2-Way Valve Flow Rate for Water Applications (Gallons Per Minute, GPM)

C_v Maximum Rating	Inches	DN mm	2-Way CCV	Pressure Drop Across the Valve									
				1 psi	2 psi	3 psi	4 psi	5 psi	6 psi	7 psi	8 psi	9 psi	10 psi
0.3	½"	15	B207(B)	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9
0.46	½"	15	B208(B)	0.5	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
0.8	½"	15	B209(B)	0.8	1.1	1.4	1.6	1.8	2.0	2.1	2.3	2.4	2.5
1.2	½"	15	B210(B)	1.2	1.7	2.1	2.4	2.8	2.9	3.2	3.4	3.6	3.8
1.9	½"	15	B211(B)	1.9	2.7	3.3	3.8	4.2	4.7	5.0	5.4	5.7	6.0
3	½"	15	B212(B)	3.0	4.2	5.2	6.0	6.8	7.3	7.9	8.5	9.0	9.5
4.7	½"	15	B213(B)	4.7	6.6	8.1	9.4	11	12	12	13	14	15
7.4	½"	15	B214(B)	7.4	10	13	15	17	18	20	21	22	23
10	½"	15	B215(B)*	10	14	17	20	22	24	26	28	30	32
4.7	¾"	20	B217(B)	4.7	6.6	8.1	9.4	11	12	12	13	14	15
7.4	¾"	20	B218(B)	7.4	10	13	15	17	18	20	21	22	23
10	¾"	20	B219(B)	10	14	17	20	22	24	26	28	30	32
24	¾"	20	B220(B)*	24	34	42	48	54	59	63	68	72	76
7.4	1"	25	B222	7.4	10	13	15	17	18	20	21	22	23
10	1"	25	B223	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*	30	42	52	60	67	73	79	85	90	95
10	1¼"	32	B229	10	14	17	20	22	24	26	28	30	32
19	1¼"	32	B230*	19	27	33	38	42	47	50	54	57	60
25	1¼"	32	B231	25	35	43	50	56	61	66	71	75	79
37	1¼"	32	B232*	37	52	64	74	83	91	98	105	111	117
19	1½""	40	B238	19	27	33	38	42	47	50	54	57	60
29	1½"	40	B239	29	41	50	58	65	71	77	82	87	92
37	1½"	40	B240*	37	52	64	74	83	91	98	105	111	117
29	2"	50	B248	29	41	50	58	65	71	77	82	87	92
46	2"	50	B249	46	65	80	92	103	113	122	130	138	145
57	2"	50	B250*	57	81	99	114	127	140	151	161	171	180
65	2"	50	B251	65	92	113	130	145	159	170	194	195	206
85	2"	50	B252	85	120	147	170	190	208	225	240	255	269
120	2"	50	B253	120	170	208	240	268	294	318	339	360	380
240	2"	50	B254*	240	339	416	480	537	588	635	679	720	759
60	2½"	65	B261	60	85	104	120	134	147	159	170	180	190
75	2½"	65	B262	75	106	130	150	168	194	198	212	225	237
110	2½"	65	B263	110	156	191	220	246	269	291	311	330	348
150	2½"	65	B264	150	212	260	300	335	367	397	424	450	474
210	2½"	65	B265*	210	297	364	420	470	514	556	594	630	664
70	3"	80	B277	70	99	121	140	157	172	185	198	210	221
130	3"	80	B278	130	194	225	260	290	318	344	368	390	411
170	3"	80	B280*	170	240	294	340	380	416	450	481	510	538
60	2½"	65	B661	60	85	104	120	134	147	159	170	180	190
75	2½"	65	B662	75	106	130	150	168	194	198	212	225	237
110	2½"	65	B663	110	156	191	220	246	269	291	311	330	348
150	2½"	65	B664	150	212	260	300	335	367	397	424	450	474
210	2½"	65	B665*	210	297	364	420	470	514	556	594	630	664
70	3"	80	B677	70	99	121	140	157	172	185	198	210	221
130	3"	80	B678	130	194	225	260	290	318	344	368	390	411
170	3"	80	B680*	170	240	294	340	380	416	450	481	510	538

$GPM = C_v \times \sqrt{\Delta p}$ * = Models with no characterizing disc.
The influence of the pipe geometry due to reduced flow is negligible for all valves 57 C_v and below with characterizing discs.

BELIMO

3-Way Valve Flow Rate for Water Applications (Gallons Per Minute, GPM)

C_v Maximum Rating	Inches	DN mm	3-Way CCV	Pressure Drop Across the Valve									
				1 psi	2 psi	3 psi	4 psi	5 psi	6 psi	7 psi	8 psi	9 psi	10 psi
0.3	½"	15	B307(B)	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.9
0.46	½"	15	B308(B)	0.5	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
0.8	½"	15	B309(B)	0.8	1.1	1.4	1.6	1.8	2.0	2.1	2.3	2.4	2.5
1.2	½"	15	B310(B)	1.2	1.7	2.1	2.4	2.8	2.9	3.2	3.4	3.6	3.8
1.9	½"	15	B311(B)	1.9	2.7	3.3	3.8	4.2	4.7	5.0	5.4	5.7	6.0
3	½"	15	B312(B)	3.0	4.2	5.2	6.0	6.8	7.3	7.9	8.5	9.0	9.5
4.7	½"	15	B313(B)	4.7	6.6	8.1	9.4	11	12	12	13	14	15
10	½"	15	B315(B)*	10	14	17	20	22	24	26	28	30	32
4.7	¾"	20	B317(B)	4.7	6.6	8.1	9.4	11	12	12	13	14	15
7.4	¾"	20	B318(B)	7.4	10	13	15	17	18	20	21	22	23
24	¾"	20	B320(B)*	24	34	42	48	54	59	63	68	72	76
7.4	1"	25	B322	7.4	10	13	15	17	18	20	21	22	23
10	1"	25	B323	10	14	17	20	22	24	26	28	30	32
30	1"	25	B325*	30	42	52	60	67	73	79	85	90	95
10	1¼"	32	B329	10	14	17	20	22	25	27	28	30	32
19	1¼"	32	B330	19	27	33	38	43	47	50	54	57	60
25	1¼"	32	B331	25	35	43	50	56	61	66	71	75	79
19	1½"	40	B338	19	27	33	38	43	47	50	54	57	60
29	1½"	40	B339	29	41	50	58	65	71	77	82	87	92
37	1½"	40	B340	37	52	64	74	83	91	98	105	111	117
46	1½"	40	B341	46	65	80	92	103	113	122	130	138	146
29	2"	50	B347	29	41	50	58	65	71	77	82	87	92
37	2"	50	B348	37	52	64	74	83	91	98	105	111	117
46	2"	50	B349	46	65	80	92	103	113	122	130	138	146
57	2"	50	B350	57	81	99	114	128	140	151	161	171	180
68	2"	50	B351	68	96	118	136	152	167	180	192	204	215
83	2"	50	B352	83	117	144	166	186	204	220	235	249	263

$GPM = C_v \times \sqrt{\Delta p}$ * = Models with no characterizing disc.
The influence of the pipe geometry due to reduced flow is negligible for all valves 83 C_v and below with characterizing discs.

SET-UP

		2-WAY VALVE		3-WAY VALVE	
		SPECIFY UPON ORDERING		SPECIFY UPON ORDERING	
NON-SPRING RETURN Stays in Last Position	**TR24-3-T US** **TR24-3 US** **On/Off or** Floating Point Actuators	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 **TR24-SR US** Proportional Type Actuators	**NC:** Closed A to AB, will open as voltage increases.	**NO:** Open A to AB, will close as voltage increases. (Can be chosen with switch inside terminal block of actuator.)	**NC:** Closed A to AB, will open as voltage increases.	**NO:** Open A to AB, will close as voltage increases. (Can be chosen with switch inside terminal block of actuator.)
	LRB24 (-3), MFT, SR **LRX24 (-3), MFT, SR** **ARB24 (-3), MFT, SR** **ARX24 (-3), MFT, SR** Floating Point or Proportional Type Actuators	Power to pin 2 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "1" position, to reverse select the "0" position.	**NO:** Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch.)	Power to pin 2 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "1" position, to reverse select the "0" position.	**NO:** Open A to AB, will close as voltage increases or power applied. (Can be chosen with CW/CCW switch.)
SPRING RETURN Note Fail Position	**TFX24 US** **LF24 US** **AF24 US**	**NO/FO** Valve: Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss.	**NC/FC** Valve: Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.	**NO/FO** Valve: Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss.	**NC/FC** Valve: Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.
	TF (-3), MFT, SR **LF (-3), MFT, SR** **AF (-3), MFT, SR** Floating Point or Proportional Type Actuators	**NC/FO** Valve: Closed A to AB will drive open. Spring Action: Will spring open A to AB upon power loss.	**NC/FC** or **NO/FC** Valve: Closed A to AB or Open A to AB. (Can be chosen with CW/CCW switch.) Spring Action: Will spring closed A to AB upon power loss. **NO/FO** Valve: Open A to AB Spring Action: Will spring open A to AB upon power loss. (**NO** action can be chosen with CW/CCW switch.)	**NC/FO** Valve: Closed A to AB will drive open Spring Action: Will spring open A to AB upon power loss.	**NC/FC** or **NO/FC** Valve: Closed A to AB or Open A to AB. (Can be chosen with CW/CCW switch.) Spring Action: Will spring closed A to AB upon power loss. **NO/FO** Valve: Open A to AB Spring Action: Will spring open A to AB upon power loss. (**NO** action can be chosen with CW/CCW switch.)

GENERAL WIRING INSTRUCTIONS

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

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

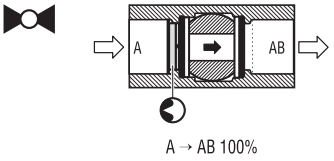
Transformer(s)
Belimo actuators require a 24 VAC class 2 transformer and draws a maximum of 10 VA per actuator. The actuator enclosure cannot be opened in the field, there are no parts or components to be replaced or repaired.

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

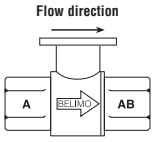
CAUTION It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these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

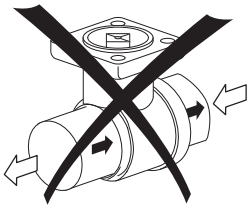
FLOW PATTERNS

2-way Characterized Control Valves™ **(Belimo B2 Series)**
(Belimo B6 Series)



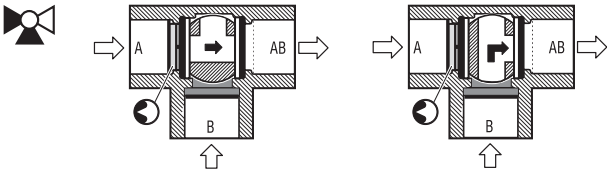
Two-way valves should be installed with the disc upstream.





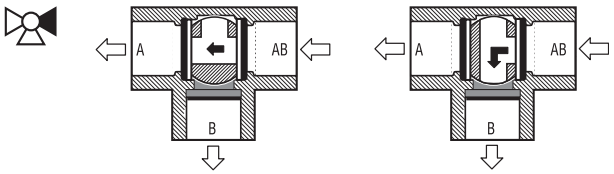
3-way Characterized Control Valves™ **(Belimo B3 Series)**

MIXING



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

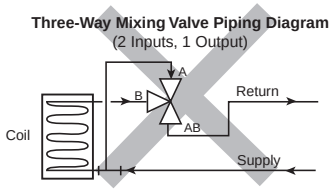
DIVERTING



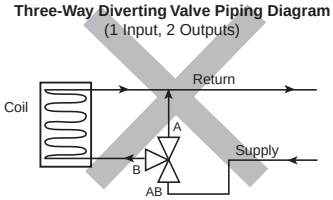
INCORRECT PIPING

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

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



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



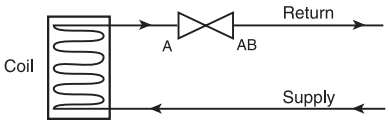
WARNING! Do Not Pipe in this manner!
Note Valve Porting!
The A-port must be piped to the coil! Not the B-port!

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.

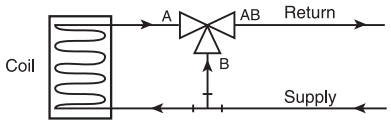
OPERATION/INSTALLATION – CORRECT PIPING

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.

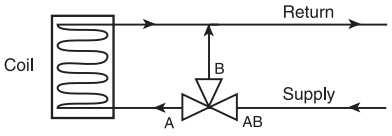
2-way Valve Piping Diagram
(1 Input, 1 Output)



3-way Mixing Valve Piping Diagram
(2 Inputs, 1 Output)



3-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.

REDUCED B-PORT FLOW

Note: The B-port flow of the 3-way CCV is lower than that of the A-port. In most applications this is beneficial since the reduced flow compensates for the inexistent pressure drop across the coil in the bypass mode. Therefore, proper sizing is important to avoid flow noise in particular when the system is designed with constant speed pumps. Please refer to our valve sizing and selection guidelines.

The flow velocity in the pipe upstream and downstream of the valve should be considered as well. The typical HVAC design maximum flow is 4 to 8 ft/s to avoid noise issues.

Also, the pipe reduction factor must be considered and can be found on pages 3 and 4. Pipe reducers decrease the C_V value of a valve and consequently increase the pressure drop across the valve, a situation that could lead to noise or a lower than designed flow.