
Wiring



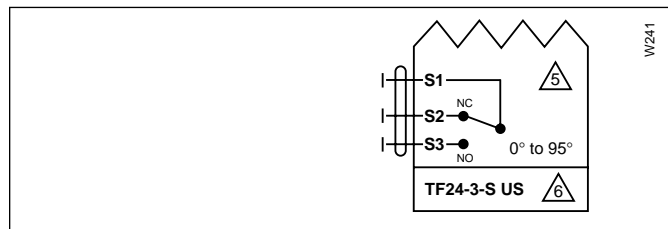
Triac source



Triac sink



Triac sink with separate transformers



Auxiliary switch of TF24-3 (-S) US

Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption must be observed.
- 3 The Common connection from the actuator must be connected to the Hot connection of the controller.
- 4 The actuator Hot must be connected to the control board Common.
- 5 For end position indication, interlock control, fan startup, etc., TF24-3-S US TF120-S US and TF230-S US incorporate one built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL listed, adjustable 0° to 95°.
- 6 Meets cULus requirements without the need of an electrical ground connection.
- 7 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.

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

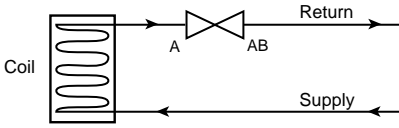
CAUTION: It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these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

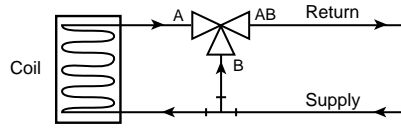
Correct Piping:

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.

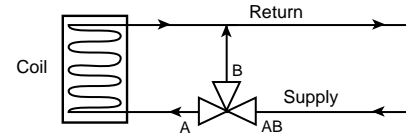
Two-Way Valve Piping Diagram
(1 Input, 1 Output)



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.

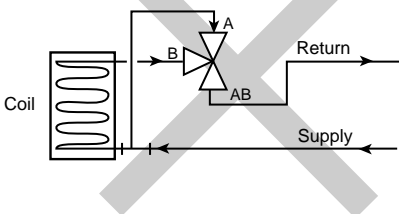
The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A port. These diagrams are for typical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

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

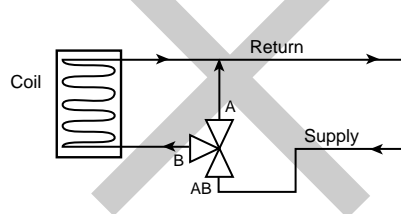
The B port restricts flow by 30% of A port value.

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.

