



V BALL CONTROL VALVES

High Performance for Aggressive Applications

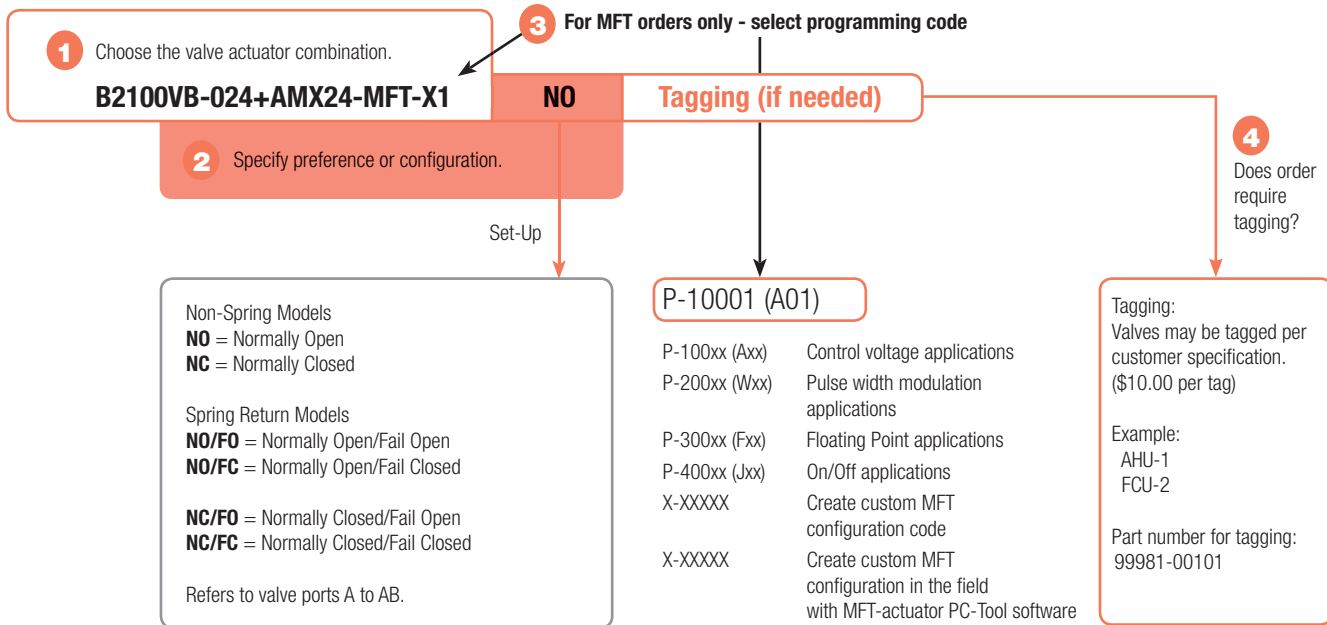
- High performance ANSI Class 150 and 300 carbon steel bodies ideal for aggressive applications.
- Fluid temperature up to 380°F is ideal for chilled, hot water or steam service.
- Fitted with rotary actuators for easy field assembly and installation.

V Ball Valve Nomenclature

B2	100	VB	-024	+AMX	24	-MFT-X1	
Valve B2 = 2-way (1" to 2") B6 = 2-way Flanged (3" to 6")	Valve Size 12-50 = 1" to 2" (Flanged) 80-150 = 3" to 6" (Flanged)	Industrial Construction/ Material VB = Chrome plated stainless steel V ball	Cv 24 - 507	Actuator Type Non-Spring Return AMB, AMX GMB, GMX SY SY...P Spring Return NFB, NFX AFB, AFX EFX Electronic Fail-Safe GKB, GKX	Power Supply Control 24 = 24 VAC/DC 120 = 120 VAC 230 = 230 VAC UP = 24-240 VAC or 24-125 VDC	Control -3-X1 = On/Off, Floating Point -MFT-X1 = Multi-Function Technology -MFT95-1X = 0-135 Ω	-S = Built-in Auxiliary Switch

"X" models are customizable.

Ordering Example



- 5** Complete Ordering Example: B2100VB-024+AMX24-MFT-X1
 Configuration: +NO
 Programming: +A01

Control Valve Product Range

V Ball Valve Product Range

C _v	Valve Nominal Size		Type		Suitable Actuators			
	Inches	DN [mm]	2-way NPT	2-way Flanged	Non-Spring Return	Spring Return	Electronic Fail-Safe	
024	1	25	B2100VB-024		SY Series	NF Series		
055	1½	40	B2150VB-055				AM Series	
077	2	50	B2200VB-077					
207	3	80		B6300VB-207			AF	GK Series
350	4	100		B6400VB-350		GM	EF	
507	6	150		B6600VB-507				

NOTE: Industrial ball valves have serviceable components. Proper maintenance of these parts will ensure a longer in-service life for the valves. The seats of these valves will require replacement at an interval consistent with number of full cycles the valve has been operated, or as field condition dictates.



Mode of Operation

The control valve is operated by an electronic actuator that responds to a standard voltage for on/off control, by a modulating VDC/4...20 mA, or 3-point control system. The actuator will then move the ball of the valve to the position dictated by the control signal thus changing the flow.

Product Features

Equal percentage of flow
300:1 rangeability
ANSI Leakage Class IV

Actuator Specifications

Control type	on/off, floating point, modulating, 2-10 VDC multi-function technology (MFT)
Manual override	all models
Electrical connection	3 ft. [1 m] cable with ½" conduit fitting, terminal block

Valve Specifications

Service	chilled or hot water, (60% glycol), steam
Flow characteristic	equal percentage
Sizes	1", 1½", 2", 3", 4", 6"
End fitting	SAE NPT female (1" to 2") ANSI flanged (3" to 6")
Materials	
Body	carbon steel
Characterizing ball	hardened chrome plated stainless steel
Stem	stainless steel
Seats	Teflon®
O-rings	ALFAS
Stem packing	spring loaded Teflon® V-ring
Bushings	Stanyl PA46
Media temp. range	380°F max.
Body pressure rating	NPT ANSI 300 (1" to 2") Flanged ANSI 150 (3" to 6")
Maximum ΔP steam	100 psi
Maximum ΔP water	100 psi
Close-off pressure	
Water	150 psi
Steam	200 psi
Maximum inlet pressure	
Steam	200 psi
Leakage	ANSI Class IV

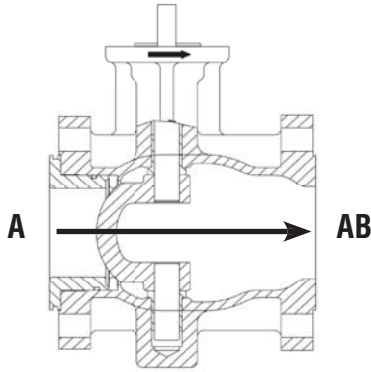
SET-UP - Specify Upon Ordering

2-WAY VALVE

NON-SPRING RETURN Stays in Last Position	AMB24-3-X1, GMB24-3-X1, SY...	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.	
	AMX24-MFT-X1, GMX24-MFT-X1, SY...MFT	NC: Normally closed A to AB, valve will open as voltage increases	NO: Normally open A to AB, valve will close as voltage increases
SPRING RETURN Note Fail Position	AFB24-X1, AFBUP-X1, NFB24-X1	NO/FO: Normally open A to AB, valve will drive closed. Spring Action: Actuator will fail open A to AB upon power loss.	NC/FC: Normally closed A to AB, valve will drive open. Spring Action: Actuator will fail closed A to AB upon power loss.
	NFX24-MFT-X1, AFX24-MFT-X1, EFX24-MFT	NC/FO: Normally closed A to AB, valve will open as voltage increases. Actuator switch on CW. Spring Action: Will fail open upon power loss.	NC/FC: Normally closed A to AB, valve will open as voltage increases. Actuator switch on CW. Spring Action: Will fail closed upon power loss.
ELECTRONIC FAIL-SAFE	GKB24-3-X1†	Power to pin 4 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "Y2" position to reverse, select the "Y1" position.	
	GKX24-MFT-X1†	NC: Normally closed A to AB, will open as voltage increases when directional switch is in the "Y2" position.	NO: Normally open A to AB, will close as voltage increases when directional switch is in the "Y1" position.

† The GK series Electronic Fail-Safe actuator will drive to a predetermined position using the FO/FC dial on the actuator upon loss of power.

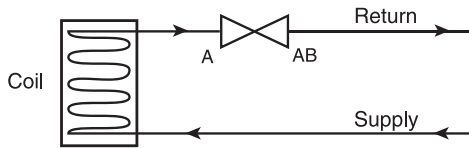
FLOW PATTERN



PIPING DIAGRAMS

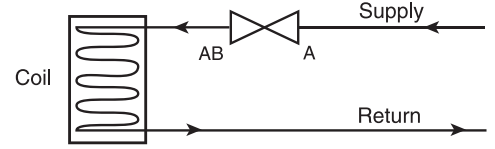
Water Application

2-way Valve Piping Diagram



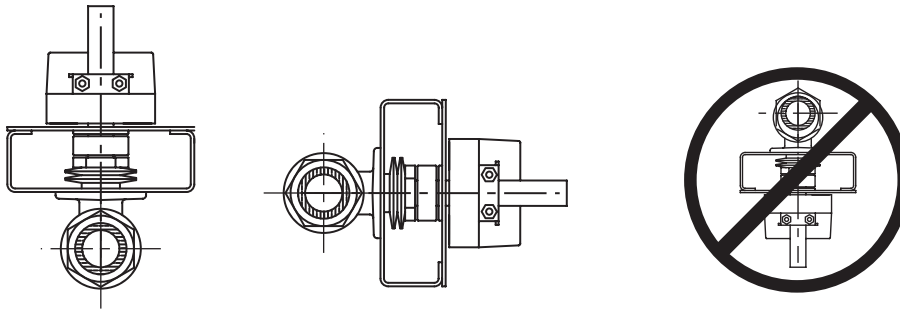
Steam Application

2-way Valve Piping Diagram



PIPING/MOUNTING ORIENTATION

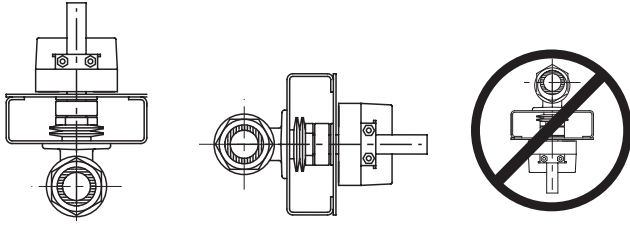
Assembly can be mounted horizontally or vertically for water applications. For steam applications the valve can be mounted vertically but if mounted horizontally the valve must be 90° off center of the pipe. Do not install with actuator below pipe.



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Mounting

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



The flange allows the actuator to be either parallel or perpendicular to the pipe; there are four orientations possible.

If field installing a spring return actuator, disconnect power and allow actuator to spring closed. Flip actuator over if necessary to achieve proper rotation direction. **DO NOT USE THE REVERSING SWITCH TO DO THIS.**

Two-way Valves Mounting

For NORMALLY CLOSED operation:

The ball of the valve must be rotated so that the ball is CLOSED to flow. The actuator should be mounted with the clamp fully rotated CW (R). Spring return actuators will show the CW (R) symbol near the clamp and position indicator. Depressing the gear release to move the clamp rotates non-spring return actuators.

For NORMALLY OPEN operation:

The ball of the valve must be rotated so that the ball is OPEN to flow. The actuator should be mounted with the clamp fully rotated CCW (L). Spring return actuators will show the CCW (L) symbol near the clamp and position indicator. Depressing the gear release to move the clamp rotates non-spring return actuators. There are marks on the top of the valve stem, which indicate the port directions.

Installation

1. Inspect shipping package, valve, linkage, and actuator for physical damage. If shipping damage has occurred notify appropriate carrier. Do not install.
2. Install valve with the proper ports as inlets and outlets. Check that inlet and outlet of 2-way valves are correct. Flow direction arrows must be correct.
3. Blow out all piping and thoroughly clean before valve installation.
4. Clean male pipe threads with wire brush and rag. If threads have been damaged or exposed to weather, running a tap or die over the threads may straighten them. Clean pipes, threads, and valve threads before installation; check for any foreign material that can become lodged in trim components. Strainers should be cleaned after initial startup.
5. Pipe sealing compound should be applied sparingly after cleaning and may not be applied to the two lead threads of a screwed pipe, which are innermost inside the valve. Sealing compound is to be placed on male threads only. The purpose is to lubricate the pipes when tightening.
6. Valve must be installed with the stem towards the vertical, not below horizontal.
7. Start the connection by turning the valve or pipe by hand as far as possible. Be certain the threads mate by the "feel" of the connection.
8. Use wrenches to tighten the valve to the pipe. Do not over tighten or strip the threads. Two wrenches are necessary to avoid damaging the valve.
9. Two-way valve Normally Open or Closed configurations must be verified by examining both the mechanical drawings and the valve and actuator.

Warning!

- Valve should not be used for combustible gas applications. Gas leaks and explosions may result. Do not install in systems, which exceed the ratings of the valve.
- Avoid installations where valve may be exposed to excessive moisture, corrosive fumes, vibration, high ambient temperatures, elements, or high traffic areas with potential for mechanical damage.
- Valve assembly location must be within ambient ratings of actuator. If temperature is below -22°F a heater is required.
- The valve assembly will require heat shielding, thermal isolation, or cooling if combined effect of medium and ambient temperatures – conduction, convection, and radiation – is above 122°F for prolonged time periods at the actuator.
- Following standard procedure, a strainer should be installed before the coil and valve or in another appropriate place in the system.
- Visual access must be provided. Assembly must be accessible for routine schedule service. Contractor should provide unions for removal from line and isolation valves.
- Avoid excessive stresses. Mechanical support must be provided where reducers have been used and the piping system may have less structural integrity than full pipe sizes.
- Sufficient upstream and downstream piping runs must be provided to ensure proper valve capacity and flow response. Five diameters in each direction are recommended.
- Life span of valve stems and O-rings is dependent on maintaining non-damaging conditions. Poor water treatment or filtration, corrosion, scale, other particulate can result in damage to trim components. A water treatment specialist should be consulted.
- Normal thread engagement between male pipe thread and valve body should be observed. Pipe run that is in too far will damage the valve.

VALVE SIZE	C _v	TYPE	MODEL #	LINE SIZE											
				1" Fp Cv	1¼" Fp Cv	1½" Fp Cv	2" Fp Cv	2½" Fp Cv	3" Fp Cv	4" Fp Cv	5" Fp Cv	6" Fp Cv	8" Fp Cv	10" Fp Cv	
1"	24	2-Way NPT	B2100VB-024	24.0	22.6	21.1	19.3	-	-	-	-	-	-	-	
1½"	55	2-Way NPT	B2150VB-055	-	-	55.0	50.4	46.3	43.9	-	-	-	-	-	
2"	77	2-Way NPT	B2200VB-077	-	-	-	77.0	74.1	70.5	66.2	-	-	-	-	
3"	207	2-Way Flanged	B6300VB-027	-	-	-	-	-	207.0	191.3	177.2	168.9	-	-	
4"	350	2-Way Flanged	B6400VB-350	-	-	-	-	-	-	350.0	333.0	313.2	290.3	-	
6"	507	2-Way Flanged	B6600VB-507	-	-	-	-	-	-	-	-	507.0	491.5	475.5	

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)

Typically 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

Typical Transformer Sizing

Actuator Series	Voltage	Max. VA Per Actuator
AF	24	10
GK	24	20
GM	24	7
AM	24	6
NM	24	4

CAUTION It is good practice to power electronic or digital controllers from a separate power transformer. 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.

Multiple Actuators, One Transformer

Multiple actuators may be powered from one transformer provided the following rules are followed:

1. The TOTAL current draw of the actuators (VA rating) is less than or equal to the rating of the transformer.
2. Polarity on the secondary transformer is strictly followed. This means that all No. 1 wires from all actuators are connected to the common leg on the transformer and all No. 2 wires from all actuators are connected to the hotleg. Mixing wire No. 1 & 2 on one leg of the transformer will result in erratic operation or failure of the actuator and/or controls.

Multiple Actuators, Multiple Transformers

Multiple actuators positioned by the same control signal may be powered from multiple transformers provided the following rules are followed:

1. Transformers are properly sized.
2. All No. 1 wires from all actuators are tied together and tied to the negative leg of the control signal. See wiring diagram.

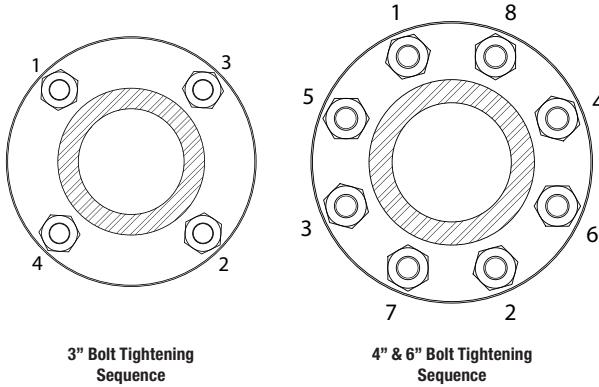
Wire Type and Wire Installation Tips

For most installations, 18 or 16 Ga. cable works well with Belimo actuators. Use code-approved wire nuts, terminal strips or solderless connectors where wires are joined. It is good practice to run control wires unspliced from the actuator to the controller. If splices are unavoidable, make sure the splice can be reached for possible maintenance. Tape and/or wire-tie the splice to reduce the possibility of the splice being inadvertently pulled apart.

Valve Installation Procedure

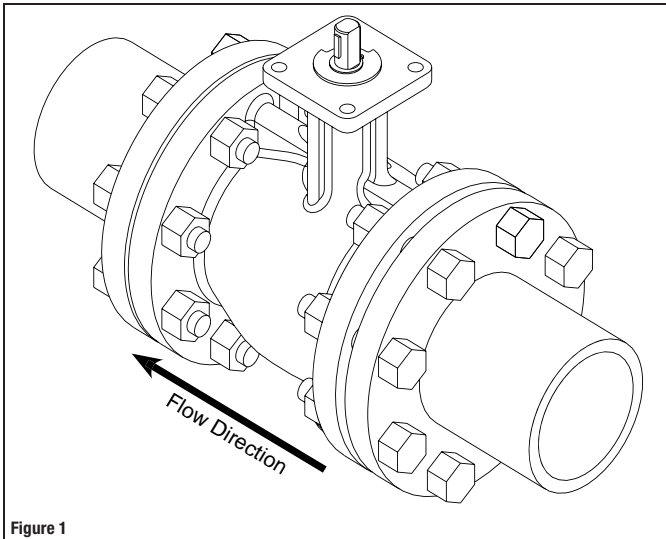
3", 4" & 6" Valves - Flanged Installation

1. Valve must be in the closed position for installation.
2. **Figure 1 illustrates a flanged valve installation.**
3. Use hex bolts & nuts to secure valve to flange.
4. Ensure proper gaskets are used between the valve flange and pipe flange.
5. Tighten bolts & nuts in alternating opposite sides until completely tightened. Please see torque requirements below. Torque wrench is required.



⚠ WARNING: Exceeding the Maximum Torque Can Damage the Valve and Void the Warranty!

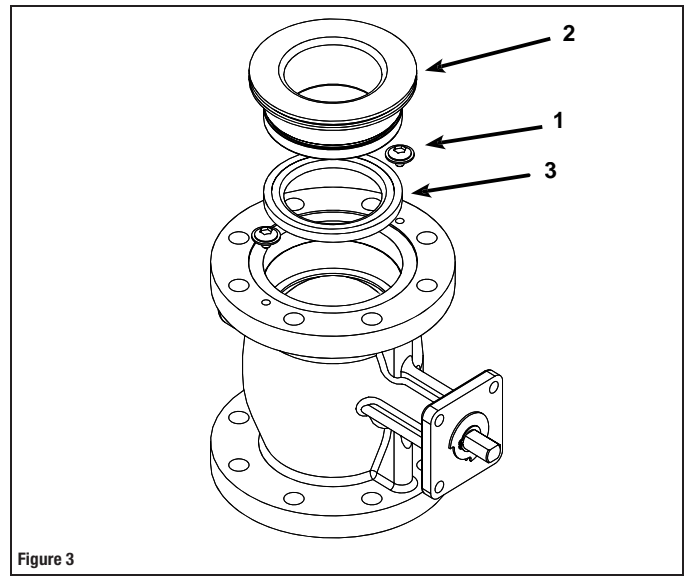
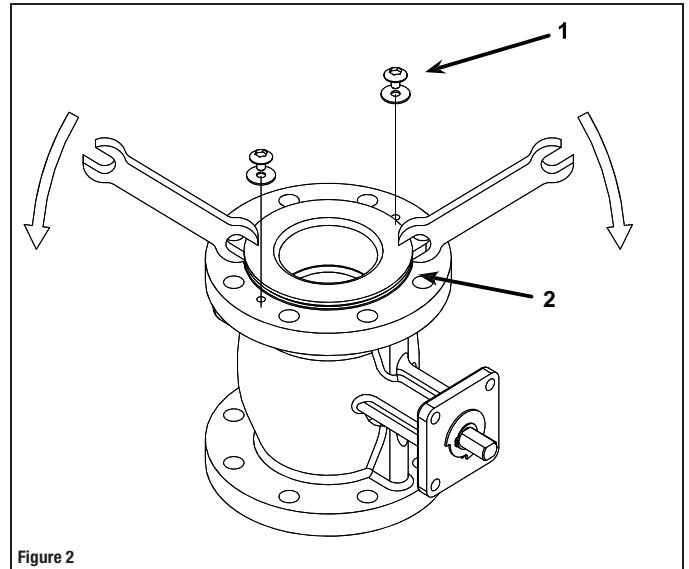
- 3" ANSI 150 Flange - 65 ft/lbs
- 4" ANSI 150 Flange - 70 ft/lbs
- 6" ANSI 150 Flange - 100 ft/lbs




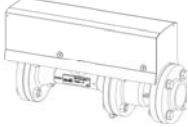






Seat Replacement Procedure*




3", 4" & 6" Valves

1. Remove valve from pipe.
2. Remove 2 cap retaining washers (1).
3. Using 2 wrenches or flat-head screwdrivers, pry cap assembly (2) out of valve.
4. Rotate valve to fully open position.
5. Using hands, pull seat (3) out of the valve.
6. Replace seat and reverse procedure to reassemble.
7. Reinstall valve per installation instructions.



* Belimo does not sell seat replacement kits.



		AM	GM	AR	GR	DR	GK	DK	SY
	ZS-EPIV-EV-20-NF For valve sizes ½" [DN15] to ¾" [DN20] (cover only)	Energy Valves	•						
		ePIV	•						
	ZS-EPIV-EV-50-SCNF For valve sizes 1" [DN25] to 2" [DN50] on non-fail-safe actuator series (cover only) For valve sizes ½" [DN15] to 2" [DN50] on electronic fail-safe actuator series (cover only)	Energy Valves	•	•	•	•			
		ePIV	•	•	•	•			
	ZS-EPIV-EV-80 For ANSI 125, valve sizes 2½" [DN65] and 3" [DN80] (cover only)	Energy Valves		•	•				
		ePIV		•	•				
	ZS-EPIV-EV-150 For ANSI 125, valve sizes 4" [DN100], 5" [DN125], and 6" [DN150] (cover only)	Energy Valves			•	•			
		ePIV			•	•			
	ZS-CCV-90* Kit for LF actuator series	PICCV				•			
		CCV				•			
	ZS-CCV-100* Kit for LR/AR actuator series	PICCV	•	•					
		CCV	•	•					
	ZS-CCV-110* Kit for AFR actuator series	PICCV					•		
		CCV					•		
	ZS-SPBV-10 For NM, AM,GM, NF, AF, and GK actuator series	Ball Valves				•	•	•	•
	ZS-SPBV-20 For dual mounted GM, AF, and GK actuator series					•	•		•
ZS-BVVS-0002 For LM actuator series on VS/VSS models							•		
ZS-BVVS-0003 For LF actuator series on VS/VSS models						•			


ZTH REPLACEMENT CABLES		VALVES	AM	GM	AR	GR	DR	GK	DK	SY
	ZK1-GEN Cable for use with ZTH US to connect to new generation non-spring return actuator via diagnostic/programming socket	Ball Valves	•	•						
		Butterfly Valves	•	•	•	•	•	•	•	
	ZK2-GEN Cable for use with ZTH US to connect to new generation non-spring return actuator via diagnostic/programming socket	<i>Available for all MFT Actuators</i>								
	ZK6-GEN Cable for use with ZTH US to connect to SY actuator via RJ11 port	Ball Valves								•
		Butterfly Valves								•

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BATTERY BACKUP		VALVES	LM/LR	NM/NR	AM	GM	AR	GR/DR	EV	RV	PR	SY		
	NSV24 US Battery backup module	Ball Valves	•	•	•	•								
		Globe Valves							•	•				
		Butterfly Valves						•	•			•		
	NSV-BAT 12VDC 1.2 AH battery (2 required)	Ball Valves	•	•	•	•								
		Globe Valves							•	•				
		Butterfly Valves						•	•			•		
	EXT-NSV-B01-120* Battery backup system for SY1 - SY3 120 VAC, on/off actuators	Ball Valves										•		
		Butterfly Valves											•	
	EXT-NSV-B02-120* Battery backup system for SY1 - SY3 120 VAC, MFT actuators	Ball Valves											•	
		Butterfly Valves											•	
	EXT-NSV-B11-24* Battery backup system for SY1 24 VAC, on/off actuators	Ball Valves											•	
		Butterfly Valves											•	
	EXT-NSV-B12-24* Battery backup system for SY1 24 VAC, MFT actuators	Ball Valves											•	
		Butterfly Valves											•	
	EXT-NSV-B21-230* Battery backup system for SY1 - SY3 230 VAC, on/off actuators	Ball Valves											•	
		Butterfly Valves											•	
	EXT-NSV-B22-230* Battery backup system for SY1 - SY3 230 VAC, MFT actuators	Ball Valves											•	
		Butterfly Valves												•
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AUXILIARY SWITCHES & POTENTIOMETERS		VALVES	LR/LM	NR/NM	AR/AM	GR/GM	AK	GK/GKR
	S1A Auxiliary switch 1x SPDT, 3A (0.5A inductive) @ 250 VAC	Available for All Valves	•	•	•	•	•	•
	S2A Auxiliary switch 2x SPDT, 3A (0.5A inductive) @ 250 VAC		•	•	•	•	•	•
	P140A GR Feedback potentiometer 140 Ω		•	•	•	•	•	•
	P500A GR Feedback potentiometer 500 Ω		•	•	•	•	•	•
	P500A GR Feedback potentiometer 500 Ω		•	•	•	•	•	•
	P1000A GR Feedback potentiometer 1000 Ω		•	•	•	•	•	•
	P2800A GR Feedback potentiometer 2800 Ω		•	•	•	•	•	•
	P5000A GR Feedback potentiometer 5000 Ω		•	•	•	•	•	•
P10000A GR Feedback potentiometer 10000 Ω	•	•	•	•	•	•		
		VALVES	LV/SV	EV	RV	LVK/SVK	AVK	SY
	S2A-GV Auxiliary switch 2x SPDT, 3A (0.5A inductive) @ 250 VAC for LV, SV, EV, and AVK series actuators.	Energy Valves		•			•	
		ePIV		•			•	
		Globe Valves	•	•	•	•	•	
SY-1000-FB01 Feedback potentiometer 1000 Ω, 2 position, factory installed option only	Ball Valves							•
	Butterfly Valves							•
SY-1000-FB02 Feedback potentiometer 1000 Ω, modulating (models Syx...P, -SR or MFT), factory installed option only	Ball Valves							•
	Butterfly Valves							•

ELECTRIC DISCONNECT		VALVES	SY
	HOA-120V Local electric disconnect for SY2-SY12 110/230V - 2 position	Ball Valves	•
		Butterfly Valves	•
	HOA-120VMFT Local electric disconnect for SY2-SY12 110/230V - modulating	Ball Valves	•
		Butterfly Valves	•
	HOA-24V Local electric disconnect for SY2-SY12 24V - 2 position	Ball Valves	•
		Butterfly Valves	•
	HOA-24VMFT Local electric disconnect for SY2-SY12 24V - modulating	Ball Valves	•
		Butterfly Valves	•

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PROGRAMMING TOOLS		
	<p>Near Field Communication (NFC) App Allows fast programming, commissioning, and troubleshooting even when the actuator is not powered. Available through Google Play</p>	<p><i>Where Available on NFC Labeled Actuators Only</i></p>
	<p>MFT-P Belimo MFT configuration software (V3.X), includes PC-Tool software (interface cables [ZTH US] not included). Physical copy of software. Free download also available at www.belimo.us/americas/mft.html</p>	<p><i>Available for all MFT Actuators</i></p>
	<p>ZTH US Handheld interface module that allows field programming. Includes ZK1-GEN, ZK2-GEN, and ZK6-GEN cables</p>	<p><i>Available for all MFT Actuators</i></p>

COVERS		
	<p>ZS-T Terminal cover for NEMA 2, -T models</p>	<p><i>Available for all -T Model Actuators (except TR)</i></p>