

# Technical Documentation

## Electronic Characterized Control Valves™ (CCV)

Effective March 2005



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## Electronic Pressure Independent Characterized Control Valves™ U.S. Patent



## Electronic Characterized Control Valves™ U.S. Patent



## Electronic Zone Valves



**PICCV** Two-way

1/2" to 2"

**Service:** Chilled/hot water, 60% glycol  
**Flow Rate:** 0.5-40 GPM  
**Material:** Brass Body  
 Brass/Stainless trim  
**Control:** Floating  
 Multi-Function Technology®  
 Spring Return or Non-Spring Return

### Typical Application

**Air Handling Units:** – Heating Coils  
 – Cooling Coils  
**Unit Ventilators**  
**VAV Box Re-heat Coils**

**B2... Series** Two-way  
**B3... Series** Three-way  
 Mixing/diverting  
**B6... Series** Two-way Flanged

1/2" to 3"

**Service:** Chilled/hot water, 60% glycol  
**C<sub>v</sub> Range:** 0.3-240  
**Material:** Stainless trim or Brass trim  
**Control:** On/Off, floating, 2-10 VDC  
 Multi-Function Technology®  
 Spring Return or Non-Spring Return

### Typical Application

**Air Handling Units:** – Heating Coils  
 – Cooling Coils  
**Fan Coil Units:** – Heating Coils  
 – Cooling Coils  
**Unit Ventilators**  
**VAV Box Re-heat Coils**  
**Bypass loops**

**ZONE2...N Series** Two-way NPT  
**ZONE2...S Series** Two-way Sweat  
**ZONE3...N Series** Three-way  
 Diverting NPT  
**ZONE3...S Series** Three-way  
 Diverting Sweat

1/2" to 1"

**Service:** Chilled/hot water, 50% glycol  
**C<sub>v</sub> Range:** 1.0 - 8.0  
**Material:** Brass Body  
**Control:** On/Off  
 Spring Return

### Typical Application

**Fan Coil Units:** – Heating Coils  
 – Cooling Coils  
**Baseboard Radiation**

For detailed information and submittal data, see Technical Documentation at [www.belimo.com](http://www.belimo.com) or on CD-ROM.

## Electronic Globe Valves



<b>G2...(S) Series</b>	Two-way Screwed Bronze or Stainless Trim
<b>G6...C (S) Series</b>	Two-way Flanged Bronze or Stainless Trim
<b>G6...(S) Series</b>	Two-way Flanged Bronze or Stainless Trim
<b>G6...(S)-250 Series</b>	Two-way Flanged ANSI 250 Bronze or Stainless Trim
<b>G3...(D) Series</b>	Three-way Screwed Bronze Trim
<b>G7...(S) Series</b>	Three-way Flanged Bronze or Stainless Trim
<b>G7...(S)-250 Series</b>	Three-way Flanged ANSI 250 Bronze or Stainless Trim

Three-way Valves available in Mixing or Diverting

1/2" to 6"

<b>Service:</b>	Chilled/hot water, 60% glycol, steam
<b>C<sub>v</sub> Range:</b>	0.4-344 (Two-way) 2.2-340 (Three-way Mix.) 4.4-248 (Three-way Div.)
<b>Material:</b>	Stainless steel stem, Bronze plug or Stainless plug
<b>Control:</b>	On/Off, floating, 2-10 VDC Multi-Function Technology® Spring Return or Non-Spring Return

### Typical Application

<b>Air Handling Units:</b>	- Heating Coils - Cooling Coils
<b>Fan Coil Units:</b>	- Heating Coils - Cooling Coils
<b>Unit Ventilators</b>	
<b>VAV Box Re-heat Coils</b>	
<b>Bypass loops</b>	

For detailed information and submittal data, see Technical Documentation at [www.belimo.com](http://www.belimo.com) or on CD-ROM.

## Electronic Butterfly Valves



<b>F6... Series (HS,HSU)</b>	Two-way
<b>F7... Series (HS,HSU)</b>	Three-way Mixing/diverting

2" to 30"

<b>Service:</b>	Chilled/hot water, 50% glycol
<b>C<sub>v</sub> Range:</b>	115-73,426
<b>Material:</b>	Stainless shaft Stainless Disc Cast Iron, Full Lug Body EPDM Liner
<b>Control:</b>	On/Off, floating, 2-10 VDC On/Off, floating 2-10 VDC, 1-5 VDC, 4-20mA (NEMA 4 actuator) Multi-Function Technology® Spring Return or Non-Spring Return

### Typical Application

<b>Chiller and cooling tower isolation</b>
<b>Change-over systems</b>
<b>Large air handler coil control</b>
<b>Bypass control applications</b>

## Retrofit Solutions and Supplementary Valve Offering



Call Belimo for Details

### Retrofit Solutions

#### Globe Valves:

<b>UNV Series</b>	Direct Coupled Actuator, Two-way Valves Three-way Valves
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<b>UGLK Series</b>	Linkage Solution, Two-way Valves Three-way Valves
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#### Butterfly Valve:

<b>UFLK Series</b>	Linkage Solution, Two-way Valves Three-way Valves
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#### Retrofit solutions for virtually any valve Manufacturers:

<b>Globe:</b>	Siemens, Johnson, Honeywell, Invensys, etc.
<b>Butterfly:</b>	Bray, Centerline, Keystone, Flowseal, etc.
<b>Control:</b>	On/Off, floating, 2-10 VDC Multi-Function Technology® Spring or Non-Spring Return

### Supplementary Valve Offering

#### Pressure Independent Valves:

Up to 8"
Non-Spring and Spring Return Actuation
Industrial NEMA 4 Actuation

#### Standard Ball Valves:

Stainless trim
Non-Spring and Spring Return Actuation
For Steam Application

#### Butterfly Valves:

Up to 30"
ANSI 150/300 Rated
Stainless Trim
Industrial Spring Return NEMA 4 Actuation
Pneumatic Actuation

Call Customer Service to discuss your application.

# Valve/Actuator Selection At A Glance

## Base product nomenclature

B209 + LF24-MFT US

### VALVE ACTUATOR

**B2 09**

#### VALVE SIZES

Valve	Designation	Sizes
CCV Valve	<u>07</u> - <u>80</u>	= 1/2" - 3"

#### TYPE OF VALVE

#### CHARACTERIZED CONTROL VALVE™ (CCV)

- B2... 2-way Stainless Steel Ball & Stem
- B2...B 2-way Chrome Plated Brass Ball & Brass Stem
- B3... 3-way Stainless Steel Ball & Stem
- B3...B 3-way Chrome Plated Brass Ball & Brass Stem
- B6... 2-way Stainless Steel Ball & Stem, Flanged

**LF24 - MFT US**

24 VAC/DC Power\*

For North/South American Market

Actuator Type	Designation	Torque	Rotation
Non-Spring Return Actuator	TR...	Increasing Torque	Rotary
	LR...		
	NM...		
	AM...		
Spring Return Actuator	TF...	Increasing Torque	Rotary
	LF...		
	AF...		

DESIGNATOR	DESCRIPTION
-MFT	Multi-Function Technology® (MFT) 2 - 10 VDC Control or Selectable (See MFT chart opposite)
-SR	2-10 VDC
-3	Floating point
None	On/Off

\*120 volt available on some models

Specify upon ordering

+NO/FO+P-10002+AHU-1

## SET-UP

NO/FO

**SET UP\***

Non-Spring Models  
**NO** = Normally Open  
**NC** = Normally Closed

Spring Return Models  
**NO/FO** = Normally Open/Fail Open  
**NO/FC** = Normally Open/Fail Closed

**NC/FO** = Normally Closed/Fail Open  
**NC/FC** = Normally Closed/Fail Closed

*See default settings*  
*\*Refers to valve ports A to AB*

## MFT CONFIGURATION

P-10002

## TAGGING

AHU-1

**TAGGING**

Valves may be tagged per customer specification

Example:  
 AHU-1  
 FCU-2

Multi-Function Technology		See Appendix for Complete List of Configurations			
Code	Control Input	Running Time	Built-in Feedback	List Price	
P-10001	2-10 VDC	150	2-10 VDC	No Charge	
P-10002	0-10 VDC	150	0-10 VDC	No Charge	
P-10028	0-10 VDC	100	0-10 VDC	No Charge	
P-10063	0.5-4.5 VDC	150	0.5-4.5 VDC	No Charge	
P-10064	5.5-10 VDC	150	5.5-10 VDC	No Charge	
P-20002	0.02-5.00 sec. PWM	150	2-10 VDC	No Charge	
P-20003	0.10-25.5 sec. PWM	150	2-10 VDC	No Charge	
P-30001	Floating Point	150	2-10 VDC	No Charge	

Example: LF24-MFT US is the basic model. Add the P... pre-set MFT configuration number and list price to the actuator when ordering, as needed.  
**Note:** Most popular configurations available at no additional cost. All other configurations carry a \$30.00 list price.

## ORDERING EXAMPLE

**1 Choose the desired valve/actuator combination based on valve ratings and actuator control parameters from the following pages.**

**B209+LF24-MFT US+**

●

**2 Specify Configuration (important)**

• **Multi-Function Technology:**

**P-10002** (0-10 VDC input / 0-10 feedback)

●

• **Set-up:**

**NO/FO** (Normally Open / Fail Open)

●

• **Tagging:**

**AHU-1**

●

**B209+LF24-MFT US+NO/FO+P-10002+AHU-1 Total**

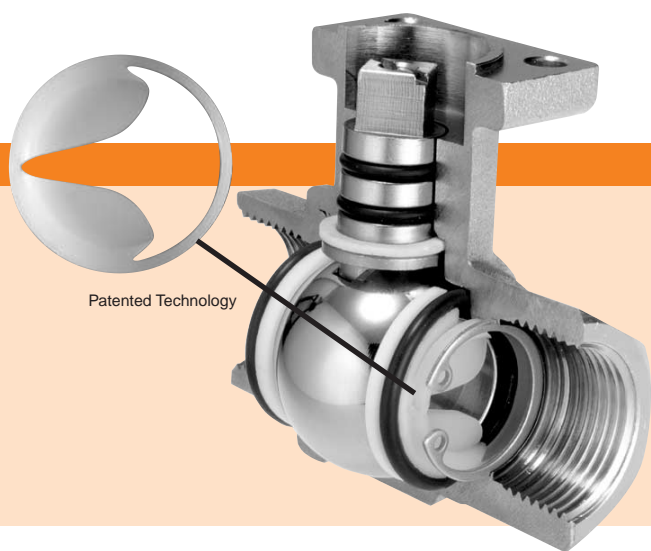
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## Equal percentage valve characteristic

In order to ensure good stability of control, it is essential for a control valve to have an equal percentage characteristic. This type of characteristic produces a linear variation in thermal output according to the amount of opening of the valve (also known as the system characteristic). Under normal testing conditions a conventional ball valve exhibits an S-shaped characteristic. When it is installed in a real system, however, this characteristic is seriously deformed because, compared with its nominal size, a ball valve possesses an extremely high flow coefficient. Whether used with or without pipe reducers or a reduced bore, they do not normally allow stable regulation of the thermal capacity.

Belimo's unique Characterized Control Valve™ (CCV) is very different. A special characterizing disc inside the valve gives it an equal percentage characteristic which is comparable with that of a globe valve of the same nominal size. The flow (the Cv value) is reduced to the required value by a combination of the hole in the ball and the shaped aperture in the disc. The increase in flow as the valve is opened is very slow and controlled.

This produces better part-load behavior and improved stability of control while also optimizing energy consumption.

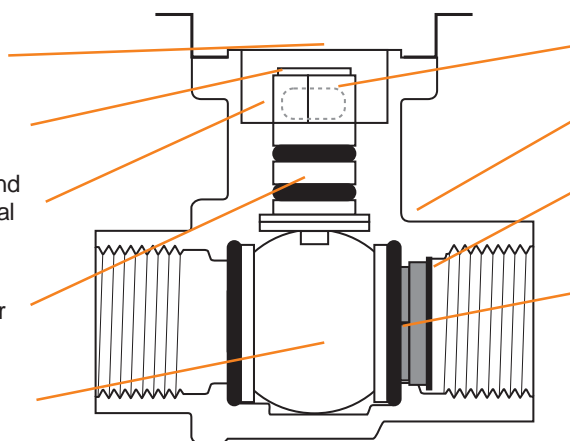


## Benefit of the Belimo Characterizing Disc

- Equal percentage flow characteristic.
- Excellent control stability assured with the characterizing disc.
- Cv values equal to Cv values of globe valves the same size.
- The need for multiple pipe reduction is usually eliminated.
- Better control prevents "hunting" of the control loop, increasing life span of actuator and valve.

## Features

- Thermal isolating adapter between flange and actuator.
- Easy direct coupling of actuator with a single screw.
- Perpendicular mounting flange and square drive head eliminate lateral forces on the stem.
- Blow-out proof stem with thrust-bearing double O-ring design for long service life.\*
- Non-corroding chrome-plated brass or stainless ball.



- Vent holes reduce condensation build-up.
- Forged brass valve body — no pin-hole leaks.
- Characterizing disc — made of Tefzel® known for excellent strength and chemical resistance.
- Teflon® seats with O-rings provide constant seating force against the ball and reduce torque requirement.
- Actuator can be mounted in four different positions.

\* Designed for service life of over 100,000 full cycles.  
Teflon® and Tefzel® are both registered trademarks of Dupont, Inc.

### Coordinated motorized operation

The optimum functionality of the Belimo CCV is assured by properly coordinating its actuation with MFT. Specially developed rotary actuators provide the necessary precision for modulating, floating-point, and on/off methods of control.

All CCVs are supplied with the appropriate rotary actuator to provide the close-off and operation desired.

### Optimized for control

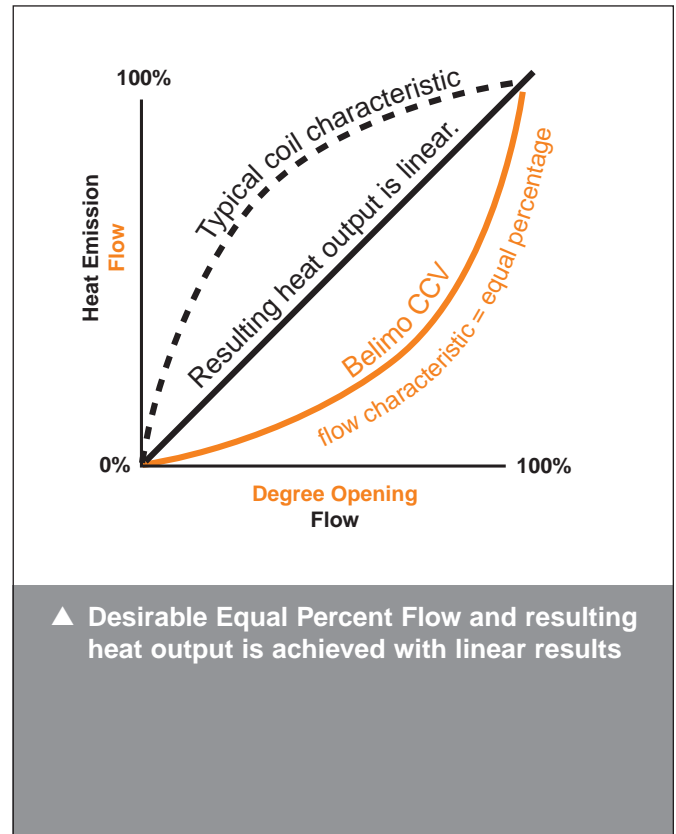
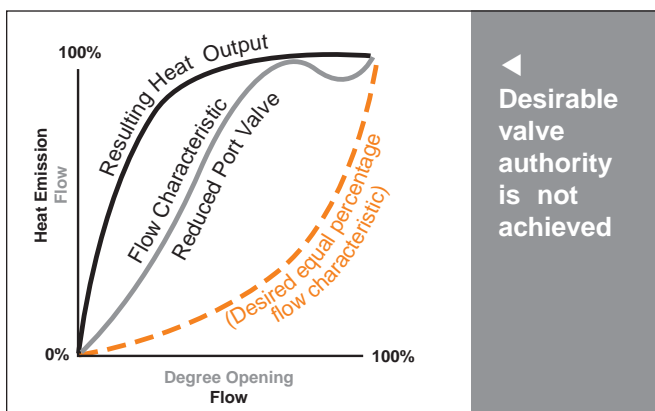
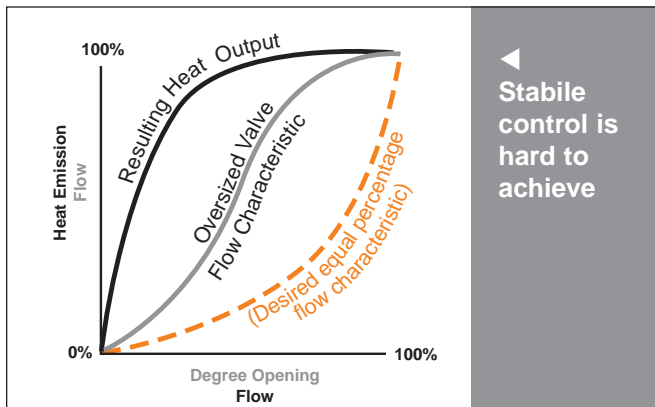
The Belimo CCV marries known technology with an innovative development – the unique characterizing disc.

The marriage of CCV and MFT technologies has produced a range of valuable features which surpass the capabilities of globe valves at a very attractive price level:

- An equal-percentage valve characteristic
- Unlike a globe valve, no sudden change in inlet flow upon opening
- Excellent stability of control
- Cv values comparable with those of globe valves of the same size or larger
- Higher close-off ratings than standard globe valves
- 100% tight shut-off on two-way valves means NO leak-by unlike globe valves that have ANSI IV shutoff (leakage rate of 0.01% of the Cv rating)
- Three-way valve can be piped in mixing or diverting application

<b>B2 Series</b>	<b>Two-way</b>
<b>B3 Series</b>	<b>Three-way Mixing/diverting</b>
<b>B6 Series</b>	<b>Two-way Flanged</b>
<b>1/2" to 3"</b>	
<b>Service:</b>	<b>Chilled/hot water, 60% glycol</b>
<b>C<sub>v</sub> Range:</b>	<b>0.3-240</b>
<b>Material:</b>	<b>Stainless trim or Brass trim</b>
<b>Control:</b>	<b>On/Off, floating, 2-10 VDC Multi-Function Technology® Spring Return or Non-Spring Return</b>

## Flow Characteristics of Conventional Ball Valves versus Belimo Characterized Control Valves





## New TR rotary actuators

The small, exceptionally compact TR rotary actuator has been specially developed for the motorized operation of 1/2" to 3/4" Characterized Control Valves™.

- On/Off, floating, or modulating control
- Easy-to-read position indicator – shows flow pattern for two- and three-way valves
- Manual override
- Constant running time
- Compact dimensions – 3.25" by 2.5" by 2.5" – perfect for reheat applications and small spaces
- Protected terminal strip or cable options of 3-ft, 6-ft and 10-ft
- 4 mounting positions
- One central screw for easy mounting
- 24 VAC power



## New TF spring return actuator

The compact TF spring return actuator has been designed for use with Belimo 1/2" to 3/4" Characterized Control Valves™ and features a true mechanical fail/safe.

- On/Off, floating, or modulating control
- Mechanical spring fail safe
- Brushless DC motor technology
- Reversible spring direction
- Compact size





Two-way NPT screwed body, sizes 2-1/2" - 3" for use in large air handling applications

Two-way with ANSI 125 flanges, in sizes 2-1/2" - 3" for use in large air handling applications



#### New Expanded Line of CCV—for ALL of your control applications

- Two-way and Three-way 1/2" valves with low  $C_v$  values—perfect for reheat applications
- Two-way 2"-3" NPT screwed valves—ideal for larger air handler applications
- Two-way 2-1/2"-3" flanged valves—offer the combination of high close-off and large  $C_v$  values

Table A: Valve Flow Rate for Water Applications (Gallons Per Minute, GPM)

C <sub>v</sub> Maximum Rating	Valve		Two Way CCV	Three Way CCV	Pressure drop across the valve									
	Inches	DN mm			1 psi	2 psi	3 psi	4 psi	5 psi	6 psi	7 psi	8 psi	9 psi	10 psi
0.3	1/2"	15	B207	B307	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9
0.46	1/2"	15	B208	B308	0.5	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
0.8	1/2"	15	B209	B309	0.8	1.1	1.4	1.6	1.8	2.0	2.1	2.3	2.4	2.5
1.2	1/2"	15	B210	B310	1.2	1.7	2.1	2.4	2.7	2.9	3.2	3.4	3.6	3.8
1.9	1/2"	15	B211	B311	1.9	2.7	3.3	3.8	4.2	4.7	5.0	5.4	5.7	6.0
3.0	1/2"	15	B212	B312	3.0	4.2	5.2	6.0	6.7	7.3	7.9	8.5	9.0	9.5
4.7	1/2"	15	B213	B313	4.7	6.6	8.1	9.4	11	12	12	13	14	15
7.4	1/2"	15	B214		7.4	10	13	15	17	18	20	21	22	23
10	1/2"	15	B215*	B315*	10	14	17	20	22	24	26	28	30	32
4.7	3/4"	20	B217	B317	4.7	6.6	8.1	9.4	11	12	12	13	14	15
7.4	3/4"	20	B218	B318	7.4	10	13	15	17	18	20	21	22	23
10	3/4"	20	B219		10	14	17	20	22	24	26	28	30	32
24	3/4"	20	B220*	B320*	24	34	42	48	54	59	63	68	72	76
7.4	1"	25	B222	B322	7.4	10	13	15	17	18	20	21	22	23
10	1"	25	B223	B323	10	14	17	20	22	24	26	28	30	32
19	1"	25	B224		19	27	33	38	42	47	50	54	57	60
30	1"	25	B225*	B325*	30	42	52	60	67	73	79	85	90	95
10	1-1/4"	32	B229	B329	10	14	17	20	22	24	26	28	30	32
19	1-1/4"	32	B230*	B330*	19	27	33	38	42	47	50	54	57	60
25	1-1/4"	32	B231	B331	25	35	43	50	56	61	66	71	75	79
37	1-1/4"	32	B232*	B332*	37	52	64	74	83	91	98	105	111	117
19	1-1/2"	40	B238	B338	19	27	33	38	42	47	50	54	57	60
29	1-1/2"	40	B239	B339	29	41	50	58	65	71	77	82	87	92
37	1-1/2"	40	B240*	B340*	37	52	64	74	83	91	98	105	111	117
29	2"	50	B248	B348	29	41	50	58	65	71	77	82	87	92
46	2"	50	B249	B349	46	65	80	92	103	113	122	130	138	145
57	2"	50	B250*	B350*	57	81	99	114	127	140	151	161	171	180
65	2"	50	B251		65	91.9	112.6	130	145.3	159.2	172.0	183.8	195	205.5
85	2"	50	B252		85	120.2	147.2	170	190.1	208.2	224.9	240.4	255.0	268.8
120	2"	50	B253		120	169.7	207.8	240	268.3	293.9	317.5	339.4	360.0	379.5
240	2"	50	B254*		240	339.4	415.7	480	536.7	587.9	635.0	678.8	720.0	758.9
60	2-1/2"	65	B261		60	84.9	103.9	120	134.2	147.0	158.7	169.7	180.0	189.7
75	2-1/2"	65	B262		75	106.1	129.9	150	167.7	183.7	198.4	212.1	225.0	237.2
110	2-1/2"	65	B263		110	155.6	190.5	220	246.0	269.4	291.0	311.1	330.0	347.9
150	2-1/2"	65	B264		150	212.1	259.8	300	335.4	367.4	396.9	424.3	450.0	474.3
210	2-1/2"	65	B265*		210	297.0	363.7	420	469.6	514.4	555.6	594.0	630.0	664.1
70	3"	80	B277		70	99.0	121.2	140	156.5	171.5	185.2	198.0	210.0	221.4
130	3"	80	B278		130	183.8	225.2	260	290.7	318.4	343.9	367.7	390.0	411.1
170	3"	80	B280*		170	240.4	294.4	340	380.1	416.4	449.8	480.8	510.0	537.6
60	2-1/2"	65	B661		60	84.9	103.9	120	134.2	147.0	158.7	169.7	180.0	189.7
75	2-1/2"	65	B662		75	106.1	129.9	150	167.7	183.7	198.4	212.1	225.0	237.2
110	2-1/2"	65	B663		110	155.6	190.5	220	246.0	269.4	291.0	311.1	330.0	347.9
150	2-1/2"	65	B664		150	212.1	259.8	300	335.4	367.4	396.9	424.3	450.0	474.3
210	2-1/2"	65	B665*		210	297.0	363.7	420	469.6	514.4	555.6	594.0	630.0	664.1
70	3"	80	B677		70	99.0	121.2	140	156.5	171.5	185.2	198.0	210.0	221.4
130	3"	80	B678		130	183.8	225.2	260	290.7	318.4	343.9	367.7	390.0	411.1
170	3"	80	B680		170	240.4	294.4	340	380.1	416.4	449.8	480.8	510.0	537.6

GPM = C<sub>v</sub> × √ Δp \* = Models with no characterizing disc.

The influence of the pipe geometry due to reduced flow is negligible for all valves 57 C<sub>v</sub> and below with characterizing discs.

Above information applies to chrome plated brass ball and stem versions also (B...B).

**Table B: Piping Reduction Factor (Fp) - Correction Factor for Valves**

Model #	Valve size		Line size										
	Inches	DN mm	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	5"	6"
B215	1/2"	15	10	7.4	6.3								
B220	3/4"	10		24	19	16.1	14.6						
B225	1"	25			30	27.3	24.9	21.9					
B230	1-1/4"	32				19	18.8	18.2	17.9				
B232	1-1/4"	32				37	35.5	31.8	30				
B240	1-1/2"	40					37	35	34	33			
B250	2"	50						57	56	54	52		
B251	2"	50						65	65	64	64		
B252	2"	50						85	81	78	74		
B253	2"	50						120	107	102	92		
B254	2"	50						240	197	182	148		
B261	2-1/2"	65							60	58	55	54	
B262	2-1/2"	65							75	73	72	70	
B263	2-1/2"	65							110	104	100	95	
B264	2-1/2"	65							150	139	132	122	
B265	2-1/2"	65							210	190	175	164	
B277	3"	80								70	69	68	68
B278	3"	80								130	119	115	113
B280	3"	80								170	148	142	139
B661	2-1/2"	65							60	58	55	54	
B662	2-1/2"	65							75	73	72	70	
B663	2-1/2"	65							110	104	100	95	
B664	2-1/2"	65							150	139	132	122	
B665	2-1/2"	65							210	190	175	164	
B677	3"	80								70	69	68	68
B678	3"	80								130	119	115	113
B680	3"	80								170	148	142	139

# 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



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



Model # CCV Valve	Cv Rating	Valve		Close-Off psi	Non-Spring Return Actuator	
		Nominal Size			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
<b>Electrical Connection</b>					<b>Covered Terminal Strip</b>	<b>Covered Terminal Strip</b>

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

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



Model # CCV Valve	Cv Rating	Valve		Close-Off psi	Non-Spring Return Actuator	
		Nominal Size			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
<b>Electrical Connection</b>					<b>Covered Terminal Strip</b>	<b>Covered Terminal Strip</b>

\* Models without characterizing discs.  
See [pg 132](#) for MFT Configuration.

Options (add to list price)		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	<input type="checkbox"/> Pg 20/22/24/26
6-foot cable	TR.../200 US	<input type="checkbox"/> Pg 20/22/24/26	<input type="checkbox"/> Pg 20/22/24/26
10-foot cable	TR.../300 US	<input type="checkbox"/> Pg 20/22/24/26	<input type="checkbox"/> Pg 20/22/24/26



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

Model # CCV Valve	Cv Rating	Valve			Spring Return Actuator		
		Nominal Size		Close-Off psi	On/Off	Floating	Proportional
		Inches	DN mm		TF24 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
<b>Electrical Connection</b>					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 Cv's with piping reduction factor.



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

Model # CCV Valve	Cv Rating	Valve			Spring Return Actuator		
		Nominal Size		Close-Off psi	On/Off	Floating	Proportional
		Inches	DN mm		TF24 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
<b>Electrical Connection</b>					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.  
TF24 US, TF120 US available March 2005.  
TF24-S US, TF120-S US, TF24-3 (-S) US, TF24-SR (-S) US available May 2005.  
See [pg 132](#) for MFT Configuration.

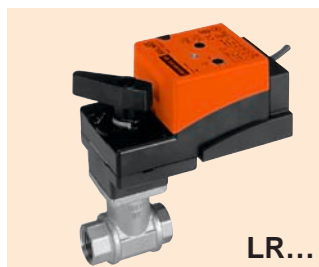
Options (add to list price)	TF24 US	TF24-3 US	TF24-SR US
built-in aux. switch ...-S US	<input type="checkbox"/> Pg 28/34	<input type="checkbox"/> Pg 30/36	<input type="checkbox"/> Pg 32/38
120 VAC power supply ..120...	<input type="checkbox"/> Pg 28/34		

# B2 Series Characterized Control Valve,™ Non-Spring Return Actuator BELIMO®

Two-way Valve with **Stainless Steel Ball and Stem**, NPT female ends



TR...



LR...



NM...



AM...

## B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem



Valve					Non-Spring Return Actuator				
Model # CCV Valve	Cv Rating	Valve Nominal Size		Close-Off psi	On/Off, Floating	On/Off, Floating	Proportional	Proportional	Proportional / MFT
		Inches	DN mm		TR24-3-T US	LR24-3 US	TR24-SR-T US	LR24-SR US	LR24-MFT US
B207	0.3	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B208	0.46	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B209	0.8	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B210	1.2	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B211	1.9	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B212	3.0	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B213	4.7	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B214	7.4	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B215*	10	1/2"	15	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B217	4.7	3/4"	20	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B218	7.4	3/4"	20	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B219	10	3/4"	20	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B220*	24	3/4"	20	200	<input type="checkbox"/> Pg 40	<input type="checkbox"/> Pg 44	<input type="checkbox"/> Pg 42	<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B222	7.4	1"	25	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B223	10	1"	25	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B224	19	1"	25	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B225*	30	1"	25	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B229	10	1-1/4"	32	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B230*	19	1-1/4"	32	200		<input type="checkbox"/> Pg 44		<input type="checkbox"/> Pg 46	<input type="checkbox"/> Pg 48
B231	25	1-1/4"	32	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B232*	37	1-1/4"	32	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B238	19	1-1/2"	40	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B239	29	1-1/2"	40	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B240*	37	1-1/2"	40	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B248	29	2"	50	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B249	46	2"	50	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B250*	57	2"	50	200		<input type="checkbox"/> Pg 50		<input type="checkbox"/> Pg 52	<input type="checkbox"/> Pg 54
B251	65	2"	50	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B252	85	2"	50	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B253	120	2"	50	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B254*	240	2"	50	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B261	60	2.5"	65	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B262	75	2.5"	65	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B263	110	2.5"	65	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B264	150	2.5"	65	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B265*	210	2.5"	65	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B277	70	3"	80	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B278	130	3"	80	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
B280*	170	3"	80	100		<input type="checkbox"/> Pg 56			<input type="checkbox"/> Pg 58
<b>Electrical Connection</b>					<b>Covered Terminal Strip</b>	<b>3 ft cable, 1/2" conduit fitting</b>	<b>Covered Terminal Strip</b>	<b>3 ft cable, 1/2" conduit fitting</b>	<b>3 ft cable, 1/2" conduit fitting</b>

\* Models without characterizing discs. See pg 11 for corrected C<sub>v</sub>s with piping reduction factor. See pg 132 for MFT Configuration.

Options (add to list price)		TR24-3-T US TR24-SR-T US	LR24-3 US
built-in aux. switch	LR...-S US		<input type="checkbox"/> Pg 44
3-foot cable	TR24-3 US, TR24-SR US	<input type="checkbox"/> Pg 40/42	
6-foot cable	TR.../200 US, LR.../200 US	<input type="checkbox"/> Pg 40/42	<input type="checkbox"/> Pg 44
10-foot cable	TR.../300 US, LR.../300 US	<input type="checkbox"/> Pg 40/42	<input type="checkbox"/> Pg 44

G20493 - 03/05 - IG-Subject to change. © Belimo Aircontrols (USA), Inc.

# BELIMO B3 Series Characterized Control Valve,™ Non-Spring Return Actuator

Three-way Valve with **Stainless Steel Ball and Stem**, NPT female ends



TR...



LR...



NM...



## B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem

Valve					Non-Spring Return Actuator					
Model # CCV Valve	Cv Rating	Valve		Close-Off psi	On/Off, Floating	On/Off, Floating	Proportional	Proportional	Proportional / MFT	
		Nominal Size Inches	DN mm		TR24-3-T US	LR24-3 US NM24 US	TR24-SR-T US	LR24-SR US NM24-SR US	LR24-MFT US NM24-MFT US	
B307	0.3	1/2"	15	200	TR24-3-T US	<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B308	0.46	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B309	0.8	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B310	1.2	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B311	1.9	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B312	3.0	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B313	4.7	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B315*	10	1/2"	15	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B317	4.7	3/4"	20	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B318	7.4	3/4"	20	200		<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68
B320*	24	3/4"	20	200	<input type="checkbox"/> Pg 60	<input type="checkbox"/> Pg 64	<input type="checkbox"/> Pg 62	<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B322	7.4	1"	25	200		<input type="checkbox"/> Pg 64		<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B323	10	1"	25	200		<input type="checkbox"/> Pg 64		<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B325*	30	1"	25	200		<input type="checkbox"/> Pg 64		<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B329	10	1-1/4"	32	200		<input type="checkbox"/> Pg 64		<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B330*	19	1-1/4"	32	200		<input type="checkbox"/> Pg 64		<input type="checkbox"/> Pg 66	<input type="checkbox"/> Pg 68	
B331	25	1-1/4"	32	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B332*	37	1-1/4"	32	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B338	19	1-1/2"	40	200	NM24 US	<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B339	29	1-1/2"	40	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B340*	37	1-1/2"	40	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B348	29	2"	50	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B349	46	2"	50	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
B350*	57	2"	50	200		<input type="checkbox"/> Pg 70		<input type="checkbox"/> Pg 72	<input type="checkbox"/> Pg 74	
<b>Electrical Connection</b>					<b>Covered Terminal Strip</b>	<b>3 ft cable, 1/2" conduit fitting</b>	<b>Covered Terminal Strip</b>	<b>3 ft cable, 1/2" conduit fitting</b>	<b>3 ft cable, 1/2" conduit fitting</b>	

\* Models without characterizing discs.

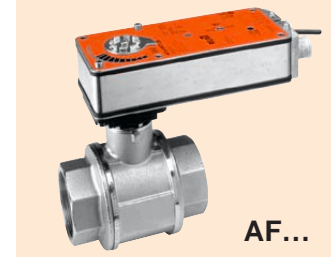
See [pg 132](#) for MFT Configuration.

Options (add to list price)		TR24-3-T US TR24-SR-T US	LR24-3 US
built-in aux. switch	LR...-S US		<input type="checkbox"/> Pg 64
3-foot cable	TR24-3 US, TR24-SR US	<input type="checkbox"/> Pg 60/62	
6-foot cable	TR.../200 US, LR.../200 US	<input type="checkbox"/> Pg 60/62	<input type="checkbox"/> Pg 64
10-foot cable	TR.../300 US, LR.../300 US	<input type="checkbox"/> Pg 60/62	<input type="checkbox"/> Pg 64

# B2 Series Characterized Control Valve,™ Spring Return Actuator



Two-way Valve with **Stainless Steel Ball and Stem**, NPT female ends



## B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem



Valve					Spring Return Actuator			
Model # CCV Valve	C <sub>v</sub> Rating	Valve Nominal Size		Close- Off psi	On/Off	Floating	Proportional	Proportional / MFT
		Inches	DN mm		TF24US LF24 US AF24 US	TF24-3 US LF24-3 US	TF24-SR US LF24-SR US AF24-SR US	LF24-MFT US AF24-MFT US
B207	0.3	1/2"	15	200	TF24 US	<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B208	0.46	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B209	0.8	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B210	1.2	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B211	1.9	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B212	3	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B213	4.7	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B214	7.4	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B215*	10	1/2"	15	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B217	4.7	3/4"	20	200		<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88
B218	7.4	3/4"	20	200	<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88	
B219	10	3/4"	20	200	<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88	
B220*	24	3/4"	20	200	<input type="checkbox"/> Pg 76	<input type="checkbox"/> Pg 80	<input type="checkbox"/> Pg 88	
B222	7.4	1"	25	200	LF24 US	<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B223	10	1"	25	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B224	19	1"	25	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B225*	30	1"	25	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B229	10	1-1/4"	32	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B230*	19	1-1/4"	32	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B231	25	1-1/4"	32	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B232*	37	1-1/4"	32	200		<input type="checkbox"/> Pg 82	<input type="checkbox"/> Pg 86	<input type="checkbox"/> Pg 88
B238	19	1-1/2"	40	200		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 92	<input type="checkbox"/> Pg 94
B239	29	1-1/2"	40	200		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 92	<input type="checkbox"/> Pg 94
B240*	37	1-1/2"	40	200	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 92	<input type="checkbox"/> Pg 94	
B248	29	2"	50	200	AF24 US	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B249	46	2"	50	200		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B250*	57	2"	50	200		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B251	65	2"	50	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B252	85	2"	50	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B253	120	2"	50	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B254*	240	2"	50	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B261	60	2-1/2"	65	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B262	75	2-1/2"	65	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B263	110	2-1/2"	65	100		<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94
B264	150	2-1/2"	65	100	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94	
B265*	210	2-1/2"	65	100	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94	
B277	70	3"	80	100	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94	
B278	130	3"	80	100	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94	
B280*	170	3"	80	100	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94	<input type="checkbox"/> Pg 94	
<b>Electrical Connection</b>					3 ft cable, 1/2" conduit fitting	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<sub>v</sub>s with piping reduction factor. See [pg 132](#) for MFT Configuration.

Options (add to list price)	TF24 US LF24 US	TF24-3 US LF24-3 US	TF24-SR US LF24-SR US	LF24-MFT US	AF24 US	AF24-MFT US
built-in aux. switch ...-S US	<input type="checkbox"/> Pg 76/82	<input type="checkbox"/> Pg 78/84	<input type="checkbox"/> Pg 80/86	<input type="checkbox"/> Pg 88	<input type="checkbox"/> Pg 90	<input type="checkbox"/> Pg 94
120 VAC power supply ..120...		<input type="checkbox"/> Pg 76/82			<input type="checkbox"/> Pg 90	
0-135Ω control	AF24-MFT95 US					<input type="checkbox"/> Pg 94†
6-9 VDC control	LF24-MFT-20 US			<input type="checkbox"/> Pg 88†		
6-9 VDC with 1 switch	LF24-MFT-S-20 US			<input type="checkbox"/> Pg 88		

† Add to ...-MFT price **Note:** AF not available on all valves. Please contact Customer Service.

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## B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem

Valve					Spring Return Actuator					
Model # CCV Valve	Cv Rating	Valve		Close-Off psi	On/Off	Floating	Proportional	Proportional / MFT		
		Nominal Size Inches	DN mm		TF24 US LF24 US AF24 US	TF24-3 US LF24-3 US	TF24-SR US LF24-SR US AF24-SR US	LF24-MFT US AF24-MFT US		
B307	0.3	1/2"	15	200	TF24 US	<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B308	0.46	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B309	0.8	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B310	1.2	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B311	1.9	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B312	3	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B313	4.7	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B315*	10	1/2"	15	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B317	4.7	3/4"	20	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B318	7.4	3/4"	20	200		<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108	
B320*	24	3/4"	20	200	<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98	<input type="checkbox"/> Pg 100	<input type="checkbox"/> Pg 108		
B322	7.4	1"	25	200	LF24 US	<input type="checkbox"/> Pg 102	<input type="checkbox"/> Pg 104	<input type="checkbox"/> Pg 106	<input type="checkbox"/> Pg 108	
B323	10	1"	25	200		<input type="checkbox"/> Pg 102	<input type="checkbox"/> Pg 104	<input type="checkbox"/> Pg 106	<input type="checkbox"/> Pg 108	
B325*	30	1"	25	200		<input type="checkbox"/> Pg 102	<input type="checkbox"/> Pg 104	<input type="checkbox"/> Pg 106	<input type="checkbox"/> Pg 108	
B329	10	1-1/4"	32	200		<input type="checkbox"/> Pg 102	<input type="checkbox"/> Pg 104	<input type="checkbox"/> Pg 106	<input type="checkbox"/> Pg 108	
B330*	19	1-1/4"	32	200		<input type="checkbox"/> Pg 102	<input type="checkbox"/> Pg 104	<input type="checkbox"/> Pg 106	<input type="checkbox"/> Pg 108	
B331	25	1-1/4"	32	200		<input type="checkbox"/> Pg 110		<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	
B332*	37	1-1/4"	32	200		<input type="checkbox"/> Pg 110		<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	
B338	19	1-1/2"	40	200		AF24 US	<input type="checkbox"/> Pg 110	<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	<input type="checkbox"/> Pg 114
B339	29	1-1/2"	40	200			<input type="checkbox"/> Pg 110	<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114
B340*	37	1-1/2"	40	200			<input type="checkbox"/> Pg 110	<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114
B348	29	2"	50	200	<input type="checkbox"/> Pg 110			<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	
B349	46	2"	50	200	<input type="checkbox"/> Pg 110			<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	
B350*	57	2"	50	200	<input type="checkbox"/> Pg 110			<input type="checkbox"/> Pg 112	<input type="checkbox"/> Pg 114	
<b>Electrical Connection</b>					<b>3 ft cable, 1/2" conduit fitting</b>		<b>3 ft cable, 1/2" conduit fitting</b>	<b>3 ft cable, 1/2" conduit fitting</b>	<b>3 ft cable, 1/2" conduit fitting</b>	

\* Models without characterizing discs.  
 TF24 US, TF120 US available March 2005.  
 TF24-S US, TF120-S US, TF24-3 (-S) US, TF24-SR (-S) US available May 2005.  
 See [pg 132](#) for MFT Configuration.

Options (add to list price)	TF24 US LF24 US	TF24-3 US LF24-3 US	TF24-SR US LF24-SR US	LF24-MFT US	AF24 US	AF24-MFT US
built-in aux. switch ...-S US	<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 98/104	<input type="checkbox"/> Pg 100/106	<input type="checkbox"/> Pg 108	<input type="checkbox"/> Pg 96	<input type="checkbox"/> Pg 114
120 VAC power supply ...120...	<input type="checkbox"/> Pg 102					
0-135Ω control	AF24-MFT95 US			<input type="checkbox"/> Pg 114†		<input type="checkbox"/> Pg 114†
6-9 VDC control	LF24-MFT-20 US			<input type="checkbox"/> Pg 108		
6-9 VDC with 1 switch	LF24-MFT-S-20 US			<input type="checkbox"/> Pg 108		

† Add to ...-MFT price **Note:** AF not available on all valves. Please contact Customer Service.

# B6 Series Flanged CCV, Non-Spring Return Actuator



Two-way Valve with **Stainless Steel Ball and Stem**, flanged ends



## B6 Two-way Characterized Control Valve, Stainless Steel Ball and Stem

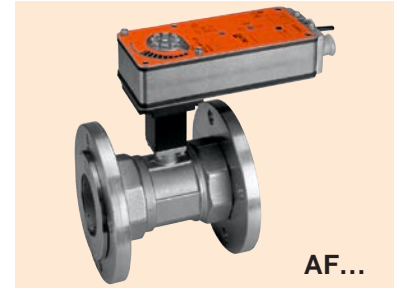
Valve					Non-Spring Return Actuator	
Model # CCV Valve	Cv Rating	Valve Nominal Size		Close- Off psi	On/Off, Floating	Proportional / MFT
		Inches	DN mm		AM24 US	AM24-MFT US
B661	60	2.5"	65	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B662	75	2.5"	65	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B663	110	2.5"	65	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B664	150	2.5"	65	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B665*	210	2.5"	65	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B677	70	3"	80	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B678	130	3"	80	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
B680*	170	3"	80	100	<input type="checkbox"/> Pg 116	<input type="checkbox"/> Pg 118
<b>Electrical Connection</b>					<b>3 ft cable, 1/2" conduit fitting</b>	<b>3 ft cable, 1/2" conduit fitting</b>

\* Models without characterizing discs.

See [pg 11](#) for corrected C<sub>v</sub>s with piping reduction factor.

**Note:** All B6 valves assembled with CCV-EXT-KIT (See accessories page).

See [pg 132](#) for MFT Configuration.



## B6 Two-way Characterized Control Valve, Stainless Steel Ball and Stem

Valve					Spring Return Actuator	
Model # CCV Valve	Cv Rating	Valve Nominal Size		Close- Off psi	On/Off	Proportional / MFT
		Inches	DN mm		AF24 US	AF24-MFT US
B661	60	2.5"	65	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B662	75	2.5"	65	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B663	110	2.5"	65	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B664	150	2.5"	65	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B665*	210	2.5"	65	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B677	70	3"	80	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B678	130	3"	80	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
B680*	170	3"	80	100	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
<b>Electrical Connection</b>					<b>3 ft cable, 1/2" conduit fitting</b>	

\* Models without characterizing discs.

See [pg 11](#) for corrected Cv's with piping reduction factor.

See [pg 132](#) for MFT Configuration.

**Note:** All B6 valves assembled with CCV-EXT-KIT (See accessories page).

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Options (add to list price)		AF24 US	AF24-MFT US
built-in aux. switch	...-S US	<input type="checkbox"/> Pg 120	<input type="checkbox"/> Pg 122
120 VAC power supply	..120...	<input type="checkbox"/> Pg 120	
0-135Ω control	AF24-MFT95 US		<input type="checkbox"/> Pg 122

# 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	fiberglass reinforced teflon® 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, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
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

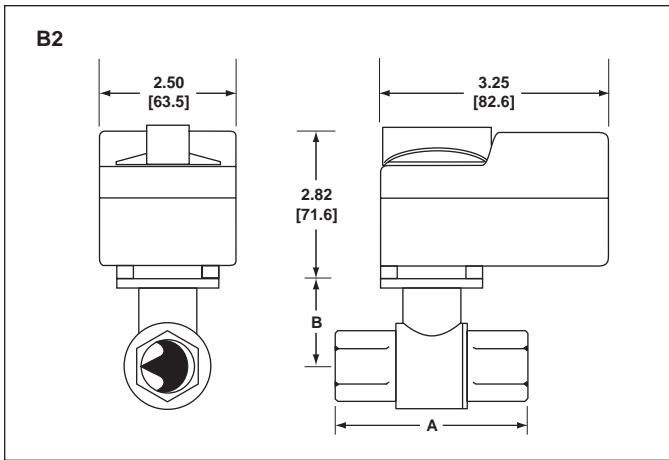
## Additional Models

TR24-3 US	TR24-3-T US with 3 ft plenum rated cable
TR24-3/200 US	TR24-3-T US with 6 ft plenum rated cable
TR24-3/300 US	TR24-3-T US with 10 ft plenum rated cable



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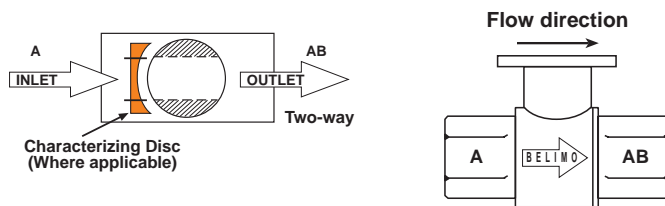
## Dimensions



D069

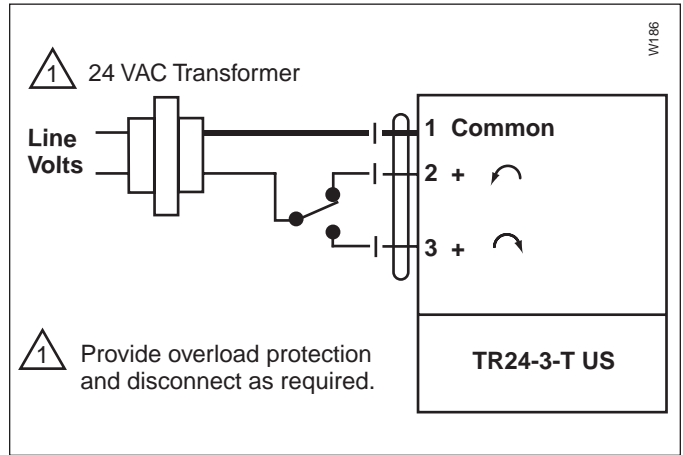
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217B-B220B	3/4"	20	2.63 [66.8]	1.75 [44.5]

## Flow Pattern



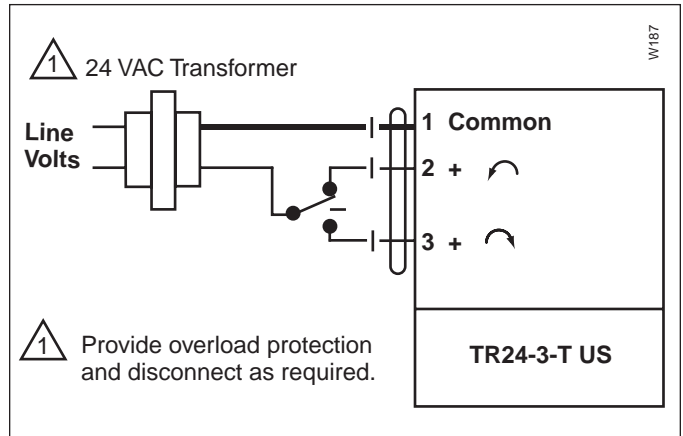
G20493 - 03/05 - (G-Subject to change. © Belimo Aircontrols (USA), Inc.

## Wiring



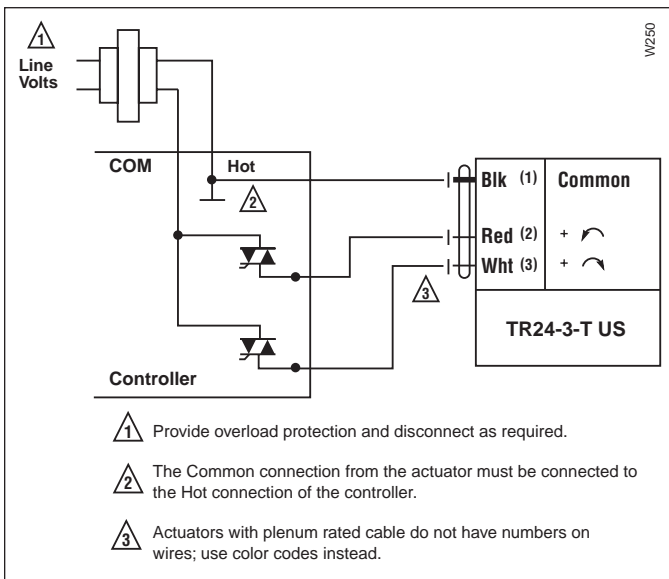
W186

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



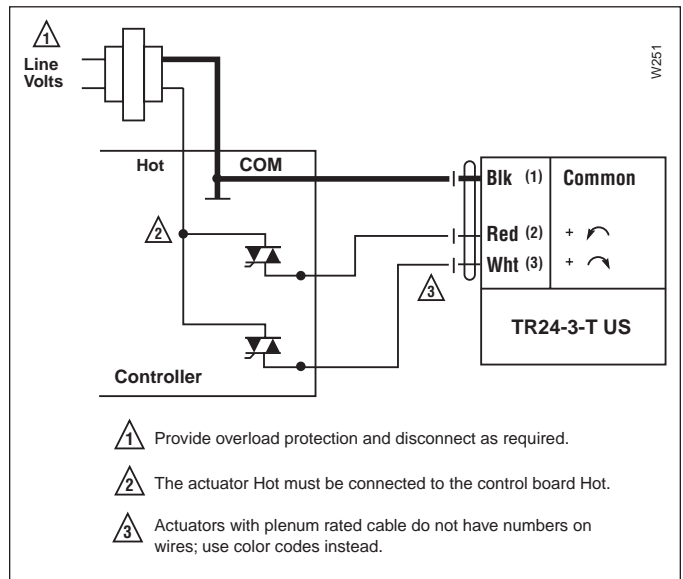
W187

**Floating Control of TR24-3-T US**



W250

**Triac Sink**



W251

**Triac Source**

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

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



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	fiberglass reinforced teflon® 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 reheat 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...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm 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"/> TR24-SR-T US	Reversing switch under cover
Control	Proportional
Input Impedance	100 kΩ
Nominal voltage	24 VAC 50/60 Hz, 24VDC
Nominal voltage range	19.2...28.8 VAC, 21.6...28.8 VDC
Power Consumption	0.5 W
Transformer Sizing	1VA (Class 2 power source)
Electrical Connection	Screw Terminals accessible after removal of small cover (3 ft, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
Position Indication	Integrated into handle
Manual override:	Push down handle
Running Time	90 seconds
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

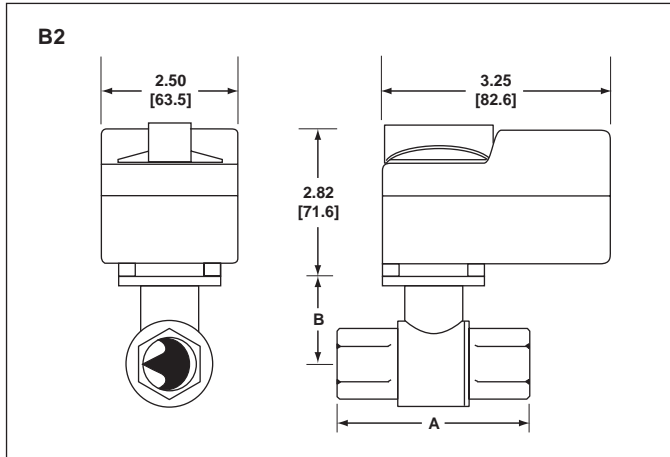
## Additional Models

TR24-SR US    TR24-SR-T US with 3 ft plenum rated cable  
 TR24-SR/200 US TR24-SR-T US with 6 ft plenum rated cable  
 TR24-SR/300 US TR24-SR-T US with 10 ft plenum rated cable



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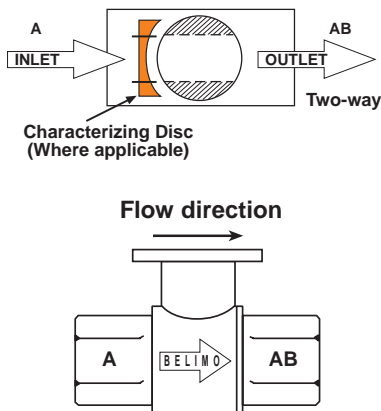
## Dimensions



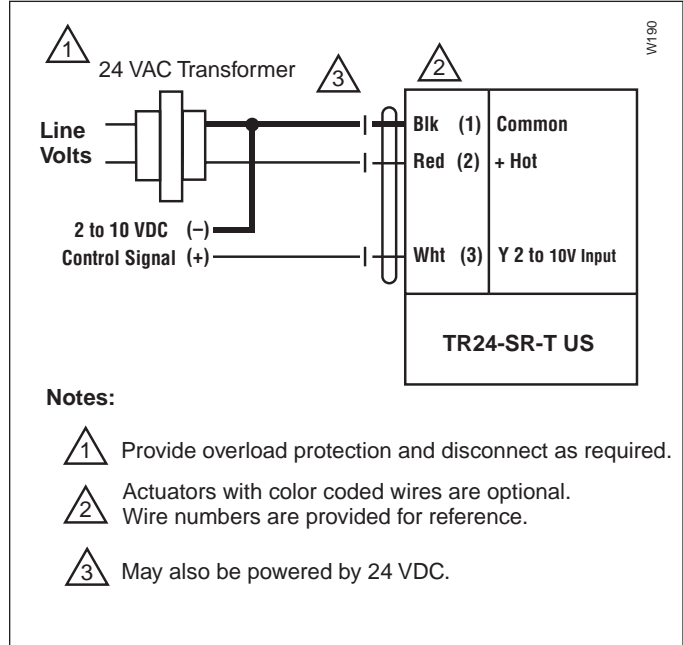
D069

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

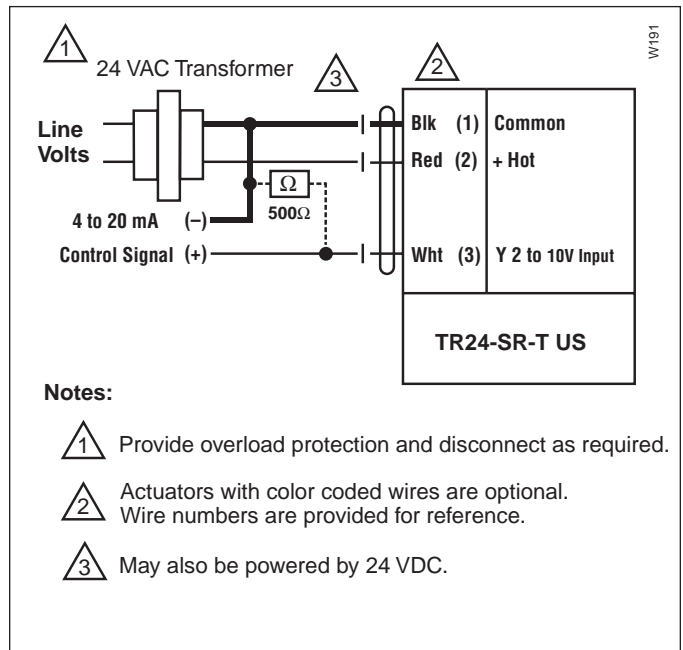


## Wiring



W190

### 2 to 10 VDC Control of TR24-SR-T US



W191

### 4 to 20 mA Control of TR24-SR-T US

Direct/Reverse acting switch is under wiring cover.  
 R = CW with decrease in signal  
 L = CCW with decrease in signal  
 No feedback

# B3...B Three-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 B port modified linear for constant AB flow
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	fiberglass reinforced teflon® 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant 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, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
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



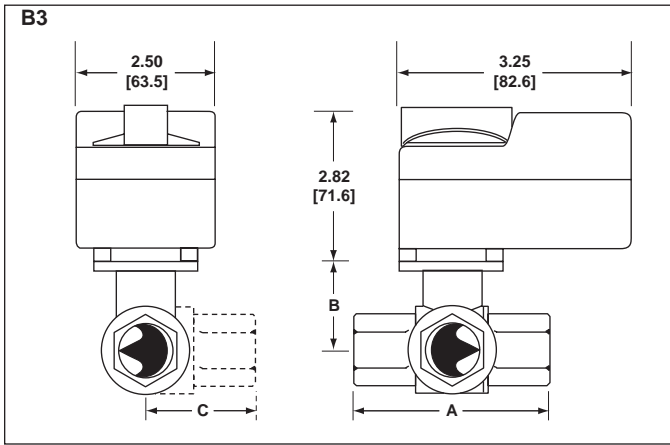
## Additional Models

TR24-3 US	TR24-3-T US with 3 ft plenum rated cable
TR24-3/200 US	TR24-3-T US with 6 ft plenum rated cable
TR24-3/300 US	TR24-3-T US with 10 ft plenum rated cable

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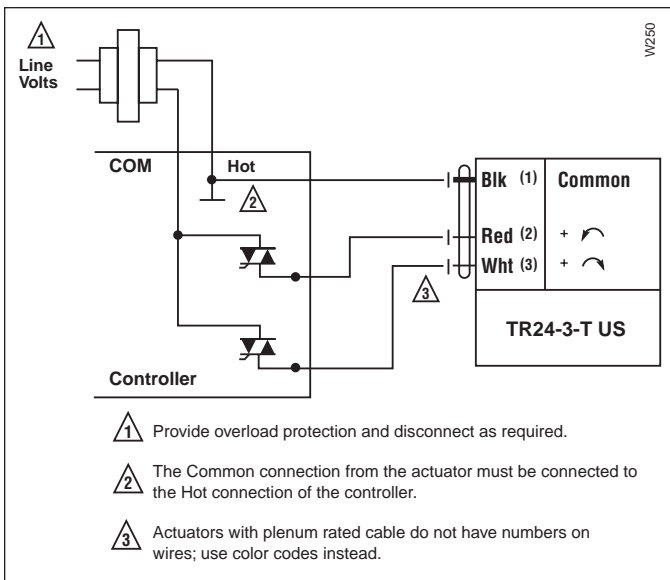
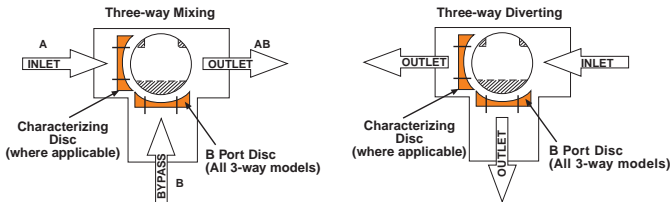
## Dimensions



D061

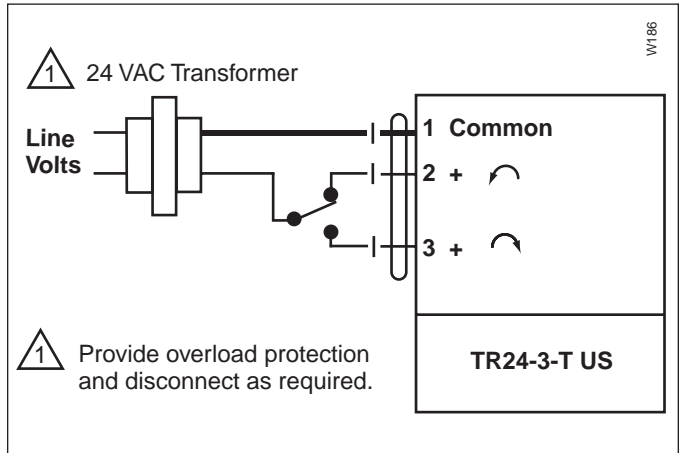
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307B-B311B	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312B-B315B	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317B-B320B	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern

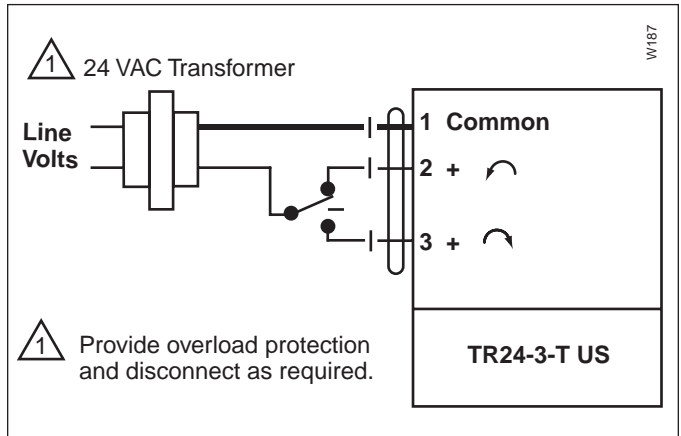


### Triac Sink

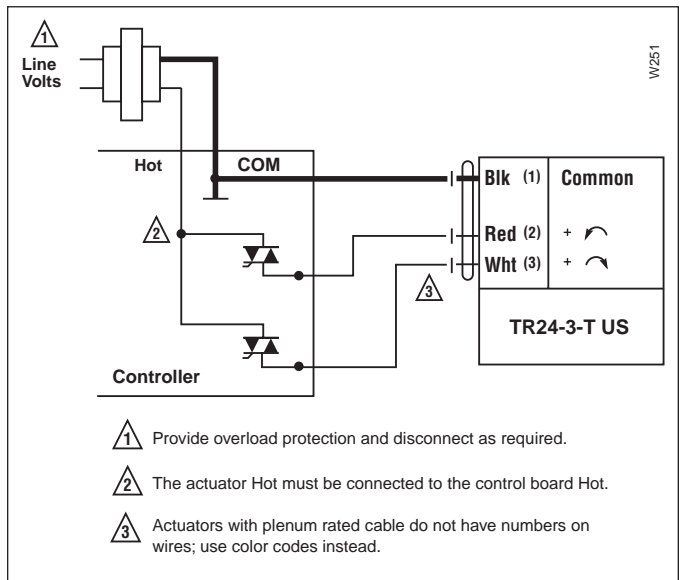
## Wiring



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



**Floating Control of TR24-3-T US**



### Triac Source

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

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



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
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	fiberglass reinforced teflon® 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm 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"/> TR24-SR-T US	Reversing switch under cover
Control	Proportional
Input Impedance	100 kΩ
Nominal voltage	24 VAC 50/60 Hz, 24VDC
Nominal voltage range	19.2...28.8 VAC, 21.6...28.8 VDC
Power Consumption	0.5 W
Transformer Sizing	1VA (Class 2 power source)
Electrical Connection	Screw Terminals accessible after removal of small cover (3 ft, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
Position Indication	Integrated into handle
Manual override:	Push down handle
Running Time	90 seconds
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

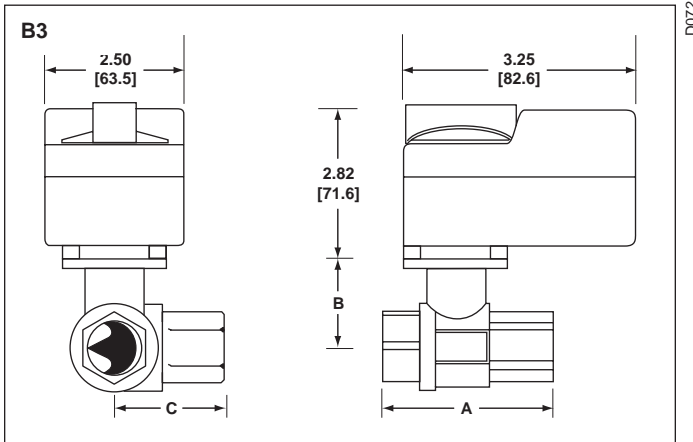


### Additional Models

TR24-SR US    TR24-SR-T US with 3 ft plenum rated cable  
 TR24-SR/200 US TR24-SR-T US with 6 ft plenum rated cable  
 TR24-SR/300 US TR24-SR-T US with 10 ft plenum rated cable

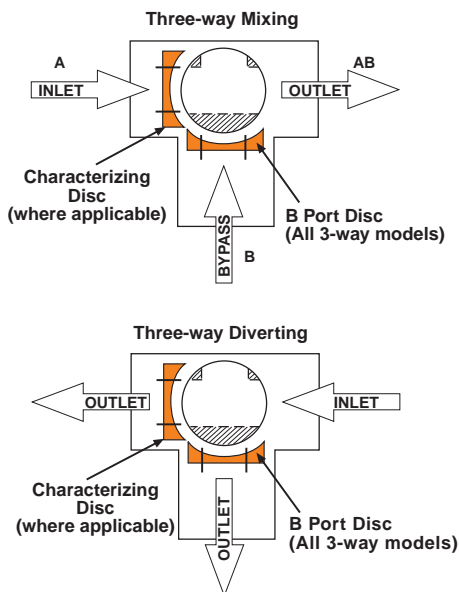
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## Dimensions

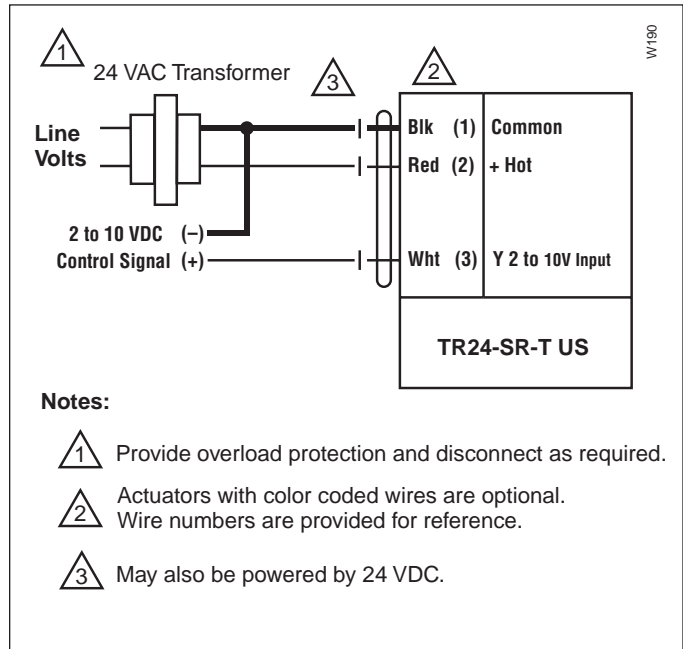


Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307B-B311B	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312B-B315B	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317B-B320B	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

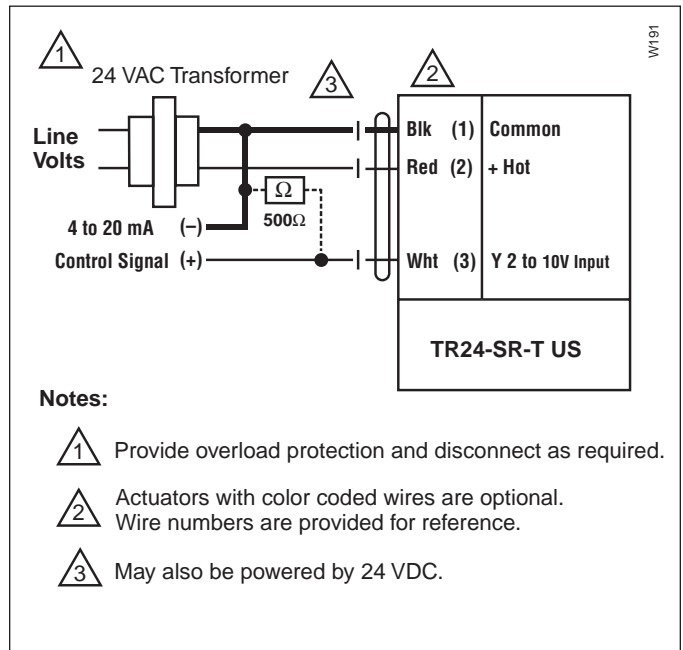
## Flow Pattern



## Wiring



### 2 to 10 VDC Control of TR24-SR-T US



### 4 to 20 mA Control of TR24-SR-T US

Direct/Reverse acting switch is under wiring cover.  
 R = CW with decrease in signal  
 L = CCW with decrease in signal  
 No feedback

# B2...B Two-way Characterized Control Valve, Chrome Plated Brass Ball and Stem TF Actuators, On-Off



## 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



### 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.

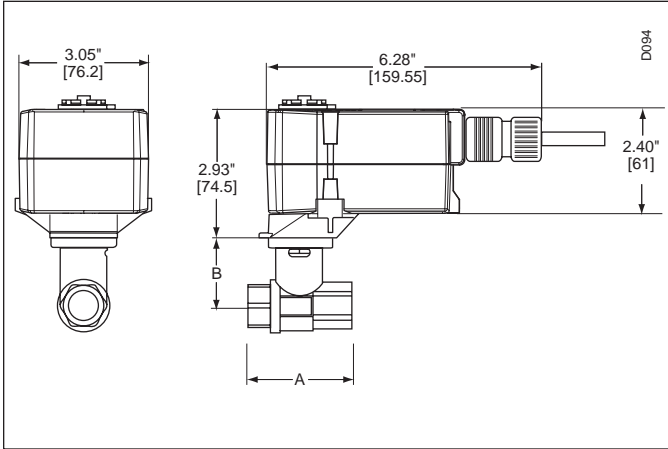
This valve is designed for on/off control using 24VAC/DC or 100 to 240 VAC where fail safe is required.

### Actuator Specifications

<input type="checkbox"/> TF24 US	<input type="checkbox"/> TF24-S US
<input type="checkbox"/> TF120 US	<input type="checkbox"/> TF120-S US
Control	On-off
Power supply TF24(-S) US:	
	24VAC ± 20%, 50/60Hz
	24VDC ± 10%
Power supply TF120(-S) US:	
	(nominal) 100 to 240 VAC, 50/60 Hz
	(tolerance) 85 to 265 VAC, 50/60 Hz
Power consumption:	running: 2.5 W
	holding: 1.3 W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	3 ft, 18 GA appliance cable
	(-S models have 2 cables)
	1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
Direction of rotation:	reversible with cw/ccw mounting
Position indication:	visual indicator, 0° to 95°
	(0° spring return position)
Auxiliary switch	1 x SPDT 3A (0.5A) @ 250 VAC,
(-S models)	UL listed adjustable 0° to 95°
Running time:	motor: < 75 sec (0 to 18 in-lb)
	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
Noise level:	max: running < 50 db (A)
	spring return 62 dB (A)
Servicing:	maintenance free
Quality standard:	ISO 9001
Weight:	TF24/120 US 1.4 lbs (0.6 kg)
	TF24/120(-S) US 1.5 lbs (0.7 kg)

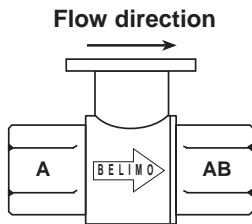
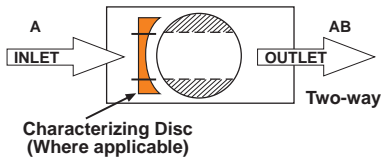
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## Dimensions

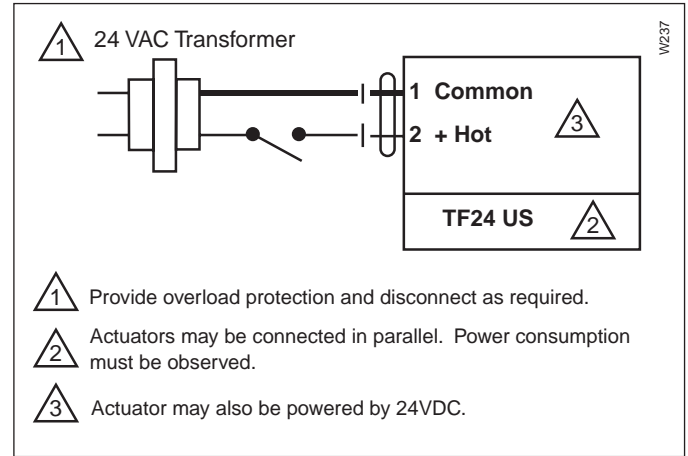


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217B-B220B	3/4"	20	2.63 [66.8]	1.75 [44.5]

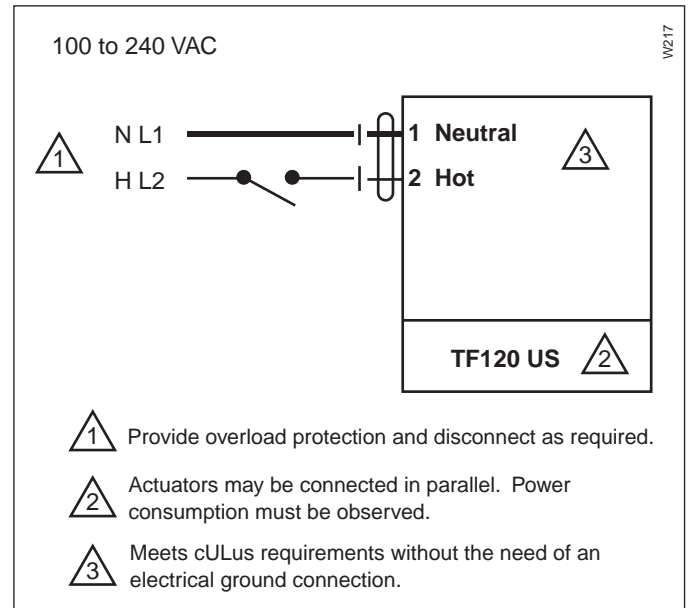
## Flow Pattern



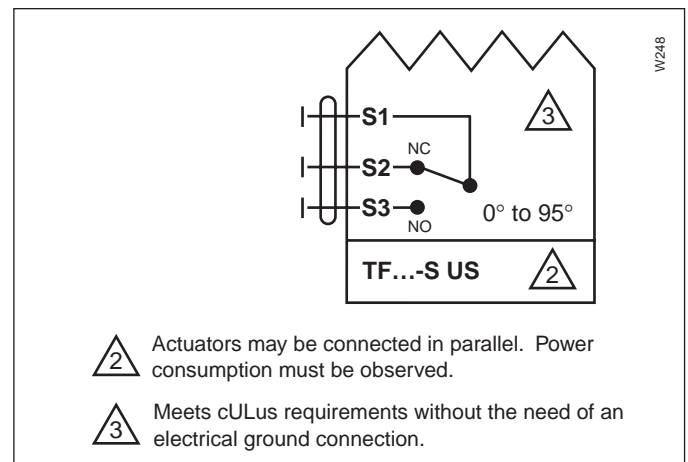
## Wiring



### On-off wiring for TF24 US



### On-off wiring for TF120 US



### On-off wiring for TF...-S US

# 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

### 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

#### ☐ TF24-3 US

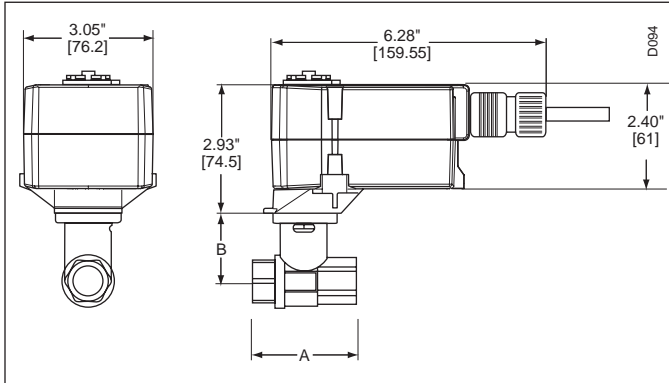
#### ☐ TF24-3-S US

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) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Input impedance	1000 Ω (0.6w) control inputs
Angle of rotation	max 95°, adjust. with mechanical stop
Torque	min. 18 in-lb [2 Nm]
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: 95 sec constant 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
Noise level	max: running < 35 db (A) spring return 62 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24-3 US 1.4 lbs (0.6 kg) TF24-3-S US 1.5 lbs (0.7 kg)

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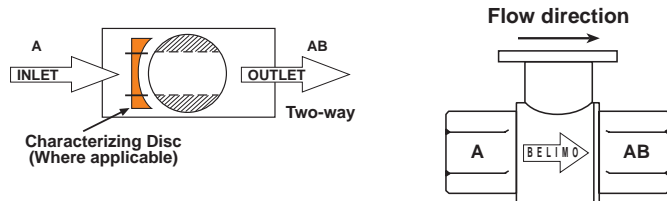


## Dimensions

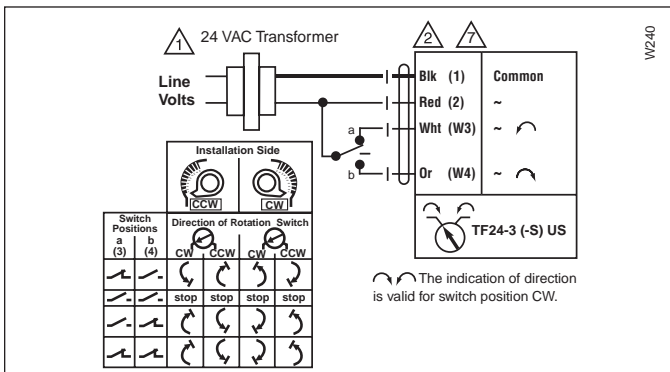


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217B-B220B	3/4"	20	2.63 [66.8]	1.75 [44.5]

## Flow Pattern

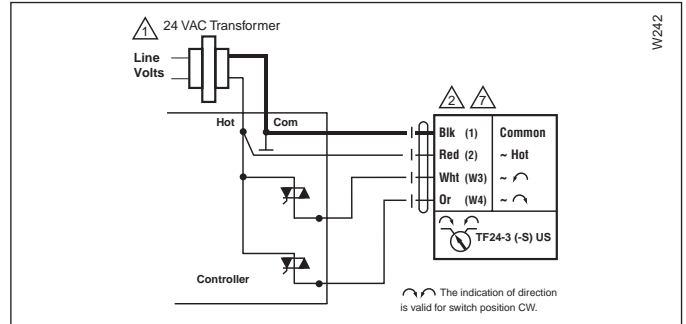


## Wiring

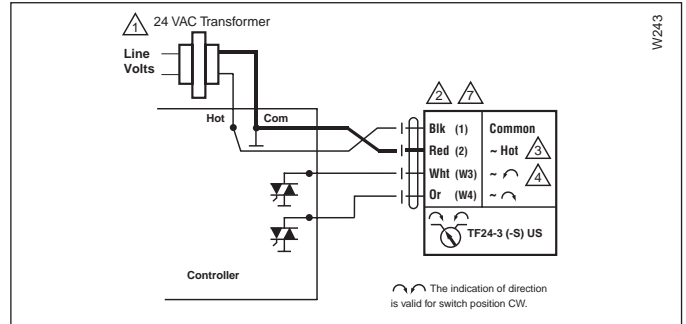


Floating point control of TF24-3 (-S) US

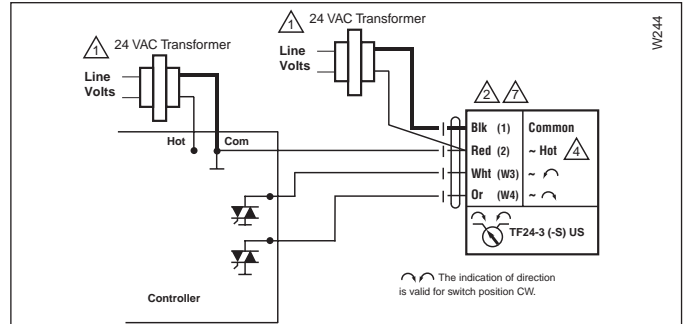
## Wiring



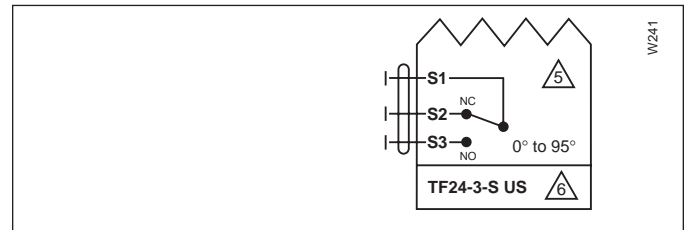
Triac source



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.

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



## 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



### 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 reheat coils. This valve is suitable for use in a hydronic system with variable flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

### Actuator Specifications

#### ☐ TF24-SR US

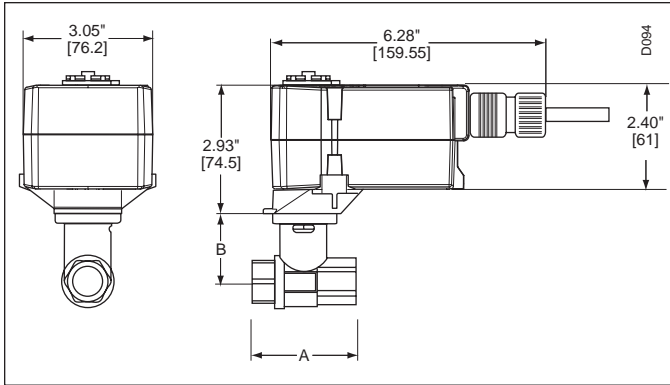
#### ☐ TF24-SR-S US

Control	Proportional
Power supply	24VAC ± 20%, 50/60Hz 24VDC ± 10%
Power consumption:	running: 2.5 W holding: 1.0 W
Transformer sizing:	4 VA (class 2 power source)
Electrical connection:	TF24-SR US 3 ft. plenum rated cable TF24-SR-S US 3 ft, 18 GA appl. cables (2) 1/2" conduit connector
Electrical protection:	actuators are double insulated
Overload protection:	electronic throughout 0 to 95° rotation
Operating range Y:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1mA), 500Ω
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
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:	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time:	motor: 95 sec constant 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
Quality standard:	ISO 9001
Noise level:	max: running < 35 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Weight:	1.4 lbs (0.6 kg)

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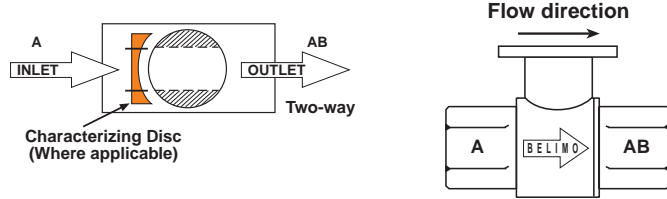


## Dimensions

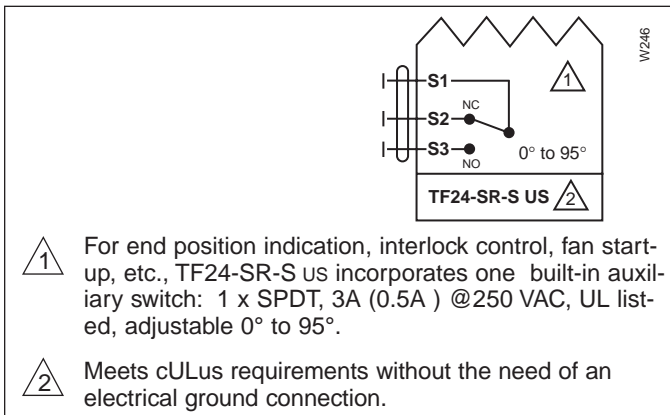


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217B-B220B	3/4"	20	2.63 [66.8]	1.75 [44.5]

## Flow Pattern

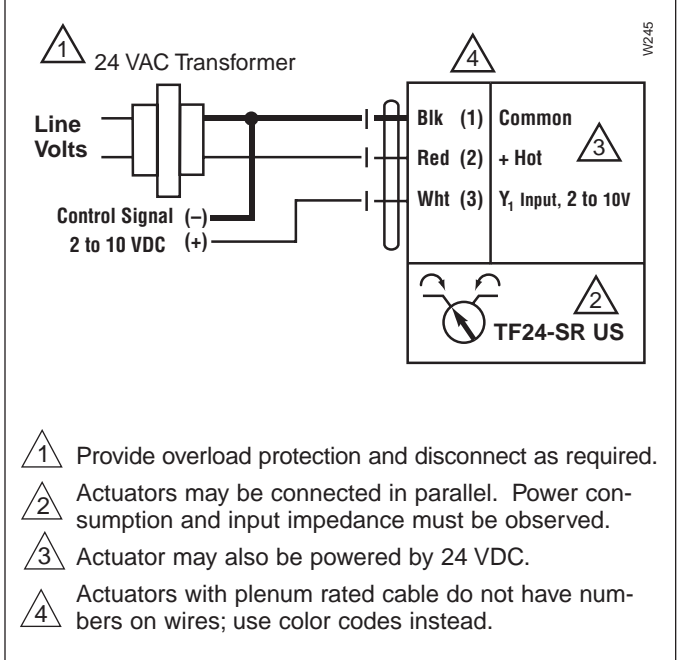


## Wiring

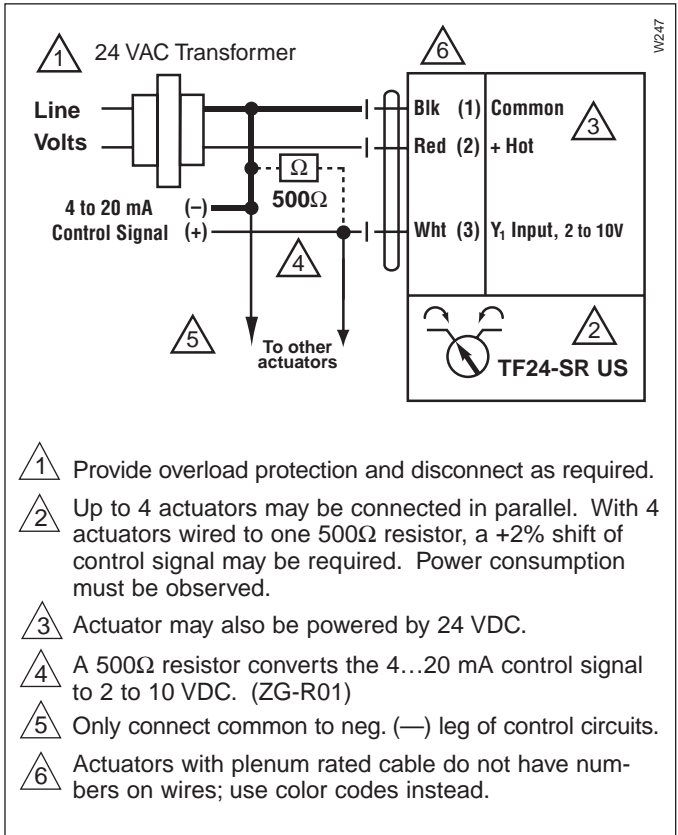


Auxiliary switch of TF24-SR-S US

## Wiring



2 to 10 VDC control of TF24-SR (-S) US



4 to 20 mA control of TF24-SR (-S) US

# B3...B Three-way Characterized Control Valve, Chrome Plated Brass Ball and Stem TF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
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 (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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

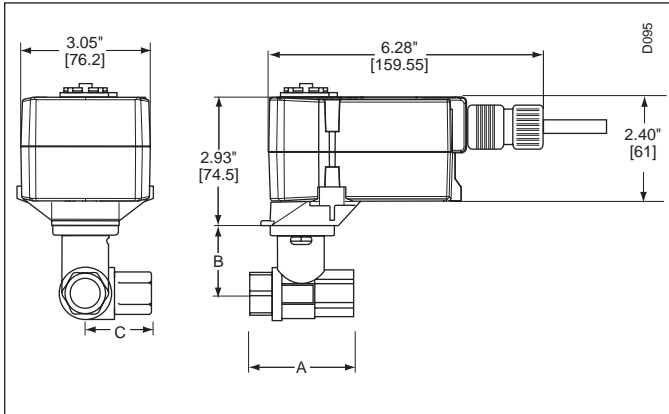
This valve is designed for on/off control using 24VAC/DC or 100 to 240 VAC where fail safe is required.

### Actuator Specifications

<input type="checkbox"/> TF24 US	<input type="checkbox"/> TF24-S US
<input type="checkbox"/> TF120 US	<input type="checkbox"/> TF120-S US
Control	On-off
Power supply TF24(-S) US:	
	24VAC ± 20%, 50/60Hz
	24VDC ± 10%
Power supply TF120(-S) US:	
(nominal)	100 to 240 VAC, 50/60 Hz
(tolerance)	85 to 265 VAC, 50/60 Hz
Power consumption:	running: 2.5 W holding: 1.3 W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	3 ft, 18 GA appliance cable (-S models have 2 cables) 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
Direction of rotation:	reversible with cw/ccw mounting
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: < 75 sec (0 to 18 in-lb) 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
Noise level:	max: running < 50 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Quality standard:	ISO 9001
Weight:	TF24/120 US 1.4 lbs (0.6 kg) TF24/120(-S) US 1.5 lbs (0.7 kg)

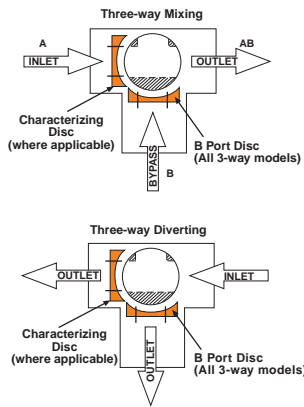
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## Dimensions

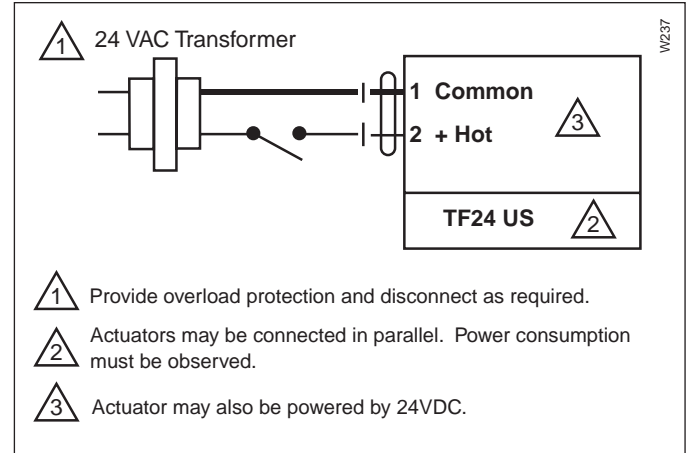


Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307B-B311B	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312B-B315B	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317B-B320B	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

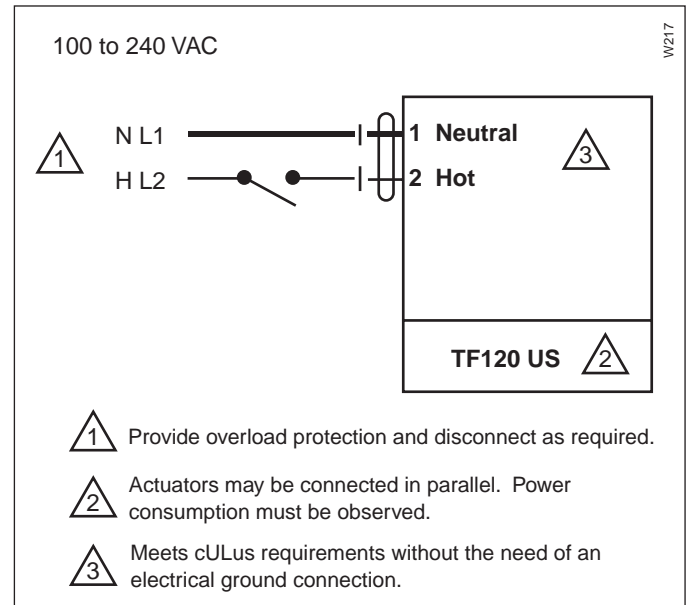
## Flow Pattern



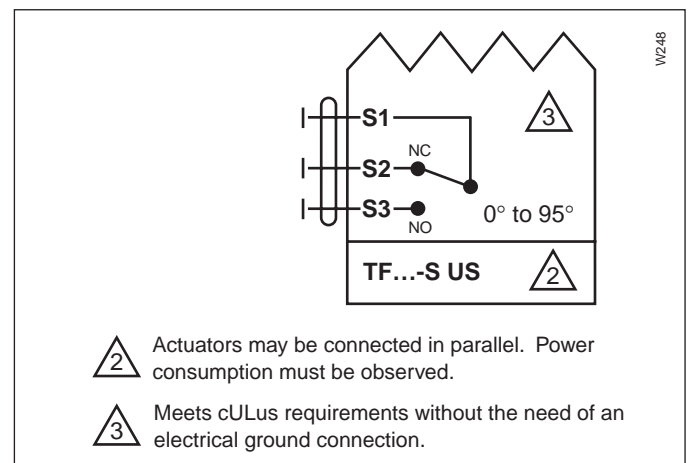
## Wiring



### On-off wiring for TF24 US



### On-off wiring for TF120 US

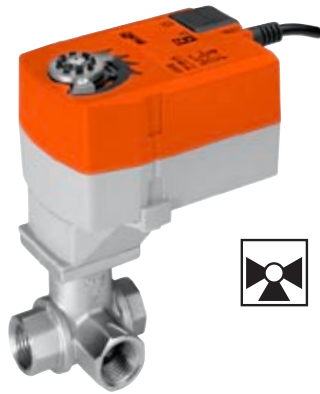


### On-off wiring for TF...-S US

# B3...B Three-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 B port modified linear for constant AB flow
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 (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 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.

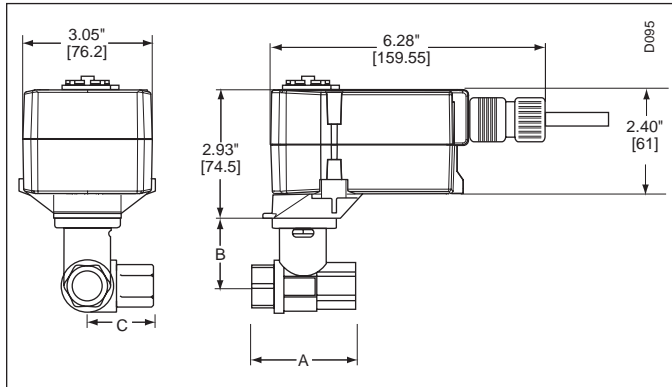
## Actuator Specifications

<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) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Input impedance	1000 Ω (0.6w) control inputs
Angle of rotation	max 95°, adjust. with mechanical stop
Torque	min. 18 in-lb [2 Nm]
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: 95 sec constant 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
Noise level	max: running < 35 db (A) spring return 62 db (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24-3 US 1.4 lbs (0.6 kg) TF24-3-S US 1.5 lbs (0.7 kg)

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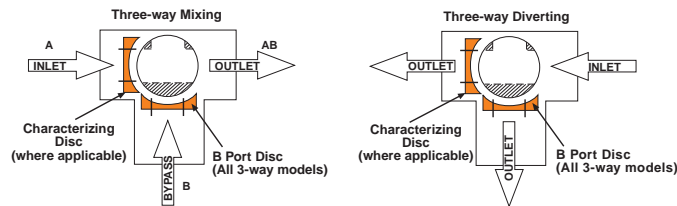


## Dimensions

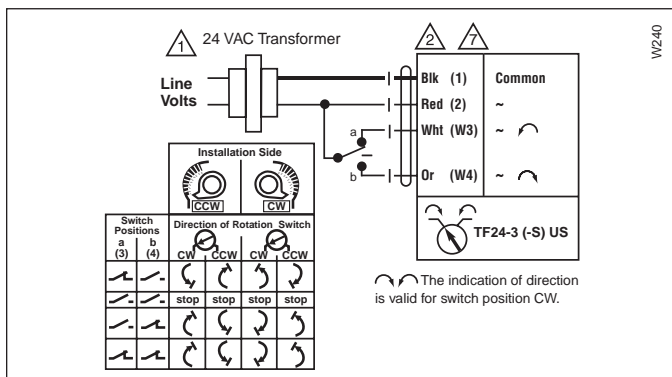


Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307B-B311B	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312B-B315B	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317B-B320B	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern

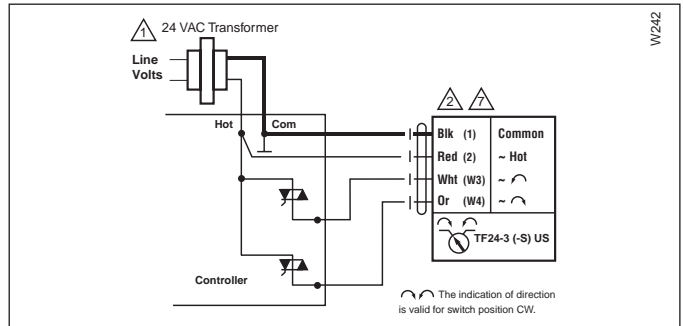


## Wiring

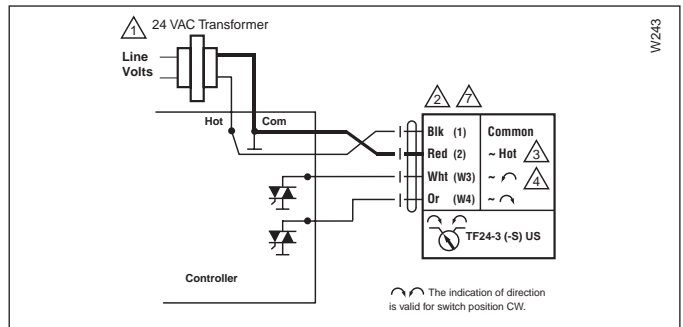


Floating point control of TF24-3 (-S) US

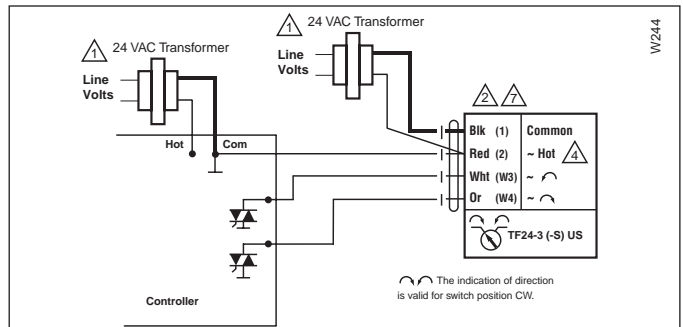
## Wiring



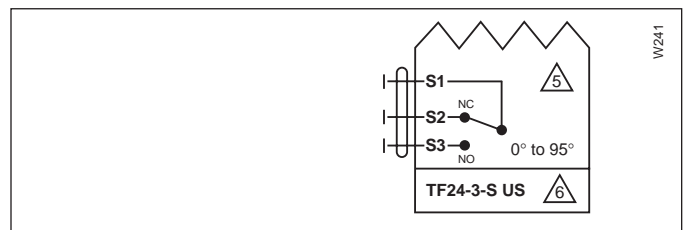
Triac source



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.

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



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
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 (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

Tefzel® is a registered trademark of DuPont



### Application

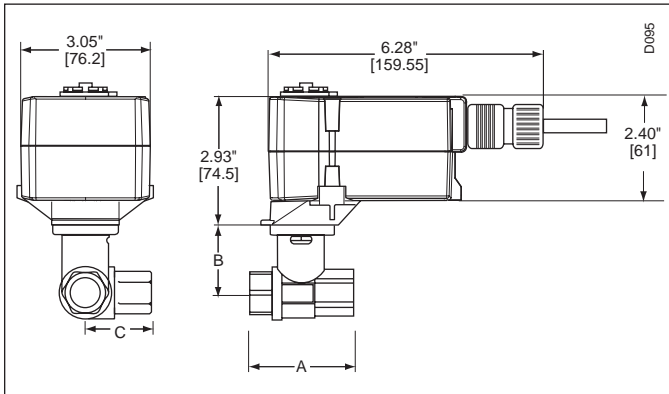
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators and VAV Box reheat coils. This valve is suitable for use in a hydronic system with variable flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

### Actuator Specifications

<input type="checkbox"/> TF24-SR US	
<input type="checkbox"/> TF24-SR-S US	
Control	Proportional
Power supply	24VAC ± 20%, 50/60Hz 24VDC ± 10%
Power consumption:	running: 2.5 W holding: 1.0 W
Transformer sizing:	4 VA (class 2 power source)
Electrical connection:	TF24-SR US 3 ft. plenum rated cable TF24-SR-S US 3 ft, 18 GA appl. cables (2) 1/2" conduit connector
Electrical protection:	actuators are double insulated
Overload protection:	electronic throughout 0 to 95° rotation
Operating range Y:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1mA), 500Ω
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
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:	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time:	motor: 95 sec constant 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
Quality standard:	ISO 9001
Noise level:	max: running < 35 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Weight:	1.4 lbs (0.6 kg)

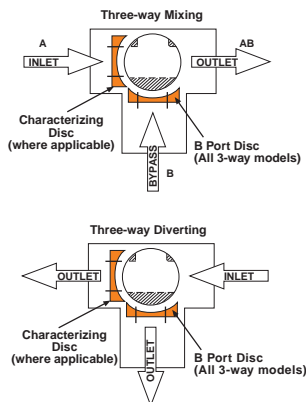
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## Dimensions



Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307B-B311B	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312B-B315B	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317B-B320B	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern



## Wiring

**1** For end position indication, interlock control, fan start-up, etc., TF24-SR-S us incorporates one built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL listed, adjustable 0° to 95°.

**2** Meets cULus requirements without the need of an electrical ground connection.

Auxiliary switch of TF24-SR-S US

## Wiring

**1** Provide overload protection and disconnect as required.

**2** Actuators may be connected in parallel. Power consumption and input impedance must be observed.

**3** Actuator may also be powered by 24 VDC.

**4** Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

2 to 10 VDC control of TF24-SR (-S) US

**1** Provide overload protection and disconnect as required.

**2** Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed.

**3** Actuator may also be powered by 24 VDC.

**4** A 500Ω resistor converts the 4...20 mA control signal to 2 to 10 VDC. (ZG-R01)

**5** Only connect common to neg. (—) leg of control circuits.

**6** Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

4 to 20 mA control of TF24-SR (-S) US

# B2 Two-way Characterized Control Valve, Stainless Steel 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	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® 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, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
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



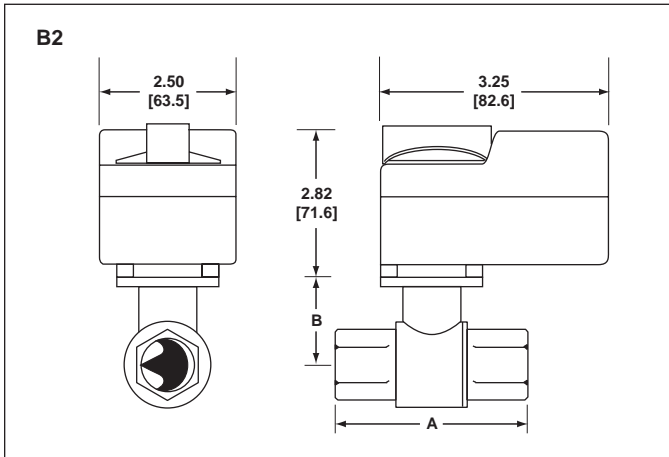
## Additional Models

TR24-3 US	TR24-3-T US with 3 ft plenum rated cable
TR24-3/200 US	TR24-3-T US with 6 ft plenum rated cable
TR24-3/300 US	TR24-3-T US with 10 ft plenum rated cable

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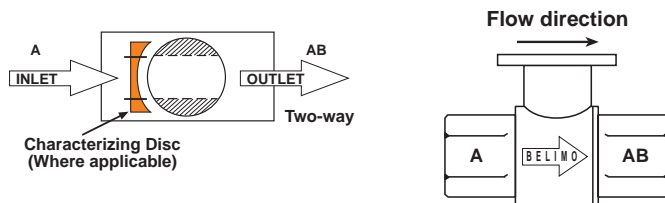
## Dimensions



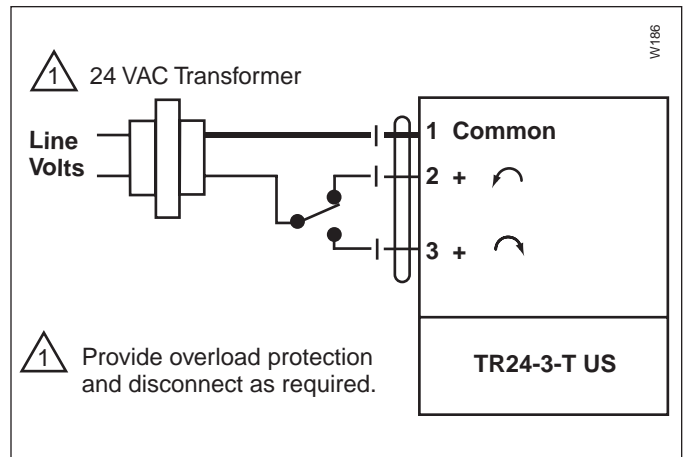
D069

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

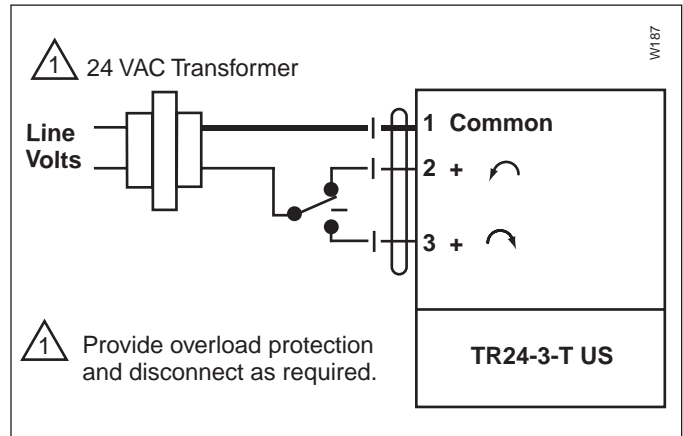


## Wiring



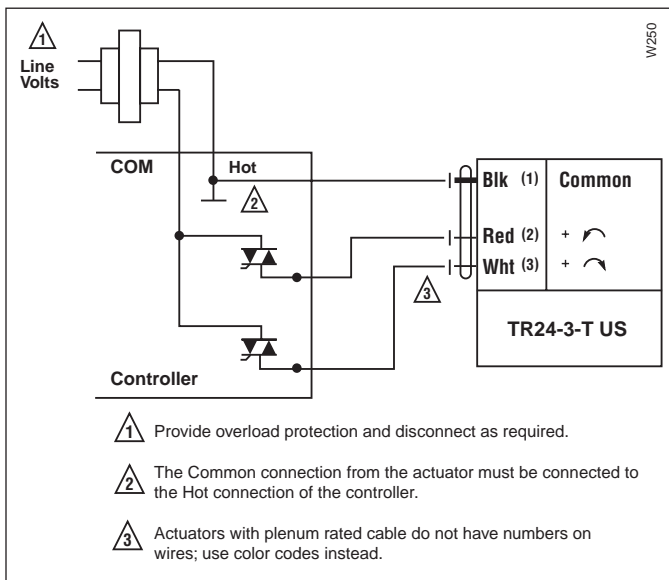
W186

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



W187

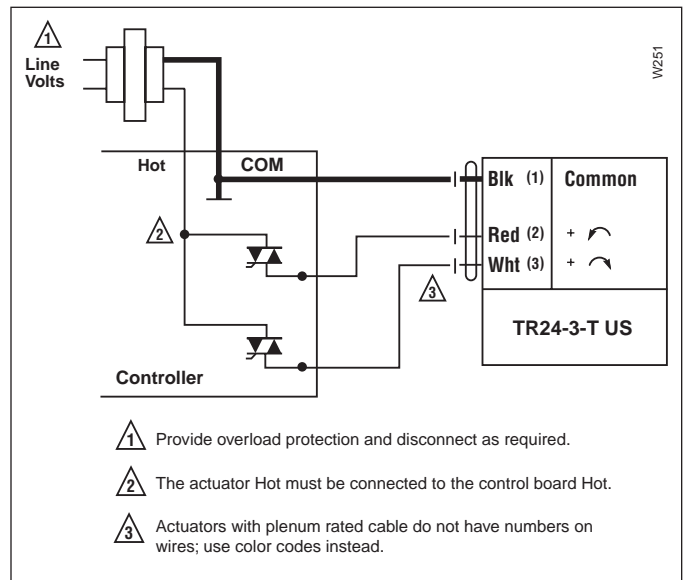
**Floating Control of TR24-3-T US**



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.**

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem TR Actuators, Proportional



## 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	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® 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 reheat 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...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm resistor is required).

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

### Actuator Specifications

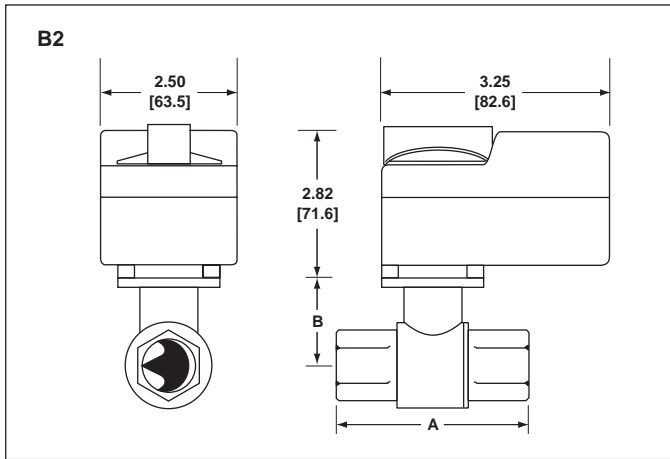
<input type="checkbox"/> TR24-SR-T US	Reversing switch under cover
Control	Proportional
Input Impedance	100 kΩ
Nominal voltage	24 VAC 50/60 Hz, 24VDC
Nominal voltage range	19.2...28.8 VAC, 21.6...28.8 VDC
Power Consumption	0.5 W
Transformer Sizing	1VA (Class 2 power source)
Electrical Connection	Screw Terminals accessible after removal of small cover (3 ft, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
Position Indication	Integrated into handle
Manual override:	Push down handle
Running Time	90 seconds
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-SR US	TR24-SR-T US with 3 ft plenum rated cable
TR24-SR/200 US	TR24-SR-T US with 6 ft plenum rated cable
TR24-SR/300 US	TR24-SR-T US with 10 ft plenum rated cable



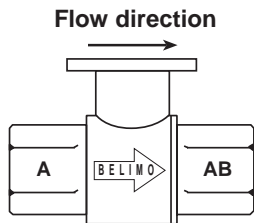
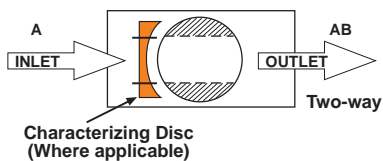
## Dimensions



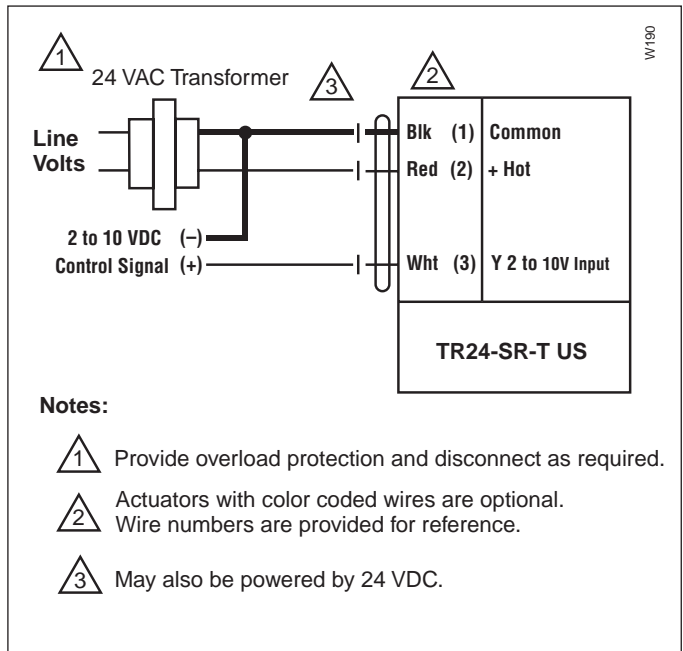
D069

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

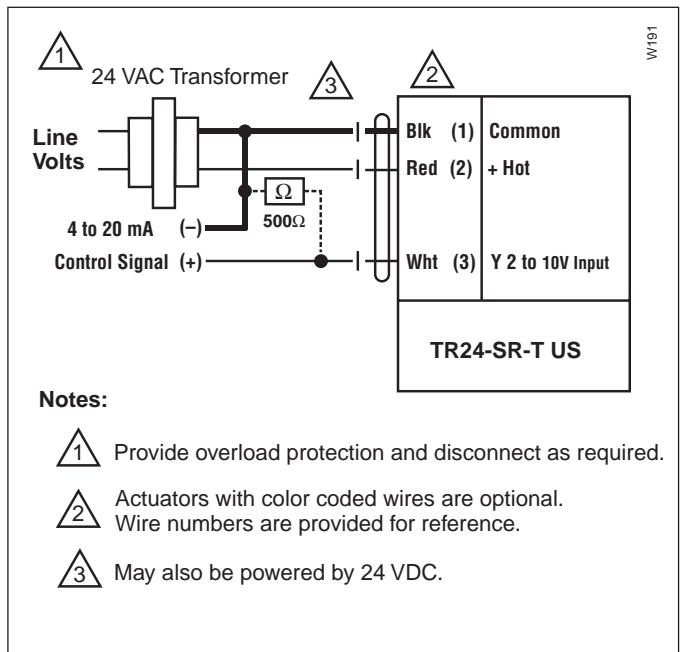


## Wiring



W190

### 2 to 10 VDC Control of TR24-SR-T US



W191

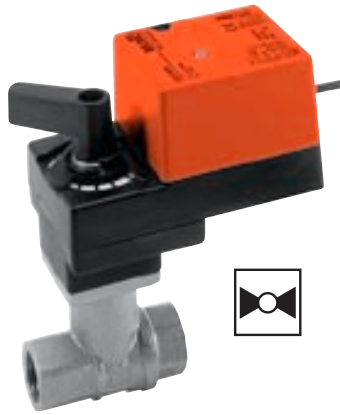
### 4 to 20 mA Control of TR24-SR-T US

**Direct/Reverse acting switch is under wiring cover.**  
**R = CW with decrease in signal**  
**L = CCW with decrease in signal**  
**No feedback**

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LR 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" to 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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"/> LR24-3 US	Running time: 95 seconds constant Direction of rotation: reversible w/switch CW/CCW Transformer sizing: 3 VA (Class 2 power source) Input impedance: 3900Ω
<input type="checkbox"/> LR24-3-S US	(LR24-3 US with auxiliary switch) Switch 0-95° SPDT 6A resistive (2.5A inductive) @ 24 VAC

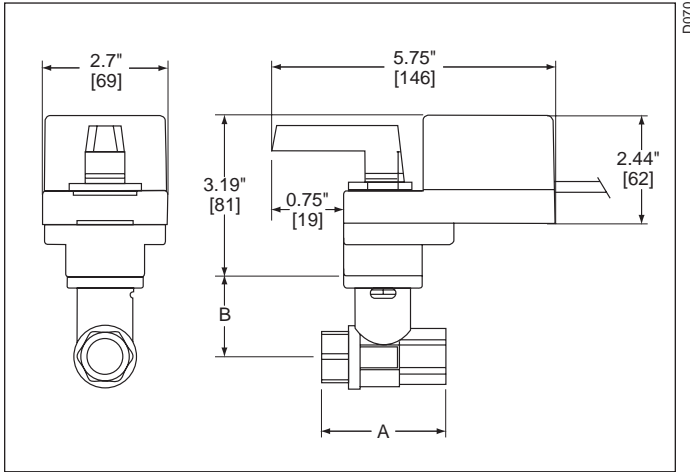
## All LR On-Off/Floating Point

Control	On-off/floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	2 W
Transformer sizing	3 VA (Class 2 power source)
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting
Overload protection	Electronic throughout 0 to 95° rotation
Torque	min 35 in-lb [4 Nm]
Position indication	Indicator/handle
Manual override	external push button
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 type	NEMA type 2
Housing material rating	UL94-5V (flammability rating)
Noise level	less than 35 dB (A)
Servicing	maintenance free
Agency listings	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard	ISO 9001

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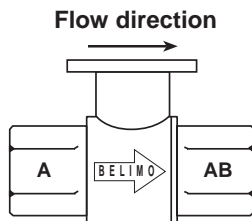
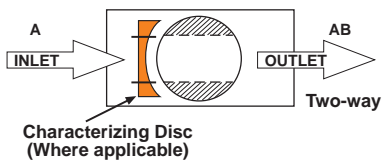
## Dimensions



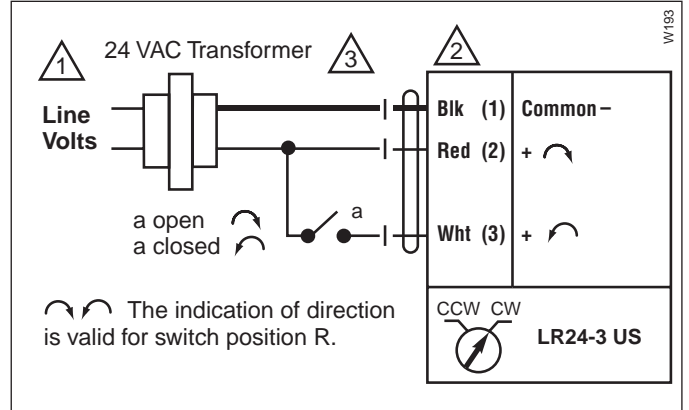
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

## Flow Pattern

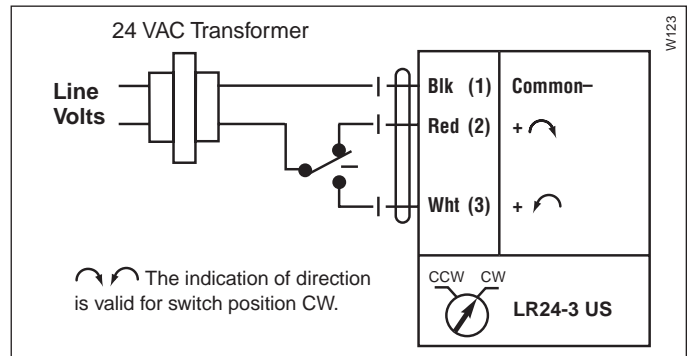


## Wiring

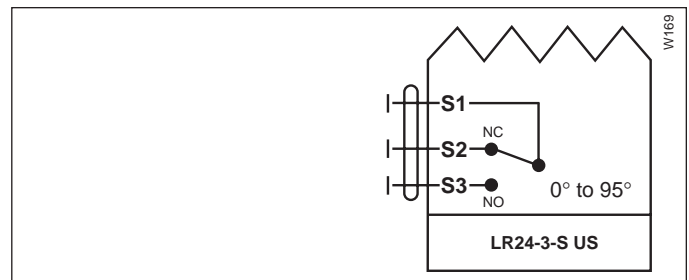


### On-Off control

- ⚠️ Provide overload protection and disconnect as required.
- ⚠️ Actuators are provided with color coded wires. Wire numbers are provided for reference.
- ⚠️ May also be powered by 24 VDC.



### Floating Point control

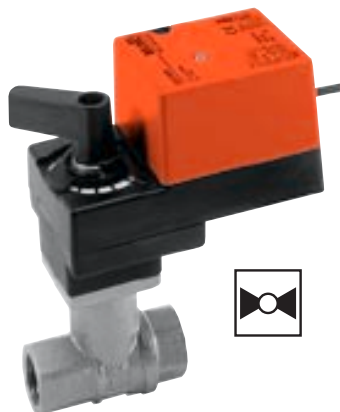


### Aux. switch

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LR Actuators, Proportional



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 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
Media temp. range	0°F to 212°F [-18°C to 100°C]
Close off pressure	200 psi
Maximum differential: pressure ( $\Delta P$ )	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 reheat 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...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm resistor is required).

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

## Actuator Specifications

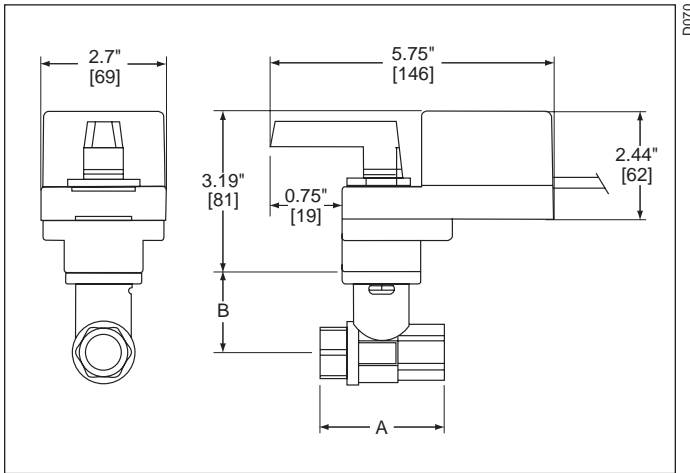
<input type="checkbox"/> LR24-SR US	Running time: 95 seconds constant Transformer sizing 4 VA (Class 2 power source) Control signal Y: 0 to 10 VDC, 0 to 20 mA Input impedance: 100 k $\Omega$ (0.1 mA), 500 $\Omega$ Operating range: 2 to 10 VDC, 4 to 20 mA Feedback output U: 2 to 10 VDC, max. 0.7 mA Direction of rotation: reversible with switch CW/CCW, CW = CW with voltage CCW = CCW with voltage
-------------------------------------	--

## All LR Proportional

Control	Proportional
Power supply	24 VAC $\pm$ 20% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption	2 W
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting (not on -1 models)
Overload protection	Electronic throughout 0 to 95° rotation
Torque	min 35 in-lb [4 Nm]
Position indication	Indicator/handle
Manual override	external push button
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 type	NEMA type 2
Housing material rating	UL94-5V (flammability rating)
Noise level	less than 35 dB (A)
Servicing	maintenance free
Agency listings	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard	ISO 9001

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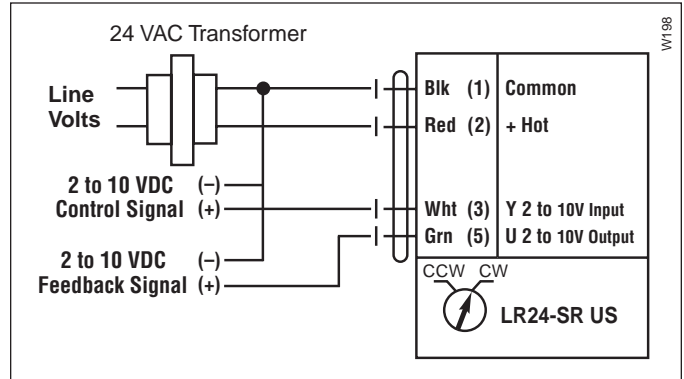
## Dimensions



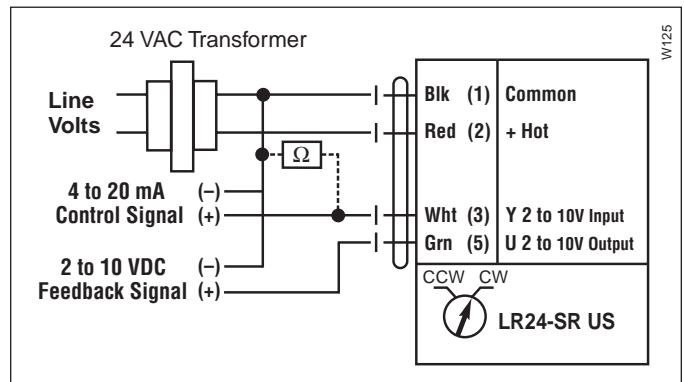
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

## Wiring

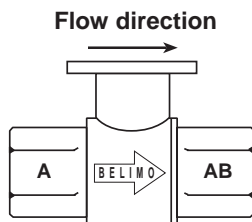
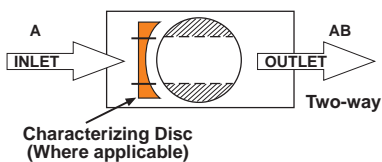


2 to 10 VDC control



4 to 20 mA control

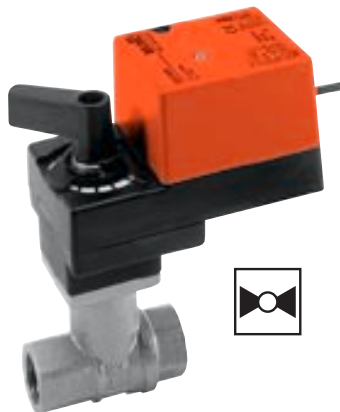
## Flow Pattern



# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LR Actuators, MFT



## 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 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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 with MFT functionality which facilitates the use of various control input.

### Actuator Specifications

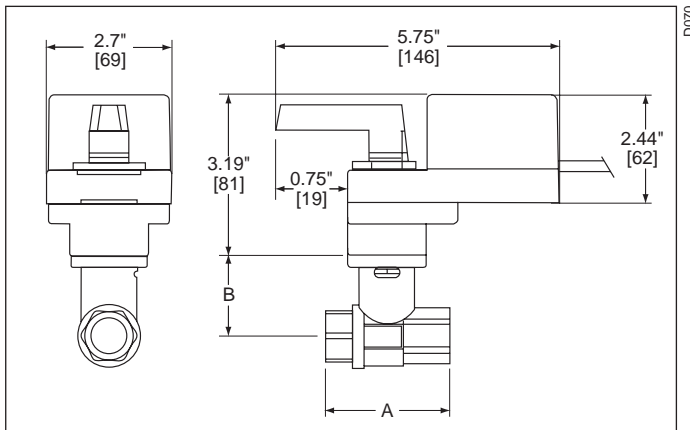
<input type="checkbox"/> LR24-MFT US	
Control	MFT
Control signal Y:	0 to 10 VDC, 0 to 20 mA
Power supply	24 VAC ± 20% 50/60 Hz    24 VDC ± 10%
Power consumption	2 W
Transformer sizing:	4 VA (Class 2 power source)
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting
Overload protection	Electronic throughout 0 to 95° rotation
Operating range:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1 mA), 500Ω
Input impedance:	100kΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA, 750Ω for PWM 1500Ω for on/off and floating point
Feedback output U:	2 to 10 VDC, max. 0.5 mA
Torque	min 35 in-lb [4 Nm]
Direction of rotation:	reversible with switch CW/CCW, CW = CW with voltage CCW = CCW with voltage
Position indication:	Indicator/handle
Manual override:	external push button
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 type:	NEMA type 2
Housing material rating:	UL94-5V (flammability rating)
Noise level:	less than 35 dB (A)
Servicing:	maintenance free
Agency listings:	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001

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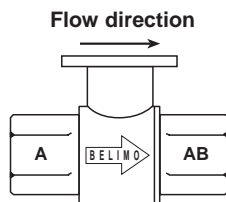
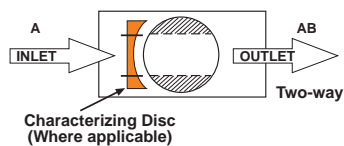
## Dimensions



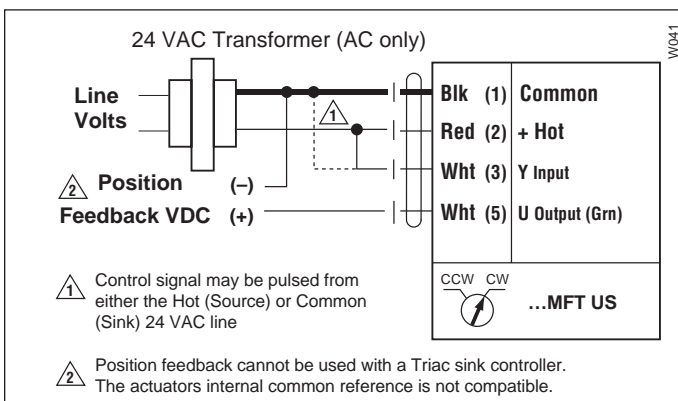
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

## Flow Pattern

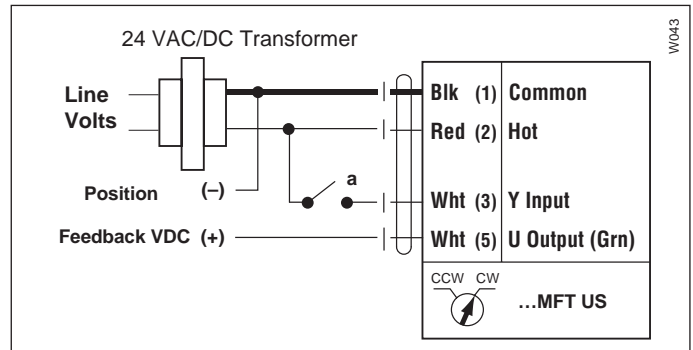


## Wiring

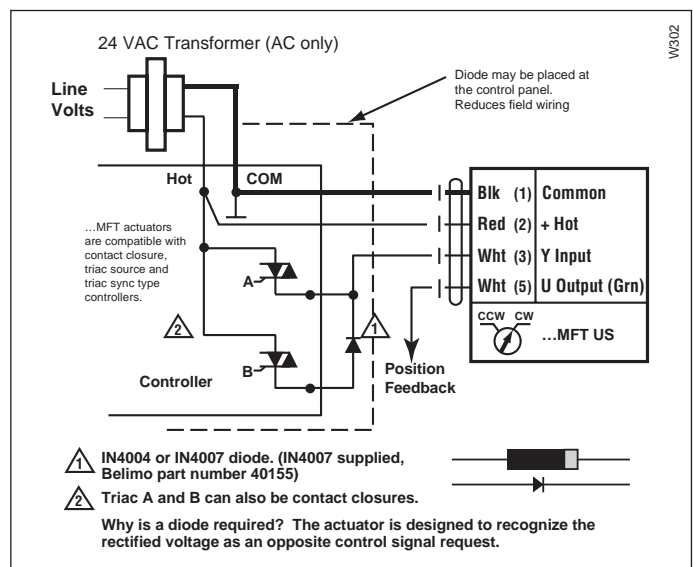


## PWM, triac source and sink

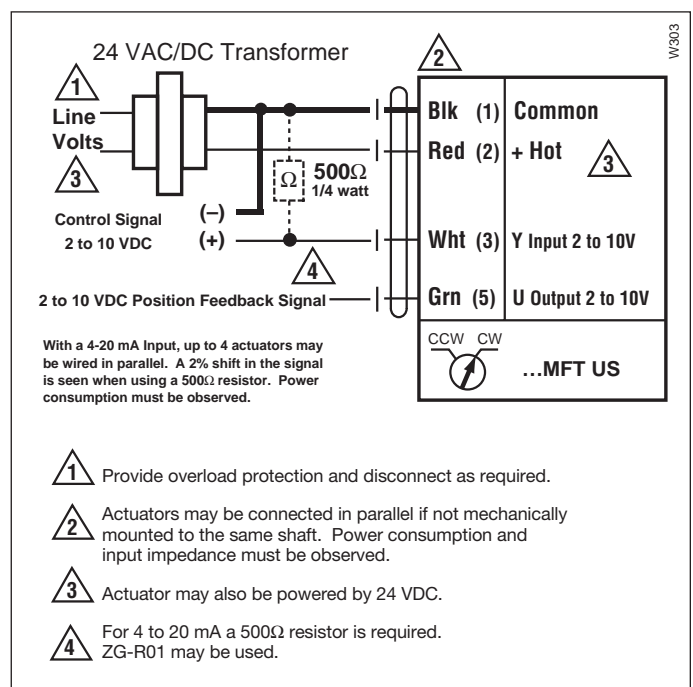
## Wiring



## On-Off control



## Floating Point control



## Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem NM 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	1-1/4" (B231) to 2" (B250)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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.

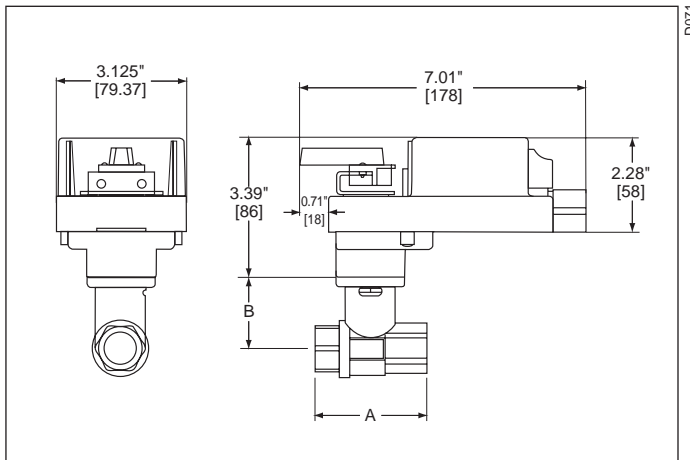
This valve is designed to fit in compact areas where on/off or floating point control is required using 24VAC.

## Actuator Specifications

<input type="checkbox"/> <b>NM24 US</b>	
Control	On-off/floating point
Power consumption:	2.0 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	75 to 150 sec.
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



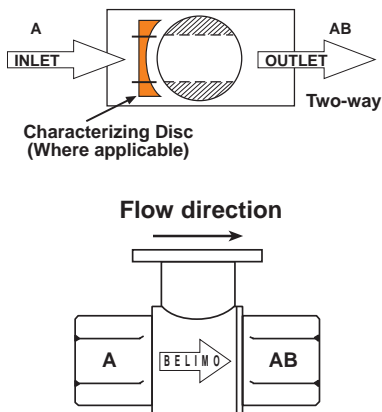
## Dimensions



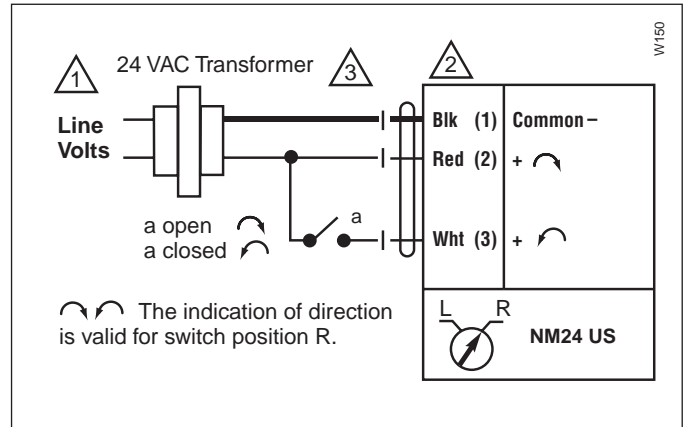
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"	50	4.19 [106.4]	2.44 [62.0]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

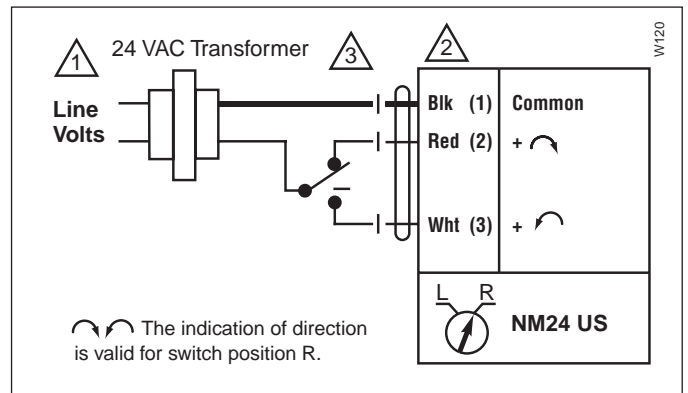
## Flow Pattern



## Wiring



### On-Off control



### Floating Point control

#### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 May also be powered by 24 VDC.

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem NM Actuators, Proportional



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage
Action	Max 95° rotation
Sizes	1-1/4" (B231) to 2" (B250)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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 reheat 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...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm resistor is required).

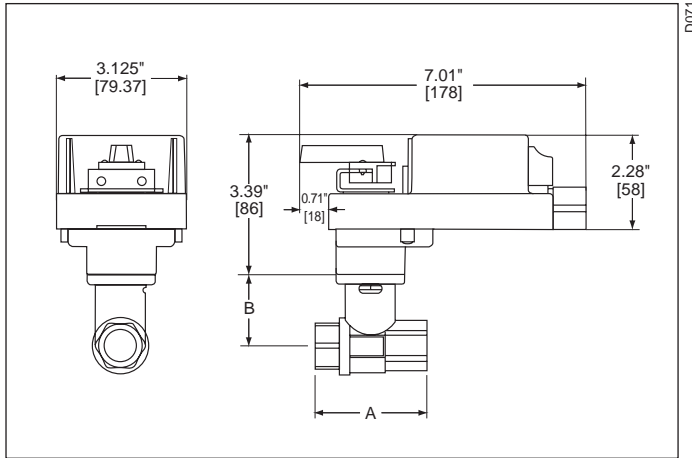
The valve is designed to fit in compact areas where proportional control is required using 24 VAC/VDC.

### Actuator Specifications

<input type="checkbox"/> <b>NM24-SR US</b>	
Control	Proportional
Control signal:	2 to 10 VDC (4 to 20 mA with 500Ω resistor)
Power consumption:	1.3 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100kΩ (500Ω)
Feedback output:	2 to 10 VDC
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	150 sec. independent of load
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



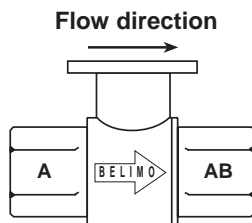
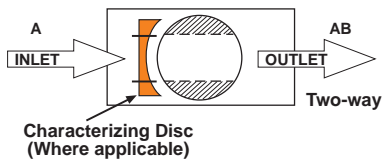
## Dimensions



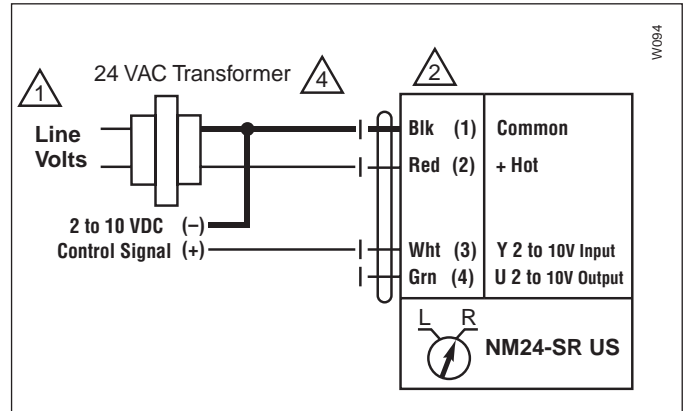
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"	50	4.19 [106.4]	2.44 [62.0]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

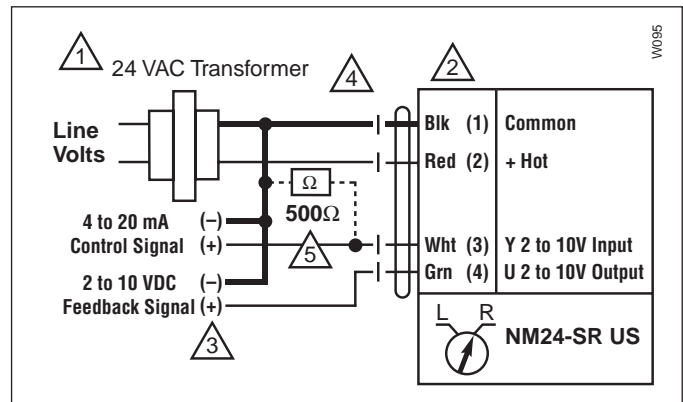
## Flow Pattern



## Wiring



2 to 10 VDC control



4 to 20 mA control

### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 Connect actuator common (Wire 1) to Negative (-) leg of control circuits only.
- 4 May also be powered by 24 VDC.
- 5 The 500Ω resistor converts the 4 to 20mA control signal to 2 to 10 VDC.

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem NM Actuators, MFT



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage
Action	Max 95° rotation
Sizes	1-1/4" (B231) to 2" (B250)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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 with MFT functionality which facilitates the use of various control input.

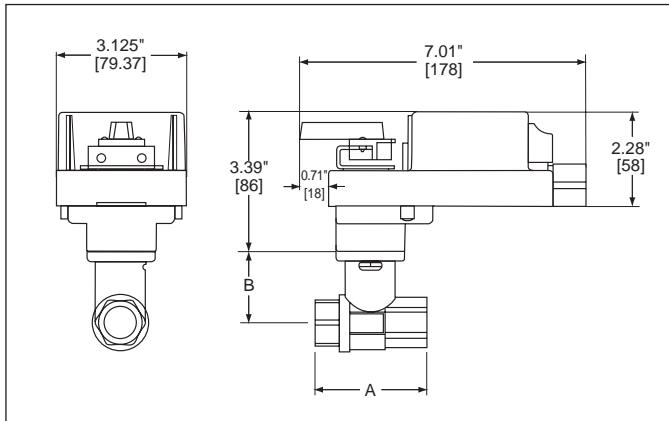
### Actuator Specifications

<input type="checkbox"/> <b>NM24-MFT US</b>	
Control	MFT
Control signal:	2 to 10 VDC
Power consumption:	1.3 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100kΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA 750Ω for PWM 1500Ω for on/off and floating point
Feedback output:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	150 sec. independent of load (proportional)
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



**MFT**

## Dimensions

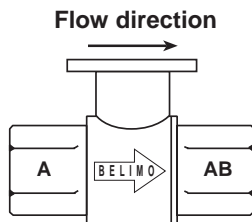
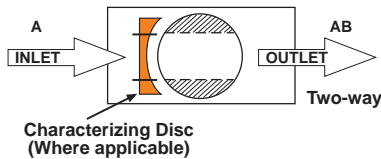


D071

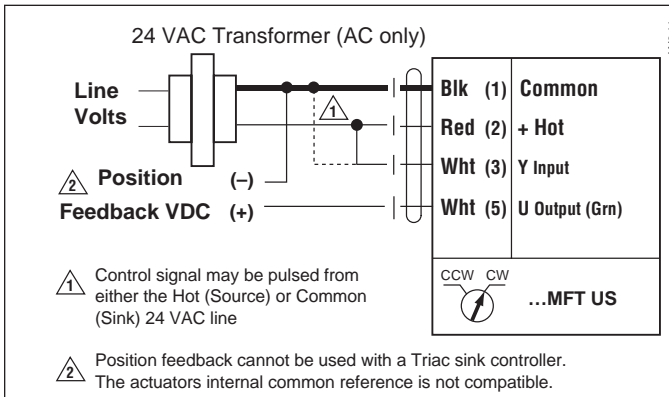
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"	50	4.19 [106.4]	2.44 [62.0]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

## Flow Pattern



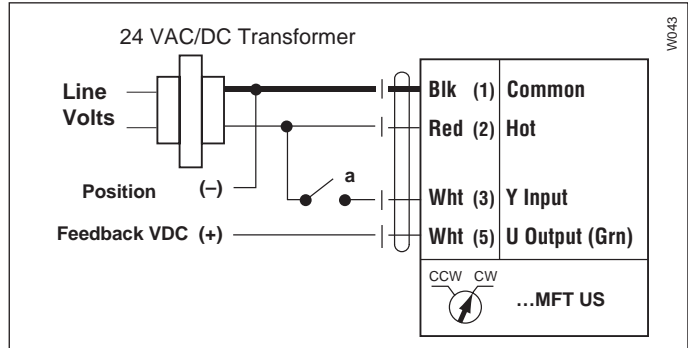
## Wiring



W041

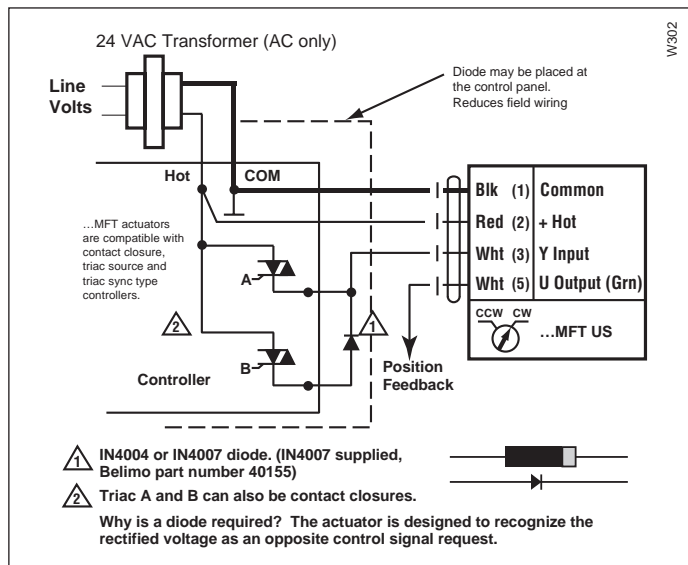
## PWM, triac source and sink

## Wiring



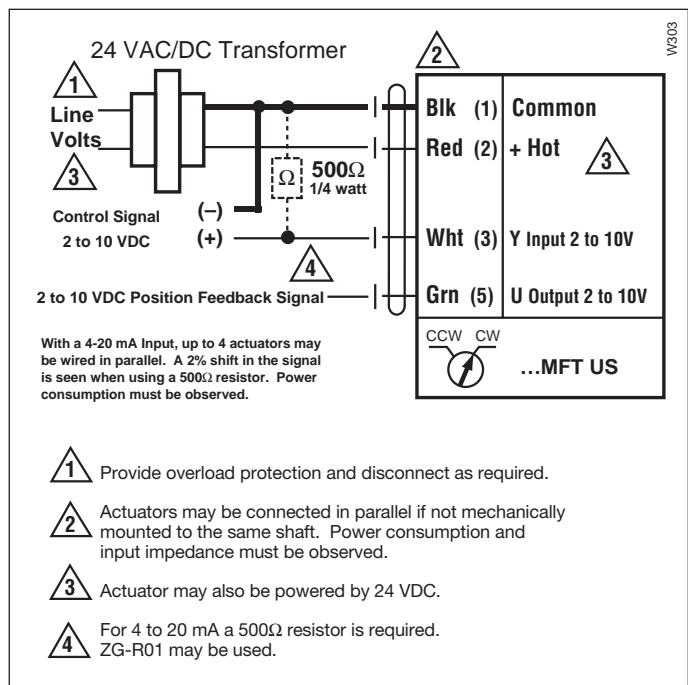
W043

## On-Off control



W302

## Floating Point control



W303

## Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem AM Actuators, On-Off/Floating Point



Technical Data/Submittal



## Valve Specifications:

Service	Chilled or Hot Water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2" to 3"
Type of end fitting	female, npt
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 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

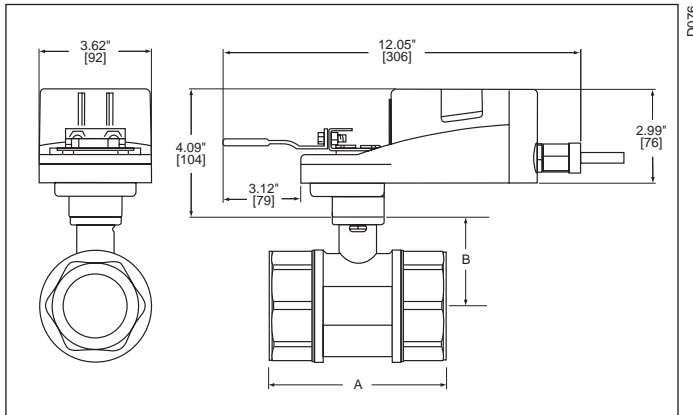
<input type="checkbox"/> <b>AM24 US</b>	
Control	On-off/floating point
Power Supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption:	2.5W
Transformer sizing:	4.5 VA (Class 2 power source)
Electrical connection:	3 ft., 18 GA, appliance cable, 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	0-95° adjustable stops
Torque:	min 160 in-lb [18 Nm]
Direction or rotation:	reversible with switch "CCW-CW"
Position indication:	indicator/handle
Running time:	100 to 150 sec. for 0 to 160 in-lb
Manual override:	external push button
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 type:	NEMA 2 (IP54 with cable entry down)
Housing material:	UL94-5V (flammability rating)
Noise level:	less than 45 dB (A)
Servicing:	maintenance free
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001



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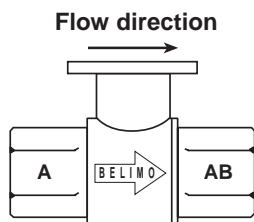
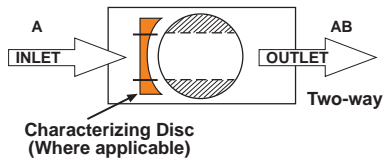


## Dimensions

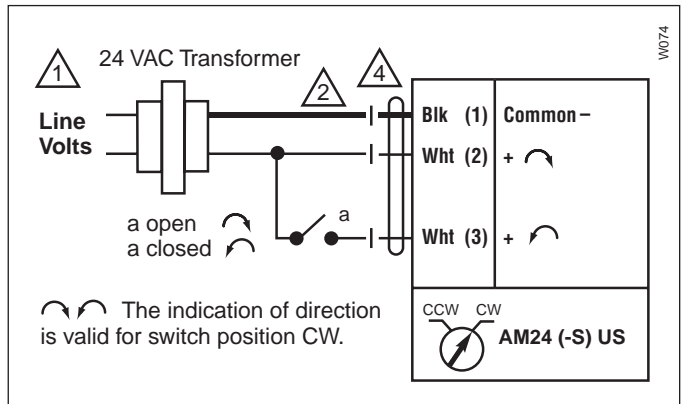


Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2"	50	5.00" [124]	2.78" [69.45]
2.5"	65	5.43" [138]	2.78" [69.45]
3"	80	5.71" [145]	2.78" [69.45]

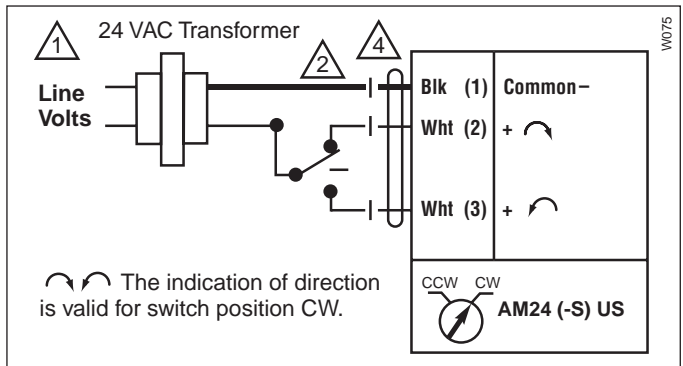
## Flow Pattern



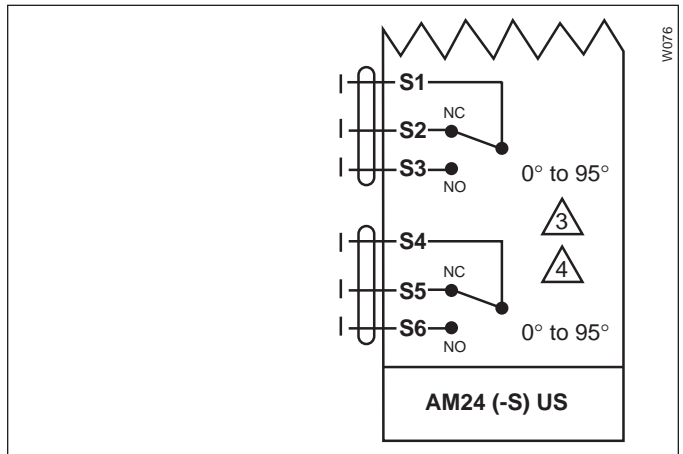
## Wiring



### On-off control



### Floating point or on-off control



### Auxiliary switch wiring for AM24-S US

## Notes

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may also be powered by 24 VDC.
- 3 For end position indication, interlock control, fan startup, etc., AM24-S us incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @24 VAC, UL listed, adjustable between 0° and 95°.
- 4 Meets UL and CSA requirements without the need of an electrical ground connection.

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem AM Actuators, MFT



Technical Data/Submittal



## Valve Specifications:

Service	Chilled or Hot Water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2" to 3"
Type of end fitting	female, npt
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 PSI
Maximum differential: pressure ( $\Delta P$ )	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



**MFT**

## 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 with MFT functionality which facilitates the use of various control input.

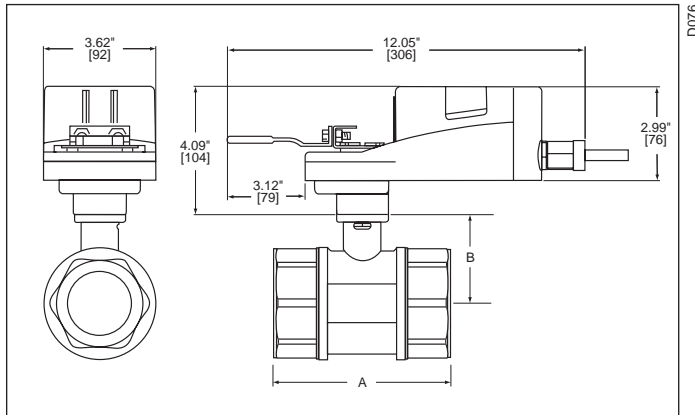
## Actuator Specifications

### AM24-MFT US

Control	MFT
Power Supply	24 VAC, $\pm 20\%$ , 50/60 Hz 24 VDC $\pm 10\%$
Power consumption:	2.5 W running, 1.2 W holding
Transformer sizing:	5 VA (Class 2 power source)
Electrical connection:	3 ft., 18 GA, appliance cable, 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Control signal Y*:	2 to 10 VDC
Operating range*:	2 to 10 VDC, 4 to 20 mA (w/500 $\Omega$ , 1/4W resistor) ZG-R01
Input impedance:	100k $\Omega$ for 2 to 10 VDC (0.1 mA) 500 $\Omega$ for 4 to 20 mA, 750 $\Omega$ for PWM 1500 $\Omega$ for on/off and floating point
Feedback output U*:	2 to 10 VDC, 0.5 mA max
Torque:	min 160 in-lb [18 Nm]
Direction or rotation*:	control direction selected by switch CW=CW with decrease in signal CCW=CCW with a decrease in signal
Angle of rotation:	0-95° adjustable mechanical stops
Running time:	150 seconds constant
Angle of rotation adaptation:	Off (default)
Override control*:	Min. (min position) = 0% ZS (mid position) = 50% Max. (max position) = 100%
Manual override:	manual push button
Position indication:	clip on indicator handle
Humidity:	5 to 95% RH, non-condensing
Operating temperature:	-22°F to 122°F [-30°C to +50°C]
Storage temperature:	-40°F to 176°F [-40°C to +80°C]
Housing type:	NEMA 2 IP54 (with cable entry down)
Housing material:	UL 94-5V (flammability rating)
Noise level:	less than 45 dB (A)
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified
Quality standard:	ISO 9001
Servicing:	maintenance free

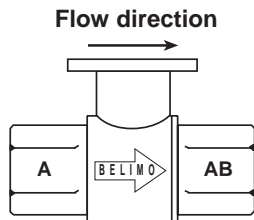
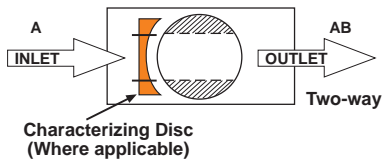
\*variable

## Valve Assembly Dimensions

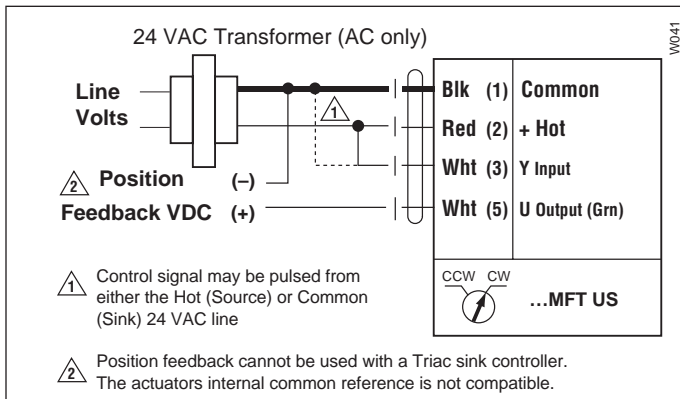


Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2"	50	5.00" [124]	2.78" [69.45]
2.5"	65	5.43" [138]	2.78" [69.45]
3"	80	5.71" [145]	2.78" [69.45]

## Flow Pattern

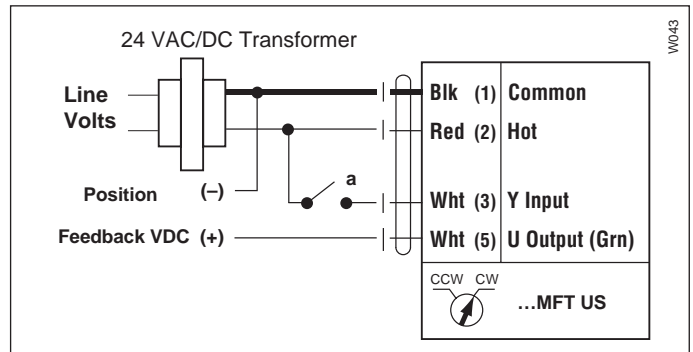


## Wiring

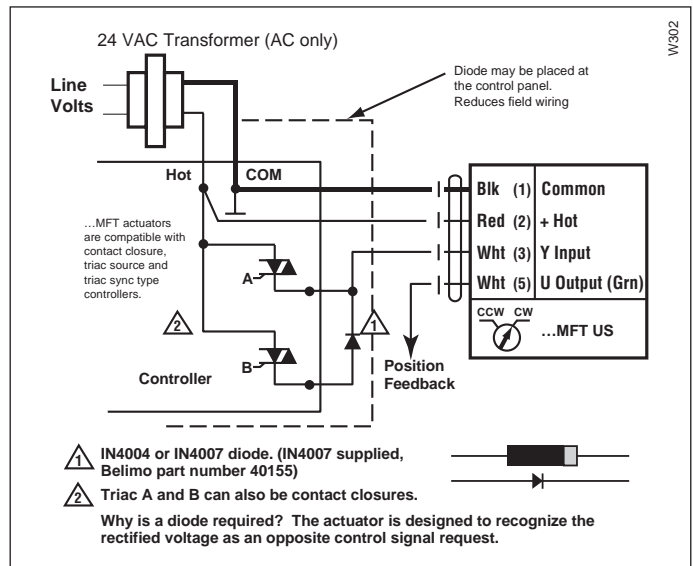


## PWM, triac source and sink

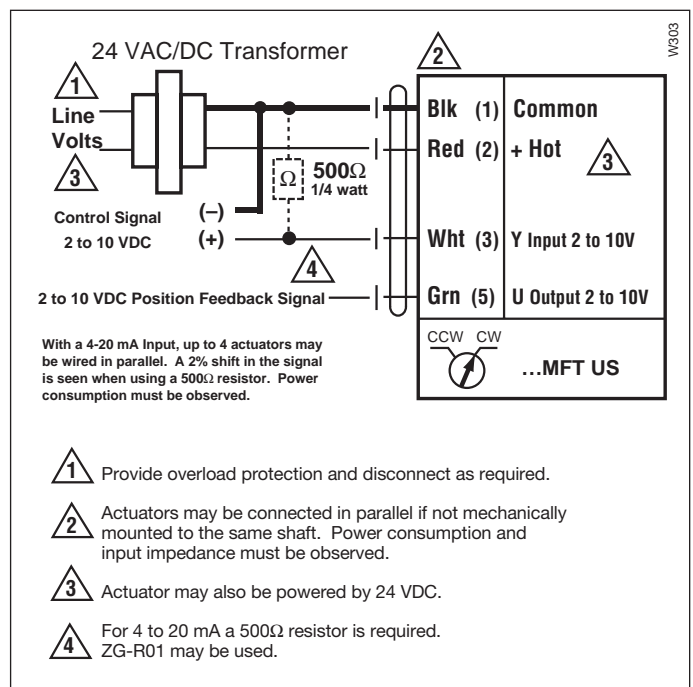
## Wiring



## On-Off control



## Floating Point control



## Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B3 Three-way Characterized Control Valve, Stainless Steel 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 B port modified linear for constant AB flow
Action	Max 95° 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	fiberglass reinforced teflon® 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant 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, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
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

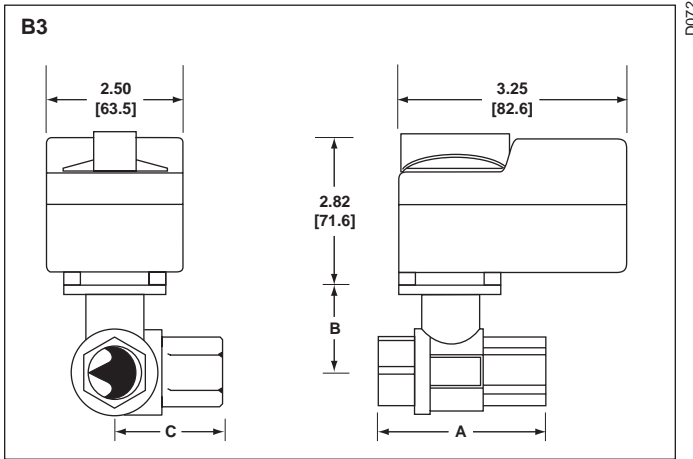


## Additional Models

TR24-3 US	TR24-3-T US with 3 ft plenum rated cable
TR24-3/200 US	TR24-3-T US with 6 ft plenum rated cable
TR24-3/300 US	TR24-3-T US with 10 ft plenum rated cable

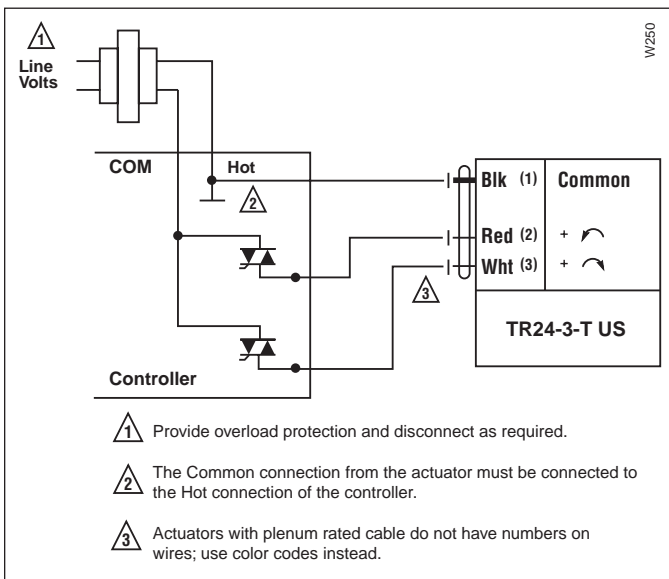
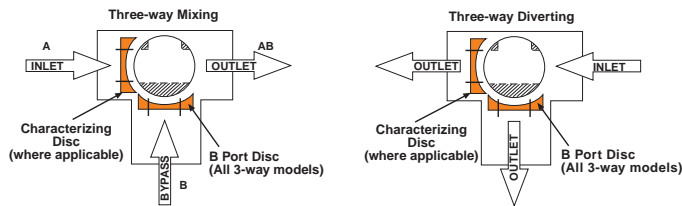
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## Dimensions



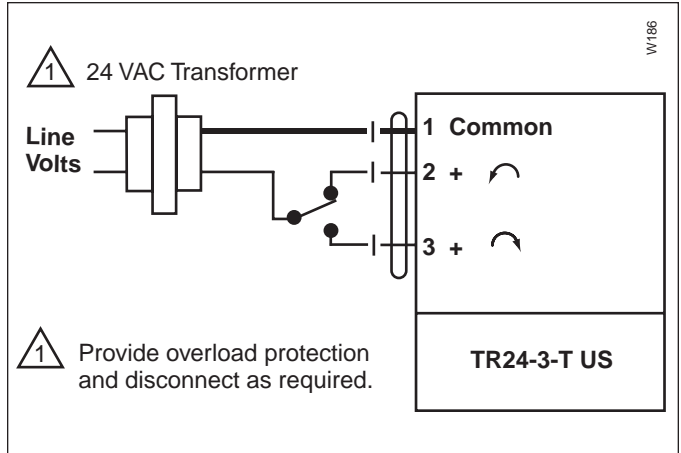
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317-B320	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern

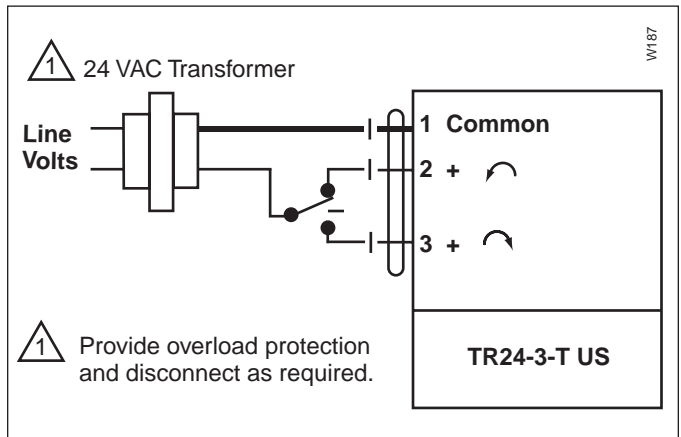


Triac Sink

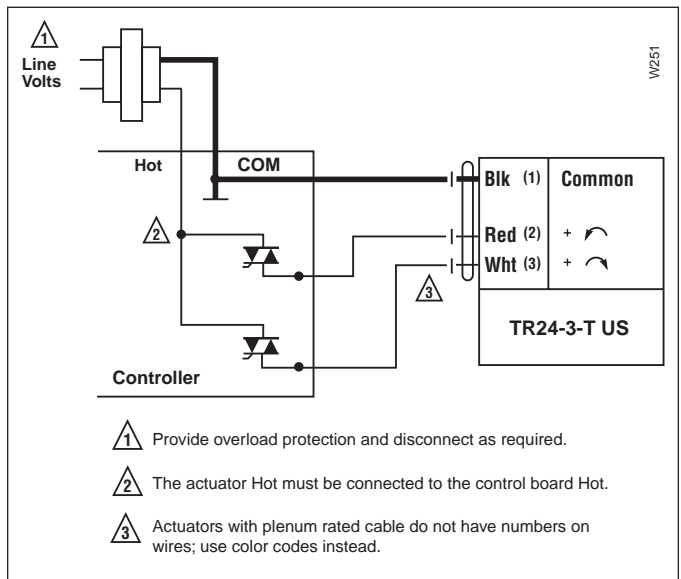
## Wiring



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



Floating Control of TR24-3-T US



Triac Source

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

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem TR Actuators, Proportional



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° 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	fiberglass reinforced teflon® 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm 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"/> TR24-SR-T US	Reversing switch under cover
Control	Proportional
Input Impedance	100 kΩ
Nominal voltage	24 VAC 50/60 Hz, 24VDC
Nominal voltage range	19.2...28.8 VAC, 21.6...28.8 VDC
Power Consumption	0.5 W
Transformer Sizing	1VA (Class 2 power source)
Electrical Connection	Screw Terminals accessible after removal of small cover (3 ft, 6 ft, 10 ft cables optional)
Angle of Rotation	90°
Torque	18 in-lbs (2Nm)
Position Indication	Integrated into Handle
Manual override:	Push down handle
Running Time	90 seconds
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

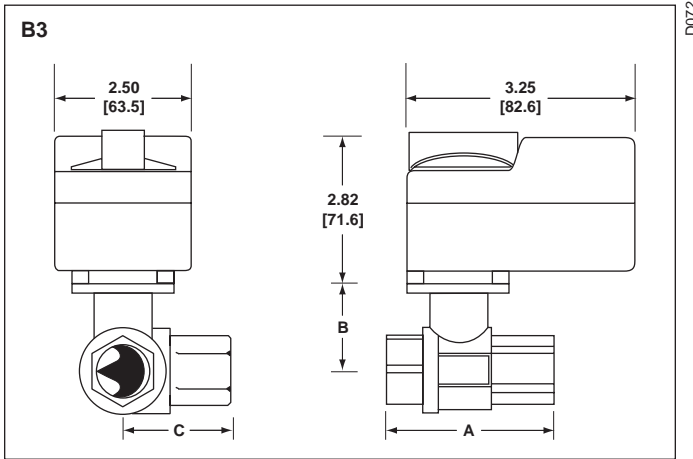


### Additional Models

TR24-SR US	TR24-SR-T US with 3 ft plenum rated cable
TR24-SR/200 US	TR24-SR-T US with 6 ft plenum rated cable
TR24-SR/300 US	TR24-SR-T US with 10 ft plenum rated cable

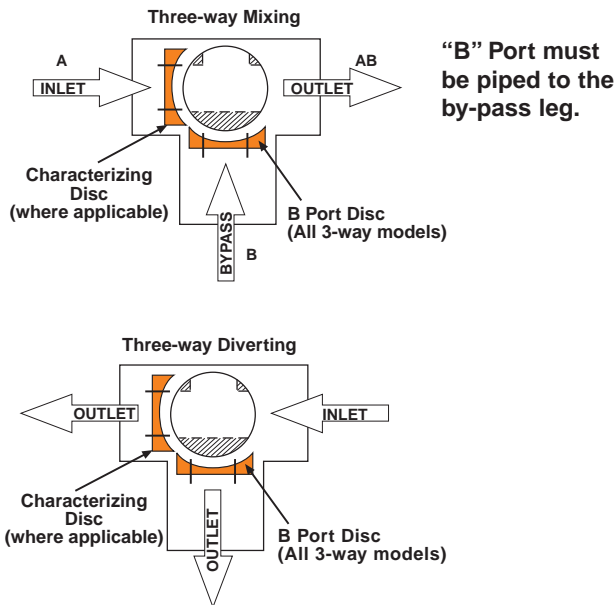
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## Dimensions

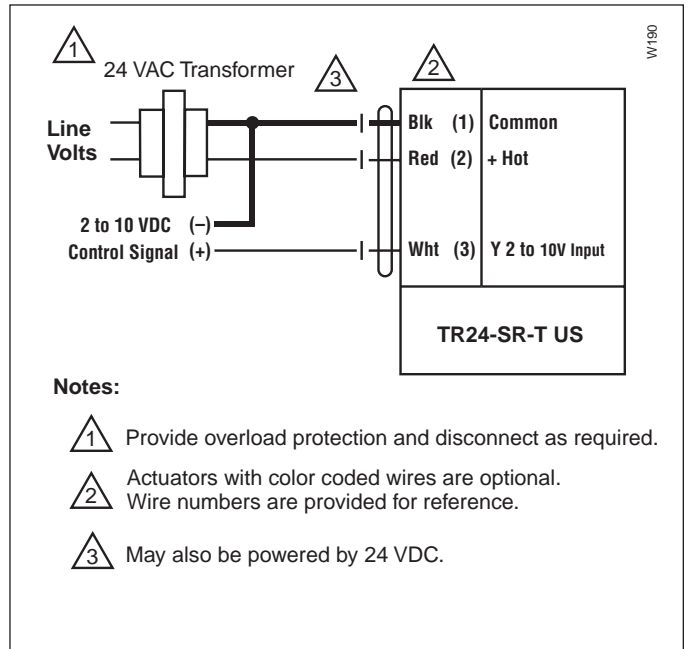


Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317-B320	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

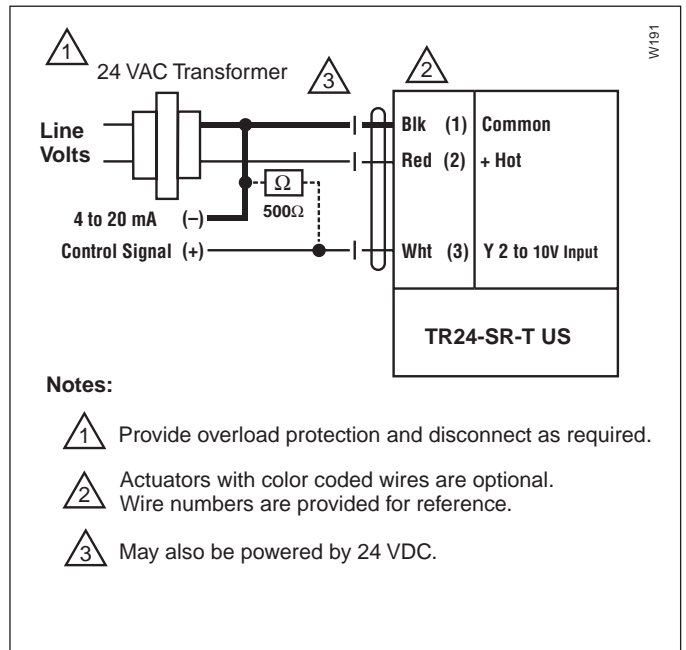
## Flow Pattern



## Wiring



### 2 to 10 VDC Control of TR24-SR-T US



### 4 to 20 mA Control of TR24-SR-T US

Direct/Reverse acting switch is under wiring cover.  
 R = CW with decrease in signal  
 L = CCW with decrease in signal  
 No feedback

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LR Actuators, On-Off/Floating



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant 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"/> LR24-3 US	Running time: 95 seconds constant Direction of rotation: reversible w/switch CW/CCW Transformer sizing: 3 VA (Class 2 power source) Input impedance: 3900Ω
<input type="checkbox"/> LR24-3-S US	(LR24-3 US with auxiliary switch) Switch 0-95° SPDT 6A resistive (2.5A inductive) @ 24 VAC

### All LR On-Off/Floating Point

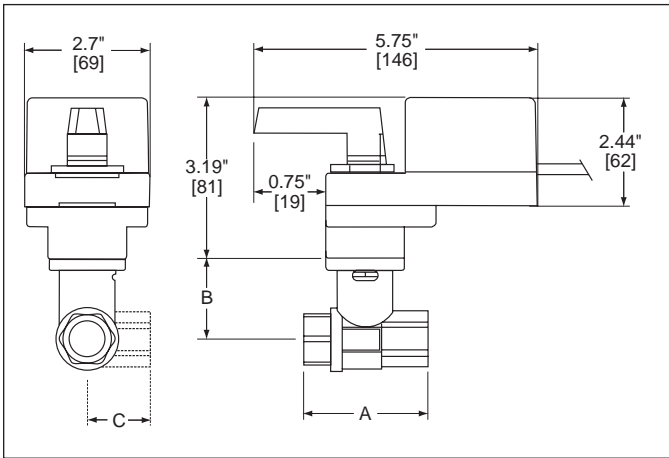
Control	On-off/floating point
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	2 W
Transformer sizing	3 VA (Class 2 power source)
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting
Overload protection	Electronic throughout 0 to 95° rotation
Torque	min 35 in-lb [4 Nm]
Position indication	Indicator/handle
Manual override	external push button
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 type	NEMA type 2
Housing material rating	UL94-5V (flammability rating)
Noise level	less than 35 dB (A)
Servicing	maintenance free
Agency listings	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard	ISO 9001

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## Dimensions

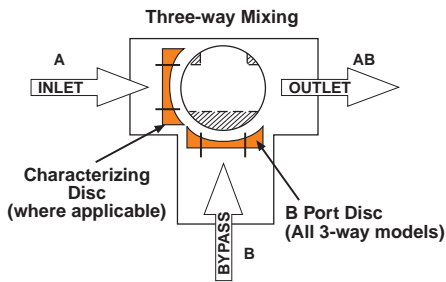


D023

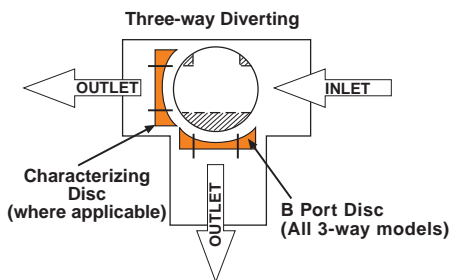
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

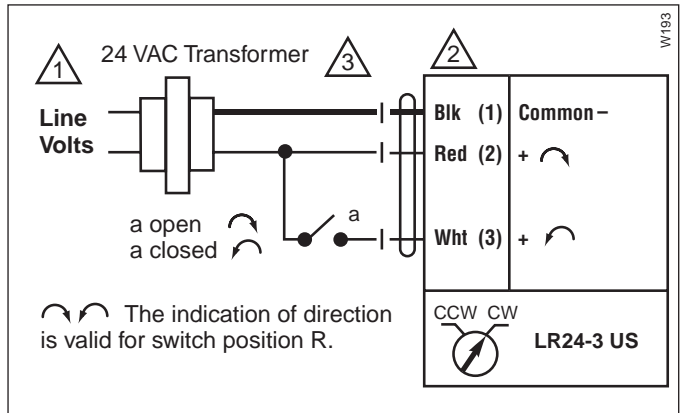
## Flow Pattern



**"B" Port must be piped to the by-pass leg.**



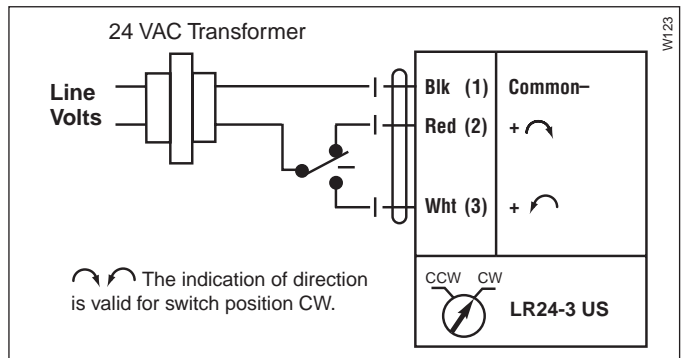
## Wiring



W193

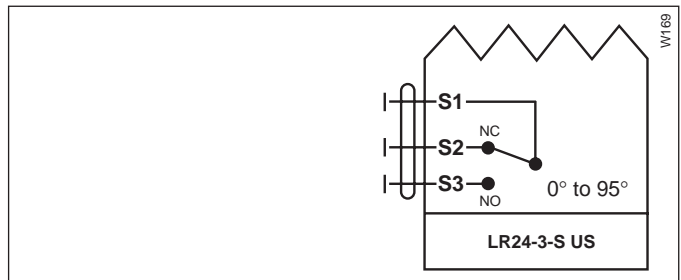
### On-Off control

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 May also be powered by 24 VDC.



W123

### Floating Point control



W169

### Aux. switch

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LR Actuators, Proportional



Technical Data/Submittal



## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm 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"/> LR24-SR US	Running time: 95 seconds constant Transformer sizing 4 VA (Class 2 power source) Control signal Y: 0 to 10 VDC, 0 to 20 mA Input impedance: 100 kΩ (0.1 mA), 500Ω Operating range: 2 to 10 VDC, 4 to 20 mA Feedback output U: 2 to 10 VDC, max. 0.7 mA Direction of rotation: reversible with switch CW/CCW, CW = CW with voltage CCW = CCW with voltage
-------------------------------------	--

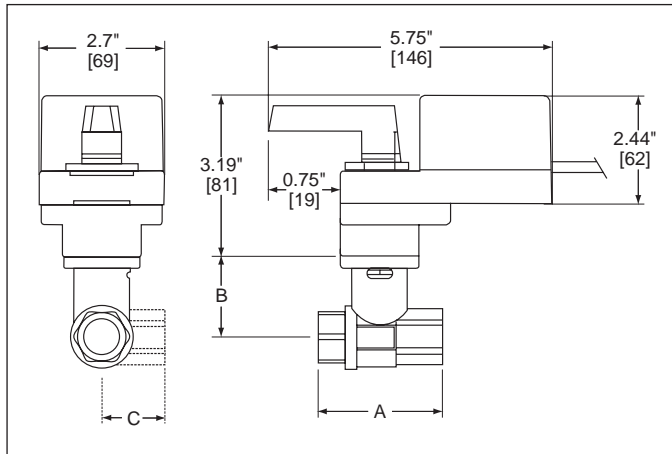
## All LR Proportional

Control	Proportional
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	2 W
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting (not on -1 models)
Overload protection	Electronic throughout 0 to 95° rotation
Torque	min 35 in-lb [4 Nm]
Position indication	Indicator/handle
Manual override	external push button
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 type	NEMA type 2
Housing material rating	UL94-5V (flammability rating)
Noise level	less than 35 dB (A)
Servicing	maintenance free
Agency listings	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard	ISO 9001

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## Dimensions

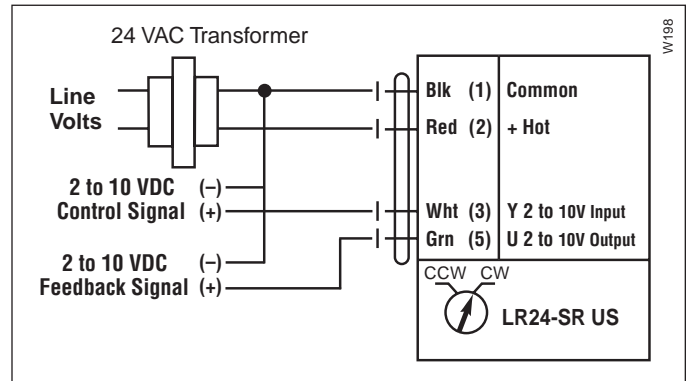


D023

Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

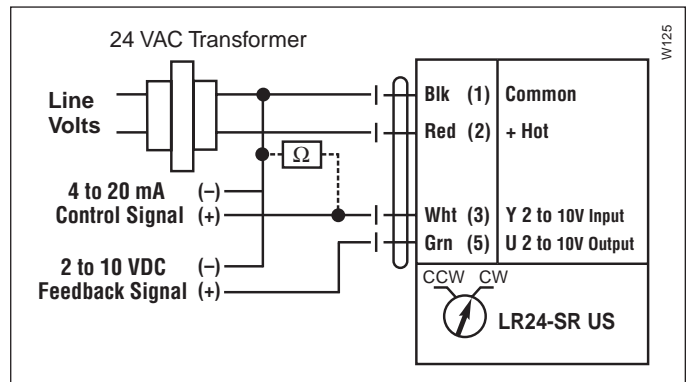
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

## Wiring



W108

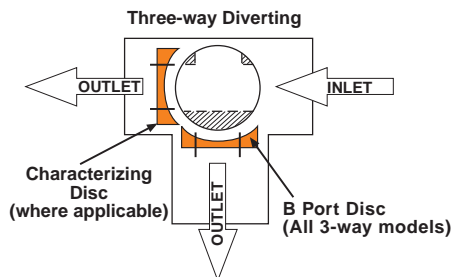
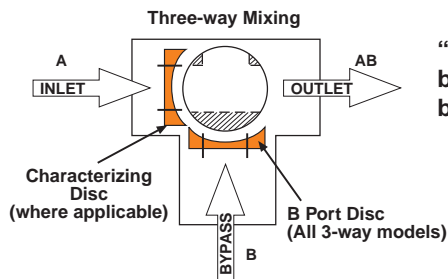
2 to 10 VDC control



W125

4 to 20 mA control

## Flow Pattern



# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LR Actuators, MFT



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

Tefzel® is a registered trademark of DuPont

### Application

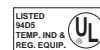
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV Box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow.

This valve is designed with MFT functionality which facilitates the use of various control input.

### Actuator Specifications

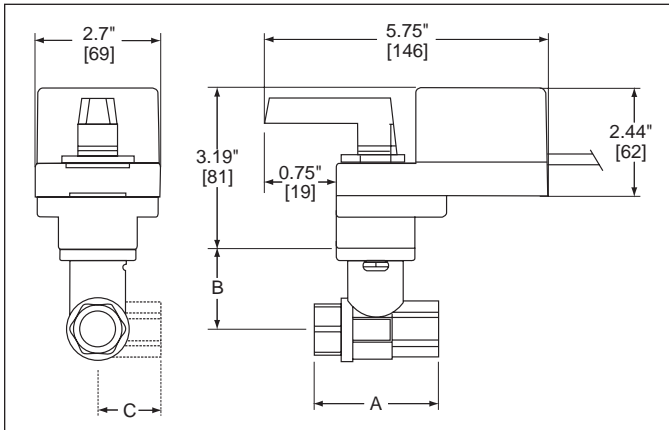
<input type="checkbox"/> LR24-MFT US	
Control	MFT
Control signal Y:	0 to 10 VDC, 0 to 20 mA
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	2 W
Transformer sizing:	4 VA (Class 2 power source)
Electrical connection	3 ft, 18 GA, UL CL2P plenum cable 1/2" conduit fitting
Overload protection	Electronic throughout 0 to 95° rotation
Operating range:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1 mA), 500Ω
Input impedance:	100kΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA, 750Ω for PWM 1500Ω for on/off and floating point
Feedback output U:	2 to 10 VDC, max. 0.5 mA
Torque	min 35 in-lb [4 Nm]
Direction of rotation:	reversible with switch CW/CCW, CW = CW with voltage CCW = CCW with voltage
Position indication:	Indicator/handle
Manual override:	external push button
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 type:	NEMA type 2
Housing material rating:	UL94-5V (flammability rating)
Noise level:	less than 35 dB (A)
Servicing:	maintenance free
Agency listings:	UL873 listed, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001

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MFT

## Dimensions

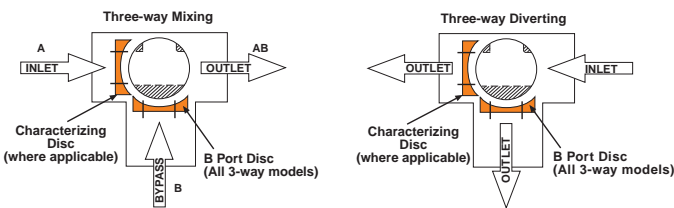


D023

Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

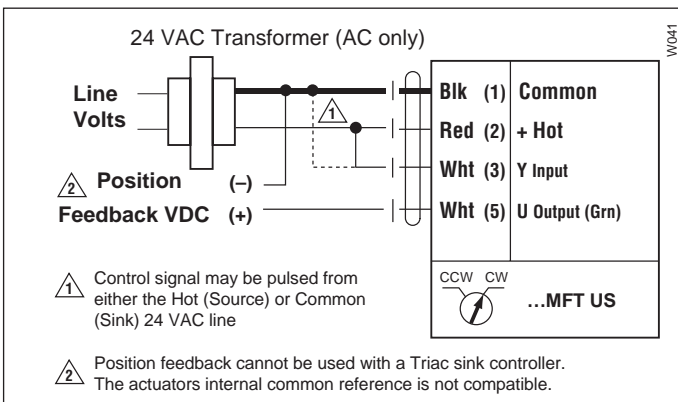
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

## Flow Pattern



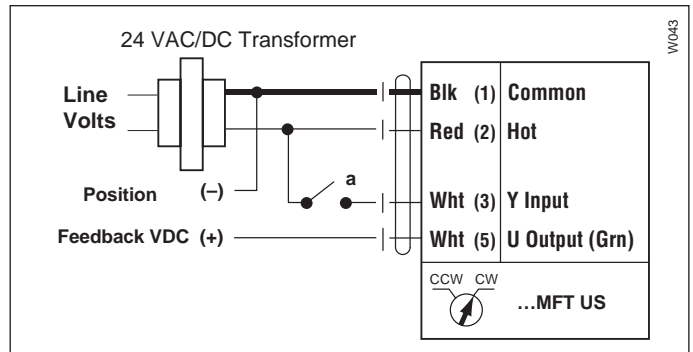
“B” Port must be piped to the by-pass leg.

## Wiring

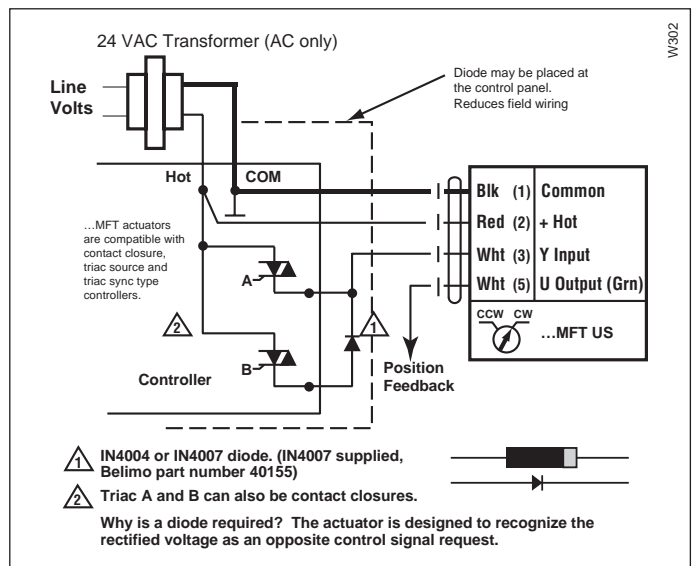


PWM, triac source and sink

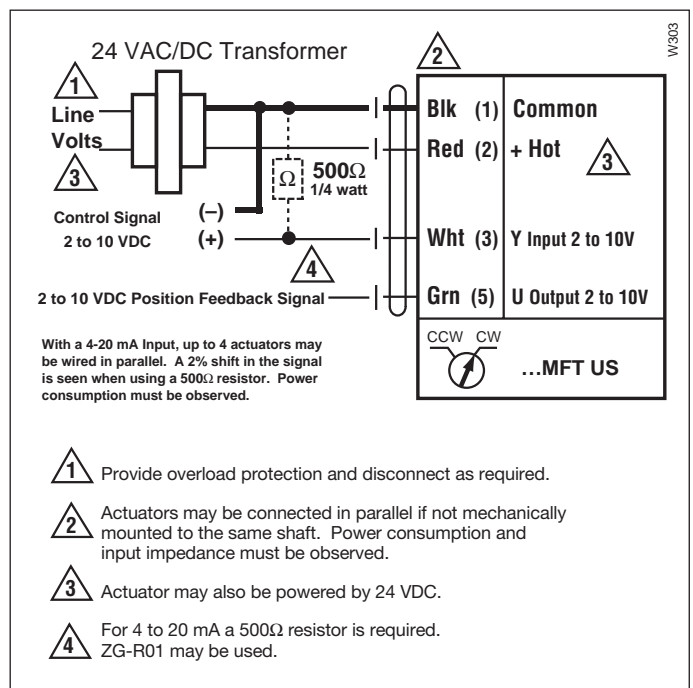
## Wiring



## On-Off control



## Floating Point control



Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem NM Actuators, On-Off/Floating Point



Technical Data/Submittal



## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1-1/4" (B331) to 2" (B350)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant flow.

This valve is designed to fit in compact areas where on/off or floating point control is required using 24VAC.

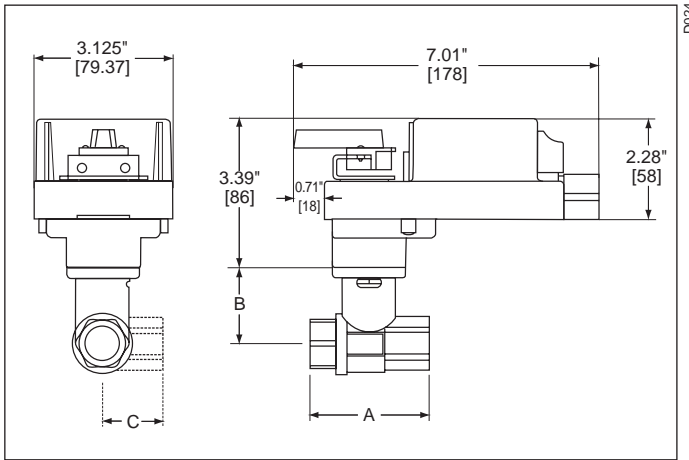
## Actuator Specifications

<input type="checkbox"/> <b>NM24 US</b>	
Control	On-off/floating point
Power consumption:	2.0 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	75 to 150 sec.
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



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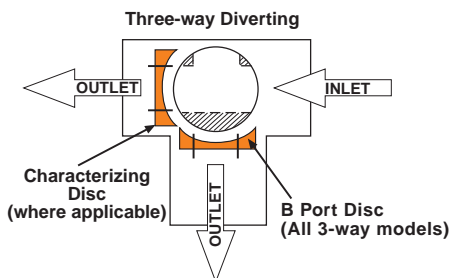
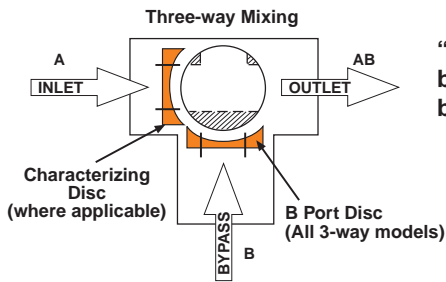
## Dimensions



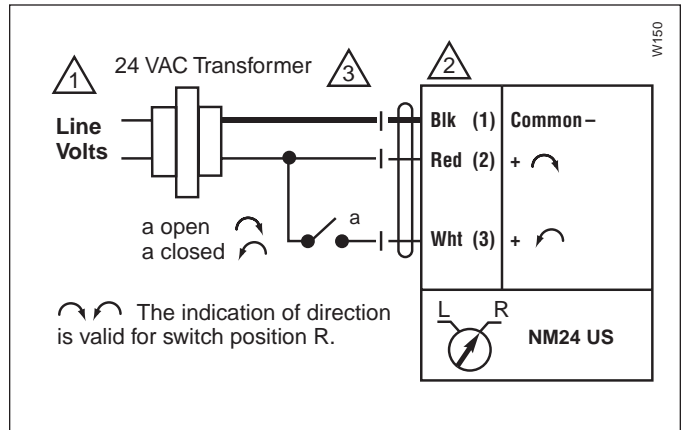
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
*1-1/4"	32	4.45 [113]	1.87 [48]	2.22 [56.5]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]	2.00 [50.8]
2"	50	4.19 [106.4]	2.44 [62.0]	2.19 [55.6]

\* On model numbers B331 and B332, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

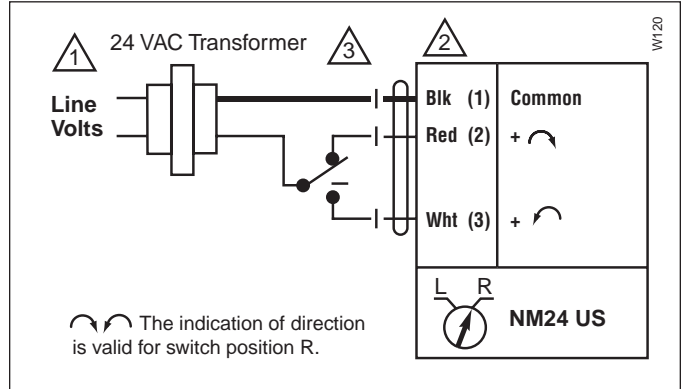
## Flow Pattern



## Wiring



### On-Off control



### Floating Point control

#### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 May also be powered by 24 VDC.

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem NM Actuators, Proportional



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1-1/4" (B331) to 2" (B350)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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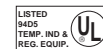
### Application

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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA. (for 4...20mA control input a 500 ohm resistor is required).

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

### Actuator Specifications

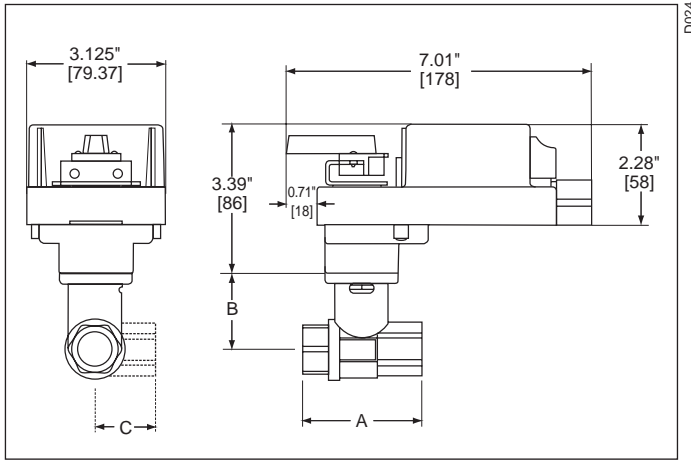
<input type="checkbox"/> <b>NM24-SR US</b>	
Control	Proportional
Control signal:	2 to 10 VDC (4 to 20 mA with 500Ω resistor)
Power consumption:	1.3 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100kΩ (500Ω)
Feedback output:	2 to 10 VDC
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	150 sec. independent of load
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



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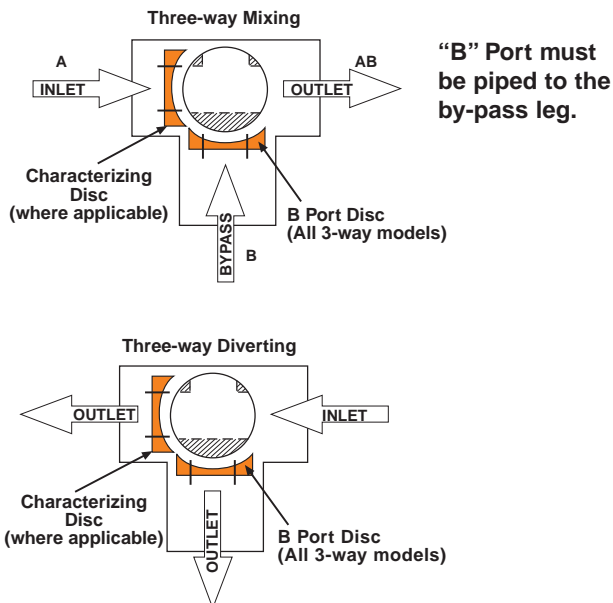
## Dimensions



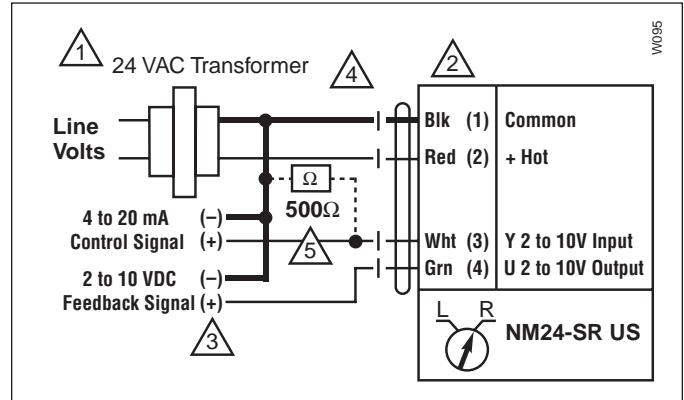
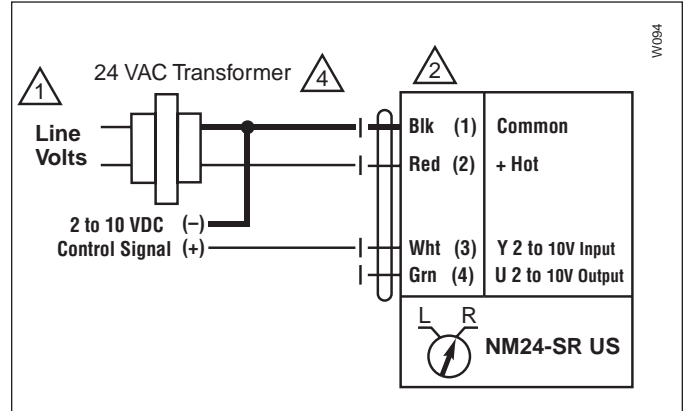
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
*1-1/4"	32	4.45 [113]	1.87 [48]	2.22 [56.5]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]	2.00 [50.8]
2"	50	4.19 [106.4]	2.44 [62.0]	2.19 [55.6]

\* On model numbers B331 and B332, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

## Flow Pattern



## Wiring



### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 Connect actuator common (Wire 1) to Negative (-) leg of control circuits only.
- 4 May also be powered by 24 VDC.
- 5 The 500Ω resistor converts the 4 to 20mA control signal to 2 to 10 VDC.

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem NM Actuators, MFT



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1-1/4" (B331) to 2" (B350)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant flow.

This valve is designed with MFT functionality which facilitates the use of various control input.

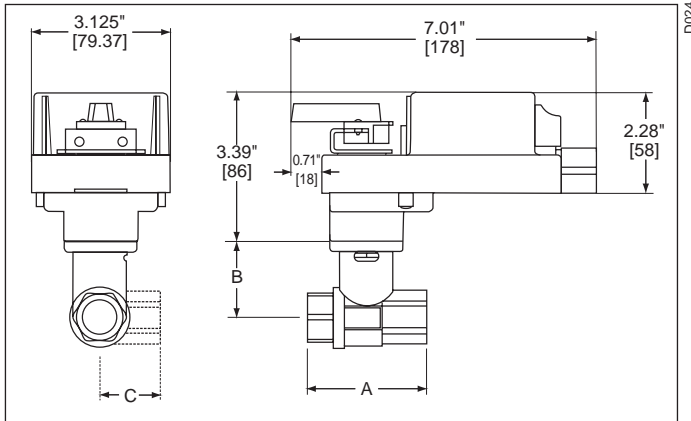
### Actuator Specifications

<input type="checkbox"/> <b>NM24-MFT US</b>	
Control	MFT
Control signal:	2 to 10 VDC
Power consumption:	1.3 W
Transformer sizing:	3.5 VA class 2 power source
Electrical connection:	3 ft, 18 GA plenum rated cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100kΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA 750Ω for PWM 1500Ω for on/off and floating point
Feedback output:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction or rotation:	L/R external switch
Position indication:	Indicator/handle
Manual override:	push button
Running time:	75 to 150 sec. (NM24 US) 150 sec. independent of load (proportional)
Ambient temperature:	-4° F to 122° F [-20° C to 50° C]
Housing:	NEMA 2 / IP54
Housing material:	UL 94-5V (flammability rating)
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	less than 35 dB(A)



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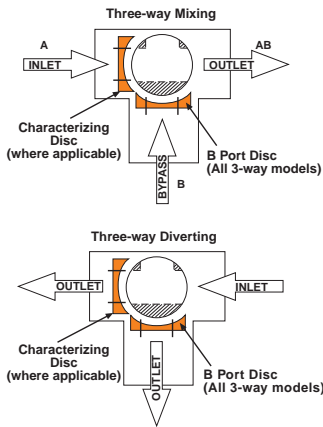
### Dimensions



Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
*1-1/4"	32	4.45 [113]	1.87 [48]	2.22 [56.5]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]	2.00 [50.8]
2"	50	4.19 [106.4]	2.44 [62.0]	2.19 [55.6]

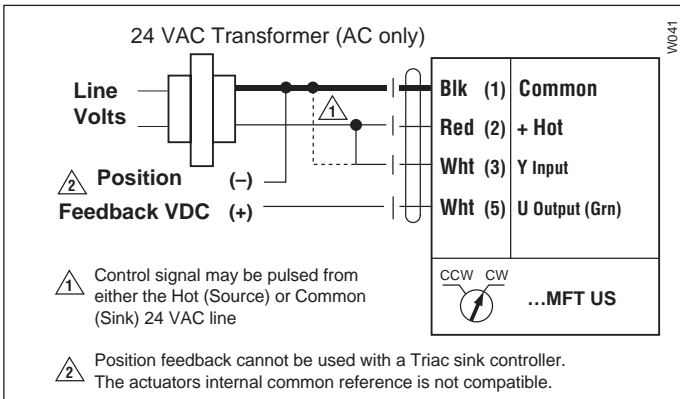
\* On model numbers B331 and B332, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

### Flow Pattern



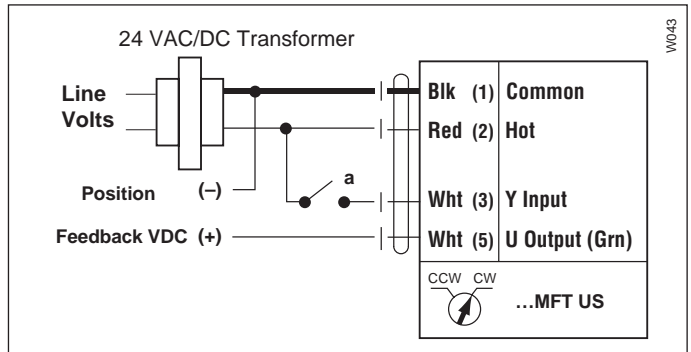
**"B" Port must be piped to the by-pass leg.**

### Wiring

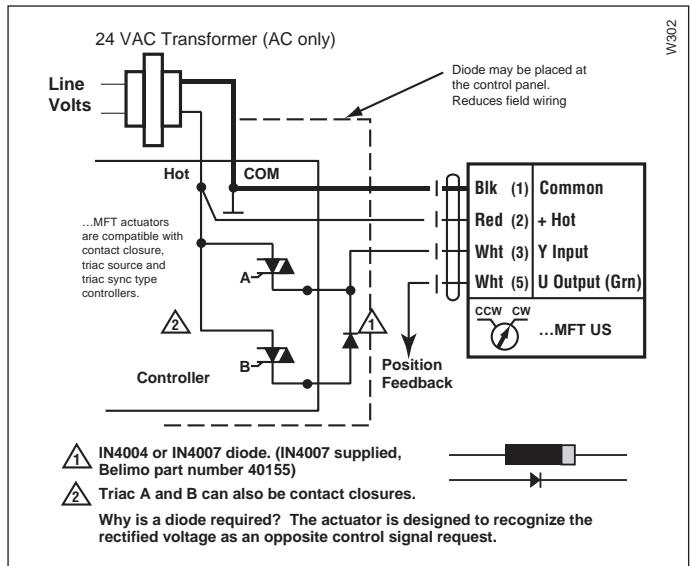


### PWM, triac source and sink

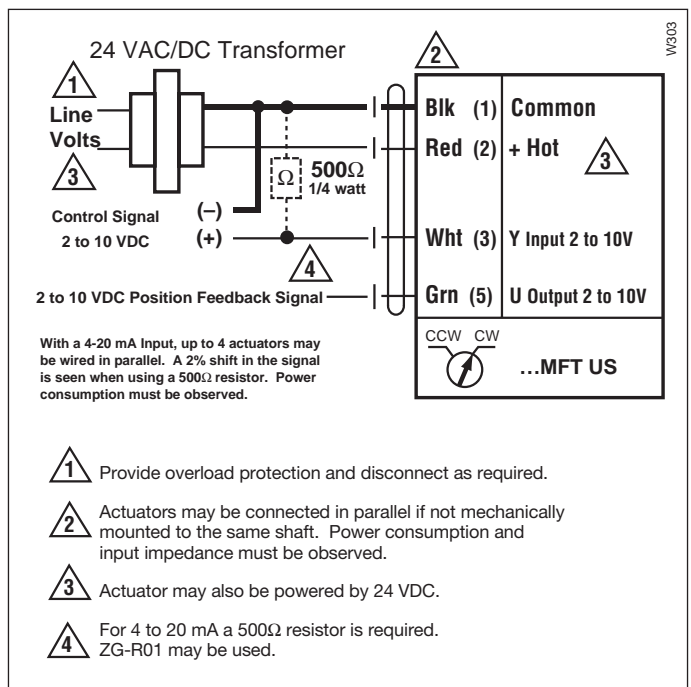
### Wiring



### On-Off control



### Floating Point control



### Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem TF Actuators, On-Off



## 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	stainless steel
Stem	stainless steel
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 ( $\Delta P$ )	For Characterized A-port 20 psi for typical applications 30 psi max for quiet service
Leakage	0%
Cv rating	A port: see product chart for values
	For full flow versions only (no A-disc) On/Off control 150 psi

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

This valve is designed for on/off control using 24VAC/DC or 100 to 240 VAC where fail safe is required.

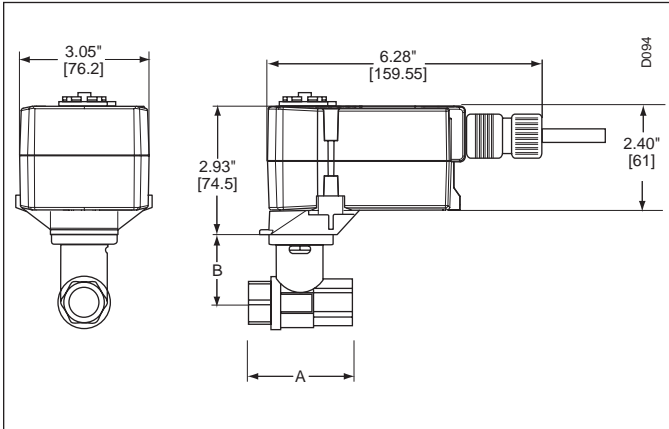
### Actuator Specifications

<input type="checkbox"/> TF24 US	<input type="checkbox"/> TF24-S US
<input type="checkbox"/> TF120 US	<input type="checkbox"/> TF120-S US
Control	On-off
Power supply TF24(-S) US:	24VAC $\pm$ 20%, 50/60Hz 24VDC $\pm$ 10%
Power supply TF120(-S) US:	(nominal) 100 to 240 VAC, 50/60 Hz (tolerance) 85 to 265 VAC, 50/60 Hz
Power consumption:	running: 2.5 W holding: 1.3 W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	3 ft, 18 GA appliance cable (-S models have 2 cables) 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
Direction of rotation:	reversible with cw/ccw mounting
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: < 75 sec (0 to 18 in-lb) 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
Noise level:	max: running < 50 db (A) spring return 62 db (A)
Servicing:	maintenance free
Quality standard:	ISO 9001
Weight:	TF24/120 US 1.4 lbs (0.6 kg) TF24/120(-S) US 1.5 lbs (0.7 kg)



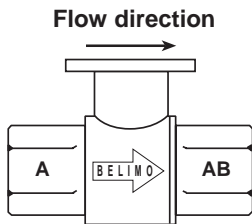
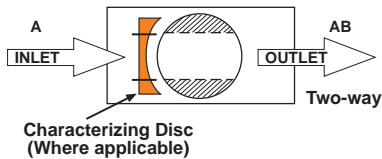
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## Dimensions

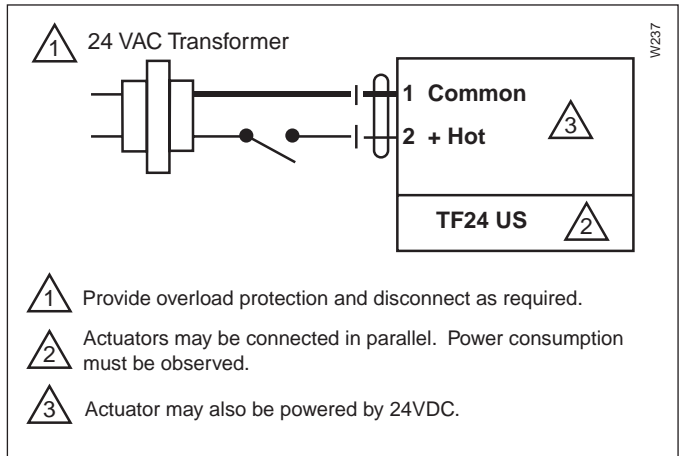


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217-B220	3/4"	20	2.63 [66.8]	1.75 [44.5]

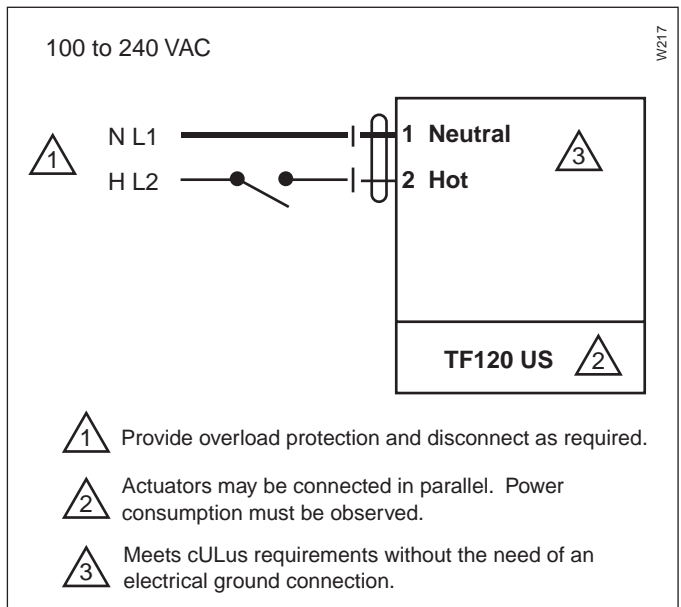
## Flow Pattern



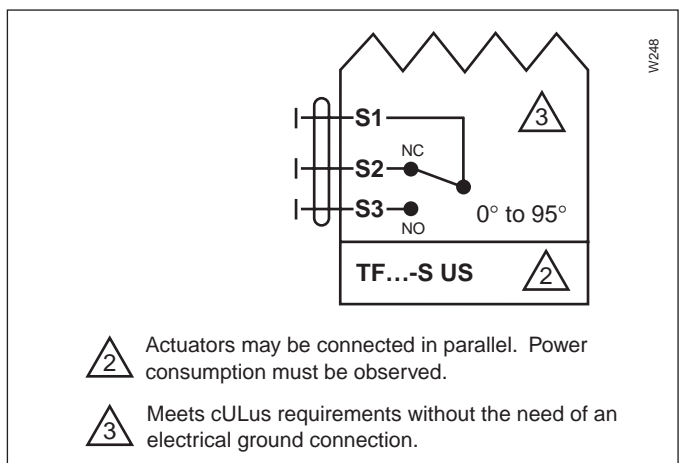
## Wiring



### On-off wiring for TF24 US



### On-off wiring for TF120 US



### On-off wiring for TF...-S US

# B2 Two-way Characterized Control Valve, Stainless Steel 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	stainless steel
Stem	stainless steel
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

### 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.

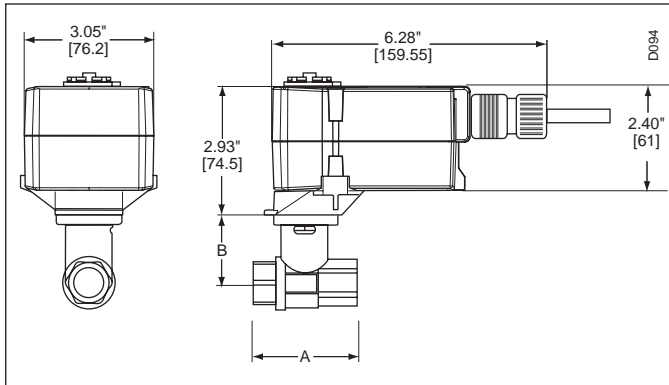
### Actuator Specifications

<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) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Input impedance	1000 Ω (0.6w) control inputs
Angle of rotation	max 95°, adjust. with mechanical stop
Torque	min. 18 in-lb [2 Nm]
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: 95 sec constant 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
Noise level	max: running < 35 db (A) spring return 62 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24-3 US 1.4 lbs (0.6 kg) TF24-3-S US 1.5 lbs (0.7 kg)

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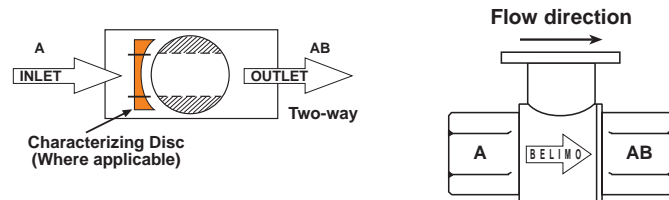


### Dimensions

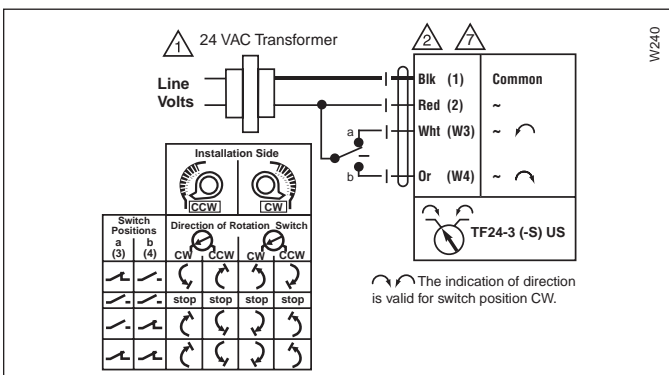


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217-B220	3/4"	20	2.63 [66.8]	1.75 [44.5]

### Flow Pattern

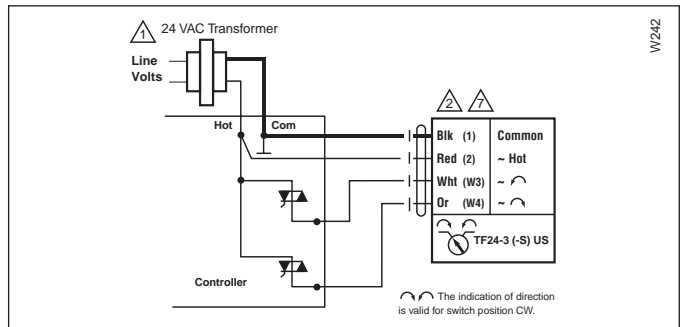


### Wiring

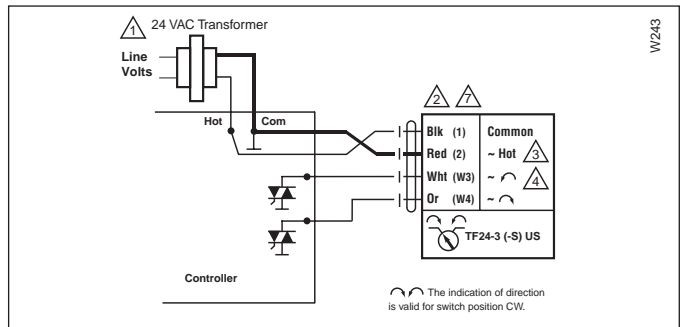


**Floating point control of TF24-3 (-S) US**

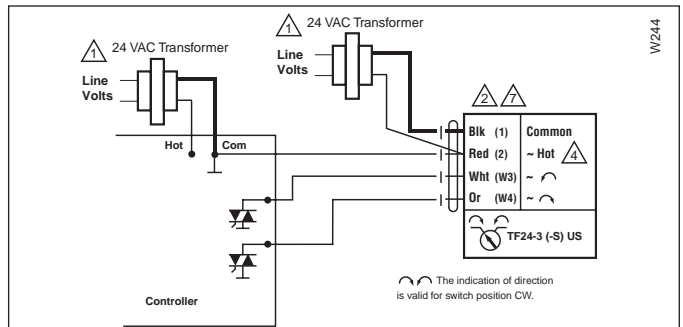
### Wiring



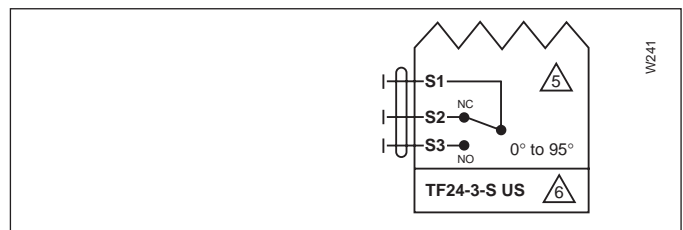
**Triac source**



**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.

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem TF Actuators, Proportional



## 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	stainless steel
Stem	stainless steel
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



### 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 reheat coils. This valve is suitable for use in a hydronic system with variable flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

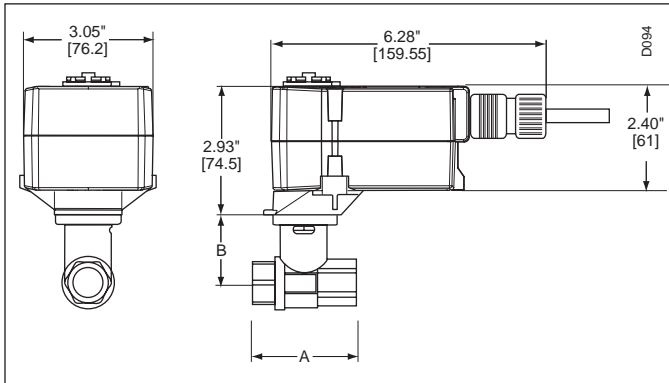
### Actuator Specifications

<input type="checkbox"/> <b>TF24-SR US</b>	
<input type="checkbox"/> <b>TF24-SR-S US</b>	
Control	Proportional
Power supply	24VAC ± 20%, 50/60Hz 24VDC ± 10%
Power consumption:	running: 2.5 W holding: 1.0 W
Transformer sizing:	4 VA (class 2 power source)
Electrical connection:	TF24-SR US 3 ft. plenum rated cable TF24-SR-S US 3 ft, 18 GA appl. cables (2) 1/2" conduit connector
Electrical protection:	actuators are double insulated
Overload protection:	electronic throughout 0 to 95° rotation
Operating range Y:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1mA), 500Ω
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
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:	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time:	motor: 95 sec constant 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
Quality standard:	ISO 9001
Noise level:	max: running < 35 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Weight:	1.4 lbs (0.6 kg)

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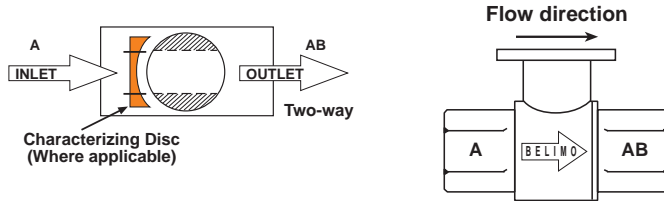


## Dimensions

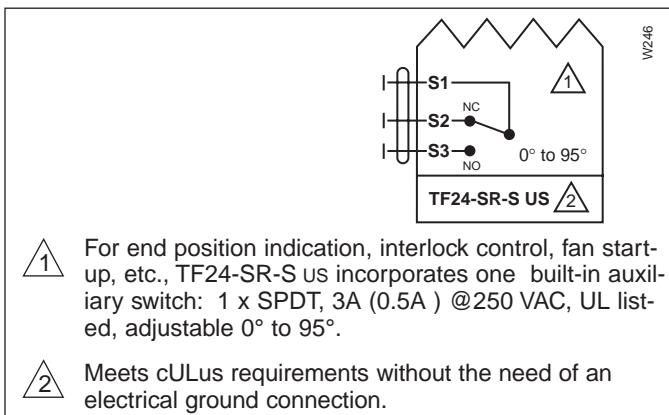


Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]
B217-B220	3/4"	20	2.63 [66.8]	1.75 [44.5]

## Flow Pattern

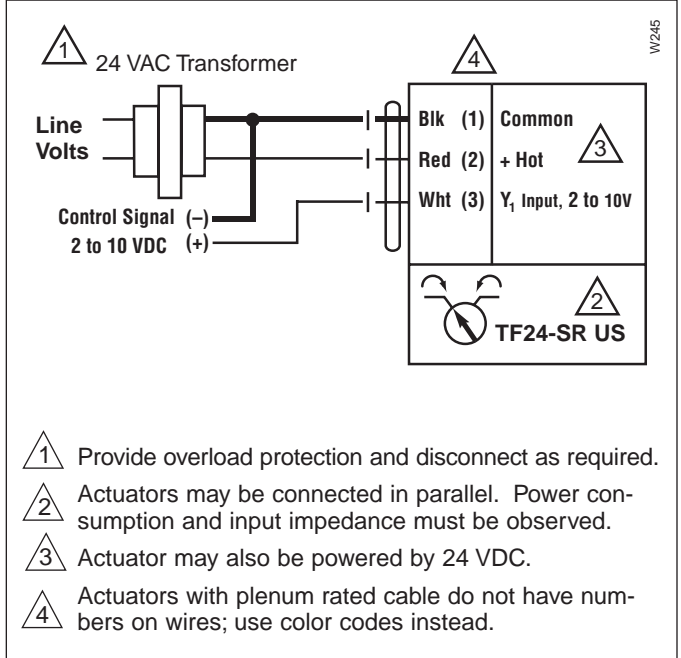


## Wiring

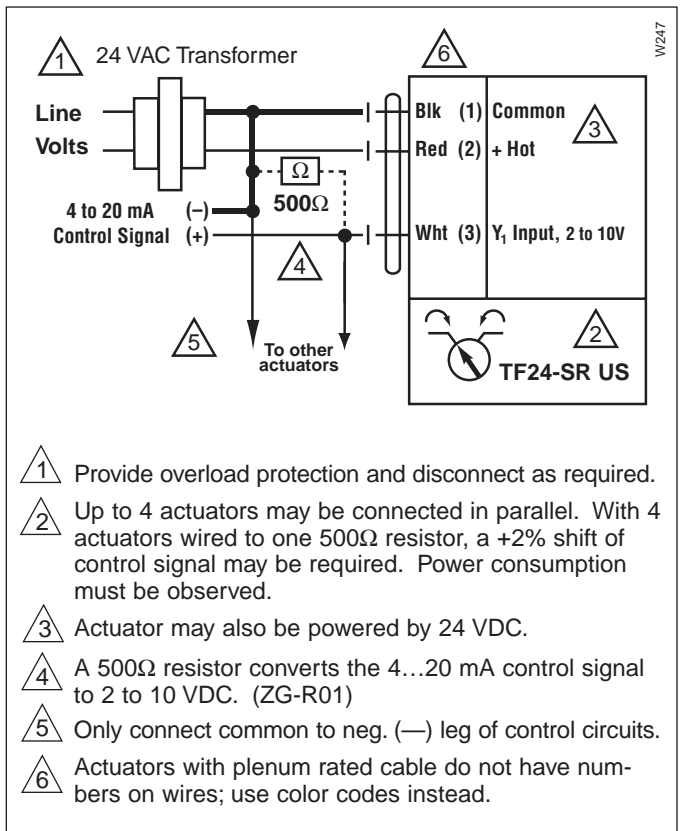


Auxiliary switch of TF24-SR-S US

## Wiring



2 to 10 VDC control of TF24-SR (-S) US



4 to 20 mA control of TF24-SR (-S) US

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 on/off control using 24VAC/DC where fail safe is required.

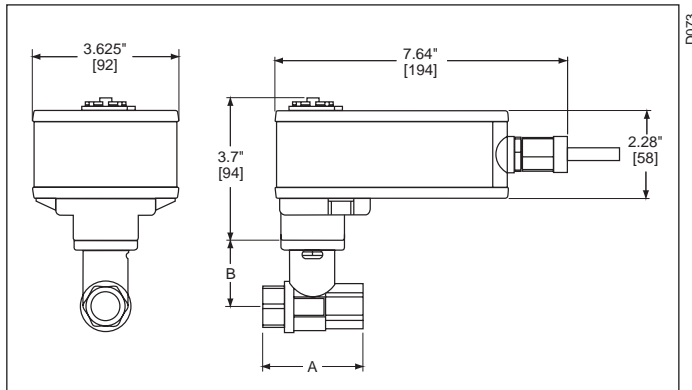
### Actuator Specifications

<input type="checkbox"/> LF24 US	
<input type="checkbox"/> LF24-S US	(LF24 US with built-in aux. switch)
<input type="checkbox"/> LF120 US	
<input type="checkbox"/> LF120-S US	(LF120 US with built-in aux. switch)
Control	On-off/floating
Power consumption:	2.5 to 5.5 W running, 1 to 3.5 W holding (models vary)
Transformer sizing:	7 VA (LF24 US), 7.5 VA (LF120 US), 7 VA (LF24-S US), 7.5 VA (LF120-S US), class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Electrical protection:	120V actuators/aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) spring: <25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @ -22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)



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## Dimensions

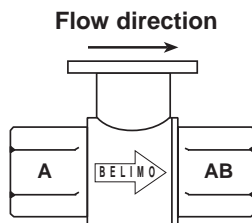
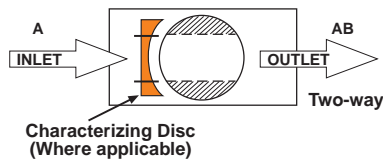


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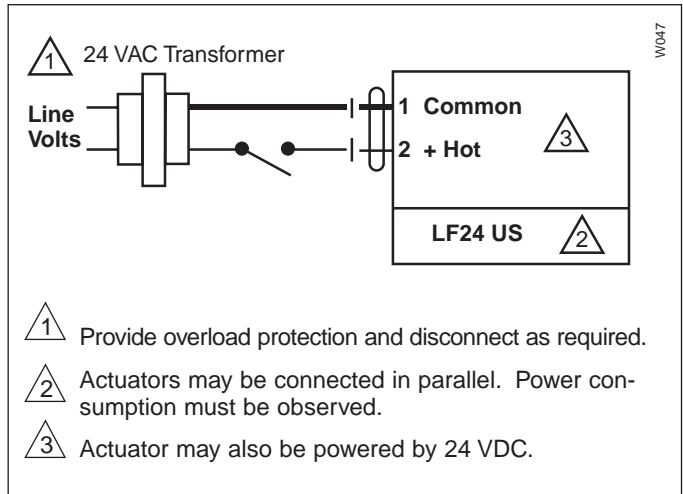
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

## Flow Pattern

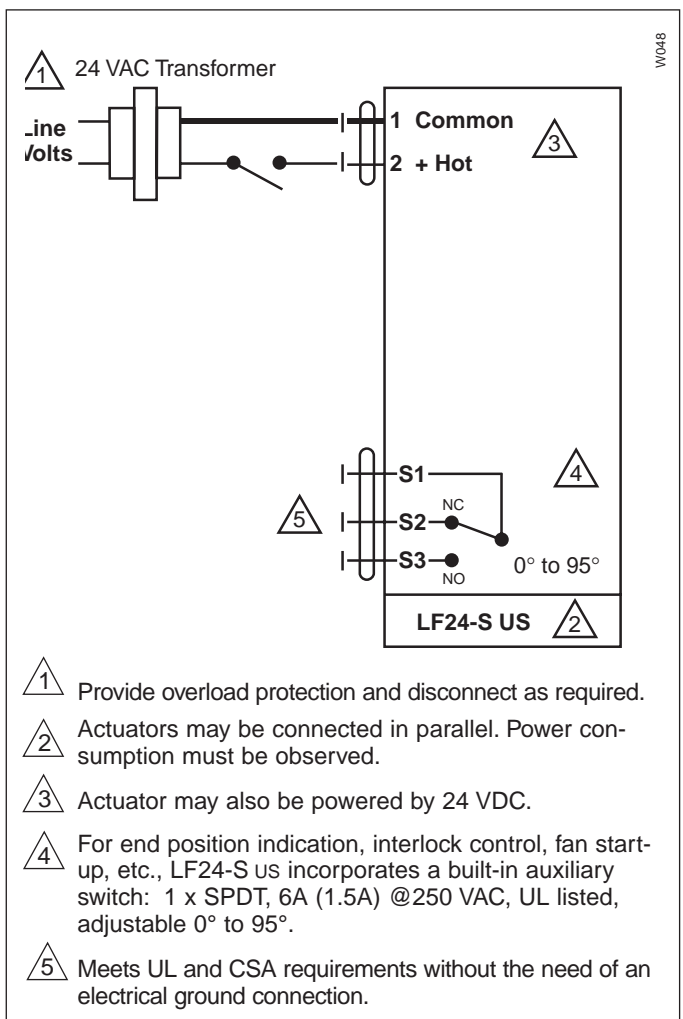


## Wiring



W047

### On-off wiring for LF24 US



W048

### On-off wiring for LF24-S US

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LF 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 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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

### 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 floating point control using 24VAC/DC where fail safe is required.

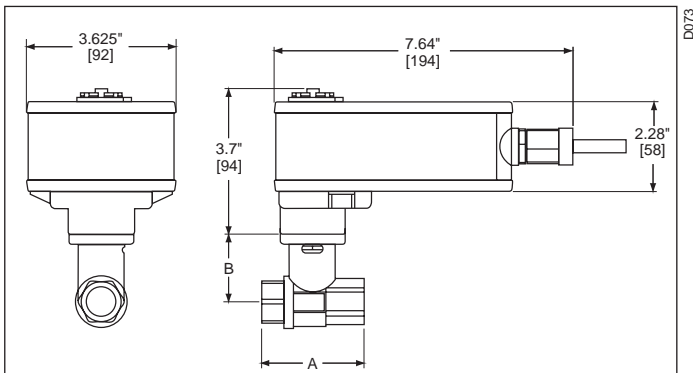
### Actuator Specifications

<input type="checkbox"/> <b>LF24-3 US</b>	
<input type="checkbox"/> <b>LF24-3 (-S) US</b>	(LF24-3 US with built-in aux. switch)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption:	running: 2.5 W; holding: 1W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	LF24-3 US, 3 ft. plenum rated cable LF24-3-S US, 3 ft, 18 GA appliance cables (2) 1/2" conduit connector
Overload protection:	electronic throughout 0° to 95° rotation
Input Impedance:	1000Ω (0.6w) control inputs
Angle of rotation:	max. 95°, adjust with mechanical stop
Torque:	35 in-lb [Nm]
Direction of rotation:	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication:	visual indicator 0° to 90° (0° is spring return position)
Auxiliary switch:	1 x SPDT. 6A (1.5A) @250 VAC, UL (-S US) adjustable 0° to 95° (double insulated)
Running time:	motor: 150 sec. constant 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/IP54
Housing material:	zinc coated metal
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified, CE
Noise level:	max: running < 30 db(A) spring return 62 db(A)
Servicing:	maintenance free
Quality standard:	ISO 9001

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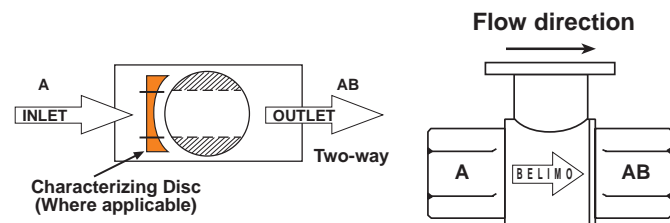
### Dimensions



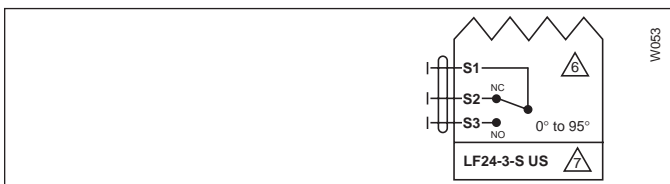
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207B-B211B	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212B-B215B	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

### Flow Pattern



### Wiring

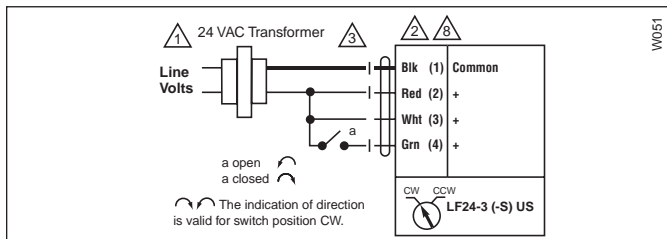


#### Auxiliary switch of LF24-3 (-S) US

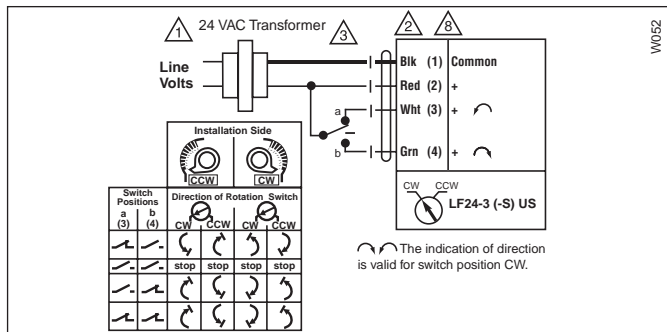
#### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption must be observed.
- 3 May also be powered by 24 VDC.
- 4 The Common connection from the actuator must be connected to the Hot connection of the controller.
- 5 The actuator Hot must be connected to the control board Common.
- 6 For end position indication, interlock control, fan startup, etc., LF24-3-S US LF120-S US and LF230-S US incorporate one built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @250 VAC, UL listed, adjustable 0° to 95°.
- 7 Meets UL and CSA requirements without the need of an electrical ground connection.
- 8 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.

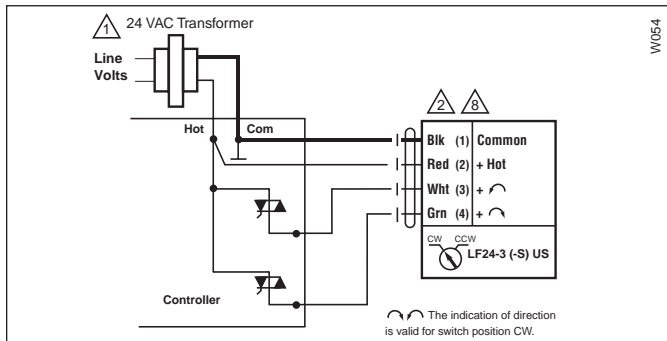
### Wiring



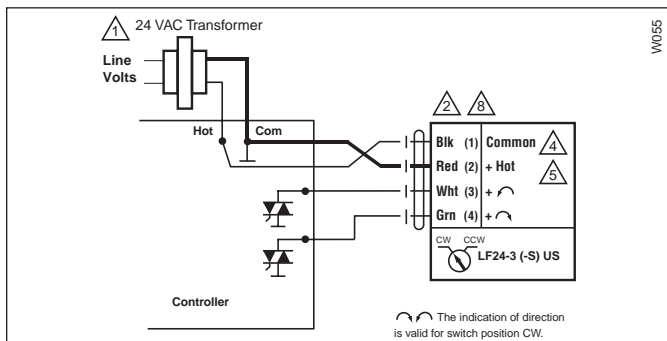
#### On-Off control of LF24-3 (-S) US



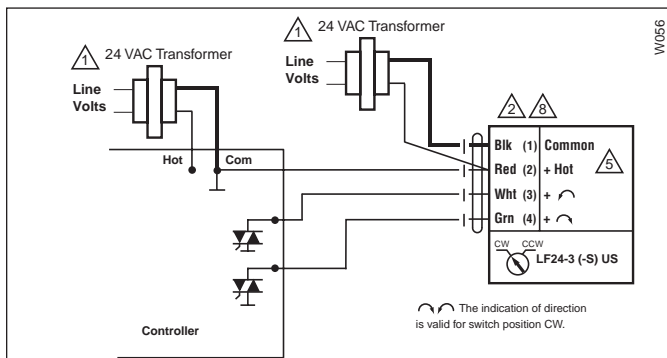
#### Floating point control of LF24-3 (-S) US



#### Triac source



#### Triac sink



#### Triac sink with separate transformers

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, Proportional



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 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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 reheat 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...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

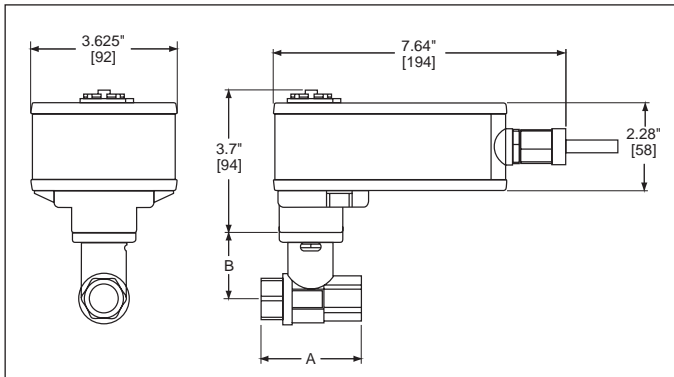
## Actuator Specifications

<input type="checkbox"/> LF24-SR US	
<input type="checkbox"/> LF24-SR-S US	(LF24-SR US with built-in aux. switch)
Control	Proportional
Control signal:	2 to 10 VDC 4 to 20 mA (with 500Ω resistor)
Power consumption:	2.5 W running, 1 W holding
Transformer sizing:	5 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Electrical protection:	120V actuators/aux. switches double insulated
Overload protection:	electronic throughout rotation
Input impedance:	100 kΩ
Feedback output:	2 to 10 VDC
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) 150 sec. independent of load (proportional) spring: <25 sec. @-4°F to +122°F [-20°C to +50°C] <60 sec. @-22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)

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## Dimensions

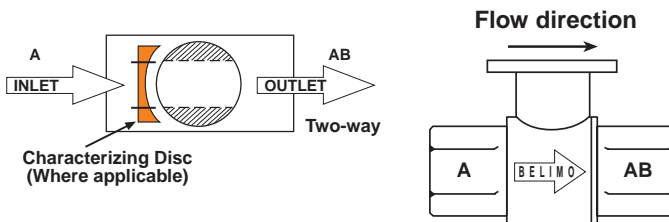


D073

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]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

## Flow Pattern



## Wiring

W058

**1** For end position indication, interlock control, fan start-up, etc., LF24-SR-S us incorporates one built-in auxiliary switch: 1 x SPDT, 6A (1.5 A) @250 VAC, UL listed, adjustable 0° to 95°.

**2** Meets UL & CSA requirements without the need of an electrical ground connection.

**Auxiliary switch of LF24-SR-S US**

## Wiring

W067

**1** Provide overload protection and disconnect as required.

**2** Actuators may be connected in parallel. Power consumption and input impedance must be observed.

**3** Actuator may also be powered by 24 VDC.

**4** Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

**5** The LF24-SR-S US wire 5 is white.

**2 to 10 VDC control of LF24-SR (-S) US**

W059

**1** Provide overload protection and disconnect as required.

**2** Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed.

**3** Actuator may also be powered by 24 VDC.

**4** A 500Ω resistor converts the 4...20 mA control signal to 2 to 10 VDC. (ZG-R01)

**5** Only connect common to neg. (—) leg of control circuits.

**6** Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

**4 to 20 mA control of LF24-SR (-S) US with 2 to 10 VDC feedback output**

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, MFT



## 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 1-1/4" (B230)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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 with MFT functionality which facilitates the use of various control input. This valve is designed for use where fail safe is required.

### Actuator Specifications

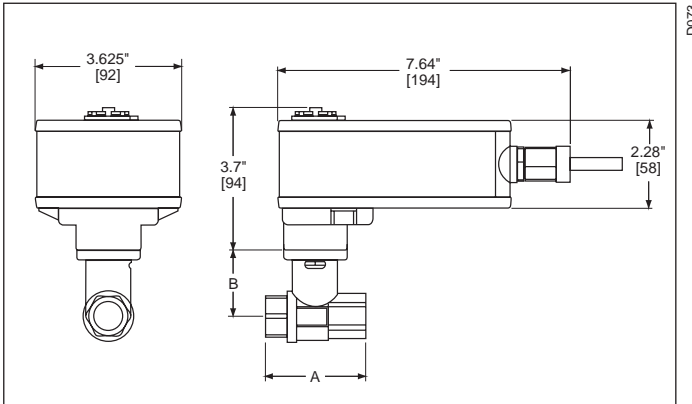
<input type="checkbox"/> LF24-MFT US	
<input type="checkbox"/> LF24-MFT-S US	
Control	MFT
Control signal:	2 to 10 VDC
Power consumption:	2.5 W running, 1 W holding
Transformer sizing:	5 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20mA 750 Ω for PWM 500 Ω for on/off and floating point
Feedback:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) 150 sec. independent of load (proportional) spring: <25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @ -22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)

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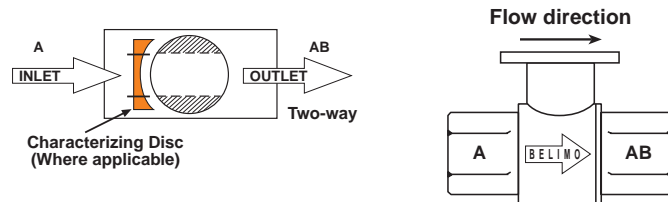
### Dimensions



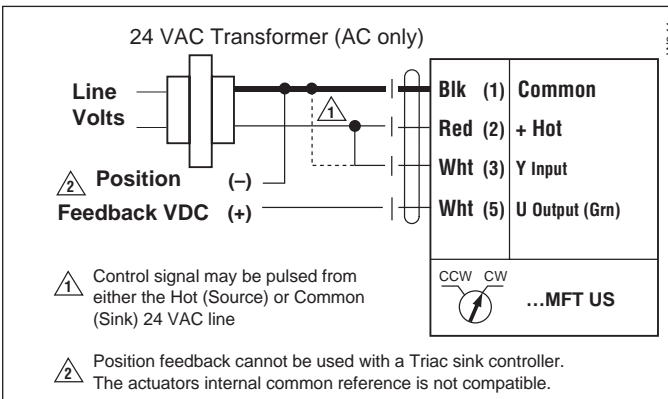
Valve Body	Nominal Valve Size		Dimensions	
	in	[mm]	A	B
B207-B211	1/2"	15	2.06 [52.2]	1.39 [35.3]
B212-B215	1/2"	15	2.38 [60.5]	1.63 [41.4]

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
3/4"	20	2.63 [66.8]	1.75 [44.5]
1"	25	3.50 [88.9]	1.81 [46.0]
1-1/4"	32	4.02 [102]	1.87 [48]

### Flow Pattern

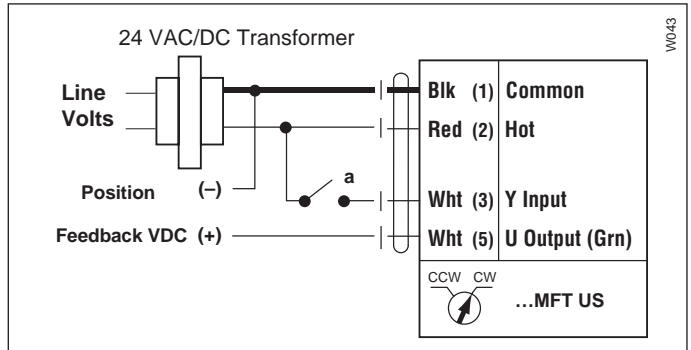


### Wiring

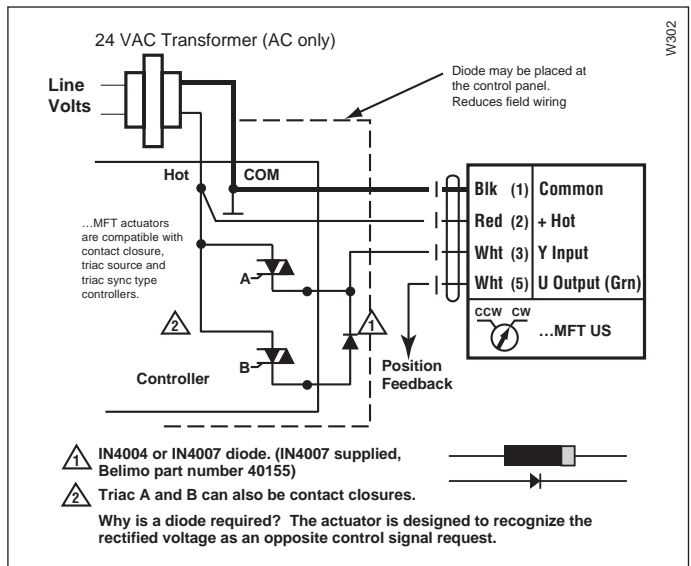


### PWM, triac source and sink

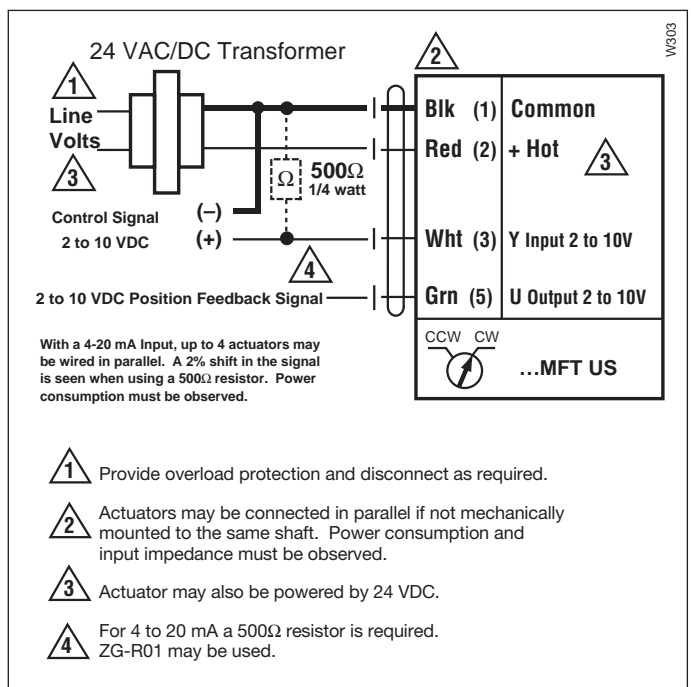
### Wiring



### On-Off control



### Floating Point control

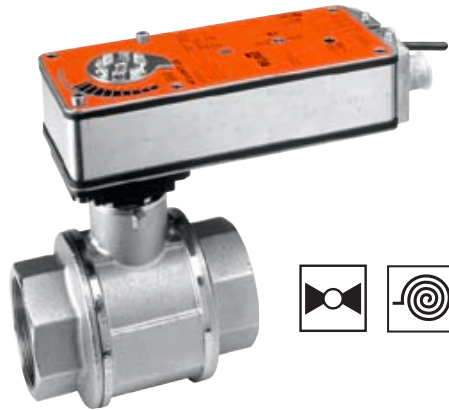


### Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications:

Service	Chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2" to 3"
Type of end fitting	female, npt
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 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.

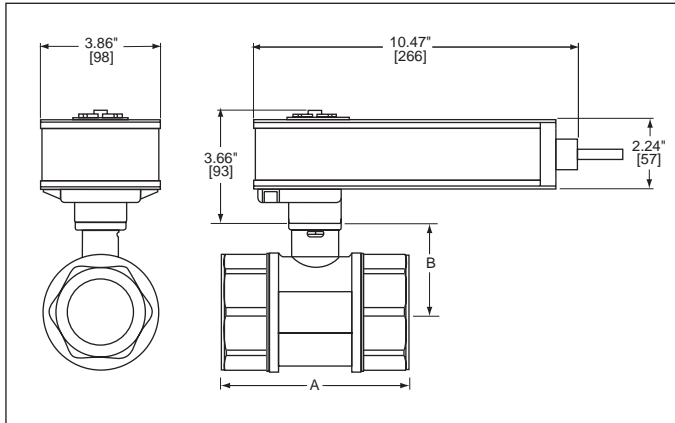
This valve is designed for on/off control is required using 24VAC/DC where fail safe is required.

### Actuator Specifications

<input type="checkbox"/> <b>AF24 US</b>	
<input type="checkbox"/> <b>AF24-S US</b>	(AF24 US with built-in aux. switches)
<input type="checkbox"/> <b>AF120 US</b>	
<input type="checkbox"/> <b>AF120-S US</b>	(AF120 US with built-in aux. switches)
Control	On-off
Power consumption:	5 to 6.5 W running, 1.5 to 2.3 W holding (models vary)
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	120 V actuators/Aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)



## Dimensions



D077

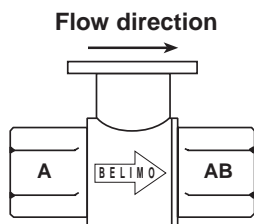
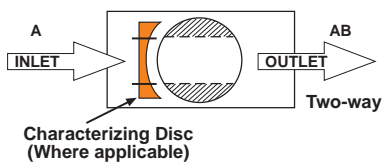
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19" [106.4]	2.44" [62.0]
2"**	50	5.00" [124]	2.78" [69.45]
2.5"	65	5.53" [138]	2.78" [69.45]
3"	80	5.82" [145]	2.78" [69.45]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

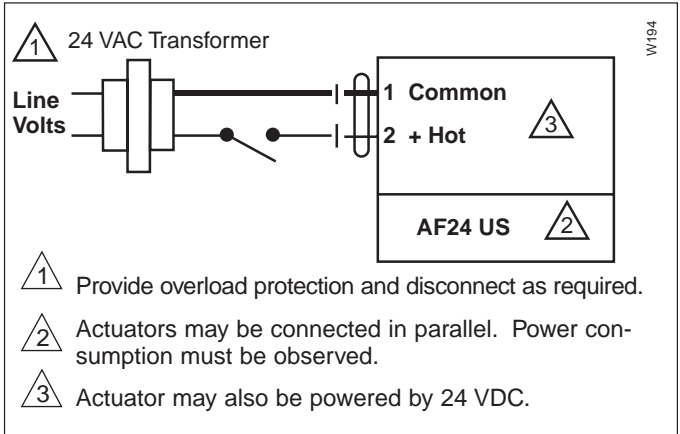
† Applies to B248-B250

\*\* Applies to B251-B254

## Flow Pattern

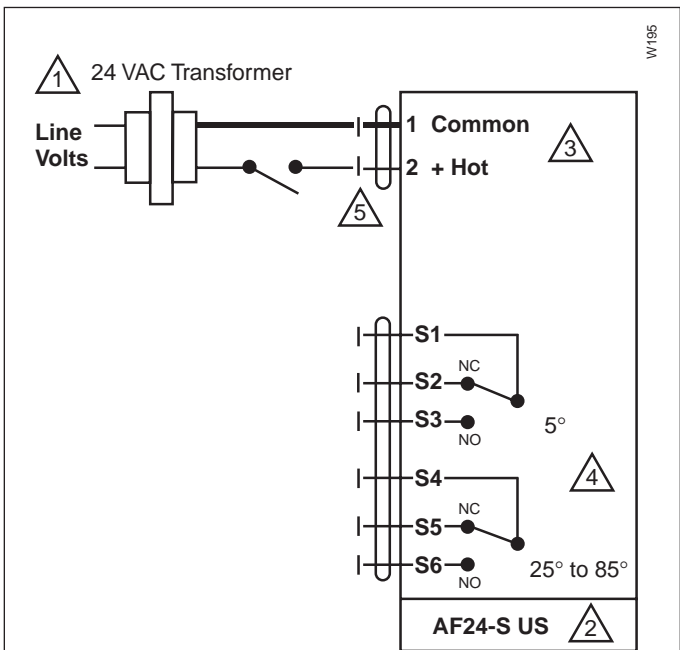


## Wiring



W194

### On-off wiring for AF24 US



W195

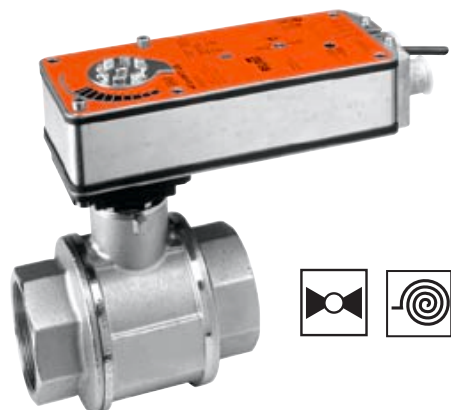
- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 For end position indication, interlock control, fan start-up, etc., AF24-S US incorporates two built-in auxiliary switches: 2 x SPDT, 7A (2.5A) @250 VAC, UL listed, one switch is fixed at +5°, one is adjustable 25° to 85°.
- 5 Meets UL and CSA requirements without the need of an electrical ground connection.

### On-off wiring for AF24-S US

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, Proportional



Technical Data/Submittal



## Valve Specifications:

Service	Chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2" to 3"
Type of end fitting	female, npt
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 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 reheat 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...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

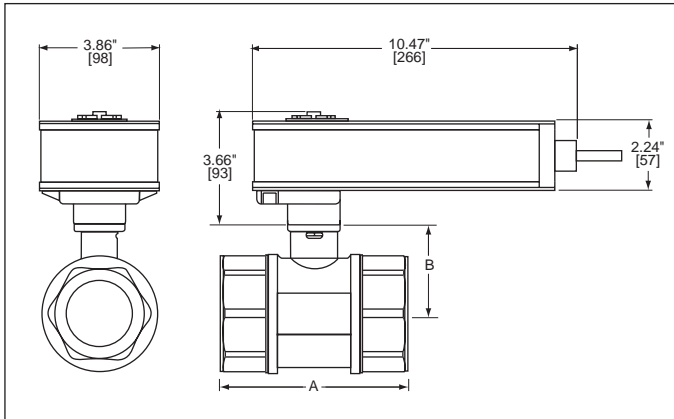
## Actuator Specifications

<input type="checkbox"/> AF24-SR US	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Feedback output:	2 to 10 VDC, 0.5 mA max
Control	Proportional
Power consumption:	6 W running, 2 W holding
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)



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## Dimensions



D077

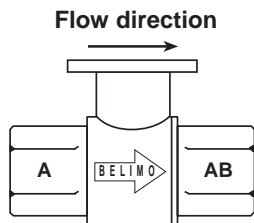
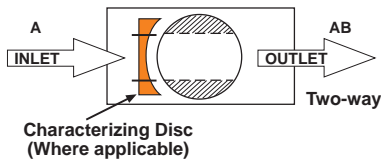
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19" [106.4]	2.44" [62.0]
2"***	50	5.00" [124]	2.78" [69.45]
2.5"	65	5.53" [138]	2.78" [69.45]
3"	80	5.82" [145]	2.78" [69.45]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

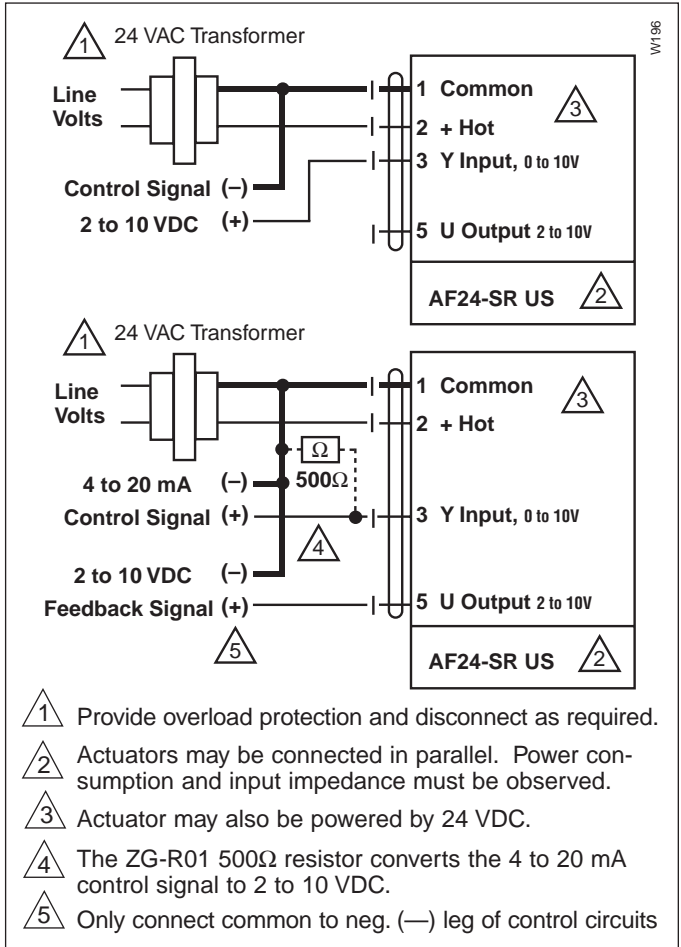
† Applies to B248-B250

\*\* Applies to B251-B254

## Flow Pattern



## Wiring

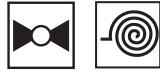
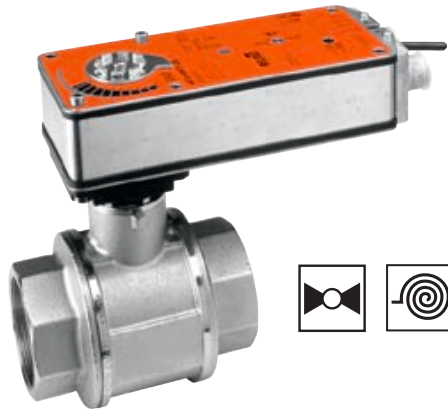


Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B2 Two-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, MFT



## Technical Data/Submittal



### Valve Specifications:

Service	Chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2" to 3"
Type of end fitting	female, npt
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 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 with MFT functionality which facilitates the use of various control input. This valve is designed for use where fail safe is required.

### Actuator Specifications

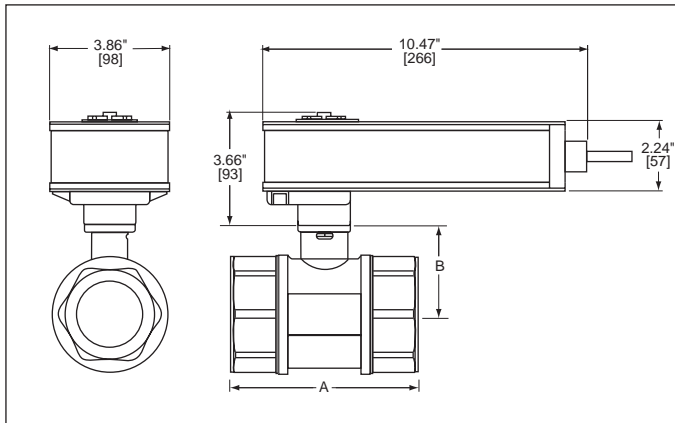
<input type="checkbox"/> AF24-MFT US	
<input type="checkbox"/> AF24-MFT-S US	(AF24-MFT US with built-in aux. switches)
Control	MFT
Control signal:	2 to 10 VDC, (4 to 20 mA with 500Ω resistor)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption:	6 W running, 2.5 W holding
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	Aux. switches double insulated
Overload protection:	electronic throughout rotation
Input impedance:	100 KΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA 750Ω for PWM 1500Ω for on/off and floating point
Feedback output:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)

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**MFT**

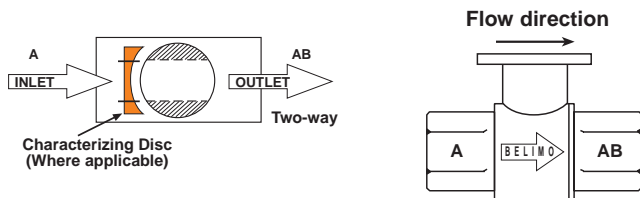
### Dimensions



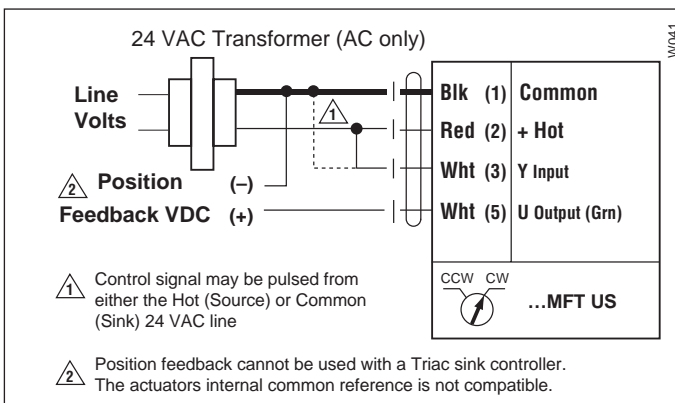
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19" [106.4]	2.44" [62.0]
2"**	50	5.00" [124]	2.78" [69.45]
2.5"	65	5.53" [138]	2.78" [69.45]
3"	80	5.82" [145]	2.78" [69.45]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.  
 † Applies to B248-B250  
 \*\* Applies to B251-B254

### Flow Pattern

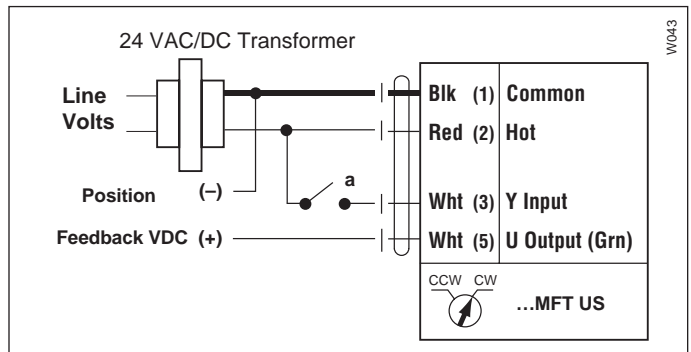


### Wiring

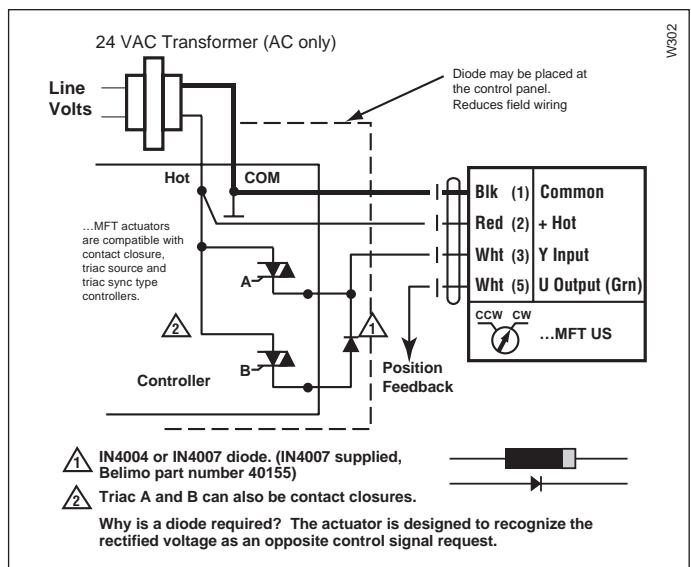


### PWM, triac source and sink

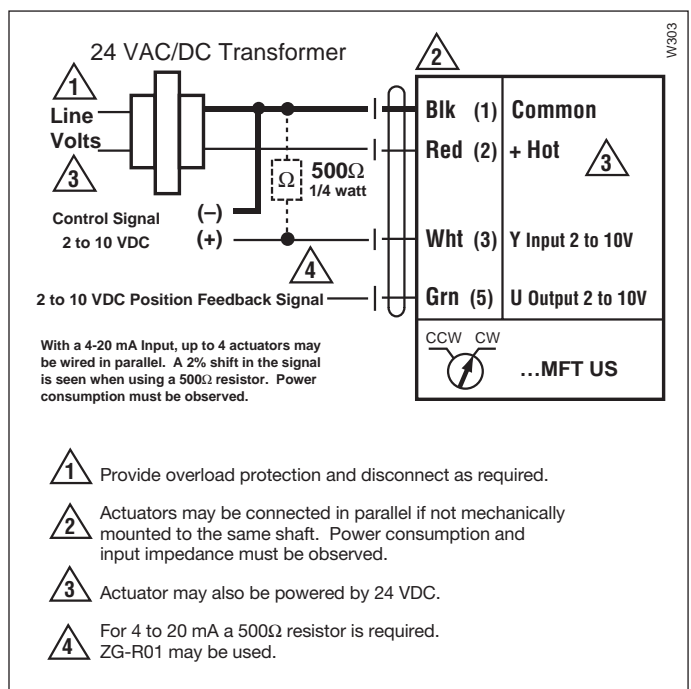
### Wiring



### On-Off control



### Floating Point control

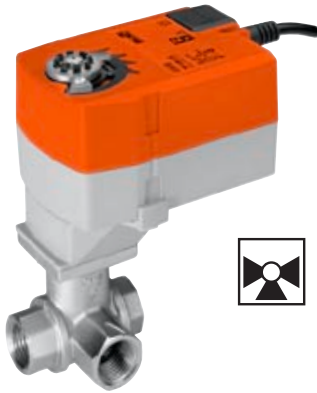


### Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem TF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 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 (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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

This valve is designed for on/off control using 24VAC/DC or 100 to 240 VAC where fail safe is required.

### Actuator Specifications

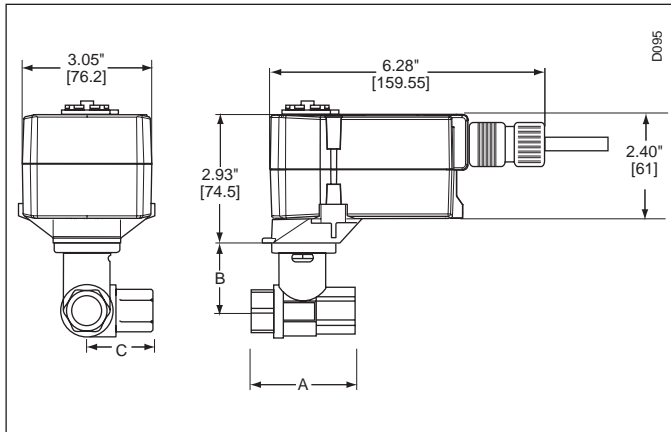
<input type="checkbox"/> TF24 US	<input type="checkbox"/> TF24-S US
<input type="checkbox"/> TF120 US	<input type="checkbox"/> TF120-S US
Control	On-off
Power supply TF24(-S) US:	
	24VAC ± 20%, 50/60Hz
	24VDC ± 10%
Power supply TF120(-S) US:	
(nominal)	100 to 240 VAC, 50/60 Hz
(tolerance)	85 to 265 VAC, 50/60 Hz
Power consumption:	running: 2.5 W holding: 1.3 W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	3 ft, 18 GA appliance cable (-S models have 2 cables) 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
Direction of rotation:	reversible with cw/ccw mounting
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: < 75 sec (0 to 18 in-lb) 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
Noise level:	max: running < 50 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Quality standard:	ISO 9001
Weight:	TF24/120 US 1.4 lbs (0.6 kg) TF24/120(-S) US 1.5 lbs (0.7 kg)



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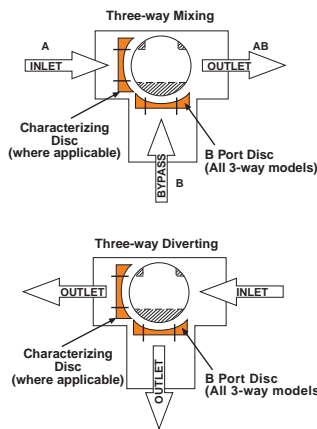


## Dimensions



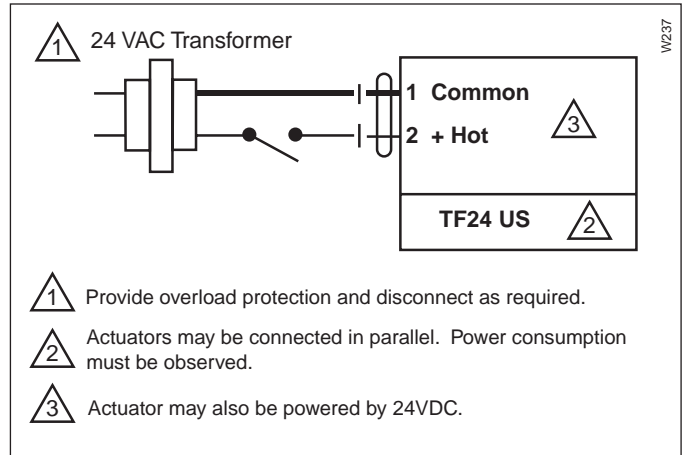
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317-B320	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern

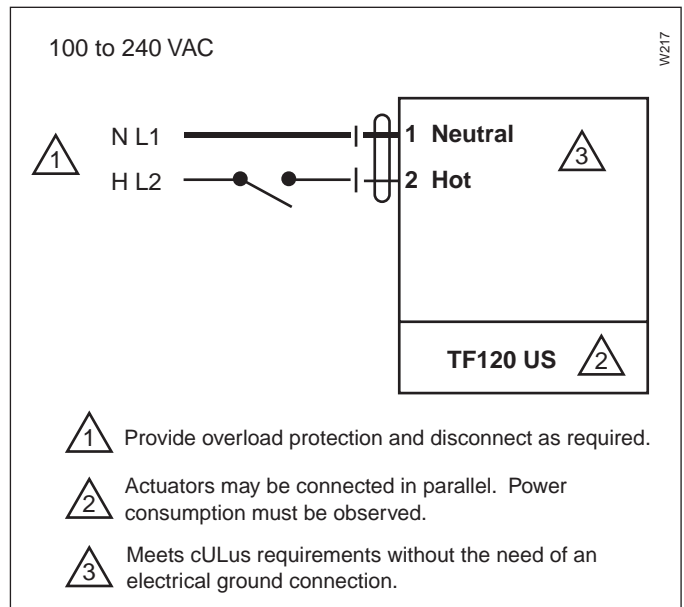


**“B” Port must be piped to the by-pass leg.**

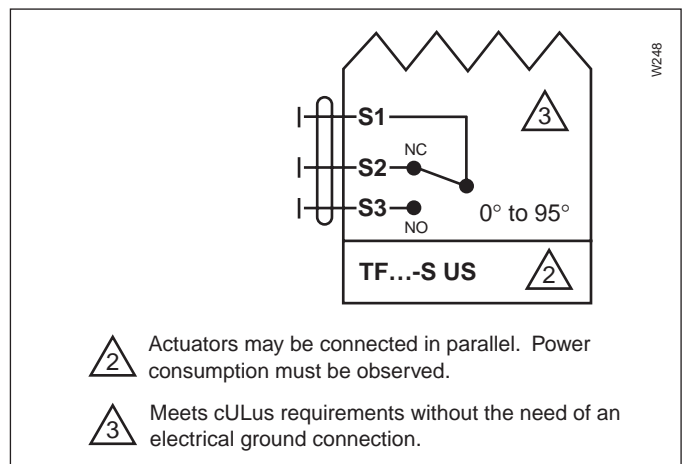
## Wiring



### On-off wiring for TF24 US



### On-off wiring for TF120 US



### On-off wiring for TF...-S US

# B3 Three-way Characterized Control Valve, Stainless Steel 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 B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 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 (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 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.

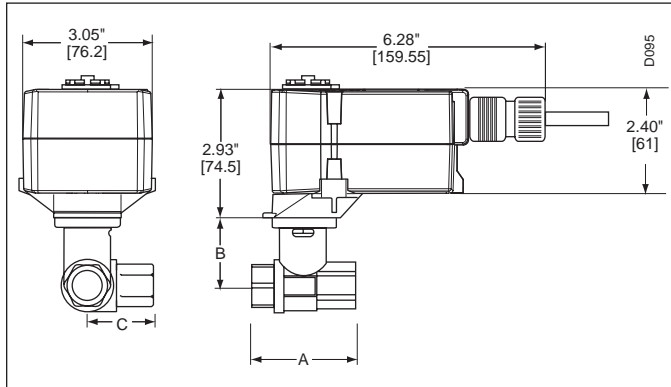
### Actuator Specifications

<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) 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Input impedance	1000 Ω (0.6w) control inputs
Angle of rotation	max 95°, adjust. with mechanical stop
Torque	min. 18 in-lb [2 Nm]
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: 95 sec constant 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
Noise level	max: running < 35 db (A) spring return 62 db (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	TF24-3 US 1.4 lbs (0.6 kg) TF24-3-S US 1.5 lbs (0.7 kg)

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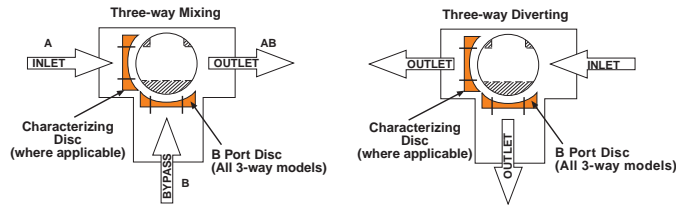


### Dimensions



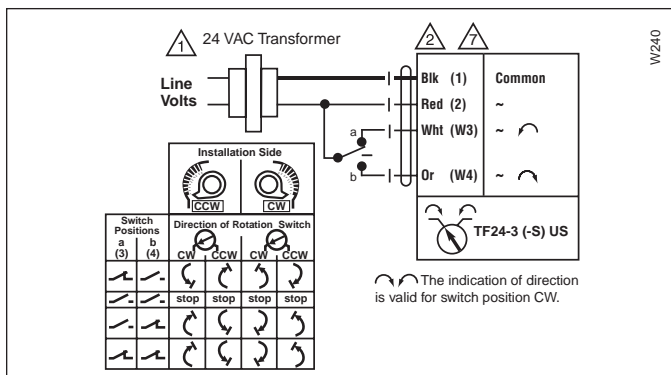
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317-B320	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

### Flow Pattern



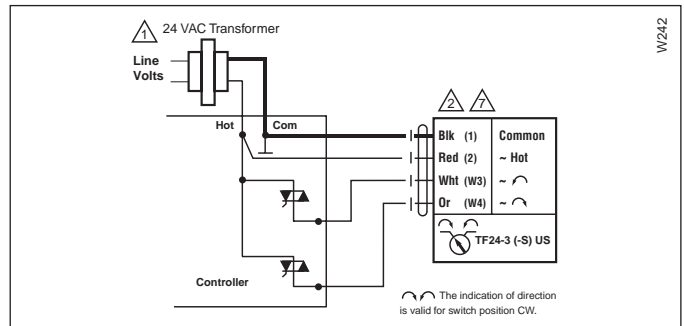
“B” Port must be piped to the by-pass leg.

### Wiring

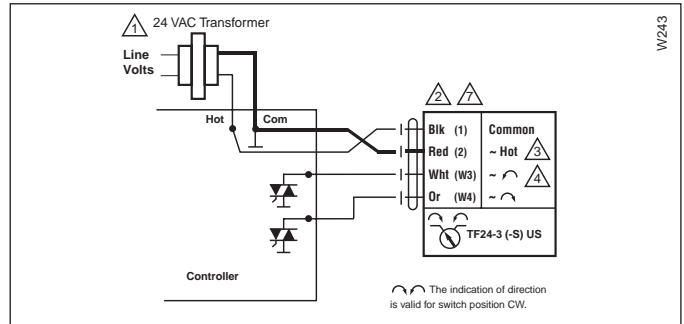


Floating point control of TF24-3 (-S) US

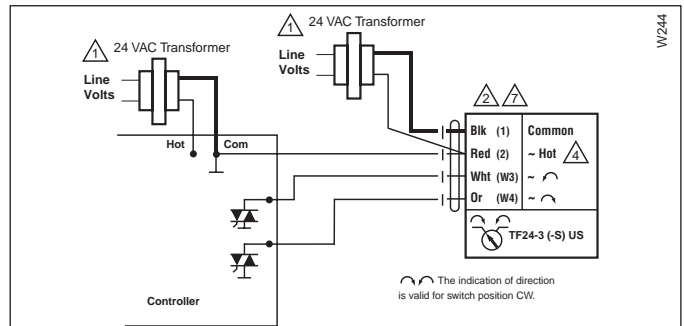
### Wiring



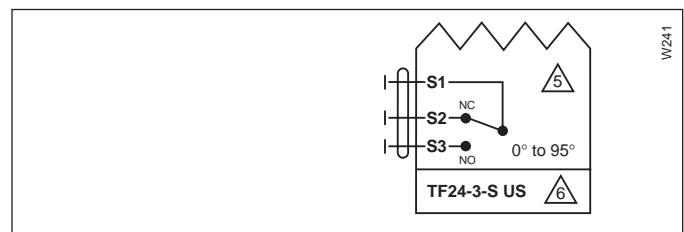
Triac source



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.

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem TF Actuators, Proportional



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 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 (1/2" to 1-1/4")
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
Leakage	For full flow versions only (no A-disc) On/Off control 150 psi A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

Tefzel® is a registered trademark of DuPont



### Application

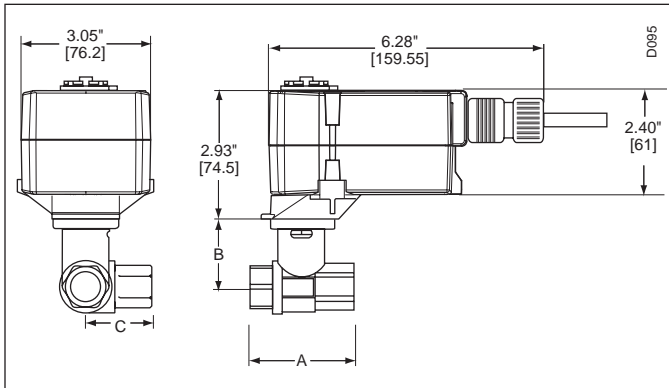
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators and VAV Box reheat coils. This valve is suitable for use in a hydronic system with variable flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

### Actuator Specifications

<input type="checkbox"/> TF24-SR US	
<input type="checkbox"/> TF24-SR-S US	
Control	Proportional
Power supply	24VAC ± 20%, 50/60Hz 24VDC ± 10%
Power consumption:	running: 2.5 W holding: 1.0 W
Transformer sizing:	4 VA (class 2 power source)
Electrical connection:	TF24-SR US 3 ft. plenum rated cable TF24-SR-S US 3 ft, 18 GA appl. cables (2) 1/2" conduit connector
Electrical protection:	actuators are double insulated
Overload protection:	electronic throughout 0 to 95° rotation
Operating range Y:	2 to 10 VDC, 4 to 20 mA
Input impedance:	100 kΩ (0.1mA), 500Ω
Angle of rotation:	max 95°, adjust. with mechanical stop
Torque:	min. 18 in-lb [2 Nm]
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:	1 x SPDT 3A (0.5A) @ 250 VAC, UL listed adjustable 0° to 95°
Running time:	motor: 95 sec constant 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
Quality standard:	ISO 9001
Noise level:	max: running < 35 db (A) spring return 62 dB (A)
Servicing:	maintenance free
Weight:	1.4 lbs (0.6 kg)

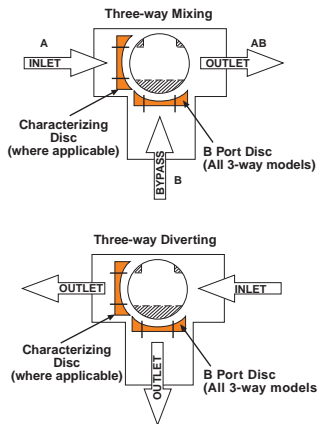
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## Dimensions



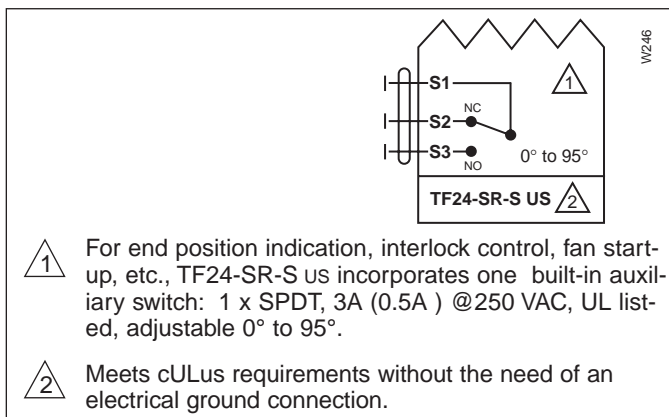
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]
B317-B320	3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]

## Flow Pattern



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

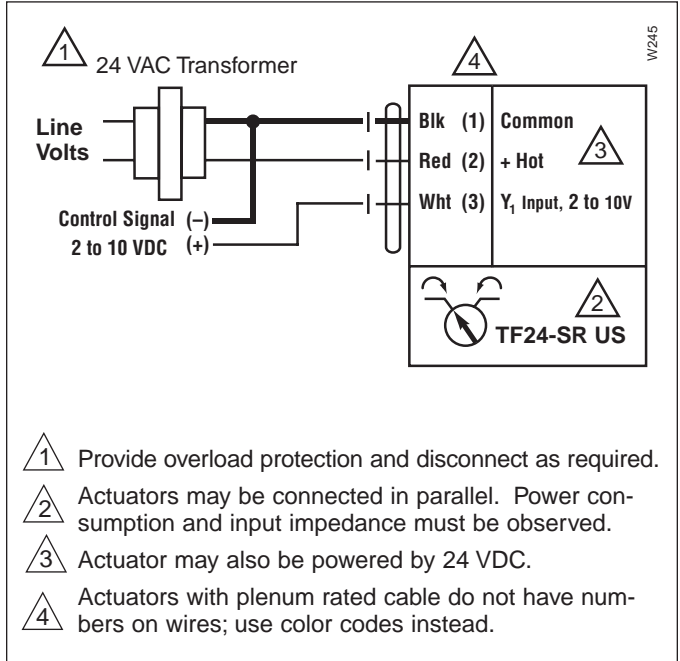
## Wiring



- 1 For end position indication, interlock control, fan start-up, etc., TF24-SR-S us incorporates one built-in auxiliary switch: 1 x SPDT, 3A (0.5A) @250 VAC, UL listed, adjustable 0° to 95°.
- 2 Meets cULus requirements without the need of an electrical ground connection.

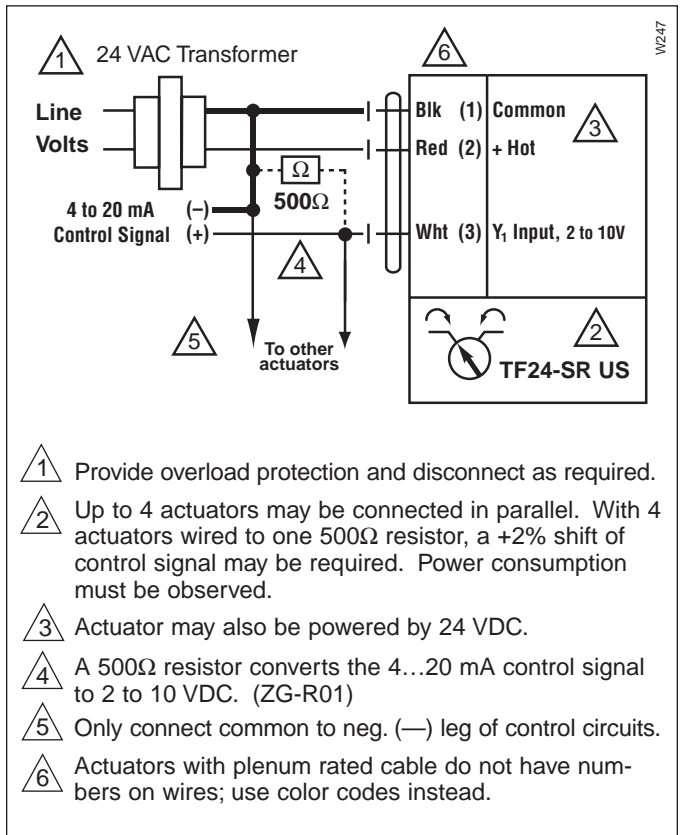
**Auxiliary switch of TF24-SR-S US**

## Wiring



- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

**2 to 10 VDC control of TF24-SR (-S) US**



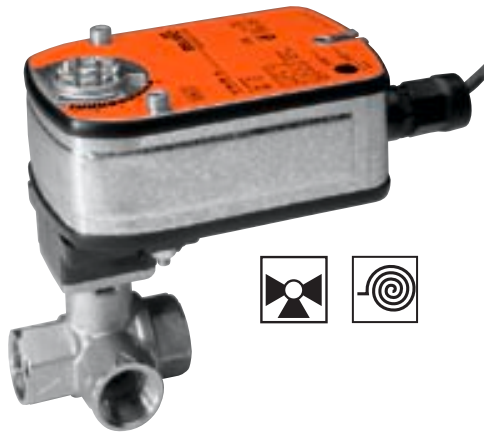
- 1 Provide overload protection and disconnect as required.
- 2 Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 A 500Ω resistor converts the 4...20 mA control signal to 2 to 10 VDC. (ZG-R01)
- 5 Only connect common to neg. (—) leg of control circuits.
- 6 Actuators with plenum rated cable do not have numbers on wires; use color codes instead.

**4 to 20 mA control of TF24-SR (-S) US**

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant flow.

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

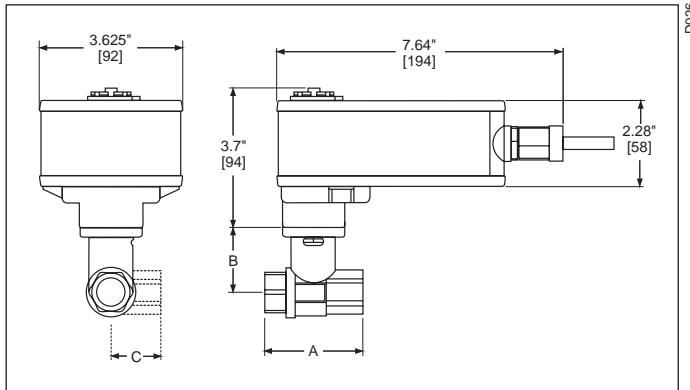
### Actuator Specifications

<input type="checkbox"/> LF24 US	
<input type="checkbox"/> LF24-S US	(LF24 US with built-in aux. switch)
<input type="checkbox"/> LF120 US	
<input type="checkbox"/> LF120-S US	(LF120 US with built-in aux. switch)
Control	On-off/floating
Power consumption:	2.5 to 5.5 W running, 1 to 3.5 W holding (models vary)
Transformer sizing:	7 VA (LF24 US), 7.5 VA (LF120 US), 7 VA (LF24-S US), 7.5 VA (LF120-S US), class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Electrical protection:	120V actuators/aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) spring: <25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @ -22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)



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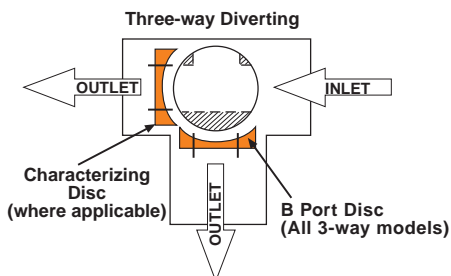
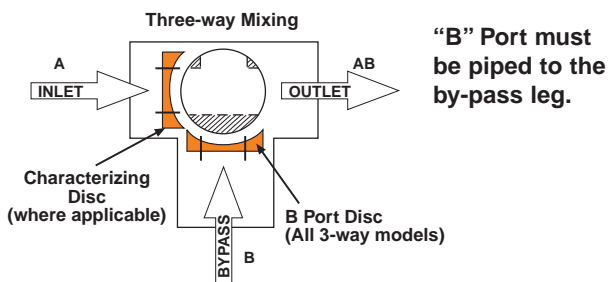
## Dimensions



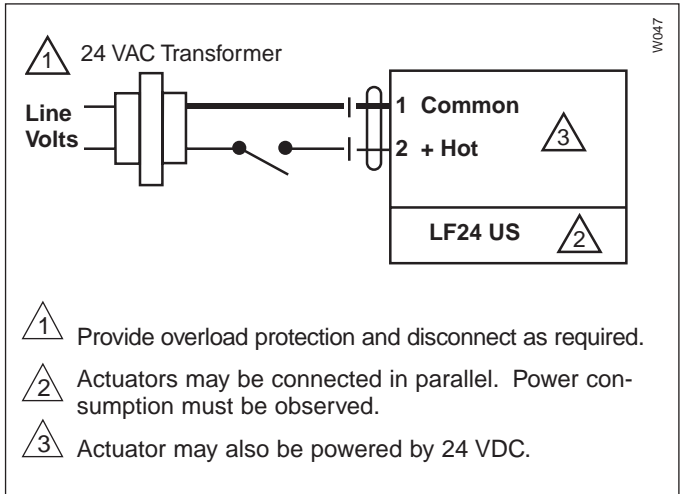
Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

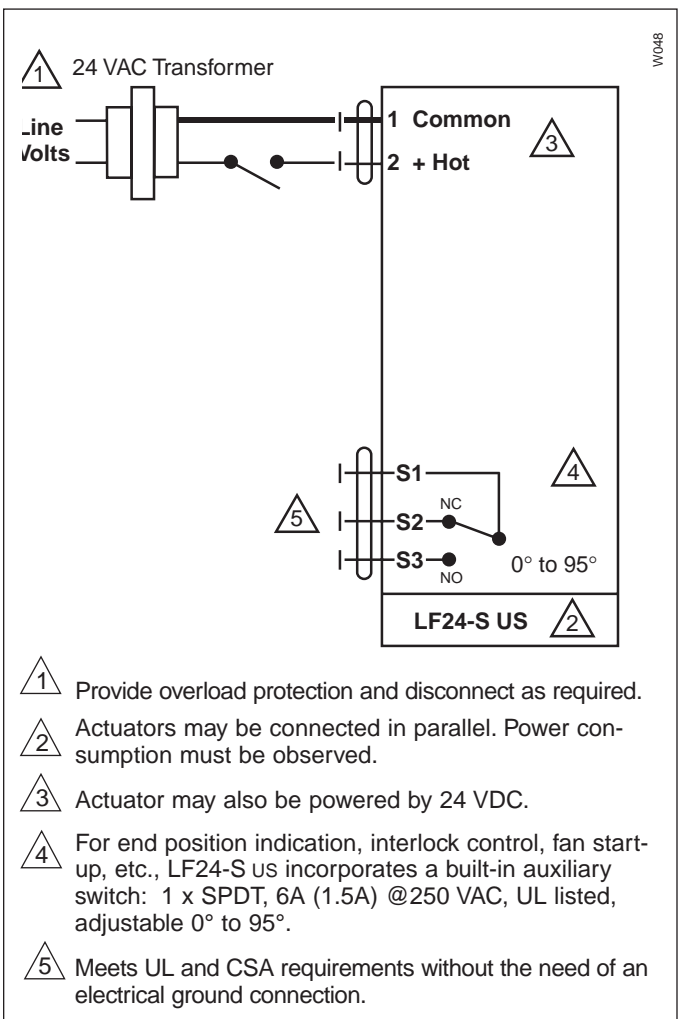
## Flow Pattern



## Wiring



### On-off wiring for LF24 US



### On-off wiring for LF24-S US

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, Floating Point



Technical Data/Submittal



## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

Tefzel® is a registered trademark of DuPont

## Application

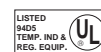
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV Box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow.

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

## Actuator Specifications

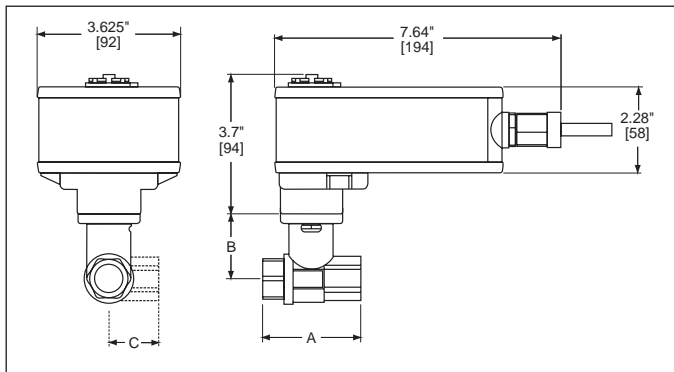
<input type="checkbox"/> LF24-3 US	
<input type="checkbox"/> LF24-3-S US	(LF24-3 US with built-in aux. switch)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption:	running: 2.5 W; holding: 1W
Transformer sizing:	5 VA (class 2 power source)
Electrical connection:	LF24-3 US, 3 ft. plenum rated cable LF24-3-S US, 3 ft, 18 GA appliance cables (2) 1/2" conduit connector
Overload protection:	electronic throughout 0° to 95° rotation
Input Impedance:	1000Ω (0.6w) control inputs
Angle of rotation:	max. 95°, adjust with mechanical stop
Torque:	35 in-lb [Nm]
Direction of rotation:	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication:	visual indicator 0° to 90° (0° is spring return position)
Auxiliary switch:	1 x SPDT. 6A (1.5A) @250 VAC, UL (-S US) adjustable 0° to 95° (double insulated)
Running time:	motor: 150 sec. constant 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/IP54
Housing material:	zinc coated metal
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified, CE
Noise level:	max: running < 30 db(A) spring return 62 db(A)
Servicing:	maintenance free
Quality standard:	ISO 9001

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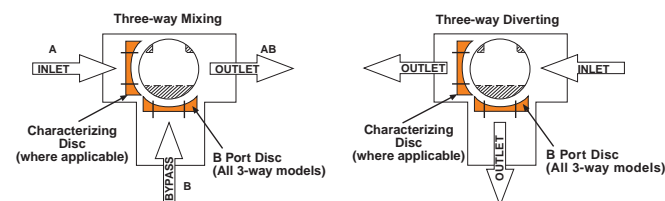
### Dimensions



Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

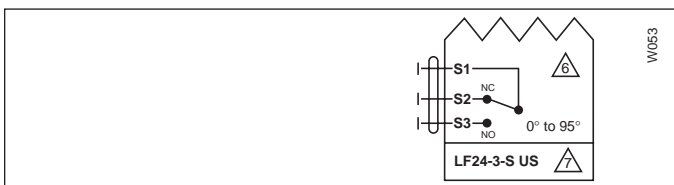
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

### Flow Pattern



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

### Wiring

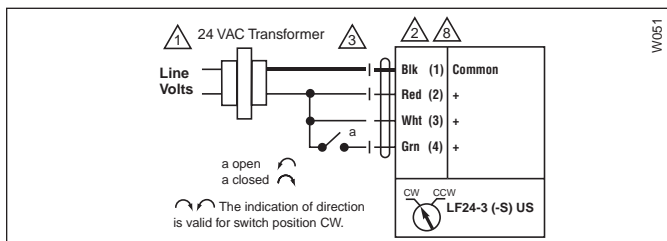


#### Auxiliary switch of LF24-3 (-S) US

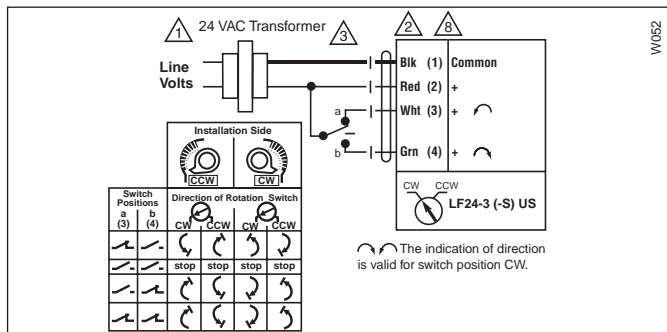
#### Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption must be observed.
- 3 May also be powered by 24 VDC.
- 4 The Common connection from the actuator must be connected to the Hot connection of the controller.
- 5 The actuator Hot must be connected to the control board Common.
- 6 For end position indication, interlock control, fan startup, etc., LF24-3-S US, LF120-S US and LF230-S US incorporate one built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @250 VAC, UL listed, adjustable 0° to 95°.
- 7 Meets UL and CSA requirements without the need of an electrical ground connection.
- 8 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.

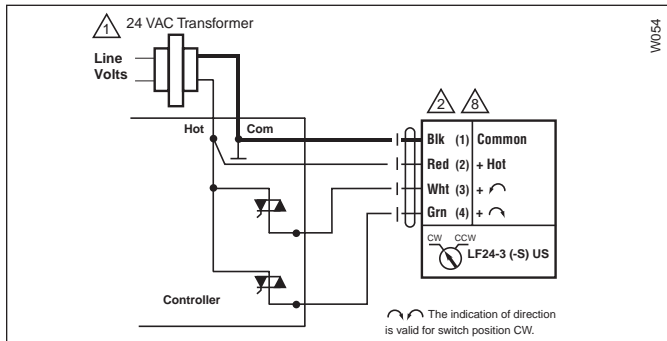
### Wiring



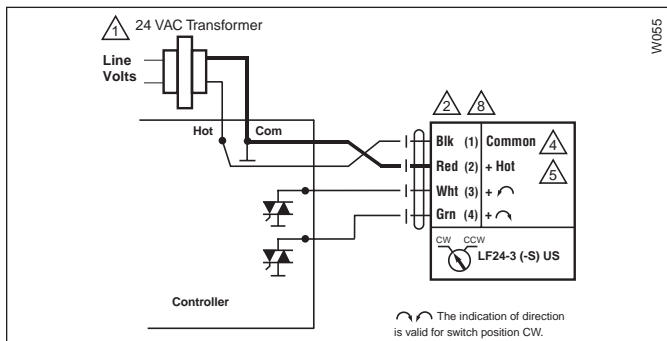
#### On-Off control of LF24-3 (-S) US



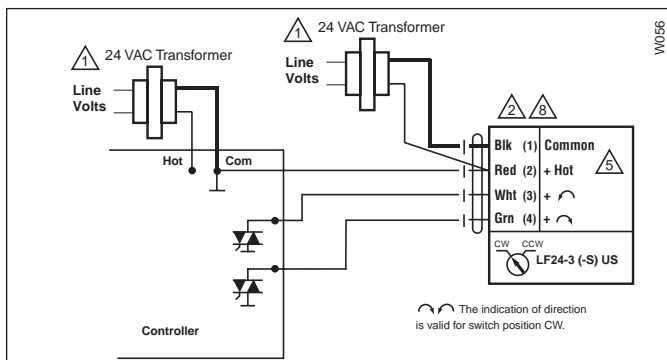
#### Floating point control of LF24-3 (-S) US



#### Triac source



#### Triac sink

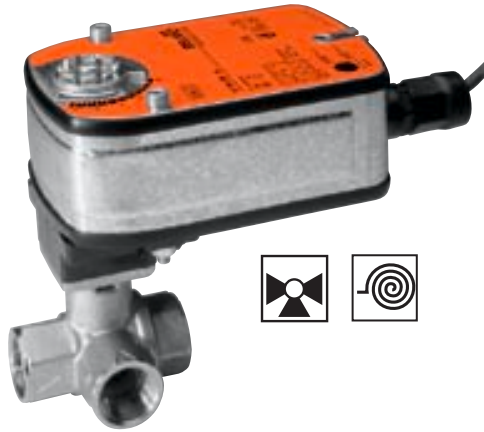


#### Triac sink with separate transformers

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, Proportional



Technical Data/Submittal



## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

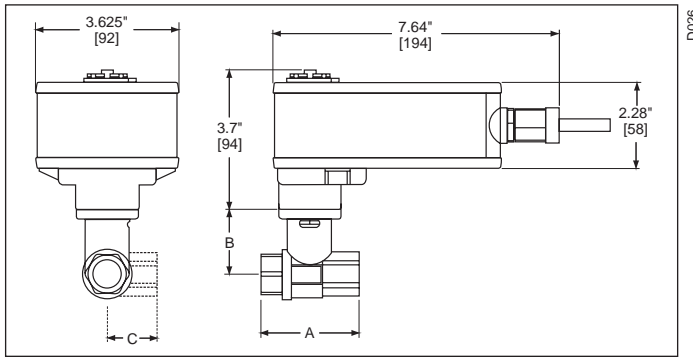
## Actuator Specifications

<input type="checkbox"/> LF24-SR US	
<input type="checkbox"/> LF24-SR-S US	(LF24-SR US with built-in aux. switch)
Control	Proportional
Control signal:	2 to 10 VDC 4 to 20 mA (with 500Ω resistor)
Power consumption:	2.5 W running, 1 W holding
Transformer sizing:	5 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Electrical protection:	120V actuators/aux. switches double insulated
Overload protection:	electronic throughout rotation
Input impedance:	100 kΩ
Feedback output:	2 to 10 VDC
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) 150 sec. independent of load (proportional) spring: <25 sec. @-4°F to +122°F [-20°C to +50°C] <60 sec. @-22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)

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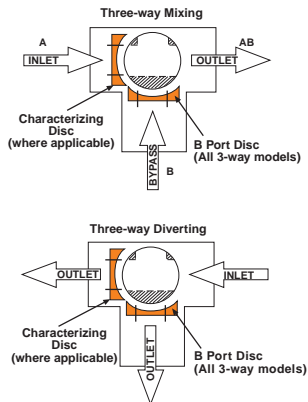
## Dimensions



Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

## Flow Pattern



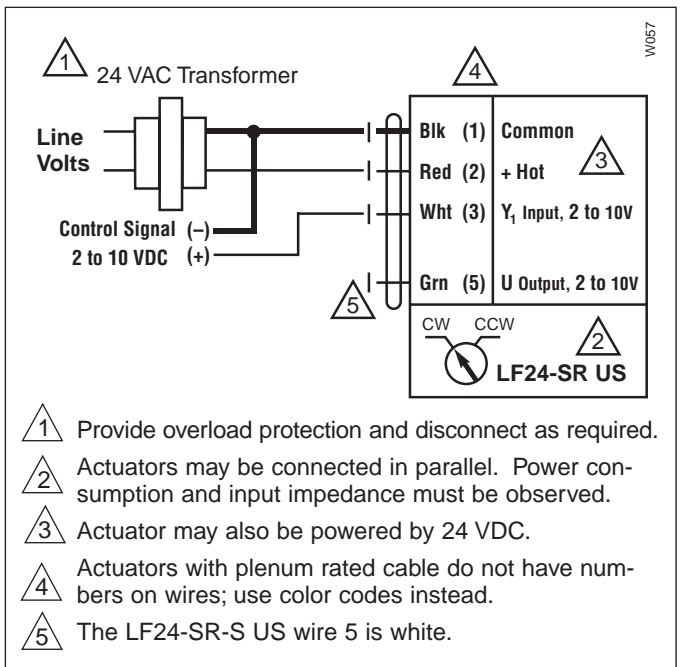
**"B" Port must be piped to the by-pass leg.**

**1** For end position indication, interlock control, fan start-up, etc., LF24-SR-S us incorporates one built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @250 VAC, UL listed, adjustable 0° to 95°.

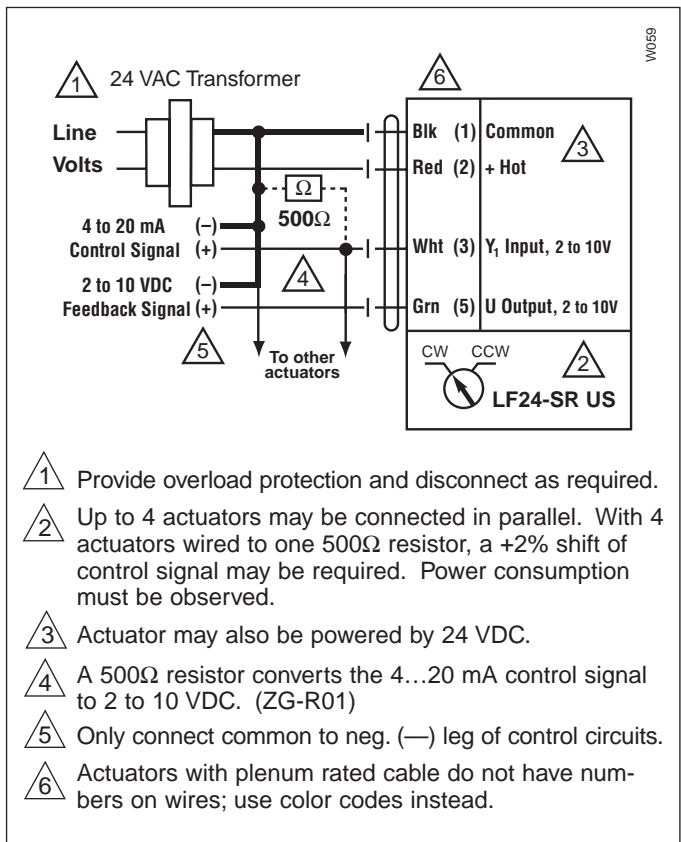
**2** Meets UL & CSA requirements without the need of an electrical ground connection.

Auxiliary switch of LF24-SR-S US

## Wiring



2 to 10 VDC control of LF24-SR (-S) US



4 to 20 mA control of LF24-SR (-S) US with 2 to 10 VDC feedback output

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem LF Actuators, MFT



Technical Data/Submittal



## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	1/2" to 1-1/4" (B330)
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	600 psi (1/2" to 1-1/4")
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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant flow.

This valve is designed with MFT functionality which facilitates the use of various control input. This valve is designed for use where fail safe is required.

## Actuator Specifications

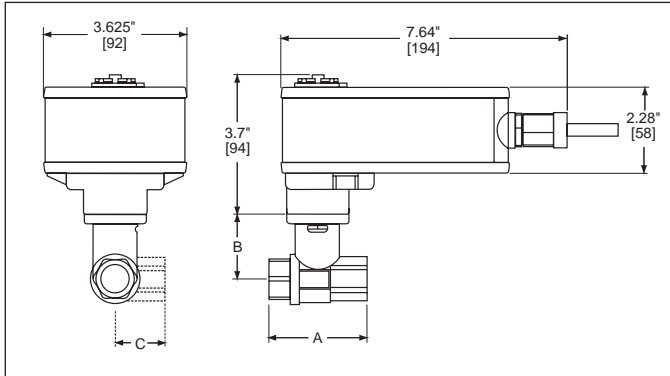
<input type="checkbox"/> LF24-MFT US	
<input type="checkbox"/> LF24-MFT-S US	
Control	MFT
Control signal:	2 to 10 VDC
Power consumption:	2.5 W running, 1 W holding
Transformer sizing:	5 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fitting
Overload protection:	electronic throughout rotation
Input impedance:	100 kΩ for 2 to 10 VDC (0.1 mA) 500 kΩ for 4 to 20mA 750 Ω for PWM 1500 Ω for on/off and floating point
Feedback:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT. 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) 150 sec. independent of load (proportional)
spring:	<25 sec. @ -4°F to +122°F [-20°C to +50°C] <60 sec. @ -22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001
Noise level:	max. 62 dB(A)

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**MFT**

## Dimensions



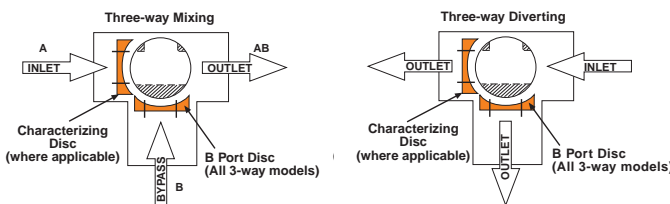
D026

Valve Body	Nominal Valve Size		Dimensions		
	in	[mm]	A	B	C
B307-B311	1/2"	15	2.06 [52.2]	1.39 [35.3]	1.07 [27.2]
B312-B315	1/2"	15	2.38 [60.5]	1.63 [41.4]	1.31 [33.3]

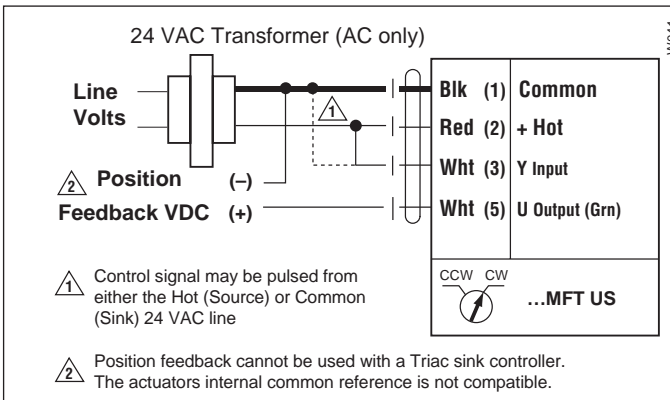
Nominal Valve Size		Dimensions in inches [mm]		
in	mm	A	B	C
3/4"	20	2.63 [66.8]	1.75 [44.5]	1.38 [35.1]
1"	25	3.50 [88.9]	1.81 [46.0]	1.63 [41.4]
1-1/4"	32	4.02 [102]	1.87 [48]	2.22 [56.5]

## Flow Pattern



**"B" Port must be piped to the by-pass leg.**

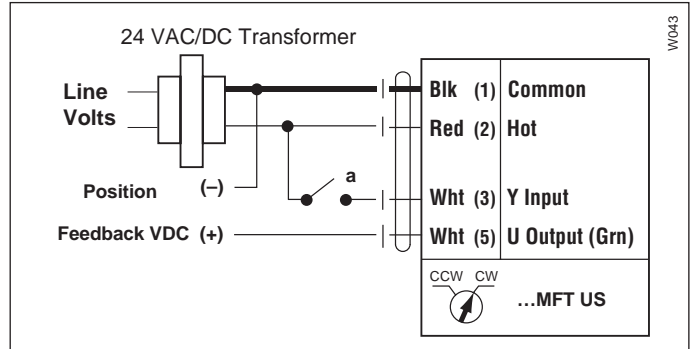
## Wiring



W041

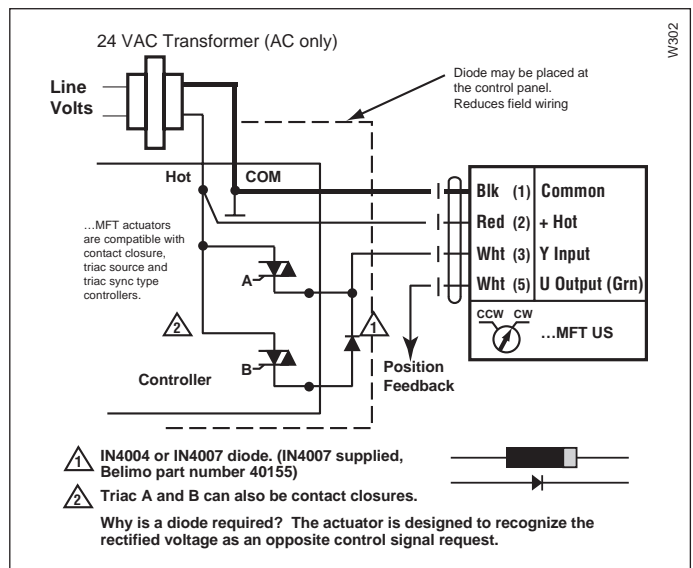
## PWM, triac source and sink

## Wiring



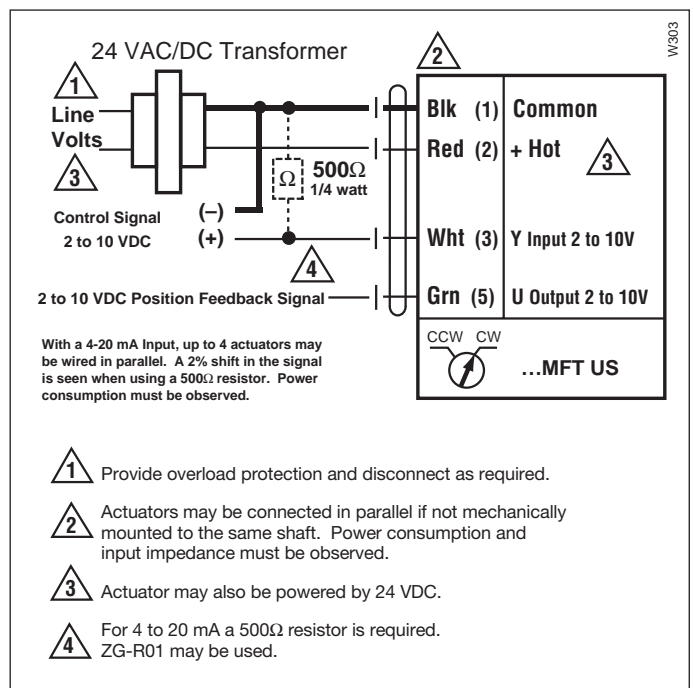
W043

## On-Off control



W302

## Floating Point control



W303

## Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, On-Off



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	2"
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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 or constant flow.

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

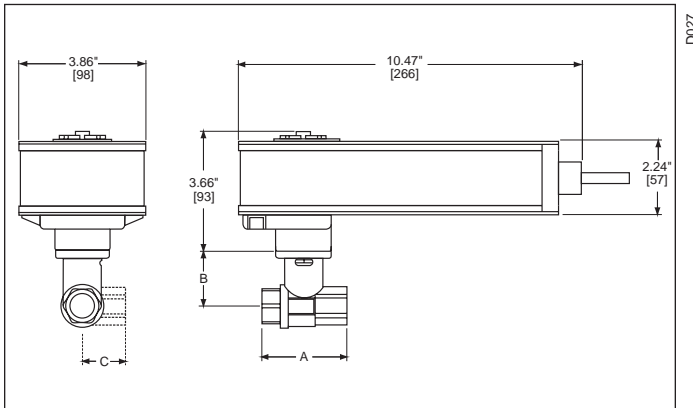
### Actuator Specifications

<input type="checkbox"/> AF24 US	
<input type="checkbox"/> AF24-S US	(AF24 US with built-in aux. switches)
<input type="checkbox"/> AF120 US	
<input type="checkbox"/> AF120-S US	(AF120 US with built-in aux. switches)
Control	On-off
Power consumption:	5 to 6.5 W running, 1.5 to 2.3 W holding (models vary)
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	120 V actuators/Aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)



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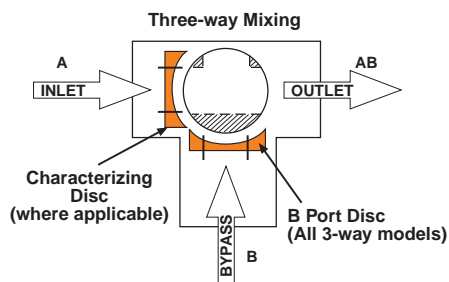
## Dimensions



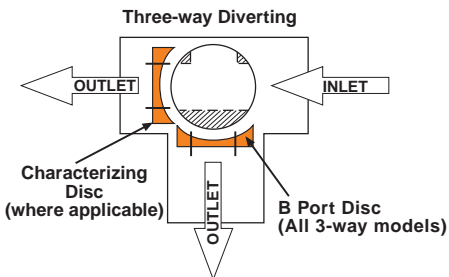
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19" [106.4]	2.44" [62.0]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

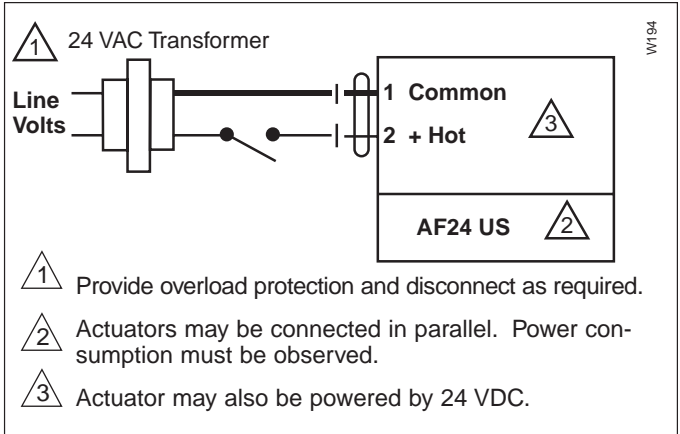
## Flow Pattern



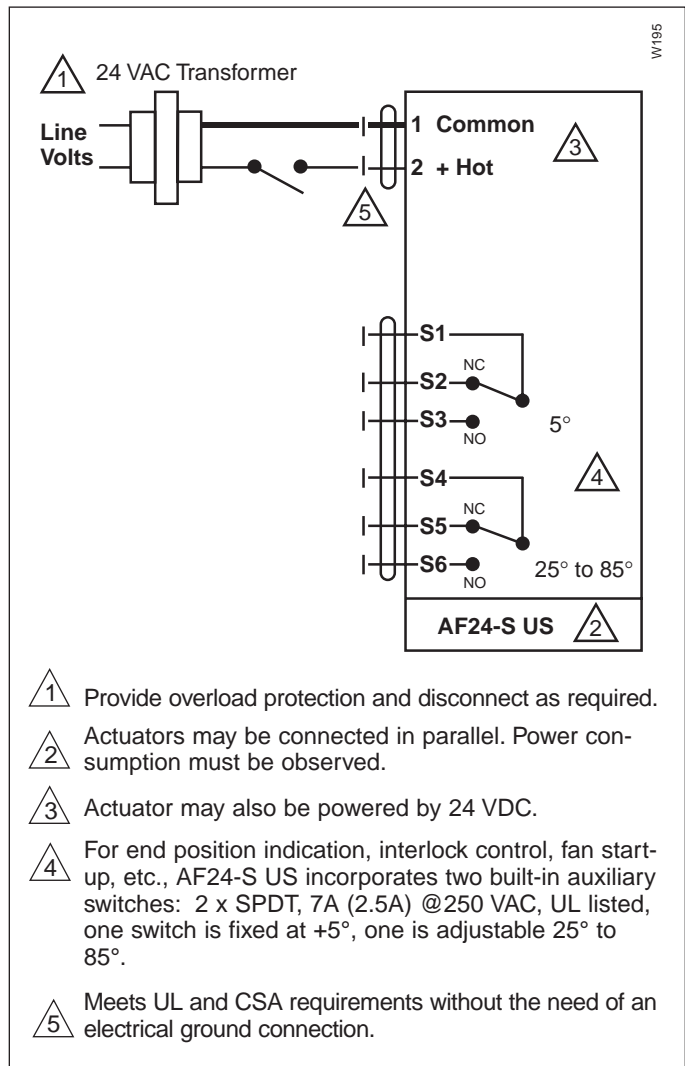
**"B" Port must be piped to the by-pass leg.**



## Wiring



### On-off wiring for AF24 US



### On-off wiring for AF24-S US

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, Proportional



## Technical Data/Submittal



## 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 reheat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow. This valve is designed for modulating control using 2...10VDC or 4...20mA and fail safe is required. (for 4...20mA control input a 500 ohm resistor is required).

## Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	2"
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

## Actuator Specifications

<input type="checkbox"/> AF24-SR US	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Feedback output:	2 to 10 VDC, 0.5 mA max
Control	Proportional
Power consumption:	6 W running, 2 W holding
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)

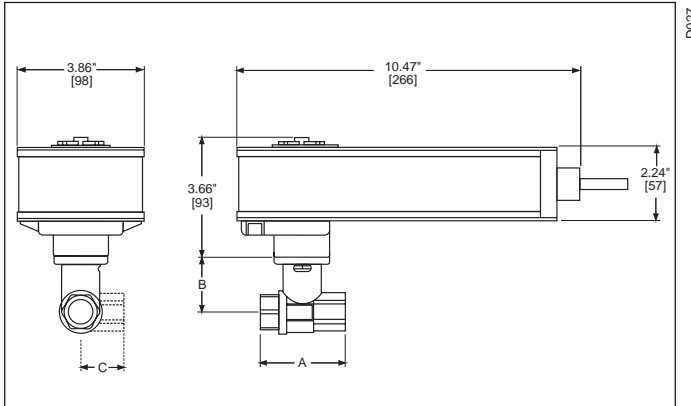
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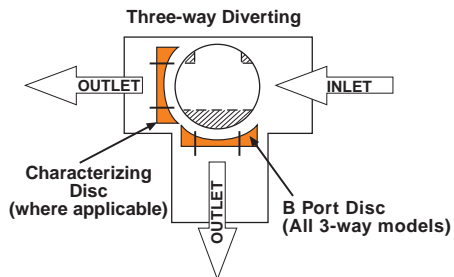
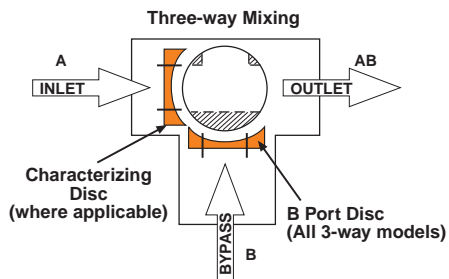
## Dimensions



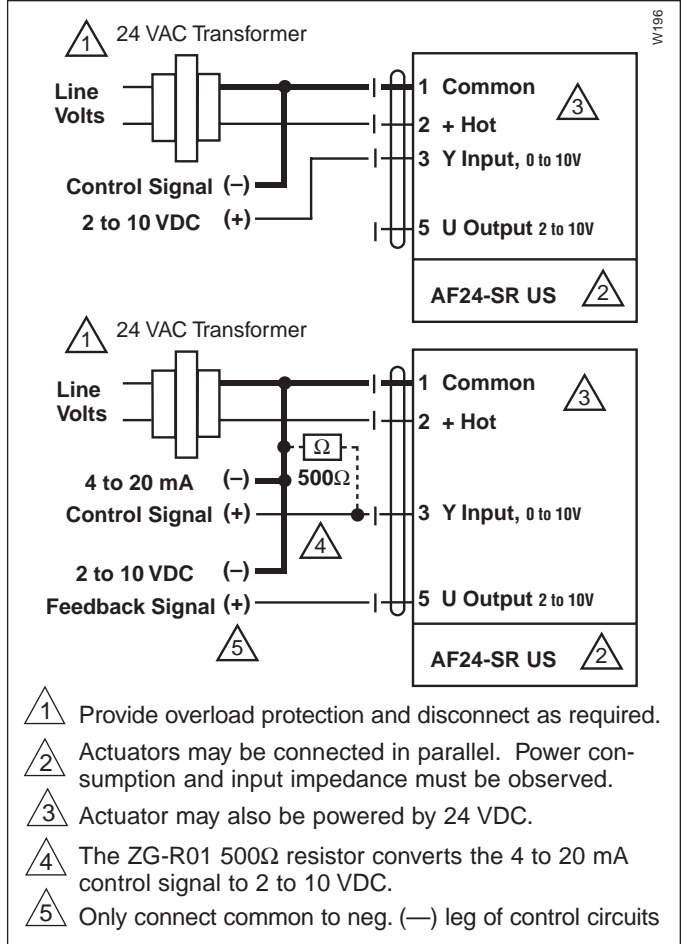
Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19 [106.4]	2.44 [62.0]

\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

## Flow Pattern



## Wiring



Proportional 2 to 10 VDC or 4 to 20 mA control signal

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuator may also be powered by 24 VDC.
- 4 The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.
- 5 Only connect common to neg. (—) leg of control circuits

# B3 Three-way Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, MFT



## Technical Data/Submittal



### Valve Specifications

Service	chilled or hot water, 60% glycol
Flow characteristic	A port equal percentage B port modified linear for constant AB flow
Action	Max 95° rotation
Sizes	2"
Type of end fitting	female, NPT
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon® PTFE
Characterizing disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Pressure rating	400 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	A port: 0% B port: 0.5% - 2% of full rated CV AB port: 0%
Cv rating	A port: see product chart for values B port: 70% of A port flow

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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 or constant flow.

This valve is designed with MFT functionality which facilitates the use of various control input. This valve is designed for use where fail safe is required.

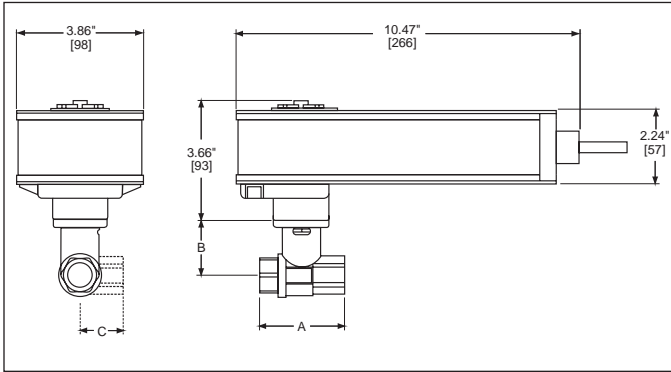
### Actuator Specifications

<input type="checkbox"/> AF24-MFT US	
<input type="checkbox"/> AF24-MFT-S US	(AF24-MFT US with built-in aux. switches)
Control	MFT
Control signal:	2 to 10 VDC, (4 to 20 mA with 500Ω resistor)
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption:	6 W running, 2.5 W holding
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	Aux. switches double insulated
Overload protection:	electronic throughout rotation
Input impedance:	100 KΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA 750Ω for PWM 1500Ω for on/off and floating point
Feedback output:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)

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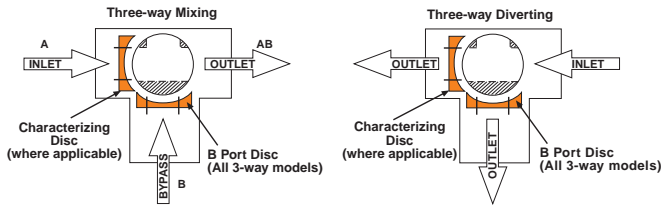
## Dimensions



Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
*1-1/4"	32	4.45 [113]	1.87 [48]
1-1/2"	40	4.31 [109.5]	1.88 [47.8]
2"†	50	4.19" [106.4]	2.44" [62.0]

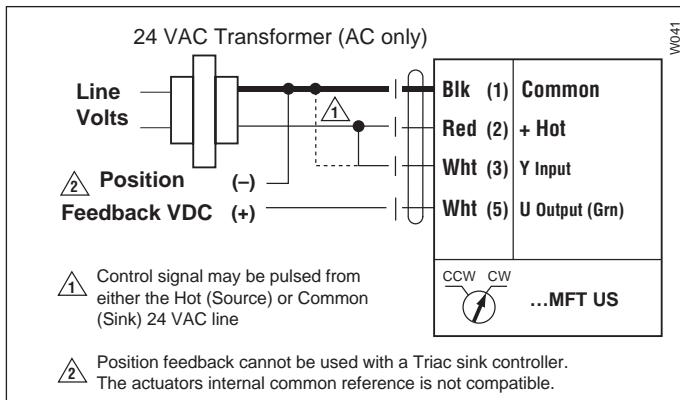
\* On model numbers B231 and B232, the 1-1/4" valve has the same dimensions as a 1-1/2" valve. These are 1-1/2" valve bodies with 1-1/4" NPT Threads.

## Flow Pattern



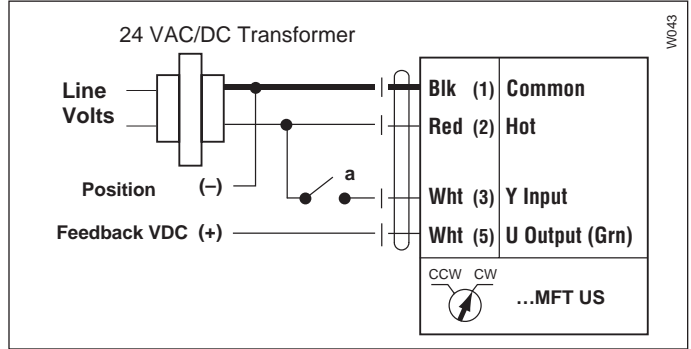
“B” Port must be piped to the by-pass leg.

## Wiring

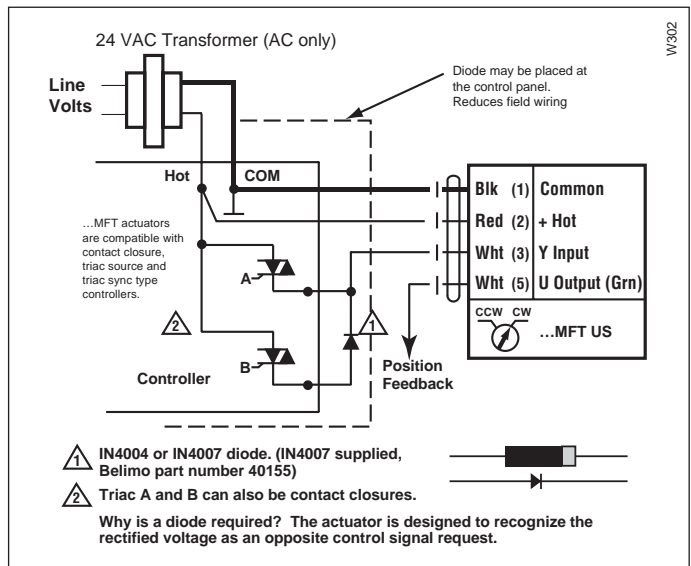


PWM, triac source and sink

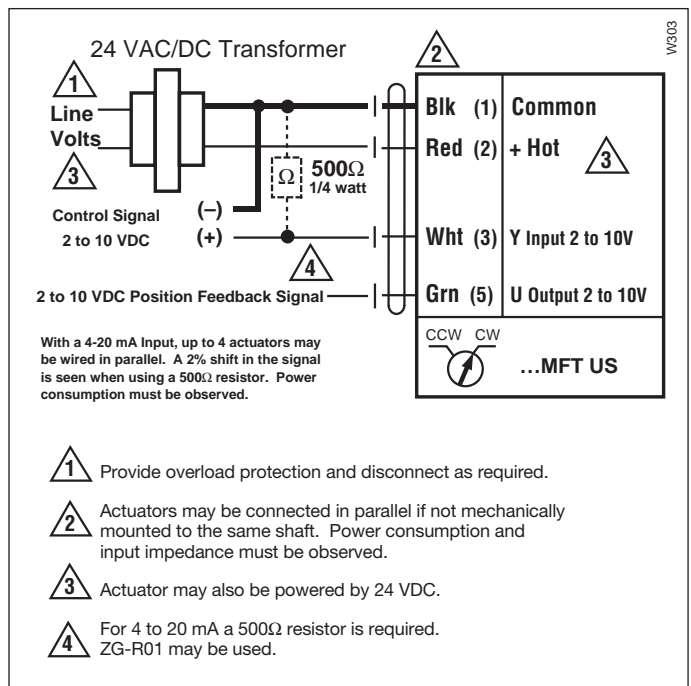
## Wiring



## On-Off control



## Floating Point control



Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B6 Two-way Flanged Characterized Control Valve, Stainless Steel Ball and Stem AM Actuators, On-Off/Floating Point



## Technical Data/Submittal



### Valve Specifications:

Service	chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2.5" to 3"
Type of end fitting	pattern to mate with ANSI 125 flange
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon PTFE®
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Flanges	carbon steel/zinc plated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 PSI
Maximum differential: pressure ( $\Delta P$ )	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

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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.

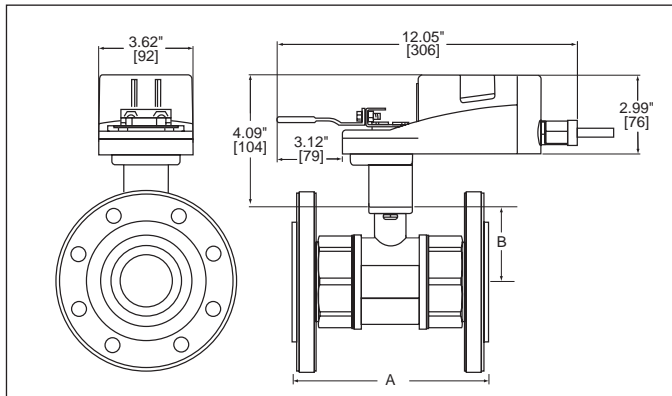
This valve is designed to fit in compact areas where on/off or floating point control is required using 24VAC.

### Actuator Specifications

<input type="checkbox"/> <b>AM24 US</b>	
Control	On-off/floating point
Power Supply	24 VAC $\pm$ 20% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption:	2.5W
Transformer sizing:	4.5 VA (Class 2 power source)
Electrical connection:	3 ft., 18 GA, appliance cable, 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Angle of rotation:	0-95° adjustable stops
Torque:	min 160 in-lb [18 Nm]
Direction or rotation:	reversible with switch "CCW-CW"
Position indication:	indicator/handle
Running time:	100 to 150 sec. for 0 to 160 in-lb
Manual override:	external push button
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 type:	NEMA 2 (IP54 with cable entry down)
Housing material:	UL94-5V (flammability rating)
Noise level:	less than 45 dB (A)
Servicing:	maintenance free
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified, CE
Quality standard:	ISO 9001



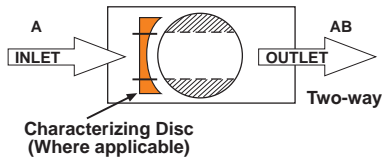
## Dimensions



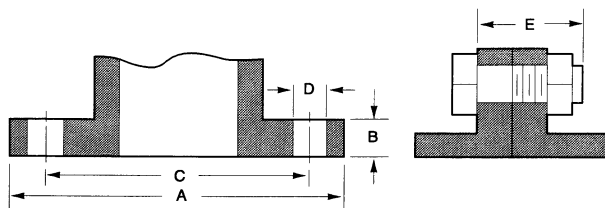
D089

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2.5"	65	7.48" [190]	3.50" [89]
3"	80	8.25" [209.5]	3.75" [95.25]

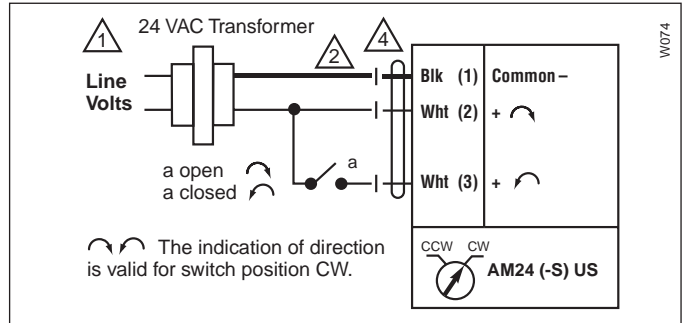
## Flow Pattern



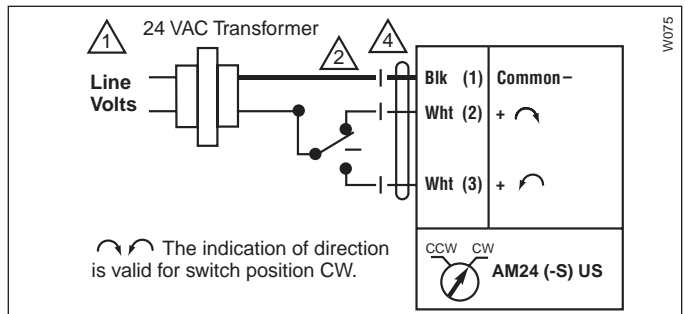
## Flange Detail for American Standard 125 lb.



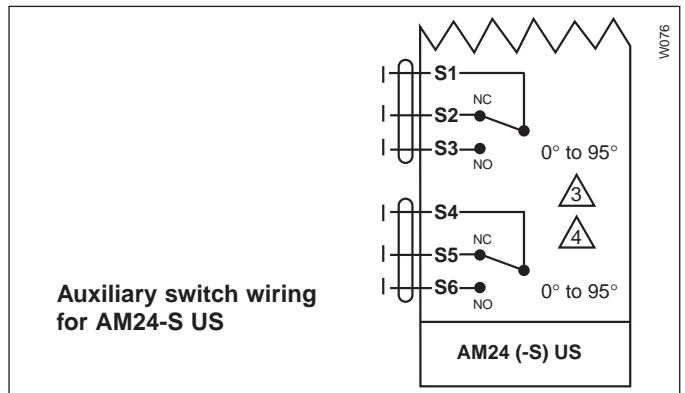
## Wiring



## On-off control



## Floating point or on-off control



## Notes

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may also be powered by 24 VDC.
- 3 For end position indication, interlock control, fan startup, etc., AM24-S us incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @24 VAC, UL listed, adjustable between 0° and 95°.
- 4 Meets UL and CSA requirements without the need of an electrical ground connection.

Nominal Pipe Size	Flanges		Drilling		Bolting		E Length of Machine Bolts
	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	
2-1/2"	7"	11/16"	5-1/2"	3/4"	4	5/8"	2-1/2"
3"	7-1/2"	3/4"	6"				

# B6 Two-way Flanged Characterized Control Valve, Stainless Steel Ball and Stem AM Actuators, MFT



## Technical Data/Submittal



### Valve Specifications:

Service	chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2.5" to 3"
Type of end fitting	pattern to mate with ANSI 125 flange
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon PTFE®
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Flanges	carbon steel/zinc plated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 PSI
Maximum differential: pressure ( $\Delta P$ )	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

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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.

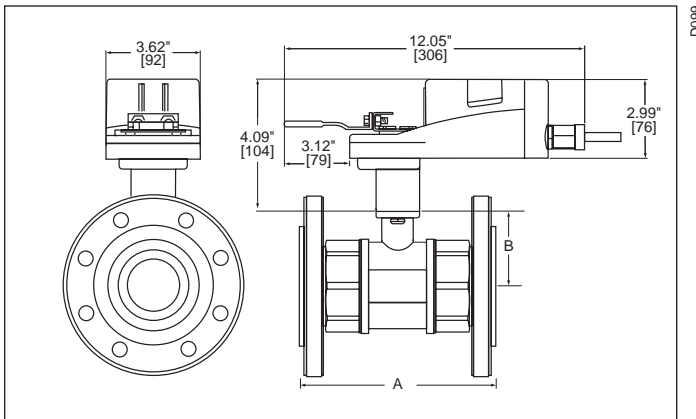
This valve is designed with MFT functionality which facilitates the use of various control input.

### Actuator Specifications

<input type="checkbox"/> AM24-MFT US	
Control	MFT
Power Supply	24 VAC, $\pm 20\%$ , 50/60 Hz 24 VDC $\pm 10\%$
Power consumption:	2.5 W running, 1.2 W holding
Transformer sizing:	5 VA (Class 2 power source)
Electrical connection:	3 ft., 18 GA, appliance cable, 1/2" conduit connector
Overload protection:	electronic throughout 0 to 95° rotation
Control signal Y*:	2 to 10 VDC
Operating range*:	2 to 10 VDC, 4 to 20 mA (w/500 $\Omega$ , 1/4W resistor) ZG-R01
Input impedance:	100k $\Omega$ for 2 to 10 VDC (0.1 mA) 500 $\Omega$ for 4 to 20 mA, 750 $\Omega$ for PWM 1500 $\Omega$ for on/off and floating point
Feedback output "U"*:	2 to 10 VDC, 0.5 mA max
Torque:	min 160 in-lb [18 Nm]
Direction or rotation*:	control direction selected by switch CW=CW with decrease in signal CCW=CCW with a decrease in signal
Angle of rotation:	0-95° adjustable mechanical stops
Running time:	150 seconds constant
Angle of rotation adaptation:	Off (default)
Override control*:	Min. (min position) = 0% ZS (mid position) = 50% Max. (max position) = 100%
Manual override:	manual push button
Position indication:	clip on indicator
Humidity:	5 to 95% RH, non-condensing
Operating temperature:	-22°F to 122°F [-30°C to +50°C]
Storage temperature:	-40°F to 176°F [-40°C to +80°C]
Housing type:	NEMA 2 IP54 (with cable entry down)
Housing material:	UL 94-5V (flammability rating)
Noise level:	less than 45 dB (A)
Agency listings:	UL 873 listed, CSA C22.2 No. 24 certified
Quality standard:	ISO 9001
Servicing:	maintenance free

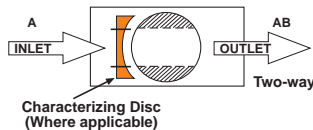
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### Dimensions

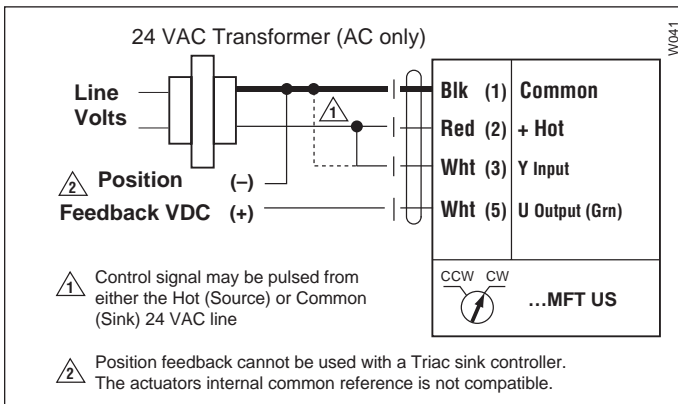


Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2.5"	65	7.48" [190]	3.50" [89]
3"	80	8.25" [209.5]	3.75" [95.25]

### Flow Pattern

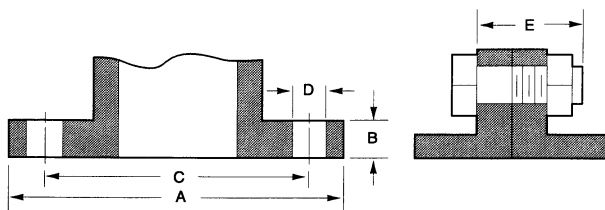


### Wiring



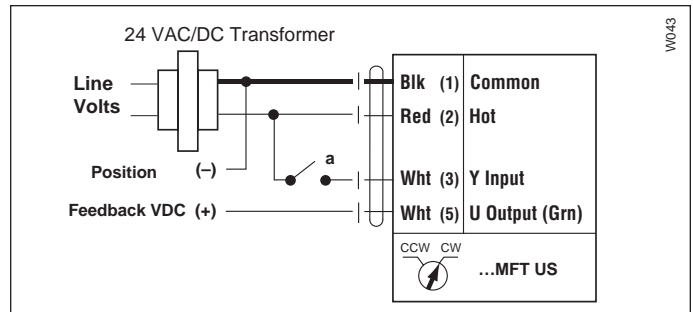
### PWM, triac source and sink

### Flange Detail for American Standard 125 lb.

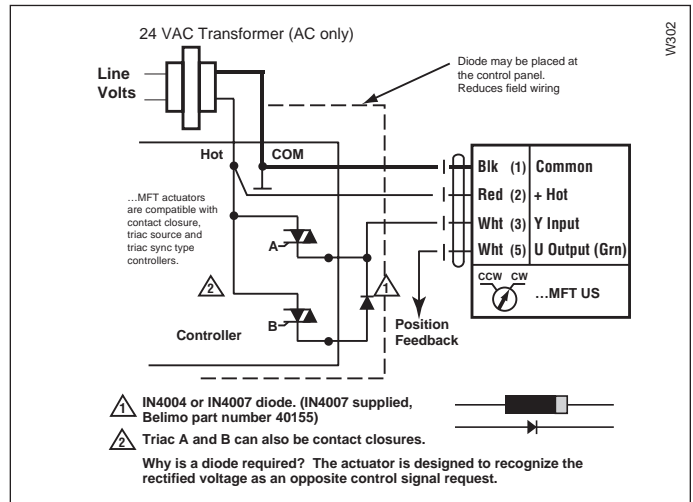


Nominal Pipe Size	Flanges		Drilling		Bolting		E Length of Machine Bolts
	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	
2-1/2"	7"	11/16"	5-1/2"	3/4"	4	5/8"	2-1/2"
3"	7-1/2"	3/4"	6"				

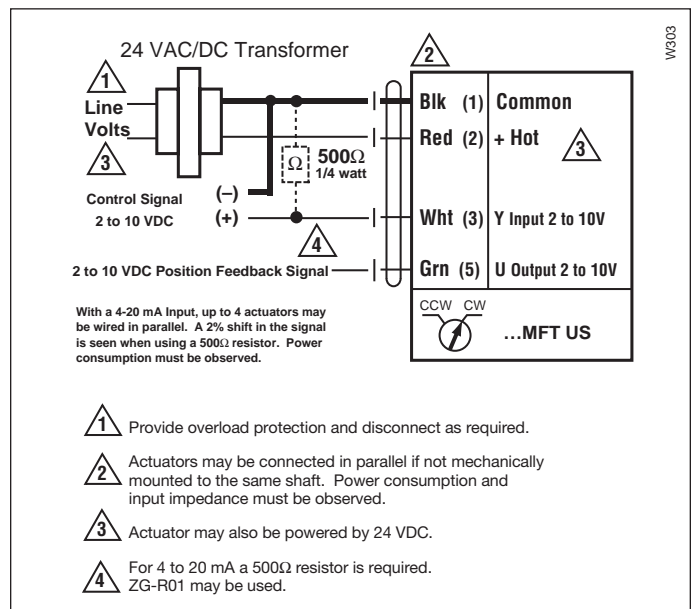
### Wiring



### On-Off control



### Floating Point control

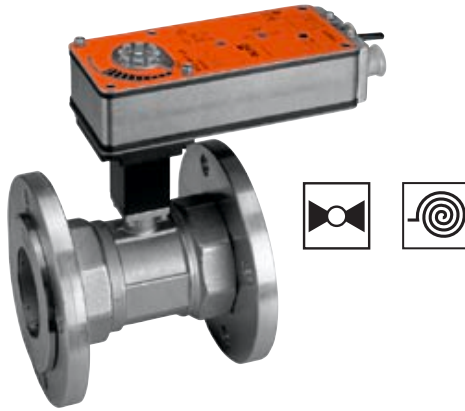


### Proportional 2 to 10 VDC or 4 to 20 mA control signal

# B6 Two-way Flanged Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, On-Off/Floating Point



## Technical Data/Submittal



### 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.

### Valve Specifications:

Service	chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2.5" to 3"
Type of end fitting	pattern to mate with ANSI 125 flange
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon PTFE®
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Flanges	carbon steel/zinc plated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 PSI
Maximum differential: pressure ( $\Delta P$ )	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

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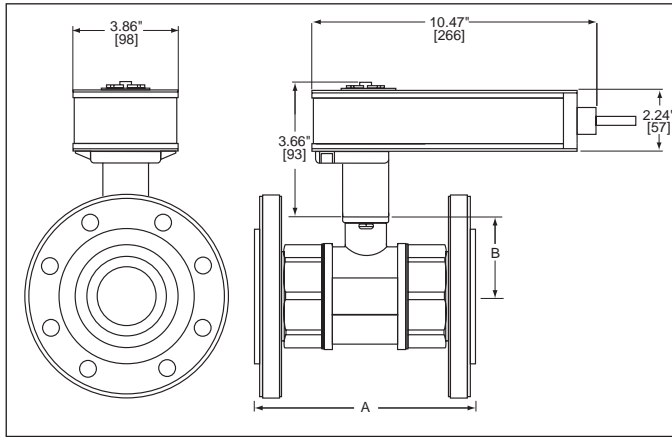
### Actuator Specifications

<input type="checkbox"/> AF24 US	
<input type="checkbox"/> AF24-S US	(AF24 US with built-in aux. switches)
<input type="checkbox"/> AF120 US	
<input type="checkbox"/> AF120-S US	(AF120 US with built-in aux. switches)
Control	On-off
Power consumption:	5 to 6.5 W running, 1.5 to 2.3 W holding (models vary)
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	120 V actuators/Aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95°
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)





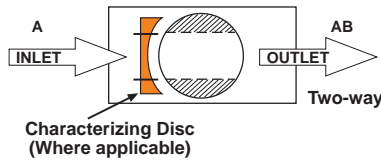
## Dimensions



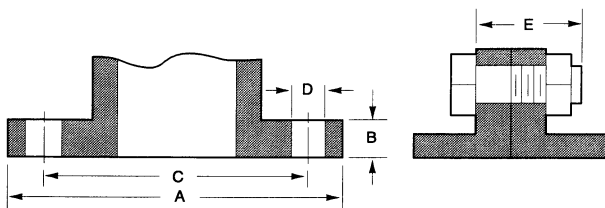
D100

Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2.5"	65	7.48" [190]	3.50" [89]
3"	80	8.25" [209.5]	3.75" [95.25]

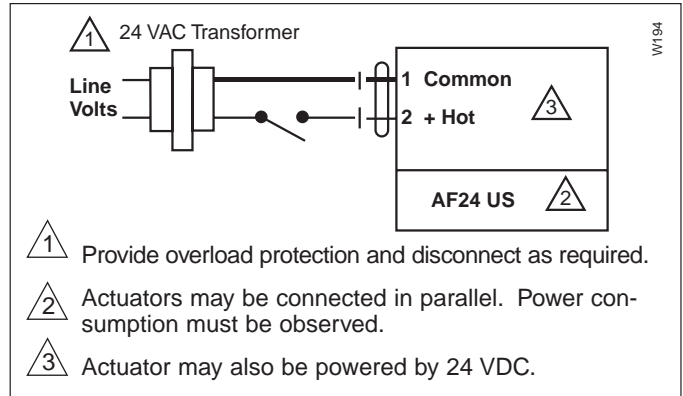
## Flow Pattern



## Flange Detail for American Standard 125 lb.

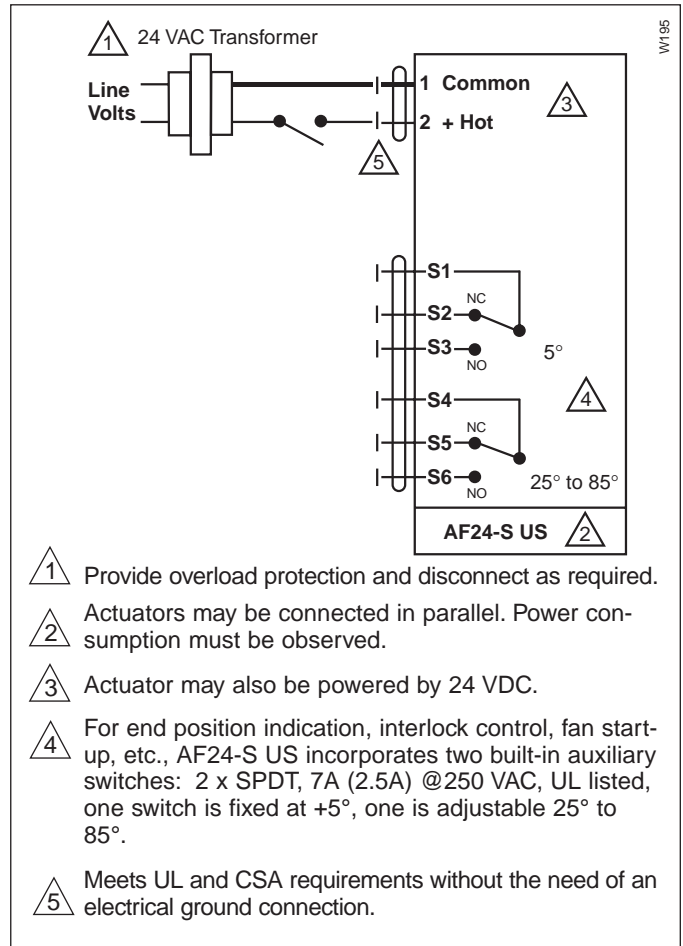


## Wiring



W194

## On-off wiring for AF24 US



W195

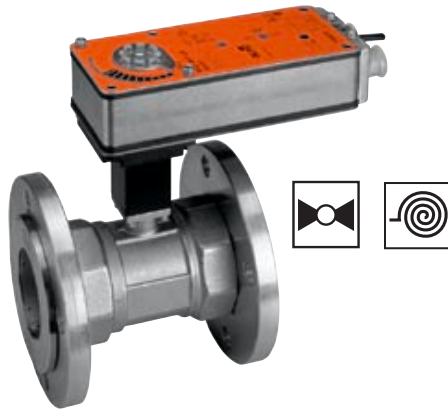
## On-off wiring for AF24-S US

Nominal Pipe Size	Flanges		Drilling		Bolting		E Length of Machine Bolts
	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	
2-1/2"	7"	11/16"	5-1/2"	3/4"	4	5/8"	2-1/2"
3"	7-1/2"	3/4"	6"				

# B6 Two-way Flanged Characterized Control Valve, Stainless Steel Ball and Stem AF Actuators, MFT



## Technical Data/Submittal



### Valve Specifications:

Service	chilled or hot water, 60% glycol
Flow Characteristic	A port equal percentage
Sizes	2.5" to 3"
Type of end fitting	pattern to mate with ANSI 125 flange
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	fiberglass reinforced teflon PTFE®
Characterizing Disc	TEFZEL®
Packing	2 EPDM O-rings, lubricated
Flanges	carbon steel/zinc plated
Pressure rating	400 PSI
Media Temp Range	0°F to 212°F
Close-off pressure	100 PSI
Maximum differential: pressure ( $\Delta P$ )	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 with MFT functionality which facilitates the use of various control input. This valve is designed for use where fail safe is required.

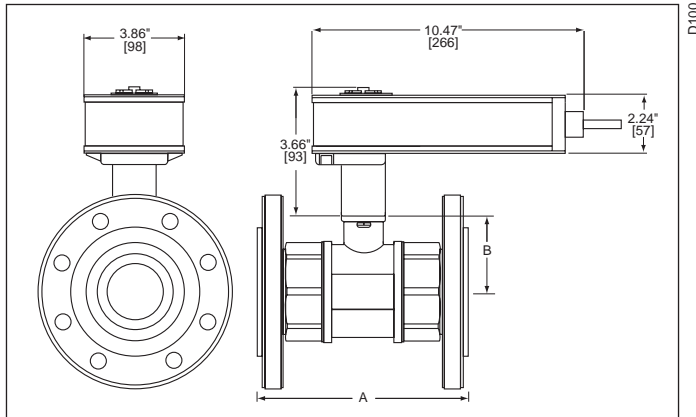
### Actuator Specifications

<input type="checkbox"/> AF24-MFT US	
<input type="checkbox"/> AF24-MFT-S US	(AF24-MFT US with built-in aux. switches)
Control	MFT
Control signal:	2 to 10 VDC, (4 to 20 mA with 500Ω resistor)
Power supply	24 VAC $\pm$ 20% 50/60 Hz 24 VDC $\pm$ 10%
Power consumption:	6 W running, 2.5 W holding
Transformer sizing:	10 VA, class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit.
Electrical protection:	Aux. switches double insulated
Overload protection:	electronic throughout rotation
Input impedance:	100 KΩ for 2 to 10 VDC (0.1 mA) 500Ω for 4 to 20 mA 750Ω for PWM 1500Ω for on/off and floating point
Feedback output:	2 to 10 VDC, 0.5 mA max
Angle of rotation:	95°
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Manual override:	hex crank
Auxiliary switches:	2 x SPDT. 5° fixed/25° to 85°(-S)
Running time:	150 sec. independent of load (control) < 20 sec. (spring)
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA C22.2 No. 24 certified, CE
Noise level:	max. 45 dB(A)

G20493 - 03/05 - IG-Subject to change. © Belimo Aircontrols (USA), Inc.

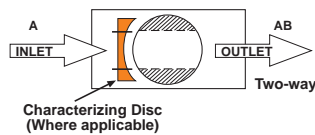


## Dimensions

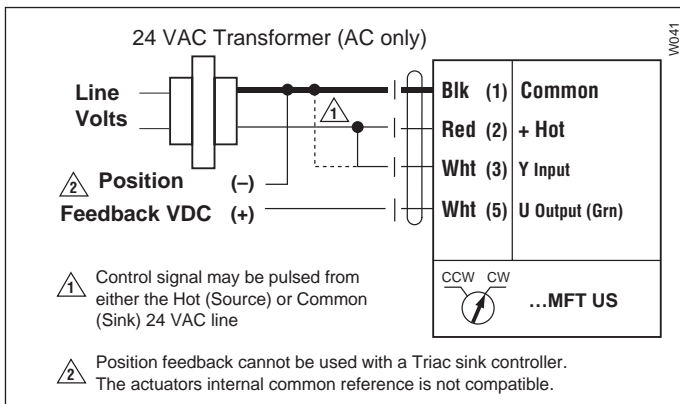


Nominal Valve Size		Dimensions in inches [mm]	
in	mm	A	B
2.5"	65	7.48" [190]	3.50" [89]
3"	80	8.25" [209.5]	3.75" [95.25]

## Flow Pattern

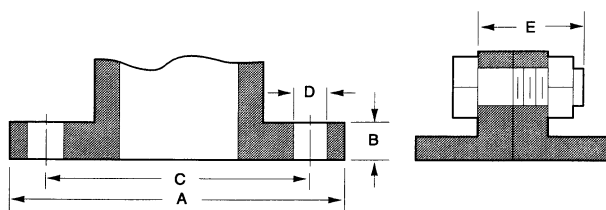


## Wiring



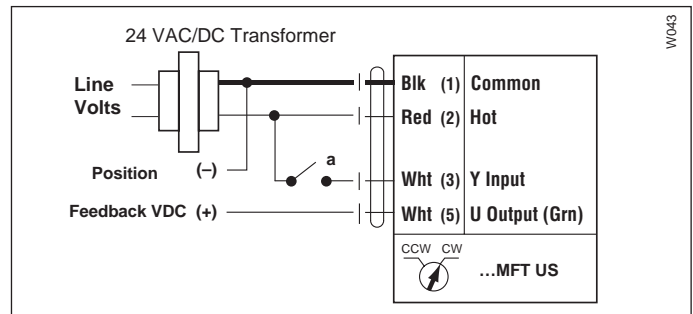
## PWM, triac source and sink

## Flange Detail for American Standard 125 lb.

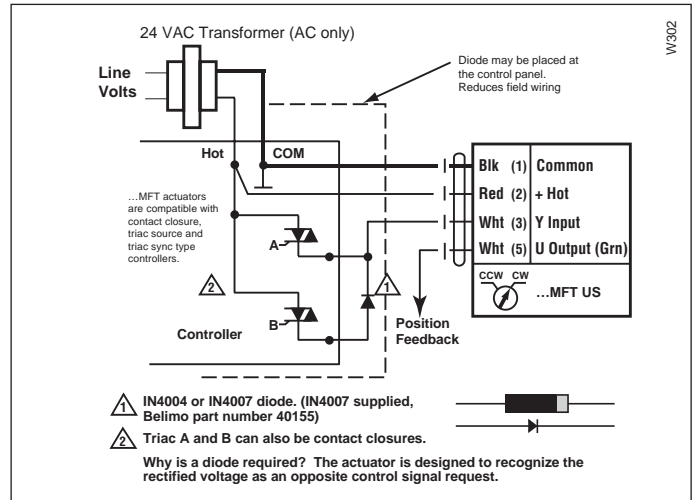


Nominal Pipe Size	Flanges		Drilling		Bolting		E Length of Machine Bolts
	A Flange Diameter	B Flange Thickness	C Diameter of Bolt Circle	D Diameter of Bolt Holes	Number of Bolts	Diameter of Bolts	
2-1/2"	7"	11/16"	5-1/2"	3/4"	4	5/8"	2-1/2"
3"	7-1/2"	3/4"	6"				

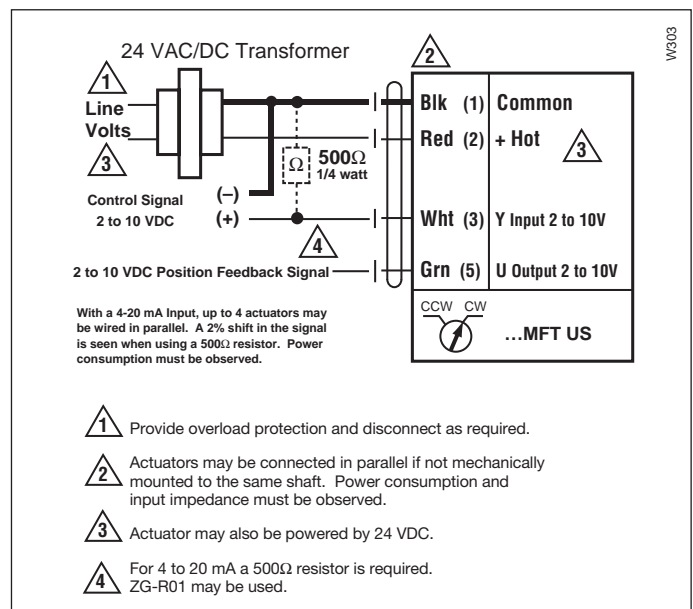
## Wiring



## On-Off control



## Floating Point control



## Proportional 2 to 10 VDC or 4 to 20 mA control signal

# Auxiliary Switches SA1 US, SA2 US

For the direct coupled actuator AM2...

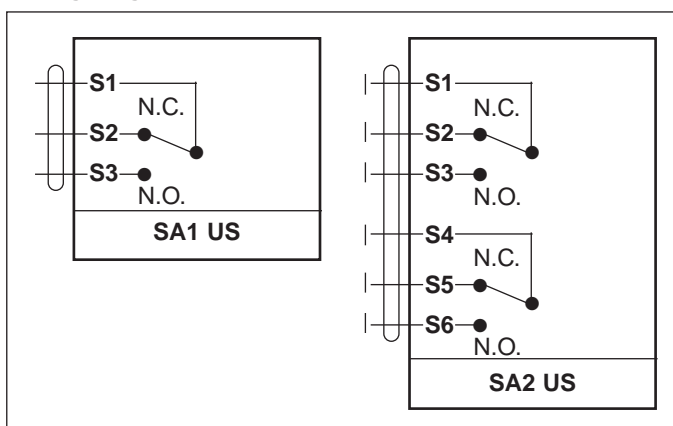


Technical Data	SA1 US	SA2 US
No. of switches	1xSPDT	2xSPDT
Switching capacity	6 A (2.5A) 250 VAC	
Switching point	adjustable over full actuator rotation 0 to 1. Pre-setting with scale possible.	
Electrical connection	3 ft, 18 GA appliance cable 1/2" conduit connector	
Humidity	5 to 95% RH non-condensing	
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 type	NEMA type 2	
Housing material rating	UL 94-5V (flammability rating)	
Agency listings	UL 873 listed, CSA 4813 02 certified, CE	
Weight	8 oz [225 g]	9.3 oz [265 g]

## Operation

The SA1 US and SA2 US auxiliary switches are used to indicate when a desired position of a damper is reached or to interface additional controls for a specific control sequence. They are modular units that mount directly onto the AM type actuators and held in place with a prefitted screw. A driver disk is attached to the actuator clamp and offers direct transmission of the actuator position to the microswitch operating cams. The switching points can be set over the full scale of 0 to 1 simply by adjusting the slotted discs.

## Wiring Diagrams



Voltage	Resistive	Inductive
120	6.0 A	5.0 A
250	6.0 A	2.5 A

## SNMV1/SNMV2 Auxiliary Switch Kit – For NM Actuator

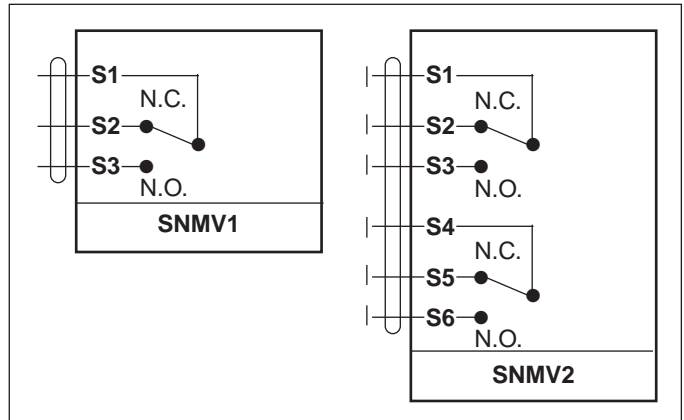
### Operation

The SNMV1 and SNMV2 auxiliary switches are used to indicate when a desired position is reached or to interface additional controls for a specific control sequence. They are modular units that mount directly onto the NM type actuators and are held in place with a prefitted screw. The switching points can be set over the full scale of 0 to 10 simply by adjusting the slotted discs.



Technical Data	SNMV1	SNMV2
No. of switches	1xSPDT	2xSPDT
Switching capacity	6 A (2.5A) 250 VAC	
Switching point	adjustable over full actuator rotation 0 to 10. Pre-setting with scale possible.	
Electrical connection	3 ft. 18 GA cable [1 m long 0.75mm <sup>2</sup> ]	
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 type	NEMA type 2	
Housing material rating	UL 94-V0 (flammability rating)	
Weight	4 oz [125 g]	5.6 oz [175 g]

### Wiring Diagrams



Voltage	Resistive	Inductive
120	6.0 A	5.0 A
250	6.0 A	2.5 A

# CCV-EXT-KIT

## CCV Valve Neck Extension Kit



### Application

The CCV-EXT-KIT can be used with most CCV's\* in order to achieve a large clearance over the pipe. The Extension Kit will provide an additional 2" of space between the top of the valve and the base of the actuator. The bracket is made from aluminum and is not intended as a thermal block.

– Extension kit will be automatically assembled with any Flanged CCV assembly.

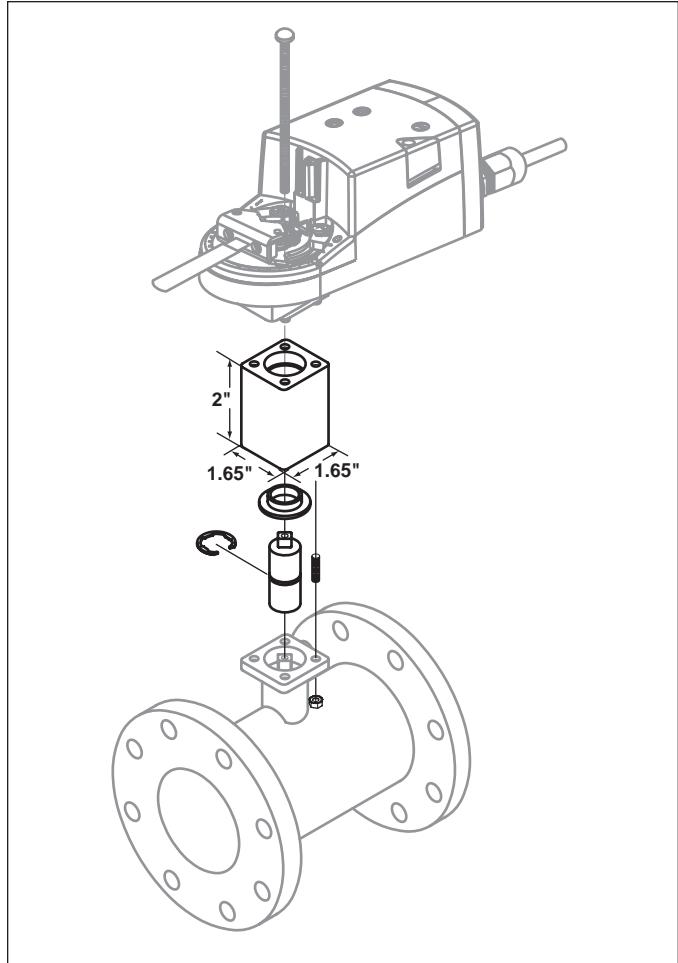
\*Available for previous NF assemblies.

#### Technical Data:

Extension Height	2"
Total Weight	0.7 lb

#### Material:

Extension Housing	Aluminum - Anodized
Shaft	Stainless Steel
Threaded Hardware	Stainless Steel
Bearing	Oil Light Bearing
Retaining Clip	Stainless Steel



	LR	NM	AM	LF	NF*	AF
Extension Bracket CCV-EXT-KIT	●	●	●	●	●	●

\*CCV-EXT-KIT cannot be used with any valve smaller than the B212(B) and B312(B).



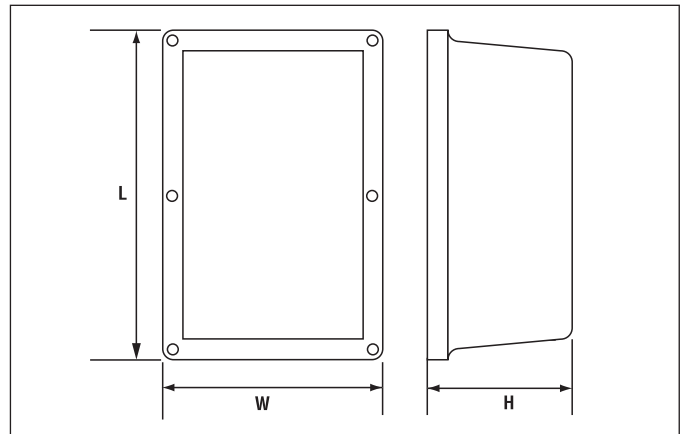
### APPLICATION

The ZS-CCV... weather shield provides moderate protection for valves which are mounted outdoors. This product is designed as a water tight enclosure. The housing allows easy mounting over the Characterized Control Valve actuator, while allowing easy viewing of the actuator in operation.

Weather shield for CCV to provide protection for actuators in outdoor applications.

### Specifications

Cover	PETG with UV resistant smoke tint
Plate	Galvaneal w/black powder coat
Perimeter Gasket	Silicon Rubber
Rubber Gasket	Silicon Rubber
Spring Clips	Stainless Steel
Temperature limitations:	-22°F to 122°F (-30°C to 50°C)



Part Number	For Actuator
ZS - CCV - 50	LR
ZS - CCV - 60	LF
ZS - CCV - 70	NM
ZS - CCV - 80	AM
ZS - CCV - 90	NF/AF

Part Number	L	W	H
ZS - CCV - 50			
ZS - CCV - 60	10" [254]	7.75" [197]	4" [100]
ZS - CCV - 70			
ZS - CCV - 80	16.25" [413]	8.75" [222]	4.5" [114]
ZS - CCV - 90			

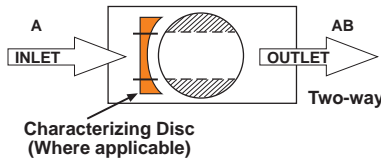
### PARTS LIST

Cover including Rubber Perimeter Gasket, Rubber Gasket  
 Back Plate  
 Anti-Rotation Post with screw and lock washer  
 Valve Gasket  
 Assorted Caplugs for unused holes

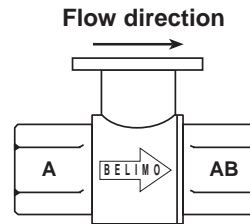
Screws: NM/LF/LR - 2 screws provided  
 AM - 2 screw provided  
 NF/AF - 2 bolts with nylon insert locking nuts  
 NM - Large washer

## Flow Pattern

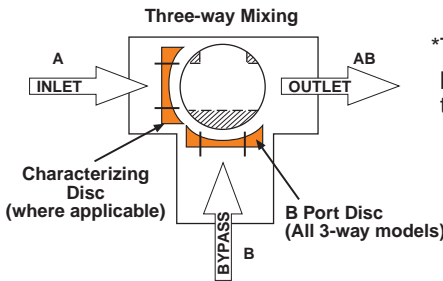
### Two-way Characterized Control Valves™ (Belimo B2 Series) (Belimo B6 Series)



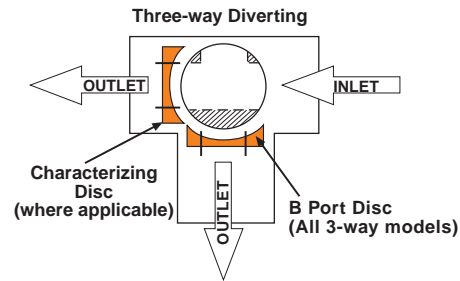
\*Two-way valves should be installed with the disc upstream.



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



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



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

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

Multi-Function Technology		See Appendix for Complete List of Configurations		
Code	Control Input	Running Time	Built-in Feedback	List Price
P-10001	2-10 VDC	150	2-10 VDC	No Charge
P-10002	0-10 VDC	150	0-10 VDC	No Charge
P-10028	0-10 VDC	100	0-10 VDC	No Charge
P-10063	0.5-4.5 VDC	150	0.5-4.5 VDC	No Charge
P-10064	5.5-10 VDC	150	5.5-10 VDC	No Charge
P-20002	0.02-5.00 sec. PWM	150	2-10 VDC	No Charge
P-20003	0.10-25.5 sec. PWM	150	2-10 VDC	No Charge
P-30001	Floating Point	150	2-10 VDC	No Charge

Example: LF24-MFT US is the basic model. Add the P... pre-set MFT configuration number and list price to the actuator when ordering, as needed.

**Note:** Most popular configurations available at no additional cost. All other configurations carry a \$30.00 list price.



**Default Set-Up:**

	Two-way valve (Default)	Two-way valve (specify upon ordering)	Three-way valve (Default)	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).
	LR24(-3) US, LR24-SR, -MFT US NM24 US, NM24-SR, -MFT US AM24 US, AM24-MFT US <b>NC:</b> Closed A to AB, will open as voltage increases or power applied	<b>NO:</b> Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch).	<b>NC:</b> Closed A to AB, will open as voltage increases or power applied	<b>NO:</b> Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch).
<b>Spring Return - Note Fail Position</b>	TF24 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.
	LF, TF, AF (-3), -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. (NO 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. (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

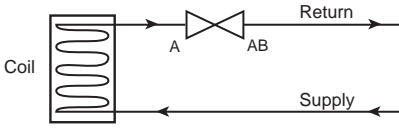
**CAUTION:** It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When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

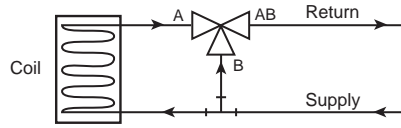
#### Correct Piping:

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.

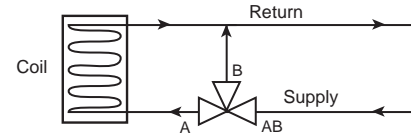
**Two-Way Valve Piping Diagram**  
(1 Input, 1 Output)



**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.**

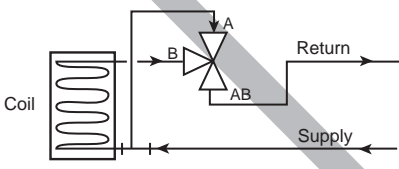
The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A port. These diagrams are for typical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

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

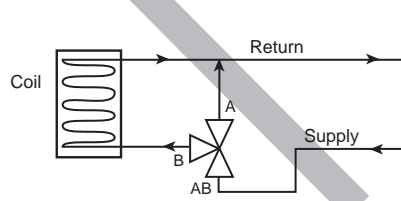
**The B port restricts flow by 30% of A port value.**

#### Incorrect Piping:

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



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



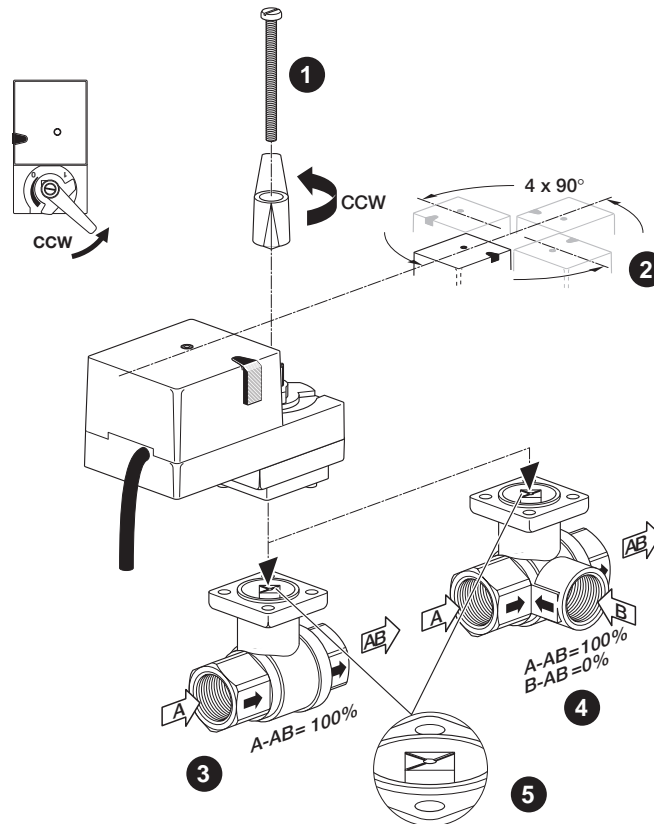
**WARNING! Do Not Pipe in this manner! Note Valve Porting! The A port must be piped to the coil! Not the B port!**

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.



A large grid of 20 columns and 30 rows, intended for notes or work. The grid is composed of thin gray lines forming small squares.

# Custom MFT Configuration Order Form

FAX: USA Toll Free 1-800-228-8283



## #1 Select an Actuator

(use one sheet for each unique actuator/configuration)

<input type="checkbox"/> AF24-MFT US	Quantity _____	<input type="checkbox"/> AF24-MFT-S US	Quantity _____
<input type="checkbox"/> AF24-MFT95 US	_____	<input type="checkbox"/> NF24-MFT-S US	_____
<input type="checkbox"/> NF24-MFT US	_____	<input type="checkbox"/> LF24-MFT-S US	_____
<input type="checkbox"/> LF24-MFT US	_____	<input type="checkbox"/> LF24-MFT-S-20 US	_____
<input type="checkbox"/> LF24-MFT-20 US	_____	<input type="checkbox"/> NV24-MFT US	_____
<input type="checkbox"/> GM24-MFT US	_____	<input type="checkbox"/> NVF24-MFT US	_____
<input type="checkbox"/> AM24-MFT US	_____	<input type="checkbox"/> NVF24-MFT-E US	_____
<input type="checkbox"/> NM24-MFT US	_____	<input type="checkbox"/> NVFD24-MFT US	_____
<input type="checkbox"/> LM24-MFT US	_____	<input type="checkbox"/> NVFD24-MFT-E US	_____
<input type="checkbox"/> LR24-MFT US	_____	(-S=Auxiliary Switch)	

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

Email \_\_\_\_\_

### Field Labeling: LBL-MFT (\$8.00 List)

- Custom configuration labels required  
 1-3/8" X 1-1/4" orange labels preprinted to your specifications  
 12 label sets per sheet. Includes configuration code and wiring labels.

## #2 Create a Custom Configuration

### Angle of rotation setting

①

- Deactivated** (default) The following settings ② - ⑥ refer to the full angle of rotation of 95°.
- Activated** The following settings ② - ⑥ are automatically adapted to the effective mechanical angle of rotation.
- Manual** triggering by pressing the pushbutton twice
- Automatic** triggering each time the unit is powered up or by pressing the pushbutton twice.

### Control Types

②

	VDC	PWM	Floating	On/Off
<input type="checkbox"/>	2 - 10	<input type="checkbox"/>	0.2 to 5.0 sec.	<input type="checkbox"/>
<input type="checkbox"/>	0 - 10	<input type="checkbox"/>	0.1 to 25.5 sec.	
<input type="checkbox"/>	Variable	<input type="checkbox"/>	0.59 to 2.93 sec.	
	Start <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/>	<input type="checkbox"/>	Variable	
	Stop <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/>		Start <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/>	
			Stop <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/>	

### Feedback signals U<sub>5</sub>

③

- Position Feedback U** DC 2...10 V (Default)
- Position Feedback U** DC 0...10 V
- Position Feedback U** Start DC  .  V (0...8 V) The finish must be at least 2 V above the start!  
 Finish DC   .  V (2...10 V)

### Diagnostic Feedback

#### Maintenance and fault signals U<sub>5</sub>

④

**OFF** (default)

**Position and Diagnostic feedback**

Maintenance signal	Fault signal	Select all maintenance and fault signals required
<input type="checkbox"/>	<input type="checkbox"/>	Actuator hunting, Stop-Go ratio
<input type="checkbox"/>	<input type="checkbox"/>	Mechanical overload, actuator stopped
<input type="checkbox"/>	<input type="checkbox"/>	Mechanical load limit reached
<input type="checkbox"/>	<input type="checkbox"/>	Mechanical travel changed 10%

For these functions with a mechanically-limited angle of rotation (<95°) the angle of rotation setting ① must be **activated!**

### Running time

⑤

- 150 s (default)
- Running time    S (75...300 s) (in 5 sec. increments)
- Note:** The sound power level [dB(A)] increases when the running time is below 150 s.

### Override control and electronic angle of rotation limiting

⑥

- Min. (min. position) =    % (0...100%) < (beginning of working range) default 0
- ZS (intermediate position) =    % (0...100%) (0% = Min.; 100% = Max.) default 50
- Max. (max. position) =    % (0...100%) < (end of working range) default 100

### Torque

⑦

- normal (default 100%)  75%  50%  25%

**Non-Spring Return Only!**

## I. GENERAL

- A. Warranty all actuators for a period of two or five years from the production date as stated in the Terms and Conditions of Sale and Warranty.
- B. Electronic valve and damper actuators shall be as manufactured, brand labeled, or distributed by Belimo.
- C. Electronic control valves, as specified, shall be Belimo or other brands manufactured, brand labeled or distributed by Belimo.
- D. Other manufacturers must be approved, in writing, 10 days prior to the bid date.

## II. PRODUCTS

### A. Electronic Damper Actuators

1. Electronic actuators, less than 600 in-lb. of rated torque, shall have ISO 9001 quality certification and be UL listed under standard 873, CSA C22.2 No. 24 and have CE certification.
2. Electronic actuators used on dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.
3. Actuators shall be fully modulating/proportional, pulse width, floating/tri-state, or two position as required and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices if required.
4. Optional auxiliary switches shall be available.
5. Actuators shall have an operating range of  $-22^{\circ}$  to  $122^{\circ}$ F.
6. Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a 500 W load resistor) operating range.
7. Actuators shall be capable of operating on 24, 120 or 230VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 10 VA for AC, including 120VAC actuators, and 8 watts per actuator for DC applications.
8. NEMA 2 rated actuators shall be provided with a three foot (minimum), pre-wired, electrical cable. Actuators requiring removal of the actuator cover for access to wiring terminals, exposing electronic, printed circuit boards to damage, are unacceptable.
9. Actuators shall have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. End switches to deactivate the actuator at the end of rotation or magnetic clutches are not acceptable.
10. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models > 60 in-lbs. will be capable of mounting on shafts up to 1.05" in diameter. Spring return actuators with more than 60 in-lb. of torque shall have a metal, manual override crank.
11. Actuators using "on-board" chemical storage systems, capacitors, or other "on-board" non-mechanical forms of fail-safe operation are unacceptable.
12. Upon loss of control signal, a proportional actuator shall fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator shall maintain the last position.
13. Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Valves and dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators.
14. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf," standard actuators ready for field wiring.
15. Damper and valve actuators will not produce more than 62 dB (A) when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB(A) with power on or in the running or driving mode.

16. Proportional actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable. Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload, mechanical travel and mechanical load limit. The actuators shall also provide actuator service data, at minimum, number of hours powered and number of hours in motion.
17. Proportional actuators shall be capable of digital communication, as built.

### B. Smoke and Combination Fire and Smoke Actuators

In Section 15820 or equivalent

1. All smoke and combination fire and smoke dampers shall be provided with Belimo Aircontrols FSLF (30 in-#), FSNF (70 in-#), or FSAF (133 in-#) actuators.
2. Equals shall be approved 10 days prior to submission of bid.
3. Actuator shall carry a manufacturer's 5-year warranty and be manufactured under ISO 9001 quality control.
4. Actuator shall have microprocessor or electronic based motor controller providing:
  - a. Electronic cut off at full open so that no noise can be generated while holding open. Holding noise level shall be inaudible.
  - b. Protection so that actuator shall be incapable of burning out if stalled before full rotation is reached.
5. Housing shall be steel and gears shall be permanently lubricated.
6. The actuators shall be direct coupled and employ a steel toothed cold-weld clamp for connecting to damper or jack shafts. Aluminum clamps or set-screw attachment are not acceptable.
7. Actuator shall have UL555S Listing by the damper manufacturer for 250°F.
8. FSLF shall be applied on dampers up to 6 sq. ft. Current draw shall be no more than .15A at 120V running, or .06A holding at 120V (5 VA and 3.5 VA respectively for 24V power). FSNF shall be applied on dampers up to 16 sq.ft. Current draw shall be no more than .23A at 120V running, or .1A holding at 120V (27 VA and 10 VA respectively for 24V power).
9. FSAF shall be applied on dampers up to 24 sq.ft. Current draw shall be no more than .1A at 120V running, or .05A holding at 120V (10 VA and 3 VA respectively for 24V power).
10. Dampers shall be installed straight and true, level in all planes, and square in all dimensions. Dampers shall move freely without undue stress due to twisting, racking, bowing, or other installation error.
11. Do not install in area where moisture can penetrate damper or actuator nor where actuator temperature exceeds  $120^{\circ}$ F.

Note: FSLF and FSNF are 350°F actuators, 15 seconds open and close. UBC and UL555S  
 FSAF is a 250F actuator, 75 seconds open, 20 seconds close. UL555S.

### C. Electronic Valve Actuators

1. Electronic actuators, less than 600 in-lb. of rated torque, shall have ISO 9001 quality certification and be cUL or UL listed under standard 873, CSA C22.2 No. 24 and have CE certification.
2. Electronic actuators used on valves shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad.
3. Actuators shall be fully modulating/proportional, floating/tri-state, or two position as required and be factory or field selectable.
4. Optional auxiliary switches shall be available.
5. Actuators shall have an operating range of  $-22^{\circ}$  to  $122^{\circ}$ F.
6. Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a load resistor) operating range.
7. Actuators shall be capable of operating on 24VAC, 120VAC or 230VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 10 VA for AC, including 120VAC actuators, and 8 watts per actuator for DC applications.

8. NEMA 2 rated actuators shall be provided with either a covered terminal strip, or a three, six, or ten foot pre-wired, electrical cable.
9. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return actuators with more than 60 in-lb. of torque shall have a metal, manual override crank.
10. Actuators using "on-board" chemical storage systems, capacitors, or other "on-board" non-mechanical forms of fail-safe operation are unacceptable.
11. Upon loss of control signal, a proportional actuator shall fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator shall maintain the last position.
12. Actuators utilizing brushless DC technology shall be capable of being mechanically and electrically paralleled to increase torque if required. Valves requiring greater torque or higher close off may be assembled with two low torque actuators.
13. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf," standard actuators ready for field wiring.
14. Valve actuators will not produce more than 62 dB (A) when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB(A) with power on or in the running or driving mode.
15. Proportional actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable. Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload, mechanical travel and mechanical load limit. The actuators shall also provide actuator service data, at minimum, number of hours powered and number of hours in motion.
16. Proportional actuators shall be capable of digital communication, as built.

## D. Industrial Actuators

### 1. Belimo SY Series Industrial Electric Actuators

- a. The valve actuator shall consist of a thermally protected capacitor-type reversible electric motor, a patented planetary worm combination drive, heater, limit switches and wiring termination blocks, all contained in a die cast aluminum enclosure. The drive system will provide continuous, smooth torque transmission throughout a 90 degree travel. Adjustable stops provide mechanical adjustment of end-of-travel. The transmission shall allow continuous duty operation of a manual override handwheel without the need to remove power, or de-clutch the manual system.
- b. Enclosure shall be designed to meet NEMA 4, 4X (weather-proof) requirements, or CSA approved for non-hazardous locations.
- c. The actuator shall employ ISO5211 mounting standards to provide for a wide range of international applications.
- d. The enclosure will have an industrial quality coating.
- e. Actuator shall have a motor rated for a minimum of 25% duty cycle in modulating applications.
- f. Actuator shall be suitable for operation in ambient temperature ranging from -4°F to +150°F [-20°C to +65°C].
- g. The motor shall be fractional horsepower; permanent split capacitor type designed to operate on 24 VAC, 110 VAC or 220 VAC, 1 pH, 50/60 Hz supply. A self resetting thermal switch shall be imbedded in the motor for overload protection.
- h. Internal terminal blocks shall be clearly marked for field wiring. A wiring diagram shall be permanently attached to the OUTSIDE of the actuator housing.
- i. Actuator will have a suitable sized NPT entry for external connections.

- j. Gears shall be hardened alloy steel, permanently lubricated. The worm drive system negates the need for a brake.
- k. Two adjustable cam actuated end travel limit switches shall be provided to control electrical movement of the actuator.
- l. 2 SPDT auxiliary switches, rated 10A at 250 VAC shall be included. The switches are factory pre-set at 3 degrees and 87 degrees rotation, and may be field adjusted.
- m. Actuator shall be equipped with a hand wheel or shaft for manual override to permit operation of the actuator in the event of electrical power failure or system malfunction. Hand wheel, where applicable, must be permanently attached to the actuator. (SY2 and larger)
- n. The handwheel override shall be continuously operational regardless of the powered state of the actuator, without the need to remove electrical power if present during the override phase. (SY2 and larger)
- o. The hand wheel will not rotate while the actuator is electrically driven.
- p. The actuator shall provide a visual indicator beacon on the top of the housing for position status of the actuator and attached devices.
- q. Actuator shall have an internal heater and thermostat to minimize the build-up of moisture inside the sealed enclosure.
- r. Modulating units shall operate under 2-10 VDC, 4-20mA, and 1-5 VDC control modes. The default shall be 2-10 VDC control.

## E. Electronic Control Valves

### 1. General

- a. The manufacturer shall be capable of providing individual valve identification tagging on each printed valve label. Valve tag identification shall be documented on the approved, submitted valve schedule.
- b. Valves shall be designed and provided with the proper actuators to provide the rated valve close-off.

### 2. Pressure Independent Characterized Control Valves

- a. Control valves shall be pressure independent. Balancing valves and associated balancing shall not be required on devices where pressure independent control valves are installed. Balancing valves and balancing are required if self-contained pressure independent control valves are not installed.
- b. The absolute flow accuracy through the valve shall be +/- 5 % due to system pressure fluctuations across the valve in the selected operating range, and +/- 5% variation due to manufacturing tolerances.
- c. The control valves shall be available with floating or proportional actuators. The actuator shall be directly coupled to the valve at the factory. Proportional actuators shall be Multi Function Technology as manufactured by Belimo. Multi-turn actuators are not acceptable.
- d. The valve shall have an equal percentage characteristic and shall accurately control the flow from 0 to 100% full rated flow.
- e. A minimum of 5 PSI shall be required to operate the valve pressure independently.
- f. Valves shall require no maintenance and shall not include replaceable cartridges.
- g. Exact flow setting shall be achieved by a mechanical device inserted between the valve and actuator.
- h. Valves shall be available with optional pressure/temperature ports to allow flow verification.
- j. Control valves shall be by Belimo.

### 3. Characterized Control Valves™

- a. Control valves shall be of the Characterized Control Valve™ type provided by Belimo.
- b. Characterized Control Valves™ shall be used for all water applications requiring equal percentage characteristics.
- c. A TEFZEL, flow-characterizing disc shall be installed in the inlet of Two-way characterized control valves and in the control port of Three-way valves. The valve trim shall utilize a stainless steel ball and stem for all water or glycol solutions up to 60%. For water applications, an optional chrome plated brass ball and brass stem may be used for sizes 3/4" and smaller.
- d. Valve bodies shall be nickel-plated, forged brass with female NPT threads. Bodies to 1-1/4" shall be rated at 600 psi and sizes 1-1/2" to 3" at 400 psi.
- e. Characterized Control Valves™ shall have a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglass reinforced Teflon seats shall be used.
- f. The valves shall have a four bolt mounting flange to provide a 4 position, field changeable, electronic actuator mounting arrangement.
- g. A non-metallic coupling, constructed of high temperature, continual use material shall provide a direct, mechanical connection between the valve body and actuator. The coupling shall be designed to provide thermal isolation and eliminate lateral and rotational stem forces. Vent hole shall be provided to reduce condensation build-up.

### 4. Globe Valves

- a. Globe valves, as specified, shall be by Belimo.
- b. Two-way and Three-way globe valves may be used only if characterized control valves do not fit the sizing criteria or application.
- c. Globe valves may be used for chilled or hot water, steam, or glycol solutions to 60%. Screwed and flanged water valves shall have equal percentage or linear flow characteristics for Two-way or Three-way valves, respectively. All stems shall be stainless steel.
- d. Screwed globe valves 1/2" through 2" shall have bronze bodies rated at ANSI Class 250. For water up to 35 psi or steam up to 15 psi, trim shall include a brass plug, a spring-loaded TFE packing, and a bronze seat. The maximum differential shall be 35 psi for water and 15 psi for steam.
- e. Two-way and Three-way flanged globe valves 2-1/2" to 6" shall have cast iron bodies rated for ANSI Class 125 or ANSI 250. The maximum differential shall be 25 psi for water and 10 psi for steam. Trim shall include stainless steel stems, bronze plugs, bronze seats, and a TFE V-ring packing.
- f. For steam inlet pressures higher than those stated above, furnish globe valves with stainless steel trim specifically rated for the application.

### 5. Direct Coupled Globe Valve Actuator and Adaptor Bracket

- a. Actuator shall be designed with an integrated adaptor bracket that will direct mount to the valve.
- b. Actuator shall provide a linear force capable of fulfilling the required close-off of the valve.
- c. Actuator shall include an automatic valve coupling device that shall lock securely to the valve stem.
- d. Proportional and spring return actuators shall adapt upon powering the actuator. This adaptation will determine stroke length and enable the actuator to set the minimum and maximum limits of the supplied control signal, thereby utilizing the entire control signal range. Feedback, running time and other parameters are automatically adjusted to the effective stroke.
- e. Actuator shall have a manual override equipped with an interlocking device to protect the actuator from over-torque of the manual override.

### 6. Butterfly Valves

- a. Butterfly valves, as specified, shall be by Belimo.
- b. Butterfly valves 2" to 12" shall have a fully lugged, drilled and tapped, cast iron body, rated to 200 psi body pressure, with 14" and larger valves having a body pressure rating of 150 psi. Flanges shall meet ANSI 125/150 standards. The one-piece body shall feature an extended neck allowing sufficient clearance for flanges and 2" of piping insulation. The disc shall be 304 stainless steel and provide bi-directional bubble-tight close off in either direction for chilled or hot water or 50% glycol applications. The disc shall be polished and contoured to minimize torque and wear. Shaft shall be mechanically retained in valve body using split-thrust washer and internal retaining-ring design for ease of service. The valve body shall employ ISO5211 actuator mounting and shaft connection standards.
- c. The disc shall have full 360-degree concentric seating. Valves up through 12" shall utilize an internal spline for the disc-to-stem connection. External mechanical methods to achieve this mechanical connection, such as pins or screws, shall not be employed. Valves 14" and larger will utilize a dual-pin method to prevent the heavy disc from settling onto the liner, causing distortion. A phenolic backed, non-collapsing, EPDM seat shall be field replaceable and shall create a positive seal between flange face and valve body. No gaskets shall be required between the valve and flange faces. The shaft shall be supported at four locations by RPTFE bushings.
- d. The flow characteristic shall be modified equal percentage for Two-way valves and linear for Three-way valves. Valves 2" through 12" shall be rated for standard HVAC service of up to 50 psi close-off, or for heavy commercial service of up to 200 psi close-off. Valves 14" and larger shall be rated for up to 150 psi close-off.
- e. A permanent metal tag shall designate manufacturer, series number and materials of construction.
- f. Butterfly valves may be used in all two-position applications and modulating applications larger than 2", or where the close off rating of other valve styles does not meet the design requirements.
- g. Butterfly valves shall be sized primarily by using velocity calculations to prevent fluid velocities from exceeding 12 feet per second. For modulating applications, CV factors at sixty (60) degrees shall be used for determining delta P once size has been determined by the velocity calculations.
- h. High torque industrial valve actuators, >300 in-lb. of rated torque, may be used where low torque actuators are not suitable. High torque actuators shall be as manufactured or provided by Belimo.

### 7. Zone Valves

- a. Zone valves, as specified, shall be by Belimo.
- b. Zone valves shall be used in terminal unit water applications requiring a Two-way or Three-way diverting valve in sizes 1" and smaller.
- c. Zone valves shall have brass bodies with female NPT or sweat ends and a stainless steel stem.
- d. Zone valve actuators shall be on/off and shall be available in 24VAC or 120VAC.
- e. Zone valve actuators shall have a minimum of 20 psi close-off rating.
- f. Zone valves shall have push button for quick removal of actuator.
- g. Zone valves shall have a leakage rate of 0.1% or lower.

## I. General

Until otherwise arranged, in writing, the following conditions are valid. The Seller as referred to in the terms of sale is Belimo Aircontrols (USA) Inc. or Belimo Aircontrols (CAN) Inc.

## II. Price

1. Our prices are net, FOB Point of Origin in US currency for sales made by Belimo Aircontrols (USA), Inc. and CAN currency for sales made by Belimo Aircontrols (CAN) Inc.
2. Freight and packaging (wooden crates, pallets etc) will be charged at cost for each shipment.
3. Orders with a net value of less than US\$300 (CAN\$450) will be subject to a US\$20 (CAN\$35) handling fee.
4. No handling fee will be applied to orders placed through the Belimo Internet ordering system (www.belimo.com).
5. We reserve the right to make partial deliveries, which can be invoiced separately.
6. Wiring diagrams, installation, and commissioning are not included in our prices.

## III. Payment

1. Invoices are payable in US currency for sales made by Belimo Aircontrols (USA), Inc. and in CAN currency for sales made by Belimo Aircontrols (CAN) Inc. within 30 days from the date of invoice without any deductions.
2. Accounts with balances exceeding 60 days will be subject to an interest charge of 2% per month.
3. Accounts with balances exceeding 45 days will be subject to restricted shipments or COD status.

## IV. Title and Risk

Title in and property to the goods shall not pass to the Buyer until the Seller has received payment in full.

## V. Damage or loss in Transit

Seller assumes no liability for damage or loss of shipment. All shipments should be unpacked and examined immediately upon receipt. Any external evidence or loss or damage must be noted on the freight bill or carrier's receipt and signed by the carrier's agent at the time of delivery. Failure to do so will result in the carrier's refusal to honor the claim. Buyer then should notify Seller with copy of freight bill or damage report so that Seller then can file claim for loss or damage in transit with the carrier. If damage does not become apparent until shipment is unpacked, customer must make a request for inspection by the carrier's agent and file with the carrier within 15 days after receipt of product and notify Seller. Seller is not liable for consequential damages resulting from the installation of damaged product.

## VI. Delivery

Belimo undertakes to make every attempt to adhere to its delivery promise(s), but does not accept cancellation of contract or liability for any direct or indirect losses which may arise, for any reason whatsoever, due to our failure to adhere to such promise(s).

## VII. Return of Goods

1. Goods received by the Buyer cannot be returned unless previously agreed upon with Seller. Buyer must acquire Return Material Authorization (RMA) number from Belimo

prior to return of the goods. At this time Buyer will also receive instructions where product is to be returned to. Only products returned to proper location with RMA number will be considered for credit.

2. Only goods in original packaging can be accepted. Goods returned must be in condition for resale as new equipment to qualify for credit. A minimum restocking charge of 10% for actuators and 15% for valve products and valve assemblies of the invoice value will be applied. Return material must be shipped prepaid.
3. Returns resulting from errors by the Seller will not be subject to restocking charges.

## VIII. Warranty

### VIII.A 5-year warranty

1. The 5-year warranty applies to products listed in our literature as having a five-year warranty if shipped after May 1, 2000 and if the product was shipped to locations within the USA and Canada.
2. The warranty is unconditional for the first two years from the date of production. For the following three years, a conditional warranty applies. Under this conditional warranty, the consequences of ordinary wear and tear, damage due to negligence or improper use, or other causes beyond our control are excluded from warranty coverage. Product specific terms of warranty with regard to warranty period or conditions of warranty may apply to certain specified products as stated in the documentation for those products.

### VIII.B 2-year conditional warranty

1. Warranty for products listed in our literature as a 2-year warranty and shipped after March 1, 2005 for products shipped to locations within the USA and Canada.
2. The warranty is conditional for two years from the date of production.
3. Under this conditional warranty, the consequences of ordinary wear and tear, damage due to negligence or improper use, or other causes beyond our control are excluded from warranty coverage. Product specific terms of warranty with regard to warranty period or conditions of warranty may apply to certain specified products as stated in the documentation for those products.

### VIII.C General Warranty Terms

1. The warranty shall be null and void should the Buyer or any other persons modify or repair any part of our equipment
2. Buyer must acquire a Return Material Authorization (RMA) number from Seller required in all cases to complete the warranty process. Ask our Customer Service department for detailed information.
3. Repaired, replaced or exchanged product will be warranted for the repair warranty period (6 months) in effect as of the date the repaired, exchanged or replaced product is shipped by Belimo, or the remainder of the original warranty, whichever is longer.
4. Products found to be defective for which warranty is applicable will be replaced or repaired at Seller's discretion. Seller is not responsible for charges resulting from the removal and/or replacement of product.
5. Before removing a product from the installation we suggest to contact an AUTHORIZED Belimo technical support technician by calling Belimo customer service at the locations listed on the back page of the Product Guide and Price List.



6. The Belimo specialist will work with the field technician to troubleshoot the problem. (Many problems are site-related and can be solved over the phone.)
7. If deemed necessary, an RMA# will be issued for return of the product by the support technician.
8. Carefully package the product for shipping, and clearly mark the RMA# on the outside of the package. Without the RMA# clearly marked, the package may be refused at the receiving point.
9. Product returned without proper RMA# documentation will void the warranty process.
10. Ship the product to the designated service facility as directed by the Belimo Customer Service.
11. Advanced warranty products can be obtained from the Belimo technical staff after the troubleshooting process has been completed. In order to obtain advanced warranty product, you will be required to issue a purchase order for the replacement product, which will be credited upon the receipt and verification of the defective product under the RMA number. Additional charges may apply if the nature of the problem has been misrepresented.
12. Warranty products are shipped from Belimo service centers via GROUND shipment. Other shipping methods are available at the expense of the recipient.
13. The conditional and unconditional warranty covers the product only, and does NOT cover labor associated with troubleshooting, removal or replacement of such product, unless, after troubleshooting the product it is deemed to be a factory defect. In these cases, labor costs associated with the process can be negotiated BEFORE the work is done. This is a process that consists of the Belimo Quality Control Manager, the Product Manager, and the Belimo Service Technician, who review the data associated with the incident before negotiating with the contractor of record.
14. NEW products ordered in an attempt to circumvent the warranty process may NOT be reimbursed if, upon receipt of a returned product, it is determined that the product defect is actually field related, or product has been returned for cosmetic reasons only.
15. Advanced Warranty for Butterfly Valves products may or may not be "new", but have been thoroughly checked by the factory for electrical and mechanical operation, and carry the full warranty through to the end of the original product warranty period.

#### **IX. No warranty for non-HVAC application**

The Seller does not grant any warranty for the use of BELIMO products in fields which are not standard HVAC applications; in particular, BELIMO does not grant any warranty for the use of BELIMO products in aircraft, industrial processes, etc. Buyers will be fully responsible for any resulting damage in this case.

#### **X. Liability disclaimer**

The liability of the Seller is defined conclusively in section 10. Any other buyer claims towards the Seller, irrespective upon which legal basis these are made, especially those concerning price reduction or cancellation, are excluded and expressly dismissed.

Buyers do not have any rights to claim for damage, which does not occur on BELIMO products. In particular, the Seller does not accept any liability for costs incurred for determination of the causes of damage, for expert opinions or indirect or resulting damage (including damage resulting from faults) of any kind, such as loss of use, downtimes, loss of profit or returns etc.

The Seller does not accept any liability for damage resulting from or contributed by the buyer or third parties acting within the scope of responsibility of the buyer when

1. BELIMO products are used for non HVAC applications, especially in aircrafts, industrial processes, etc.;
2. BELIMO products are used without compliance with applicable legal or institutional regulations or the BELIMO data and installation sheets;
3. BELIMO products are used by personnel who have not received suitable instruction;
4. BELIMO products are modified or repaired without the written approval of BELIMO.

When requested to do so, the buyer shall immediately release BELIMO in full from any possible third party claims resulting in connection with the circumstances listed above. This also applies to claims in connection with product liability.

#### **XI. Force majeure**

Neither the Seller nor the buyer accept liability for damage of any kind if obstacles occur which they are unable to prevent in spite of all due care, irrespective of whether these occur at the site of the Seller, the buyer or a third party. Such obstacles are, for example, epidemics, mobilization, war, uprisings, serious operational problems, accidents, labor disputes, delayed or faulty delivery of the required raw materials, semi-finished or finished goods, off-spec rejection of important work pieces, institutional measures or injunctions, natural hazards or any other circumstances which are, to a large extent, not within the scope of control of the Seller or the buyer. However, payment may not be retained or delayed for product(s) delivered to Buyer with reference to such circumstances. In such cases, both parties shall undertake all effective measures, which can be expected of them to prevent damage, or if damage occurs, to minimize the scope of this damage as far as possible.

#### **XII. Non-Stock and Non-Catalog Items**

Products not listed in the current price list or catalogs are considered to be special order items and subject to minimum order quantities, special handling charges, and/or other conditions stipulated to us by suppliers. Such items normally are subject to longer delivery times. Special order items may carry cancellation charges once an order is placed and may also be subject to a restricted return policy.

#### **XIII. Proper Law and Jurisdiction**

For sales made by Belimo Aircontrols (USA) Inc., this contract is and shall be deemed to have been made in the United States, and shall in all respects, be governed by U.S. laws or the laws of the State of manufacture. For sales made by Belimo Aircontrols (CAN) Inc., this contract is and shall be deemed to have been made in Canada, and shall in all respects, be governed by Canadian laws or the laws of the Province from which they were sold.



**USA****Aireco Supply**

9120 Washington Blvd.  
Savage, MD 20763-0414  
Phone: 301-953-8800

**With branch in MD, VA**

**Amcon Controls, Inc.**

11906 Warfield  
San Antonio, TX 78216  
Phone: 210-349-6161

**Applied Automation**

3186 South Washington Street, #230  
Salt Lake City, UT 84115  
Phone: 801-486-6454

**Boston Aircontrols, Inc.**

8 Blanchard Road  
Burlington, MA 01803  
Phone: 781-272-5800

**Charles D. Jones Co.**

445 Bryant Street, Unit #1  
Denver, CO 80204-4800  
Phone: 800-777-0910

**With branches in CO, MO**

**Climatic Control Co., Inc.**

5061 W. State Street  
Milwaukee, WI 53208  
Phone: 800-242-1656

**With branches in WI**

**Cochrane Supply and Engineering, Inc.**

30303 Stephenson Highway  
Madison Heights, MI 48071-1633  
Phone: 800-482-4894

**With branches in MI**

**Columbus Temperature Control**

1053 E. 5th Ave.  
Columbus, OH 43201  
Phone: 800-364-9600

**Control Consultants & Supply Co.**

2330 Hampton Avenue  
St. Louis, MO 63139-2909  
Phone: 314-647-6680

**With branch in TN**

**Controlco**

5600 Imhoff Drive, Ste. G  
Concord, CA 94520  
Phone: 925-602-7728

**With branches in CA**

**Edward C. Smyers & Co.**

223 Fort Pitt Blvd.  
Pittsburgh, PA 15222-1505  
Phone: 412-471-3222

**G & O Thermal Supply**

5435 N. Northwest Highway  
Chicago, IL 60630  
Phone: 773-763-1300

**With branches in IL, WI**

**Hoffman – Hoffman, Inc.**

3816 Patterson Street  
Greensboro, NC 27407  
Phone: 336-292-8777

**Industrial Controls Distributors LLC**

1776 Bloomsbury Avenue  
Wanamassa, NJ 07712  
Phone: 800-631-2112

**With branches in NY, PA**

**Interstate Electric Equipment**

30 Vineland St.  
Brighton, MA 02135  
Phone: 617-782-9000

**Jackson Controls**

1708 E. 10th Street  
Indianapolis, IN 46201  
Phone: 317-231-2200

**M & M Controls**

9E West Aylesbury Road  
Timonium, MD 21093  
Phone: 410-252-1221

**MICONTROLS, Inc.**

6516 5th Place South  
Seattle, WA 98124  
Phone: 800-877-8026

**With branches in WA, OR**

**Minvalco, Inc.**

3340 Gorham Avenue  
Minneapolis, MN 55426-4267  
Phone: 952-920-0131

**RSD/Total Control**

26021 Atlantic Ocean Dr.  
Lake Forest, CA 92630  
Phone: 949-380-7878

**With branches in CA, NV, OR, AK,  
AZ, ID, UT, WA**

**South Side Control Supply, Co.**

488 N. Milwaukee Avenue  
Chicago, IL 60610-3923  
Phone: 312-226-4900

**With branches in IL, IN**

**Stromquist and Company**

4620 Atlanta Rd.  
Smyrna, GA 30080  
Phone: 404-794-3440

**With branch in FL**

**Temperature Control Systems**

10315 Brockwood Road  
Dallas, TX 75238  
Phone: 214-343-1444

**With branches in TX - Temperature  
Controls-Dallas, Climate Control Systems,  
Austin Controls and OK - Tulsa Controls**

**Tower Equipment Co., Inc.**

1320 West Broad Street  
Stratford, CT 06615  
Phone: 800-346-4647

**Twinco Supply Corporation**

55 Craven Street  
Huntington Station, NY 11746-2143  
Phone: 800-794-3188

**With branches in NY**

**CANADA****Airex**

C - 5 Sandhill Crt.  
Brampton, ON, L6T 5J5  
Phone: 905-908-8667

**Baymar Supply Co.**

3200 Jefferson Blvd.  
Windsor, ON N8T 2W8  
Phone: 519-974-5800

**Controls Depot**

#105 2150 Thurston Drive  
Ottawa, ON K1G 5T9  
Phone: 613-248-1212

**With branches in Scarborough, ON**

**Cypress Sales**

2615 Wentz Ave.  
Saskatoon, SK, S7K 5J1  
Phone: 306-242-3333

**With branches in Regina**

**O'Dell Associates Inc.**

#3 - 1038 Cooke Blvd.  
Burlington, ON L7T 4A8  
Phone: 905-681-3901

**Prokontrol**

1989 Michelin  
Laval, QC, H7L 5B7  
Phone: 450-973-7765

**With branches in Ville Vanier and Ontario**

**Refrigerative Supply**

3958 Myrtle Street, Burnaby, BC, V5C 4G2  
Phone: 604-435-7151

**With branches in British Columbia,  
Alberta, Saskatchewan, Manitoba**

**Regal Controls**

1156 Kingsway  
Vancouver, BC, V5V 3C8  
Phone: 604-879-6357

**With branch in Langley**

**Regulvar Laval**

1985 Boul Industriel Laval Q.C  
H7S-1P6  
Phone: 450-629-0435

**With branches in Hull, Sherbrooke,  
St. Hubert, Lachine, Quebec City**

**Regulvar Ottawa Inc.**

170 Laurier Ax West Suite 714  
Ottawa, Ontario, K1P-5V6  
Phone: 613-565-2129

**Sinclair Supply**

10914 - 120 Street  
Edmonton, AB, T5H 3P7  
Phone: 780-452-3110

**With branches in British Columbia,  
Alberta, Saskatchewan**

**Southern Supplies**

323 Bloor St. W  
Oshawa, ON, L1J 6X4  
Phone: 905-728-6216

**With branch in Belleville**

**SCI**

3311 Boul Industriel  
Laval, QC, H7L 4S3  
Phone: 450-668-8866

**Wiles & Legault**

#5 - 505 Industriel Avenue  
Ottawa, ON, K1G 0Z1  
Phone: 613-747-1867

**Yorkland Controls**

2689 Steeles Avenue, W.  
Downsview, ON, M3J 2Z8  
Phone: 416-661-3306

**With branch in Mississauga**

**For Latin American distributors  
please call 954-456-8077**

## Together to the Top

### Belimo Aircontrols (USA), Inc. / 1-800-543-9038

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43 Old Ridgebury Road  
Danbury, CT 06810  
Toll Free: (800) 543-9038  
(203) 791-9915  
Fax: (800) 228-8283  
(800-ACTUATE)  
(203) 791-9919

1675 East Prater Way  
Suite 101  
Sparks, NV 89434  
Toll Free: (800) 987-9042  
(775) 857-4243  
Fax: (775) 857-4255  
(800) 987-8875

3151 E. Thomas Street  
Inverness, FL 34453  
Toll Free: (888) 829-3166  
(352) 637-9280  
Fax: (352) 637-9634  
(888) 829-3412

651 South Roselle Road  
Schaumburg, IL 60193  
Toll Free: (877) 833-1647  
(847) 352-0528  
Fax: (847) 352-1442  
(877) 833-1663

### Belimo Aircontrols (CAN), Inc.

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14/16 – 5716 Coopers Ave.  
Mississauga, Ontario  
L4Z 2E8  
Toll Free: (866) 805-7089  
(905) 712-3118  
Fax: (905) 712-3124

Belimo Servomoteur, Inc.  
2790 Chemin du Lac  
Longueuil, Québec  
J4N 1B8  
Toll Free: (866) 928-1440  
(450) 928-1440  
Fax: (450) 928-0050

### Belimo in Latin America

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1250 E. Hallandale Beach Blvd.  
Suite 802  
Hallandale Beach, FL 33009  
(954) 456-8077  
Fax: (954) 456-8092

[www.belimo.com](http://www.belimo.com)

### Belimo Worldwide

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*Belimo Aircontrols serves customers throughout the United States, Canada, and Latin America.*

*It is part of Belimo Holding, a publicly held company in Switzerland with business units in the Americas, Europe, and Asia Pacific.*