



Technical Data/Submittal



**Valve Specifications**

Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage
Action	max 90° rotation
Sizes	1/2", 3/4"
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
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 <sub>v</sub> rating	A-port: see product chart for values

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**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 24 VAC.

**Actuator Specifications**

<input type="checkbox"/> TR24-3-T US	
Control	On/Off, Floating Point
Input impedance	.36kΩ
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	-22°F to 122°F (-30°C to +50°C)
Storage temperature	-40°F to 176°F (-40°C to +80°C)
Housing	NEMA 1/IP40
Housing rating	UL94-5V(B)
Agency listing†	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	max. 35 db (A)
Quality standard	ISO 9001

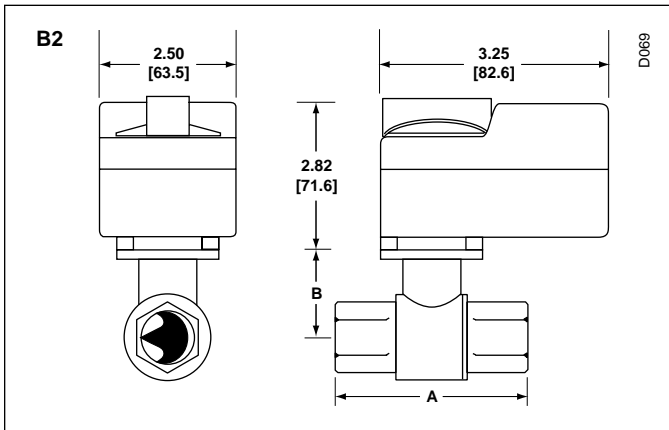
† Rated impulse voltage 330V, Control pollution degree 2, Type of action 1

**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

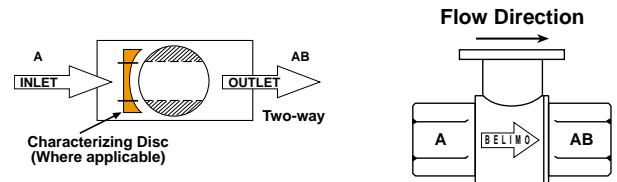


### Dimensions



Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217-B220	3/4"	20	2.63 [66.8]	1.75 [44.5]

### Flow Pattern



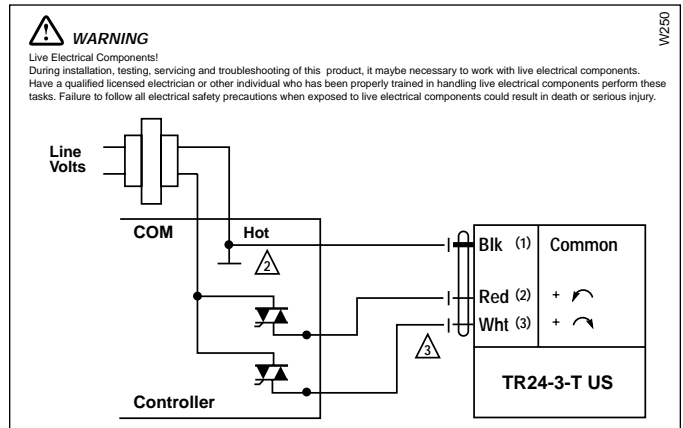
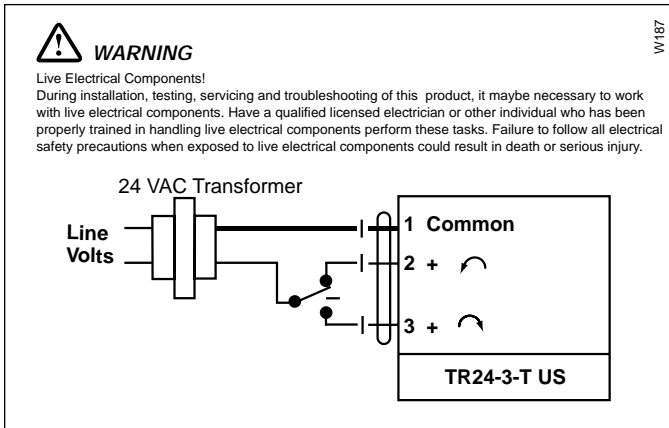
### Wiring Diagrams

#### CAUTION

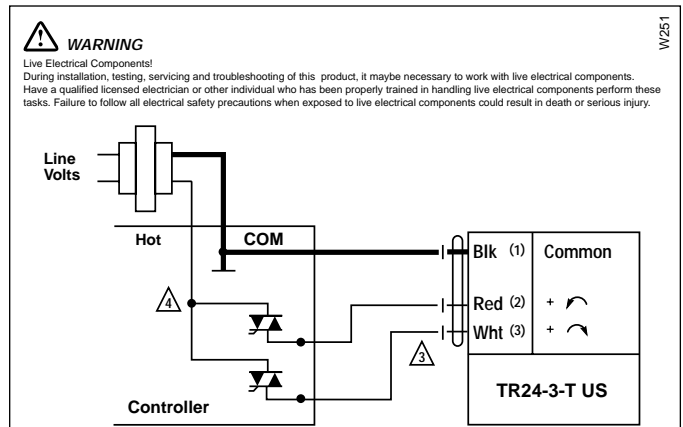
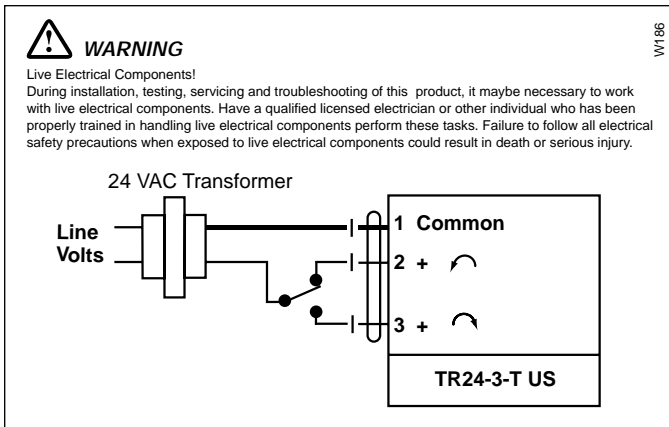
- ⚠️ Equipment damage!  
Actuators may be connected in parallel. Power consumption and input impedance must be observed.

#### INSTALLATION NOTES

- ⚠️ 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.
- ⚠️ The actuator Hot must be connected to the control board Hot.



### Floating Control



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

Triac Source

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

**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)
<b>Non-Spring Return - Stays in Last Position</b>	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	<b>NC:</b> Closed A to AB, will open as voltage increases.	<b>NO:</b> Open A to AB, will close as voltage increases. (Can be chosen with switch inside terminal block of actuator).	<b>NC:</b> Closed A to AB, will open as voltage increases. <b>NO:</b> 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.	<b>NO:</b> 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.
<b>Spring Return - Note Fail Position</b>	TFX24 US LF24 US AF24 US	<b>NO/FO Valve:</b> Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss.	<b>NC/FC Valve:</b> Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.	<b>NO/FO Valve:</b> Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss. <b>NC/FC Valve:</b> 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	<b>NC/FO Valve:</b> Closed A to AB will drive open. Spring Action: Will spring open A to AB upon power loss.	<b>NC/FC or NO/FC Valve:</b> 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. <b>NO/FO Valve:</b> Open A to AB Spring Action: Will spring open A to AB upon power loss. ( <b>NO</b> action can be chosen with CW/CCW switch).	<b>NC/FO Valve:</b> Closed A to AB will drive open Spring Action: Will spring open A to AB upon power loss. <b>NC/FC or NO/FC Valve:</b> 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. <b>NO/FO Valve:</b> Open A to AB Spring Action: Will spring open A to AB upon power loss. ( <b>NO</b> 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

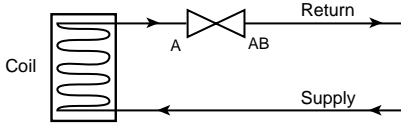
**CAUTION:** It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When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

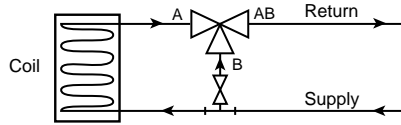
**Correct Piping:**

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.

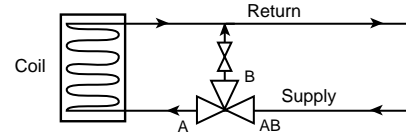
**Two-Way Valve Piping Diagram**  
(1 Input, 1 Output)



**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.**

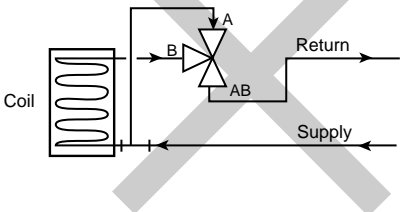
The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A port. These diagrams are for typical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

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

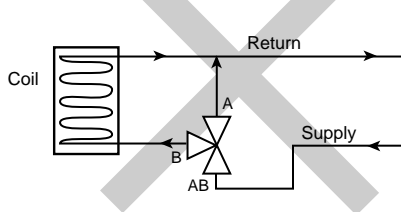
**The B port restricts flow by 30% of A port value.**

**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.

