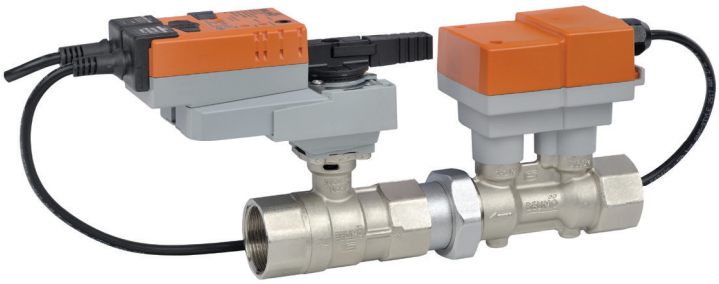
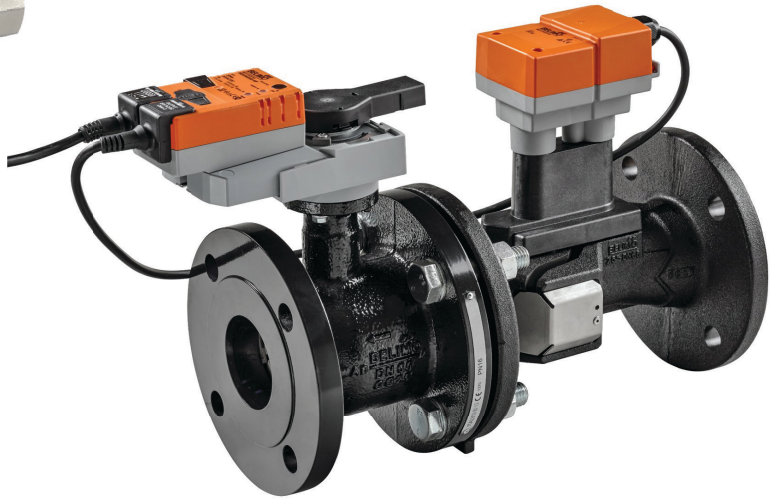
Electronic Pressure Independent Valves (EPIV)





Valve Innovations

- Pressure independent valves compensate for pressure variations, performing a continual balancing function to maintain system performance at varying loads.
- Precise flow control eliminates over-pumping and provides favorable energy savings.
- Pressure independent valves prevent energizing additional chillers by maintaining desirable Delta T.
- Pressure independent valves are selected based on flow rate and no Cv calculations are needed.

Features and Benefits

- Simplified valve sizing and selection, no Cv calculations required.
- Ultrasonic flow sensor, no maintenance required with no moving parts.
- True flow feedback or valve position feedback is available as 0-10 VDC or 2-10 VDC.
- Settings can be viewed or changed using the optional ZTH US or with a computer using the PC-Tool software.
- Glycol compensation for the entire range.
- Bus communication - BACnet and Modbus.

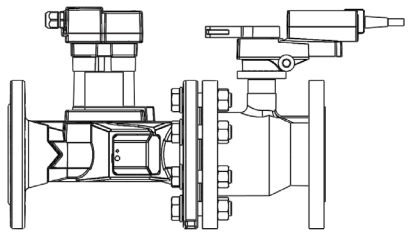
Set-Up

		2-WAY VALVE SPECIFY UPON ORDERING			
NON-SPRING RETURN STAYS IN LAST POSITION	**LRX...Series** **NRX...Series** **ARX...Series** **GRX...Series** **EVX...Series**	**NC:** Normally Closed-valve will open as voltage increases.	**NO:** Normally Open-valve will close as voltage increases.		
ELECTRONIC FAIL-SAFE STAYS IN FAIL-SAFE POSITION	**AKRX...Series** **GKRX...Series** **AVK...Series**	**NC/FO Valve:** Normally Closed-valve will open as voltage increases. Fail Action: Will fail open upon power loss.	**NC/FC Valve:** Normally Closed-valve will open as voltage increases. Fail Action: Will fail closed upon power loss.	**NO/FC Valve:** Normally Open-valve will close as voltage increases. Fail Action: Will fail closed upon power loss.	**NO/FO Valve:** Normally Open-valve will close as voltage increases. Fail Action: Will fail open upon power loss.

NOTE: Feedback signal is always direct acting (2V close, 10V open).

Functionality

The EPIV is a pressure independent control valve that incorporates a flow meter and a 2-way control valve. The actuator has a powerful algorithm that modulates the control valve to maintain the flow regardless of variations in system differential pressure. In addition, the EPIV provides a feedback as a 0-10 VDC or 2-10 VDC to the BMS system. Depending on the system requirement, this feedback can be configured to be either True Flow or Valve Position using the PC-Tool software.

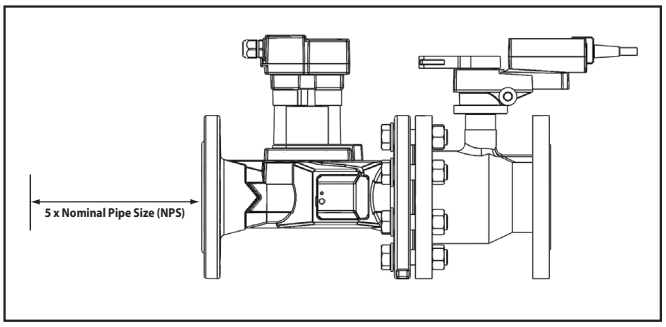


Installation

Inlet

The EPIV requires a section of straight pipe on the valve inlet to guarantee sensor accuracy. The length should be at least 5 diameters long.

½" [DN15] 5 x nominal pipe size = 2½" [63.5 mm]
¾" [DN20] 5 x nominal pipe size = 3¾" [95.2 mm]
1" [DN25] 5 x nominal pipe size = 5" [127 mm]
1¼" [DN32] 5 x nominal pipe size = 6¼" [158.7 mm]
1½" [DN40] 5 x nominal pipe size = 7½" [190.5 mm]
2" [DN50] 5 x nominal pipe size = 10" [254 mm]
2½" [DN65] 5 x nominal pipe size = 12½" [317 mm]
3" [DN80] 5 x nominal pipe size = 15" [381 mm]
4" [DN100] 5 x nominal pipe size = 20" [508 mm]
5" [DN125] 5 x nominal pipe size = 25" [635 mm]
6" [DN150] 5 x nominal pipe size = 30" [762 mm]



Outlet Length

No requirements for outlet length.

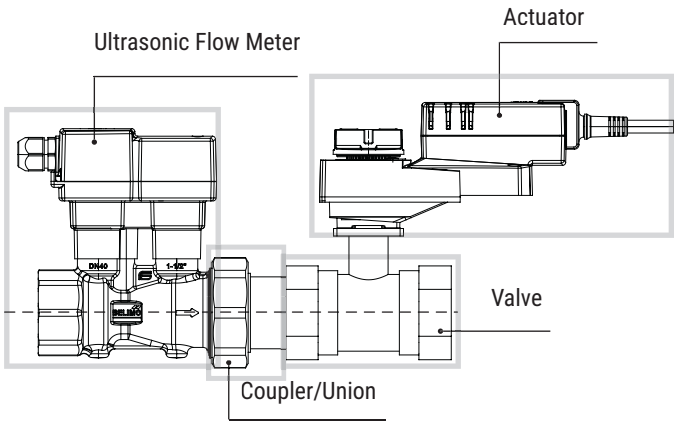
Elbows can be installed directly after the valve.

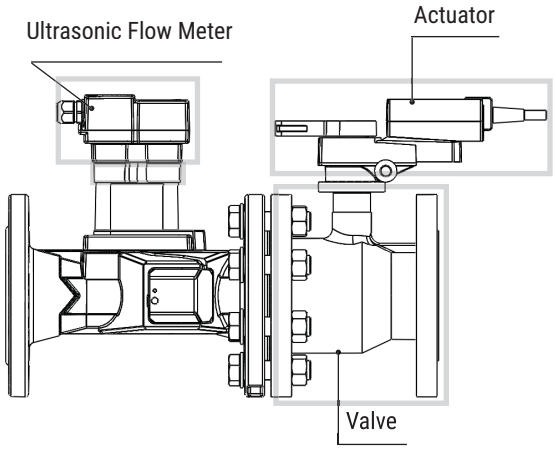
Actuator & Flow Sensor Removal

To replace flow sensor, isolation valves need to be closed or system needs to be drained.

½" to 6" EPIV

The flow sensor cannot be separated from the flow housing. However, it can be separated from the valve using the coupler/union connecting both.

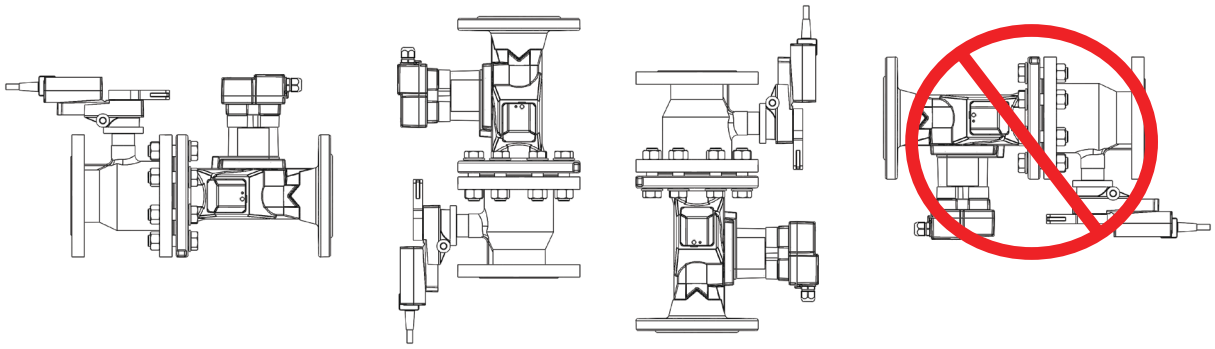




Orientation

EPIVs shall be installed with flow in the direction of the arrow on the valve body.

The valve assembly can be installed in a vertical or horizontal arrangement, as long as the actuator is positioned to avoid condensation from dripping onto the actuator.



(Not for use with weather shields)

Flow Reduction Chart

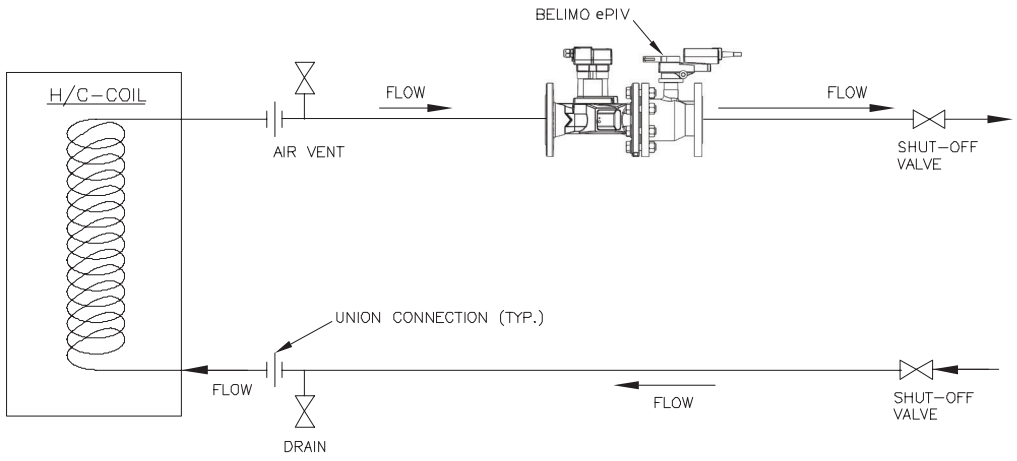
MAXIMUM FLOW BASED ON MINIMUM DIFFERENTIAL PRESSURE FOR ANSI 125 NPT MODELS

Size		8 psi	5 psi*	4 psi	3 psi	2 psi	1 psi
Inches	DN [mm]						
½	15	5.5 GPM	5.5 GPM	5.5 GPM	5.5 GPM	4.8 GPM	3.4 GPM
¾	20	10.3 GPM	10.3 GPM	10.3 GPM	9.9 GPM	8.1 GPM	5.7 GPM
1	25	18.2 GPM	18.2 GPM	18.2 GPM	17.2 GPM	14.1 GPM	9.9 GPM
1¼	32	28.5 GPM	28.5 GPM	28.5 GPM	28.5 GPM	23.3 GPM	16.5 GPM
1½	40	39.6 GPM	39.6 GPM	39.6 GPM	39.6 GPM	34.9 GPM	24.7 GPM
2	50	100 GPM**	76.1 GPM	74 GPM	64.1 GPM	52.3 GPM	37 GPM
2½	65	127 GPM	127 GPM	93 GPM	81 GPM	66 GPM	47 GPM
3	80	180 GPM	180 GPM	138 GPM	120 GPM	97 GPM	69 GPM
4	100	317 GPM	317 GPM	235 GPM	203 GPM	166 GPM	117 GPM
5	125	495 GPM	495 GPM	367 GPM	318 GPM	260 GPM	183 GPM
6	150	713 GPM	713 GPM	550 GPM	476 GPM	389 GPM	275 GPM

* Select valve based on a minimum of 5 PSI differential.
** Applies to 2" EPIV model P2200SU-1000 only.

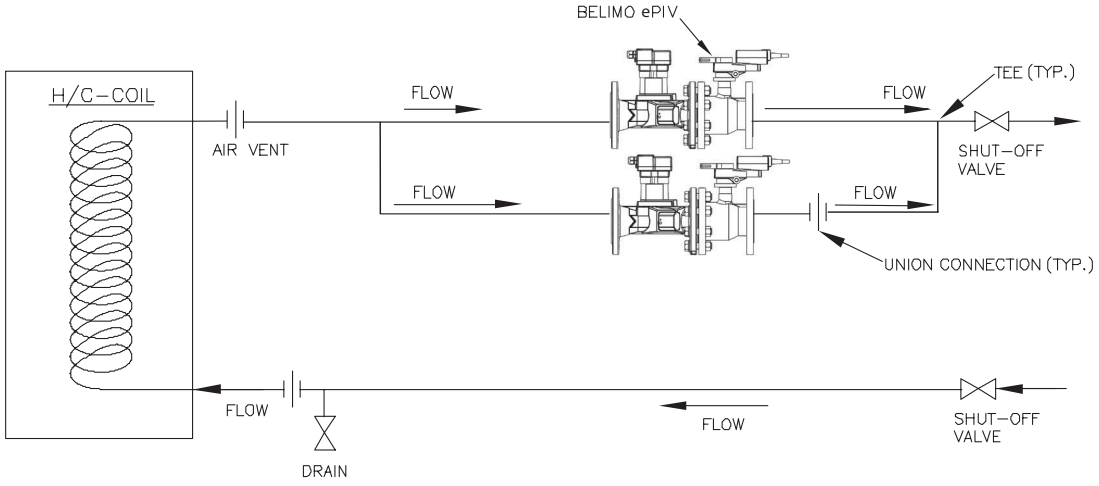
Piping

The EPIV is recommended to be installed on the return side of the coil. This diagram is for typical applications only. Consult engineering specification and drawings for particular circumstances. Refer to Belimo documentation for flow verification and commissioning procedures.
It is not necessary to install one strainer per unit. Belimo recommends installing one strainer per system. If the system has multiple branches, it is recommended to install one strainer per branch.



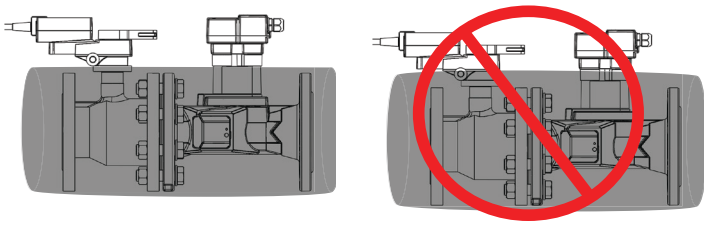
Typical Parallel Piping in Relation to the Input and Output

To achieve flows larger than V'nom or nominal flow, it is recommended to connect two valves in parallel leading to a common manifold. To correctly operate these valves, the Multi-Function Technology (MFT) will be employed to utilize one common control signal. It is recommended to use the same signal in parallel (2-10 VDC); the two actuators are wired from the same control signal and the two valves control the flow in an identical pattern, the resulting flow will be double an individual valve.



Insulation:

The insulation should be below the actuator.



Electronic Pressure Independent Valve (EPIV) Nomenclature

P6	250SU	-127		+ARX	24	-EP2	-MOD
Electronic Pressure Independent Valve P2- NPT 2-way (½...2") P6- Flanged 2-way (2½...6")	**Valve Size** 050 = ½" 075 = ¾" 100 =1" 125 = 1¼" 150 = 1½" 200 = 2" 250 = 2½" 300 = 3" 400 = 4" 500 = 5" 600 = 6" SU = Ultra-sonic Flow Sensor	**Flow Rate** 127 GPM Refer to valve pages for full list	**Pressure Rating** Blank = ANSI 125 -250 = ANSI 250	**Actuator Type** Non Fail-Safe LRX NRX ARX GRX Electronic Fail-Safe AKRX GKRX	**Power Supply** 24 = AC/DC 24 V	EP2 = ½...6" Modulating Control	Modbus & BACnet communication*

*Only available with non fail-safe actuators

Ordering Example

1 Choose the valve actuator combination.

P6250SU-127+ARX24-EP2

2 Specify maximum flow (Vmax)

Requested Flow

Vmax = 30...100% Vnom (nominal flow)

3 Specify preference or configuration.

Set-Up

Non Fail-Safe Models
NO = Normally Open
NC = Normally Closed

Electronic Fail-Safe 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

4 Control / Feedback signal

Y (0) 2...10 V / U 2...10 V

Y (0) 0.5...10 V / U 0.5...10 V
Y (0) 2...10 V / U 2...10 V

5 Does order require tagging?

Tagging:
Valves may be tagged per customer specification. ($12.00 charge per tag)

Example:
AHU-1
FCU-2

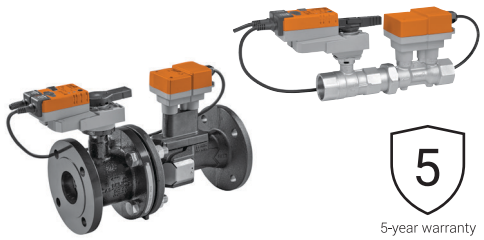
Part number for tagging: 99981-00101

6 Complete Ordering Example: P6250SU-127+ARX24-EP2
Requested Flow: 100 GPM
Setup: NC
Control/Feedback Signal: Y (0) 2...10V / U 2...10V
Tag: FCU-2

NOTE: All models should be entered with the GPM designed - in case GPM is not provided this will come with V'nom set up.

		Valve Nominal Size		Type	Suitable Actuators	
	GPM	Inches	DN [mm]	2-way	Non Fail-Safe	Electronic Fail-Safe
NPT	5.5*	½	15	P2050SU-055	LRX24-EP2(-MOD)	AKRX24-EP2
	10.3*	¾	20	P2075SU-103		
	18.2*	1	25	P2100SU-182		
	28.5*	1¼	32	P2125SU-285	NRX24-EP2 (-MOD)	
	39.6*	1½	40	P2150SU-396		
	76.1*	2	50	P2200SU-761	ARX24-EP2 (-MOD)	
	100*	2	50	P2200SU-1000**		
Flanged ANSI 125	127*	2½	65	P6250SU-127		
	180*	3	80	P6300SU-180		
	317*	4	100	P6400SU-317	GRX24-EP2 (-MOD)	GKRX24-EP2
	495*	5	125	P6500SU-495		
	713*	6	150	P6600SU-713		
Flanged ANSI 250	127*	2½	65	P6250SU-127-250	ARX24-EP2 (-MOD)	AKRX24-EP2
	180*	3	80	P6300SU-180-250		
	317*	4	100	P6400SU-317-250	GRX24-EP2(-MOD)	GKRX24-EP2
	495*	5	125	P6500SU-495-250		
	713*	6	150	P6600SU-713-250		

*V'nom = Maximum flow for each valve body size.
** Fluid temperature range is 39...250°F [4...120°C].
Note: For all models, flows can be field set to 30% of nominal flow rate.



5-year warranty

Mode of Operation

The Electronic Pressure Independent Control Valve (EPIV) is a two-way valve which is unaffected by pressure variations in a system.

Product Features

Provides constant flow regardless of pressure variations in the system. Simplified valve sizing and selection, no Cv calculations required.

Actuator Specifications

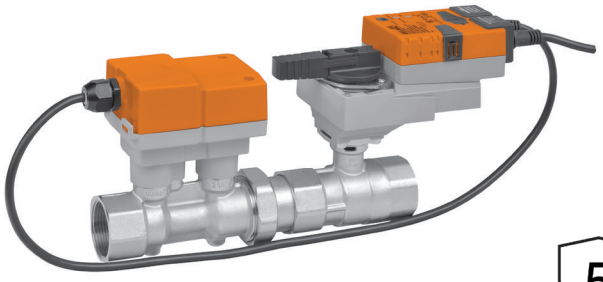
Control type	modulating
Manual override	LR, NR, AR, GR, AKR, GKR
Electrical connection	3 ft. [1 m] cable with ½" conduit fitting
Communication	analog and Belimo MP-Bus BACnet MS/TP, Modbus RTU (-MOD actuators)

Valve Specifications

Fluid	chilled or hot water, up to 60% glycol
Sizes	½", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6"
End fitting	NPT female (½...2") pattern to mate with ANSI 125 or 250 flange (2½...6")
Materials	
Body	
Valve	brass, nickel plated (½...2") cast iron-GG25 (2½...6")
Sensor housing	forged brass, nickel plated (½...2") ductile iron- GGG50 (2½...6")
Ball	stainless steel
Stem	stainless steel
Characterizing disc	Tefzel® (½...2") stainless steel (2½...6")
Fluid temp range	14...250°F [-10...+120°C], 39...250°F [4...120°C] (P2200S-1000)
Body pressure rating	360 psi (½...2") ANSI 125, Class B (2½...6") ANSI 250 (2½...6") (-250)
Close-off pressure	200 psid (½...2") 100 psid (2½...6") 310 psid (2½...6") (-250)
Differential pressure range (ΔP)	see technical documentation
Leakage	0%
Rangeability	100:1
Flow control tolerance	±5%
Flow measurement tolerance	±2%

All flow tolerances @ 68...77°F [20...25°C] and 0% glycol.

P2... Series Electronic Pressure Independent Valves (EPIV)
Stainless Steel Ball, NPT Female Ends



5-year warranty

Application
Water-side control of heating and cooling systems for AHUs and heat pumps.

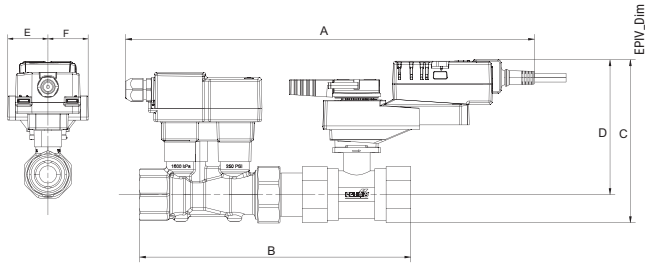
Mode of Operation
The Electronic Pressure Independent Control Valve is a two-way valve which maintains constant flow regardless of pressure variations in the system.

Product Features
Provides constant flow regardless of pressure variations in the system. Maximizes chiller Delta T, preventing energizing additional chillers due to low Delta T. Simplified valve sizing and selection, no Cv calculations required.

Valve Specifications	
Service	chilled or hot water, 60% glycol max (open loop/steam not allowed)
Controllable flow range	75° rotation
Size	½", ¾", 1", 1¼", 1½", 2"
End fitting	NPT female ends
Materials	
Body	forged brass, nickel plated
Sensor Housing	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seat	Teflon® PTFE
Characterizing disc	Tefzel®
O-ring	EPDM
Packing	EPDM
Body pressure rating	360 psi
Media temperature range	14°F to 250°F [-10°C to +120°C], 39°F to 250°F [4°C to 120°C]**
Noise level	<35 dB(A)
Leakage	0%
Close-off pressure	200 psi
Differential pressure range(ΔP)	1 to 50 psi*, 5 to 50 psi, 8 to 50 psi**
Inlet length required to meet specified measurement accuracy	5x nominal pipe size (NPS)
Humidity	<95% RH non-condensing
Flow metering technology	ultrasonic with temperature and glycol compensation
Flow control tolerance	±5%
Flow measurement tolerance	±2%***
Flow measurement repeatability	±0.5%
Rated impulse voltage	actuator/sensor: 0.8 kV (in accordance with EN 60730-1)
Rangeability	100:1
Power supply for the flow sensor	sensor is powered by the actuator
Quality standard	ISO 9001
Agency listings	UL 60730-1/2-14, 2-18, CE according to 2004/108/EC and 2006/95/EC

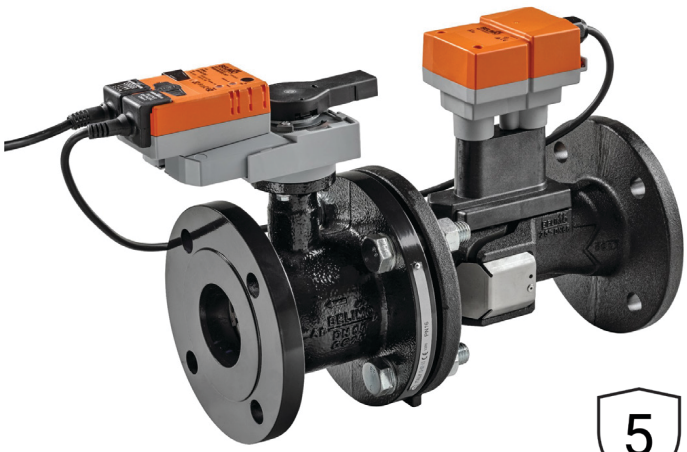
* See flow reduction chart on page 5.
** Applies to 2" EPIV model P2200SU-1000 only
***All flow accuracies are @ 68°F (20°C).

Dimensions



Valve Nominal Size		Dimensions (Inches [mm])					
Inches	DN [mm]	A	B	C	D	E	F
½"	15	14.56" [370]	7.50" [191]	5.47" [139]	4.92" [125]	1.55" [39]	1.55" [39]
¾"	20	14.83" [377]	8.00" [203]	5.57" [141]	4.92" [125]	1.55" [39]	1.55" [39]
1"	25	15.30" [390]	9.10" [231]	5.80" [147]	5.00" [127]	1.55" [39]	1.55" [39]
1¼"	32	16.37" [416]	10.00" [254]	6.08" [154]	5.15" [131]	1.73" [44]	1.73" [44]
1½"	40	16.76" [426]	10.78" [274]	6.65" [169]	5.55" [141]	1.73" [44]	1.73" [44]
2"	50	17.04" [433]	11.18" [284]	6.89" [175]	5.59" [142]	1.73" [44]	1.73" [44]

	Valve Nominal Size		Type	Actuator Type	
GPM	Inches	DN [mm]	2-way Female NPT	Non-Spring Return	Electronic Fail-Safe
5.5	½"	15	P2050SU	LRX	AKRX
10.3	¾"	20	P2075SU	LRX	AKRX
18.2	1"	25	P2100SU	LRX	AKRX
28.5	1¼"	32	P2125SU	NRX	AKRX
39.6	1½"	40	P2150SU	NRX	AKRX
100**	2"	50	P2200SU	ARX	AKRX



5-year warranty

Application

Water-side control of heating and cooling systems for AHUs and water coils.

Operation

The Electronic Pressure Independent Control Valve is a two-way valve that maintains constant flow regardless of pressure variations in the system.

Product Features

Provides constant flow regardless of pressure variations in the system.
Maximizes chiller Delta T, preventing energizing additional chillers due to low Delta T.
Simplified valve sizing and selection, no Cv calculations required.

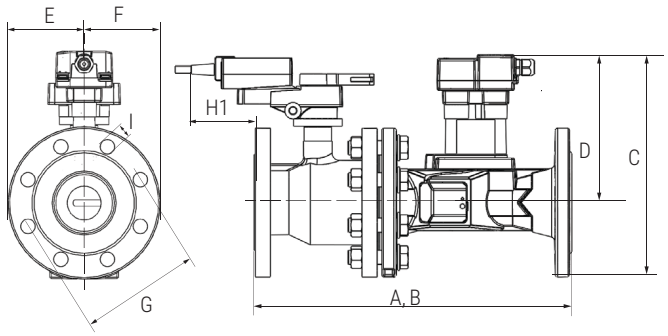
Suitable Actuators

	Non-Spring	Electronic fail-safe
P6250SU-127	ARB(X)	AKRB(X)

Technical Data	
Media	chilled or hot water, up to 60% glycol max (open loop/steam not allowed)
Valve Size [mm]	2.5" [65]
Pipe connection	pattern to mate with ANSI 125 flange
Housing	Cast iron - GG 25
Flow measuring pipe	Ductile cast iron - GGG50
Ball	stainless steel
Stem	stainless steel
Seat	PTFE
O-ring	Viton
Characterised disc	stainless steel
Package	EPDM
Body Pressure Rating	ANSI Class 125, standard class B
ANSI Class	125
Differential Pressure Range	5 to 50 psid, 1 to 50 psid (with flow reduction. See chart.), or 8 to 50 psid (with flow increase. See chart.)
Close-off pressure Δps	100 psi
Ambient temperature	-22...122°F [-30...50°C]
Inlet Length to Meet Specified Measurement Accuracy	5X nominal pipe size (NPS)
Ambient humidity	max. 95% r.H., non-condensing
Measuring accuracy flow	±2%*
Control accuracy	±5%
Flow Measurement Repeatability	±0.5%
Sensor Technology	ultrasonic with glycol and temperature compensation
Rangeability Sv	100:1
Power supply for the flow sensor	sensor is powered by the actuator
Media Temp Range (water)	14...250°F [-10...120°C]
Leakage rate	0%

*All flow tolerances are at 68°F (20°C) & water.

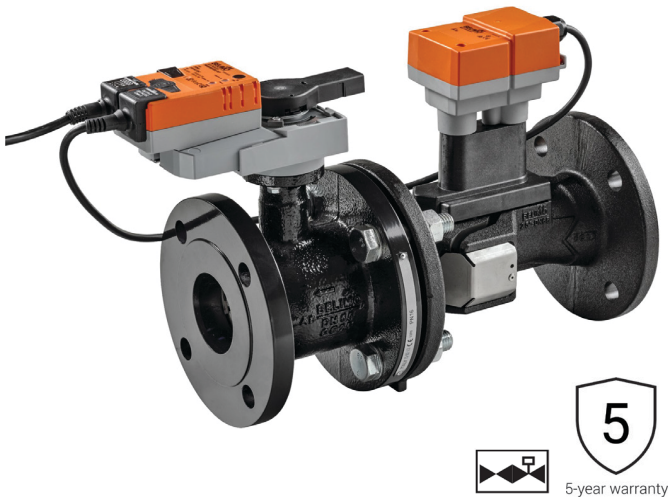
Dimensions (Inches [mm])



Valve Nominal Size			Dimensions (Inches [mm])								
In.	DN [mm]	# of Bolts	A	B	C	D	E	F	G	H1	I
2½"	65	4	14.9" [379]	14.9" [379]	11.5" [292]	7.9" [200]	3.7" [95]	3.7" [95]	5.7" [145]	2.8" [72]	0.7" [19]
3"	80	4	16.9" [430]	16.9" [430]	11.8" [300]	7.9" [200]	3.9" [100]	3.9" [100]	6.3" [160]	2.1" [53]	0.7" [19]
4"	100	8	18.7" [474]	18.7" [474]	13.3" [337]	8.7" [221]	4.5" [114]	4.5" [114]	7.1" [180]	1.8" [46]	0.7" [19]
5"	125	8	22.8" [579]	22.8" [579]	14.4" [366]	9.4" [239]	5.0" [127]	5.0" [127]	8.3" [210]	0.8" [20]	0.7" [19]
6"	150	8	25.6" [651]	25.6" [651]	15.0" [380]	9.4" [239]	5.6" [142]	5.6" [142]	9.5" [241]	N/A	0.9" [22]

	Valve Nominal Size		Type	Actuator Type	
GPM	Inches	DN [mm]	2-way Flanged	Non-Spring Return	Electronic Fail-Safe
127	2½"	65	P6250SU	ARX	AKRX
180	3"	80	P6300SU	ARX	AKRX
317	4"	100	P6400SU	GRX	AKRX
495	5"	125	P6500SU	GRX	GKRX
713	6"	150	P6600SU	GRX	GKRX

P6... Series Electronic Pressure Independent Valves (EPIV)
Stainless Steel Ball, ANSI 250 Flange Ends



5-year warranty

Application
Water-side control of heating and cooling systems for AHUs and water coils.

Operation
The Electronic Pressure Independent Control Valve is a two-way valve that maintains constant flow regardless of pressure variations in the system.

Product Features
Provides constant flow regardless of pressure variations in the system.
Maximizes chiller Delta T, preventing energizing additional chillers due to low Delta T.
Simplified valve sizing and selection, no Cv calculations required.

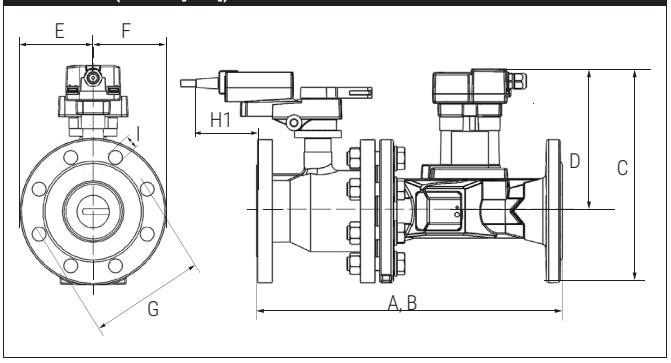
Technical Data	
Media	chilled or hot water, up to 60% glycol max (open loop/steam not allowed)
Valve Size [mm]	2.5" [65]
Pipe connection	pattern to mate with ANSI 250 flange
Housing	Cast iron - GG 25
Flow measuring pipe	Ductile cast iron - GGG50
Ball	stainless steel
Stem	stainless steel
Seat	PTFE
O-ring	Viton
Characterised disc	stainless steel
Package	EPDM
Body Pressure Rating	ANSI Class 250, standard class B
ANSI Class	250
Differential Pressure Range	5 to 50 psid, 1 to 50 psid (with flow reduction. See chart.), or 8 to 50 psid (with flow increase. See chart.)
Close-off pressure Δps	310 psi
Ambient temperature	-22...122°F [-30...50°C]
Inlet Length to Meet Specified Measurement Accuracy	5X nominal pipe size (NPS)
Ambient humidity	max. 95% r.H., non-condensing
Measuring accuracy flow	±2%*
Control accuracy	±5%
Flow Measurement Repeatability	±0.5%
Sensor Technology	ultrasonic with glycol and temperature compensation
Rangeability Sv	100:1
Power supply for the flow sensor	sensor is powered by the actuator
Media Temp Range (water)	14...250°F [-10...120°C]
Leakage rate	0%

*All flow tolerances are at 68°F (20°C) & water.

Suitable Actuators

	Non-Spring	Electronic fail-safe
P6250SU-127-250	ARB(X)	AKRB(X)

Dimensions (Inches [mm])



Valve Nominal Size			Dimensions (Inches [mm])								
In.	DN [mm]	# of Bolts	A	B	C	D	E	F	G	H1	I
2½"	65	8	15.4" [391]	15.4" [391]	11.5" [292]	7.6" [194]	3.7" [95]	3.7" [95]	5.9" [149]	3.9" [99]	0.9" [22]
3"	80	8	17.0" [433]	17.0" [433]	12.0" [305]	7.9" [200]	4.1" [105]	4.1" [105]	6.6" [168]	3.3" [85]	0.9" [22]
4"	100	8	18.7" [474]	18.7" [474]	13.1" [333]	8.1" [206]	5.0" [127]	5.0" [127]	7.9" [200]	3.1" [80]	0.9" [22]
5"	125	8	22.9" [581]	22.9" [581]	14.1" [358]	8.5" [216]	5.5" [140]	5.5" [140]	9.3" [235]	2.1" [53]	0.9" [22]
6"	150	12	25.7" [653]	25.7" [653]	15.3" [389]	9.0" [229]	6.3" [160]	6.3" [160]	10.6" [270]	1" [25]	0.9" [22]

	Valve Nominal Size		Type	Actuator Type	
GPM	Inches	DN [mm]	2-way Flanged	Non-Spring Return	Electronic Fail-Safe
127	2½"	65	P6250SU	ARX	AKRX
180	3"	80	P6300SU	ARX	AKRX
317	4"	100	P6400SU	GRX	AKRX
495	5"	125	P6500SU	GRX	GKRX
713	6"	150	P6600SU	GRX	GKRX

Non-Spring Return Actuators

AR Series LR Series
GR Series NR Series

Actuator Specifications	
Power supply	24 VAC ± 20% 24 VDC ± 10%
Electric Frequency	50/60 Hz
Power consumption	
LR Series	3.5W
NR Series	4.5W
AR Series	4.5W (½" to 2") 8.5W (2½" to 6")
GR Series	9.5W
Transformer sizing	
LR Series	6 VA (class 2 power source)
NR Series	7 VA (class 2 power source)
AR Series	7 VA (class 2 power source) (½" to 2") 11 VA (class 2 power source) (2½" to 6")
GR Series	13 VA (class 2 power source)
Electrical connection	18 GA, Plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3ft [1m] cable
Overload protection	electronic throughout 0° to 90° rotation
Operation range Y	2 to 10 VDC (default) VDC variable
Control	modulating
Input impedance	100 kΩ (0.1 mA), 500Ω
Feedback	2 to 10VDC (default), VDC variable
Torque	
LR Series	45 in-lbs [5 Nm]
NR Series	90 in-lbs [10 Nm]
AR Series	180 in-lbs [20 Nm]
GR Series	360 in-lbs [40 Nm]
Direction of rotation	electronically variable
Manual override	external push button
Running time normal operation	90 seconds
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]
Actuator/sensor	NEMA 2, IP54, UL enclosure type 2
Agency listings	cULus acc. to UL60730-1A/-2-14, CAN/CSA, CE acc. to 2004/108/EC and 2006/95/EC
Noise level	<45dB(A) at 90 seconds
Servicing	maintanence free
Quality standard	ISO 9001
Weight	
LR Series	1.50 lbs [.68 kg]
NR Series	1.20 lbs [.54 kg]
AR Series	2.65 lbs [1.2 kg]
GR Series	4.85 lbs [2.2 kg]

Operation
The actuator is electronically protected against overload.

The actuators use a brushless DC motor, which is controlled by an Application Specific Integrated Circuit (ASIC). The ASIC monitors and controls the actuators rotation and provides a digital rotation sensing (DRS) function to prevent damage to the actuator in a stall condition. Power consumption is reduced in a holding mode.

Add-on auxiliary switches or feedback potentiometers are easily fastened directly onto the actuator body for signaling and switching functions.

Electronic Fail-Safe Actuators

AKR Series
GKR Series

Actuator Specifications	
Power supply	24VAC ±20% 24VDC ±10%
Electric Frequency	50/60 Hz
Power consumption	
AKR Series	12W
GKR Series	14W
Transformer sizing	24 VA (class 2 power source)
Electrical connection	18 GA plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] 16 ft [5m]
Overload protection	electronic throughout 0° to 90° rotation
Operation range Y	2 to 10VDC (default), VDC variable
Input impedance	100 kΩ (0.1 mA), 500Ω
Feedback output U	2 to 10VDC, 0.5mA max, VDC variable
Torque	
AKR Series	180 in-lb [20Nm]
GKR Series	360 in-lb [40 Nm]
Direction of rotation	electronically variable
Fail-safe position	adjustable with dial or tool 0 to 100% in 10% increments
Manual override	external push button
Running time normal operation	90 seconds
Running time fail-safe	35 seconds
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]
Actuator/sensor	NEMA2, IP54, UL enclosure type 2
Agency list	cULus acc. to UL 60730-1A/-2-14 CAN/CSA E60730-1:02 CE acc. to 2004/108/EEC and 2006/95/EC
Noise level	< 45dB(A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	
AKR Series	3.30 lb [1.5 kg]
GKR Series	5.51 lb [2.5 kg]

The ZTH US and the PC-Tool are tools created to easily adapt the flow settings for the EPIV in the field. It directly connects to the Belimo actuator.

Wiring Diagrams

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

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

3 Actuators may also be powered by 24 VDC.

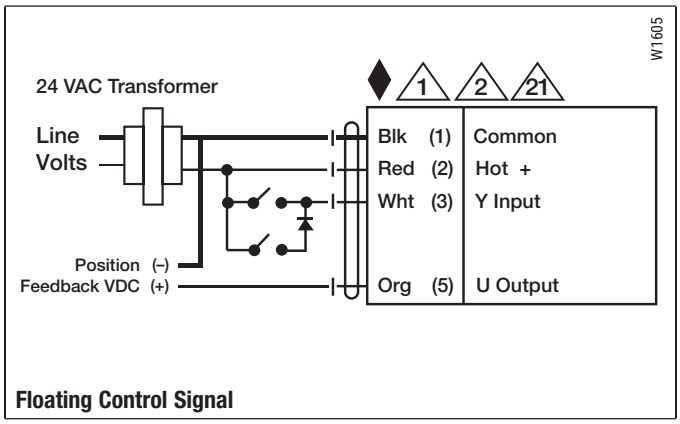
18 Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Wire numbers are provided for reference.

21 IN4004 or IN4007 diode required

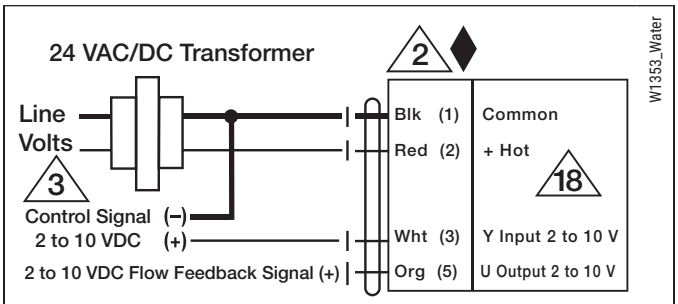
APPLICATION NOTES

◆ Meets UL requirements without the need of an electrical ground connection.

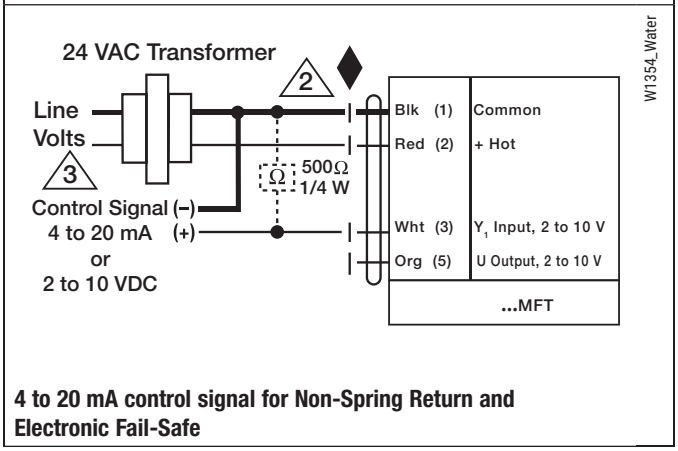
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



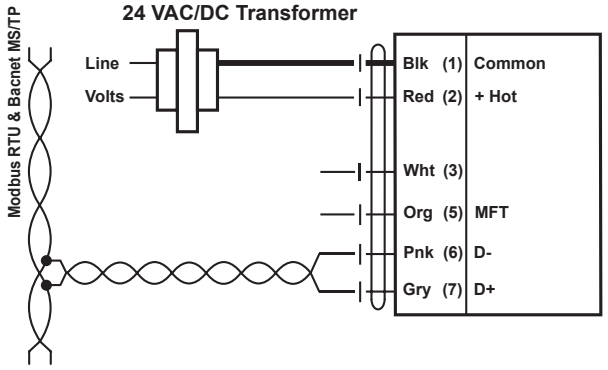
Floating Control Signal



2 to 10 VDC control signal for Non-Spring Return and Electronic Fail-Safe



4 to 20 mA control signal for Non-Spring Return and Electronic Fail-Safe

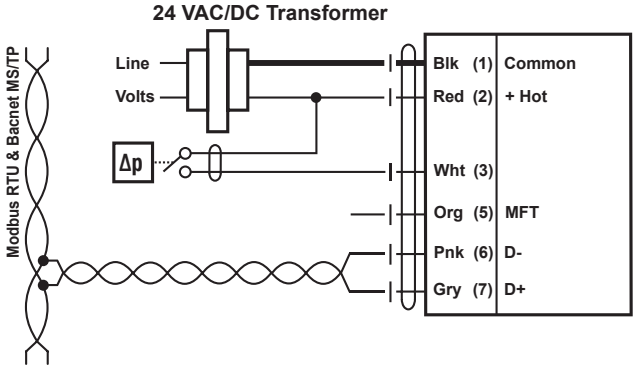


Modbus & BACnet control for Non-Spring Return

Note:

Modbus signal assignment:
C_1 = D- = A
C_2 = D+ = B

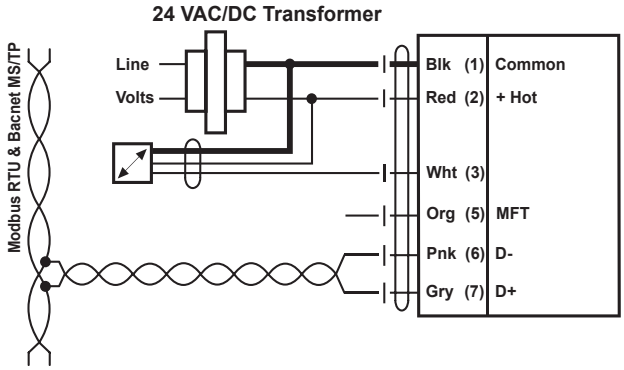
Power supply and communication are not galvanically isolated.
Interconnect ground signal of the devices.



Modbus & BACnet control with switching contact for Non-Spring Return

Requirements for switching contact:

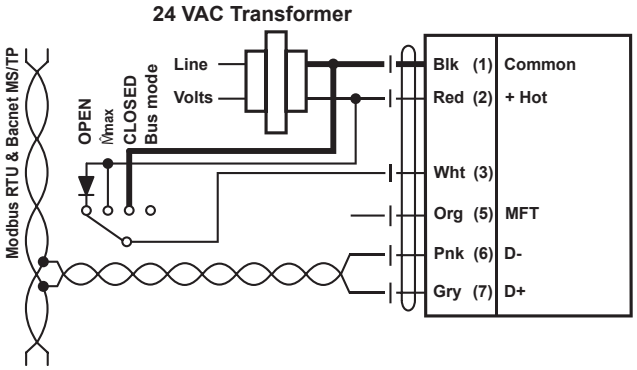
The switching contact must be able to accurately switch a current of 16 mA at 24 V.



Modbus &BACnet control with active sensor for Non-Spring Return

Possible input voltage range:

0...32 V (resolution 30 mV)



Modbus & BACnet control with local override (AC only, analog override) for Non-Spring Return

Note:

If no sensor is integrated, then connection 3 (Y) is available for the protective circuit of a local override control. Options: CLOSED, Vmax, OPEN

BLK	RED	WHT	ORG	PNK	GRY
Black	Red	White	Orange	Pink	Gray
Negro	Rojo	Blanco	Anaranjado	Rosado	Gris
Noir	Rouge	Blanc	Orange	Rosa	Gris
Preto	Vermelho	Branco	Alaranjado	Cor-de ros	Cinza

General Warnings

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.
- 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 piping runs must be provided to ensure proper valve capacity and flow response. See installation section for details.
- 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.
- It is not necessary to install one strainer per unit. Belimo recommends installing one strainer per system. If the system has multiple branches, it is recommended to install one strainer per branch.

WARNING: Lift EPIV from valve body. Do not lift this valve by the actuator. Lifting the valve body by the actuator can break the linkage and void the warranty.

1. Inspect shipping package, valve, linkage, and actuator for physical damage. If shipping damage has occurred notify appropriate carrier. Do not install.
2. When replacing the EPIV, remove existing valve, linkage and actuator from the piping system.
3. If actuator and linkage are removed, they must be reinstalled correctly. The actuator must be rotated so that the valve seats properly for close off.
4. 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.
5. Blow out all piping and thoroughly clean before valve installation.
6. Clean fittings with wire brush and rag. Clean pipes, fittings, and valve before installation; check for any foreign material that can become lodged in trim components. Strainers should be cleaned after initial startup.
7. Valve must be installed with the stem towards the vertical, not below horizontal.
8. These valves are designed to be installed between ANSI Class 125/150 flanges only.
9. -250 models are designed to be installed between ANSI Class 250/300 flanges only.
10. Carefully follow installation using ANSI piping practices.

Parameter	PC-Tool	ZTH US	Description
Volume	Read Only	Read Only	The actual GPM flowing through the valve.
Setpoint	Read Only	Read Only	The limiting GPM for which the valve has been set.
Position	Read Only	Read Only	The valve position displayed in % of V'max.
Step			Override Command. The following commands are available:
- Open	Read/Write	Read/Write	Open - Overrides the valve to the fully open position.
- Close	Read/Write	Read/Write	Close - Overrides the valve to the fully closed position.
V'max	Read/Write	Read/Write	This is the limiting GPM for which the valve is set. Range is 30% - 100% of maximum flow of the valve.
PF-Delay	Read/Write	Read/Write	Power Fail-Safe Delay - Delay for the time to react on fail-safe operation.
MP Address	Read/Write	Read/Write	Belimo's proprietary communication protocol. Can be set from 1 to 8.
Valve Size	Read Only		The valve size set by the manufacturer.
Control Signal	Read/Write		The input from the DDC controller; 0.5V - 10 VDC and 2-10 VDC are available.
Control Signal Inverted	Read/Write		Inverts control signal, i.e. 2 VDC open, 10 VDC closed.
Feedback	Read/Write		The feedback signal from the actuator; 0.5V - 10 VDC and 2-10 VDC are available.
Valve Charactersitic	Read/Write		The valve can be configured for pressure dependent or pressure independent operation.
Bus Fail Position			The predetermined fail position of the valve. The following options are available:
- Last Setpoint	Read/Write		Last Setpoint - Volumetric flow in accordacnce with the last setpoint received.
- Open	Read/Write		Open - Overrides the valve to the fully open position.
- Close	Read/Write		Close - Overrides the valve to the closed position.
- V'max	Read/Write		The limiting GPM for which the valve is set.

The ZTH US is a tool created to easily adapt the flow settings for the EPIV in the field. It directly connects to the Belimo actuator.

CONNECTION PROCESS:

AR, GR, LR, NR, AK, GK, EV, AVK Series
Use the interface on the top of the actuator.
(Leave all of the wires of the actuator installed.)

Technical Information

Supply	24 VAC/DC
Communication	PP
Used with actuator types	ARX24 AKRX24 GRX24 GKRX24 LRX24 NRX24 EVX AVKX

RE-PROGRAMMING PROCESS:

Initial Screen
Connect cable to actuator port, twist to lock in place. Will display the handheld software and hardware versions for 5 seconds then it will display the actuator being connected

Screen 1
Start EPIV process by pressing the up arrow (ESC)
The first screen displays the MFT adress, press ESC to continue to the next screen.

Screen 2

To change the Vmax value press the – button until you reach the required value then press the OK button.

Screen 3

A message is displayed “Y and U5 Adjusted” for 5 seconds. Then the new Vmax value is displayed. Press ESC to continueto the next screen or simply disconnect the device from the actuator.

Screen 4

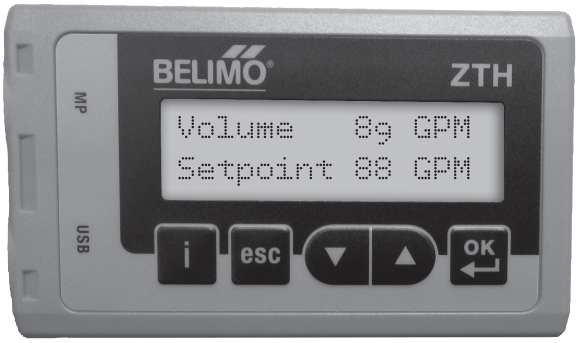
Press the +/- buttons to select different override commands, once selected press OK to execute.
AUTO: Automatic Operation
OPEN: Overrides the valve to the maximum rotation (90°)
CLOSE: Overrides the valve to minimum rotation (0°)
Vmax: Overrides the valve to its maximum GPM
STOP: Overrides the valve to the last valve position.

Screen 5

This screen displays the current GPM and valve position. This is used for troubleshooting. A small valve position and large GPM reading might indicate overpressure in the system. A small flow and a big valve position might indicate that there is not enough flow or pressure in the system.

Screen 6

This screen displays the current GPM and the setpoint send by the controller. The voltage signal is converted to GPM in the actuator. This can be used to troubleshooting to verify the signal send by the controller and to verify Setpoint vs. Actual flow.



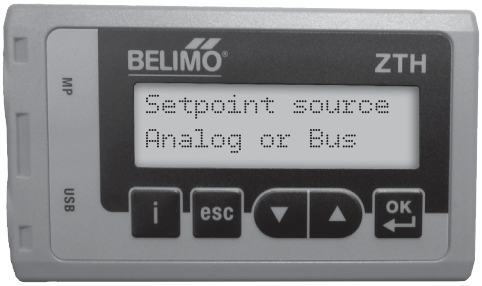
Troubleshooting					
Problem	**Green LED**	**Valve Position**	**Feedback Signal**	**Possible Cause**	**Possible Solution**
The LED on the actuator is not green.	OFF	Static on the last position.	-	• The actuator is not powered. • The actuator is out of service.	• Verify the power supply and the electrical components (fuse, on/ switches, etc). • If the actuator is out of service send the actuator and the sensor back to Belimo, please do not disconnect the assembly.
Requested flow can not be reached: U5 is lower than Y.	ON	Fully Open	Below setpoint U5<Y	Dp is too low. The requested flow can not be reached.	Increase the pump power.
Wrong flow rate measurements.	ON	-	-	• “Scaling adjusted” PC-Tool or ZTH US. • Requirements regarding media are not taken into consideration. • 5x DN as an inlet length is not taken into consideration. • The installation wiring is not equipotential. • Dp too high.	• Default to factory settings. • Check the datasheet for media options. • Piping should be modified to fulfill the minimum inlet length. • Check earth ground connection. • Adjust the Dp to lower value.
Flow measurements are not stable.	ON	Cyclic Movement	-	The electrodes are not in proper contact with the fluid.	• Remove air from the system. • Verify proper installation. • Ensure electrodes are always in contact with the fluid.
Valve operating as pressure dependent	ON	Varying based on control signal	0.3 V	• Air in the system (air bubble error). • Sensor failure.	• Remove air from the system. • Replace the sensor. • Ensure electrodes are always in contact with the fluid.

The adaptation button calibrates the actuator input signal range (2-10V) to the actuator's angle of rotation range. It does that by driving the actuator to the mechanical end stops. After the adaptation cycle, the actuator will follow the current input signal. By default, the actuator will run the adaptation cycle after the first power up.

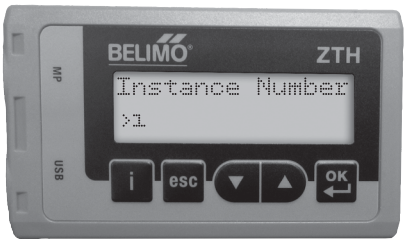
Belimo recommends performing a manual adaptation to the actuator after changing the actuator V'max or direction settings. The manual adaptation can be activated by pressing the translucent "Adaptation" LED button for three seconds.

Screen 1
Ensure you are using the correct -MOD actuator

Screen 2
Setpoint source can be selected:
Analog: Control from the controller (0.5-10V or 2-10)
Bus: Control from Bus Communication BACnet or Modbus
Default: Bus



Screen 3a - 8a
Bus Protocol - BACnet



Screen 3b - 8b
Bus Protocol - Modbus

General information	Date	25.03.2019
	Vendor Name	BELIMO
	Vendor ID	423
	Product Name	2-way EPIV
	Product Model Number	P2...-MOD, P6...-MOD
	Applications Software Version	03.04-0000
	Firmware Revision	08.03.0003
	BACnet Protocol Revision	12
	Product Description	Communicative characterised control valve with sensor-operated flow control, 2-way
	BACnet Standard Device Profile	BACnet Application Specific Controller (B-ASC)
	Segmentation capability	No
	Data Link Layer Options	MS/TP master
	Device Address Binding	No static device binding supported
	Networking Options	None
	Character Sets Supported	ISO 10646 (UTF-8)
	Gateway Options	None
	Network Security Options	Non-secure device
	Conformation	Listed by BTL
BACnet Interoperability Building Blocks supported BIBBs	Data sharing – ReadProperty-B (DS-RP-B) Data sharing – ReadPropertyMultiple-B (DS-RPM-B) Data sharing – WriteProperty-B (DS-WP-B) Data sharing – COV-B (DS-COV-B) Device management – DynamicDeviceBinding-B (DM-DDB-B) Device management – DynamicObjectBinding-B (DM-DOB-B) Device management – DeviceCommunicationControl-B (DM-DCC-B)	
BACnet MS/TP	Baud rates	9‘600, 19‘200, 38‘400, 76‘800 (Default: 38‘400)
	Address	0...127 (Default: 1)
	Number of nodes	Max 32 (without repeater), 1 full busload
	Terminating resistor	120 Ω
Parameterisation	Tool	ZTH US

All writeable objects which are persistent and are **not** supposed to be written on a regular base.

Standard Object Types Supported

Object type	Optional properties	Writeable properties
Device	Description Location Active COV Subscriptions Max Master Max Info Frames Profile Name	Object Identifier Object Name Location Description APDU Timeout (1‘000…60‘000) Number of APDU Retries (0...10) Max Master (1...127) Max Info Frames (1...255)
Analog Input [AI]	Description COV Increment	COV Increment
Analog Output [AO]	Description COV Increment	Present Value COV Increment Relinquish Default
Analog Value [AV]	Description COV Increment	Present Value COV Increment
Binary Input [BI]	Description Active text Inactive Text	
Multi-state Input [MI]	Description State Text	
Multi-state Output [MO]	Description State Text	Present Value Relinquish Default
Multi-state Value [MV]	Description State Text	Present Value

The device does not support the services CreateObject and DeleteObject.
The specified maximum length of writable strings is based on single-byte characters.
– Object name: 32 char
– Location: 64 char
– Description: 64 char

Service processing

The device supports the DeviceCommunicationControl and ReinitializeDevice services. No password is required.
A maximum of 6 active COV subscriptions with a lifetime of 1…28‘800 sec. (8 hours) are supported.

Quick addressing

Actuators support quick addressing via the „Address“ and „Adaption“ buttons.
For detailed information, please see product datasheet (chapter Service).

Object Name	Object Type [Instance]	Description Comment *Status_Flags*	Values	COV Increment	Access
Device	Device [Inst.Nr]		0…4‘194‘302 *Default: 1*	–	W
RelPos	AI[1]	Relative Position in % *Overridden = true, if the gear is disengaged*	0...100	0.01...100 *Default: 1*	R
AbsPos	AI[2]	Absolute Position in degree or mm The unit depends on the device: [°] for actuators with rotary movement [mm] for actuators with linear movement *Overridden = true, if the gear is disengaged*	0...max angle	0.01...65‘535 *Default: 1*	R
SpAnalog	AI[6]	Analog Setpoint in % Shows the setpoint in % if actuator is control by analog signal (SpSource MV[122] is analog(1)) *If SpSource MV[122] is Bus(2) then Out_Of_Service is TRUE*	0...100	0.01...100 *Default: 1*	R
RelFlow	AI[10]	Relative Flow in %	0…100	0.01...100 *Default: 1*	R
AbsFlow_UnitSel	AI[19]	Absolute Flow in unit selected Flow in unit selected in MV[121]	0...Vnom	0.01...1‘000 *Default: 1*	R
Sens1Analog	AI[20]	Sensor 1 as analog value in mV / - Current value of sensor 1 in case Sensor1Type MV[220] is Active *If Sens1Type MV[220] is not Active(2) or SpSource MV[122] is Analog(1) then Out_Of_Service is TRUE*	–	0.01...1‘000 *Default: 1*	R
SpRel	AO[1]	Relative Setpoint in % Setpoint for actuator between 0 and Max AV[98] if controlled via bus *If SpSource MV[122] is Analog(1) then Out_Of_Service is TRUE*	0…100 *Default: 0*	0.01...100 *Default: 1*	C
Max	AV[98]	Max Setpoint in % Vmax has to be ≥ 30%	30...100 *Default: 100*	0.01...100 *Default: 1*	W
Vnom_UnitSel	AV[104]	Nominal Flow in unit selected Vnom in unit selected in MV[121]	–	0.01...100 *Default: 1*	R
Bus Watchdog	AV[130]	Timeout for Bus Watchdog in s 0 = watchdog deactivated If the Present_Value is not ZERO, the implementation tracks write procedures to Present_Value of AO[1] and MO[1] If the Present_Value of AO[1] or MO[1] is written, the timer is reset. Upon timeout the Priority_Array of the AO[1] is cleared and the Reliquish_Default becomes valid In Hybrid Mode (SpSource MV[122] is Analog(1)) the implementation tracks write procedures to Present_Value of MO[1]	0...3‘600 *Default: 0*	0.01...1‘000 *Default: 1*	W

Object Name	Object Type [Instance]	Description Comment *Status_Flags*	Values	Access
Sens1Switch	BI[20]	Sensor 1 as Switch Indicates value on sensor 1 in case Sensor1Type MV[220] is Switch(5) *If Sens1Type MV[220] is not Switch(5) or SpSource MV[122] is Analog(1) then Out_Of_Service is TRUE*	Inactive_Text: Inactive Active_Text: Active	R
BusTermination	BI[99]	Bus Termination Indicates if bus termination (120 Ω) is enabled. Bus termination can be set with the configuration tools.	Inactive_Text: Inactive Active_Text: Active	R
SummaryStatus	BI[101]	Summary Status Summary of all Status (MI[106], MI[110])	Inactive_Text: OK Active_Text: Not OK	R
InternalActivity	MI[100]	Internal Activity Test: Internal test running, activated by bus Adaption: Adaption is running	1: None 2: Test 3: Adaption	R
StatusActuator	MI[106]	Status Actuator Actuator cannot move: Mechanical overload e.g. blocked actuator, etc. Gear disengaged: Button is pressed Mechanical travel increased: The actuator has been moved outside the adapted working range	1: OK 2: Actuator cannot move * 3: Gear disenganged 4: Mechanical travel increased *	R
StatusDevice	MI[110]	Status Device Indicates general status about the device Bus Watchdog triggered: Timeout for Bus Watchdog expired	1: OK 2: Bus Watchdog triggered	R
Override	MO[1]	Override Control Override the setpoint (SpRel AO[1] or analog signal) with defined values	1: None 2: Open 3: Close 4: Min_Vmin 5: Mid_Vmid 6: Max_Vmax *Default: None(1)*	C
Command	MV[120]	Initiate Function Initiation of actuator functions for service and test. After command is sent, value returns to None(1). With Reset(4) all status in StatusActuator MI[106] can be reset	1: None 2: Adaption 3: Test 4: Reset *Default: None(1)*	W
UnitSelFlow	MV[121]	Unit Selection Flow The selected unit is valid for AI[19] and AV[104]	1: m^3/s 2: m^3/h 3: l/s 4: l/min 5: l/h 6: gpm 7: cfm *Default: m^3/h(2)*	W
SpSource	MV[122]	Setpoint Source *If Analog(1) then actuator is controlled by analog signal 0...10 V on wire 3.* *If Bus(2) then setpoint via bus SpRel AO[1]*	1: Analog 2: Bus *Default: Bus(2)*	W
ControlMode	MV[123]	Control Mode PosCtrl: Position Control FlowCtrl: Flow Control	1: PosCtrl 2: FlowCtrl *Default: FlowCtrl(2)*	W
Sens1Type	MV[220]	Sensor 1 Type *If SpSource MV[122] is Analog(1) then Out_Of_Service is TRUE*	1: None 2: Active / Hybrid 3: – 4: – 5: Switch 6: – 7: – 8: – 9: – 10: – 11: – *Default: None(1)*	W

Access: R = Read, W = Write, C = Commandable with priority array
* Status information must be reset Command MV[120] -> Reset(4)

General information	Date	25.03.2019
	Product Name	2-way EPIV
	Actuator type	P2...-MOD, P6...-MOD
	Protocol	Modbus RTU over RS-485
Modbus RTU	Transmission formats	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 (Default: 1-8-N-2)
	Baud rates	9‘600, 19‘200, 38‘400, 76‘800, 115’200 Bd (Default: 38‘400 Bd)
	Address	1...247 (Default: 1)
	Number of nodes	Max. 32 (without repeater)
	Terminating resistor	120 Ω
Parameterisation	Tool	ZTH US

Quick adressing

Actuators support quick addressing via the „Address“ and „Adaption“ buttons.
For detailed, information please see product datasheet (chapter Service).

Register implementation

All data is arranged in a table and addressed by 1..n (Register No.) or 0..n-1 (Address). No distinction is made between data types (Discrete Inputs, Coils, Input Registers and Holding Registers). As a consequence, all data can be accessed with the two commands for Holding Register. The commands for Discrete Inputs and Input Registers can be used as an alternative.

Commands

Standard commands:
Read Holding Registers [3]
Write Single Register [6]

Optional commands:
Read Discrete Inputs [2]
Read Input Registers [4]
Write Multiple Registers [16]

Command „Read Discrete Inputs“

The command reads one or more bits and can alternatively be used for Register No. 105 (Malfunction and Service information).

Example

The start address to be used is 1664 → **104** (Register Address) * **16** (Bit) = **1664**

Interpret values in the registers

All values in the register are unsigned integer datatypes.

Example

Read (Function 03, 1 Register) Value Register No. 12 = 0001‘1010‘1100‘10002 = 6‘85610
Actual Value = Value * Scaling factor * Unit = 6‘856 * 0.01 * m3/h = **68.56 m³/h**

32-Bit values in two registers

Values that exceed 65,535 are stored in two consecutive Registers and have to be interpreted as „little endian“ / LSW (Least Significant Word) first

Example

Register No. 10 (AbsFlow LowWord) = 14,55110 = 0011‘1000‘1101‘0111$_2$
Register No. 11 (AbsFlow HighWord) = 1910 = 0000‘0000‘0001‘0011$_2$

AbsFlow HighWord	AbsFlow LowWord
19	14,551
0000‘0000‘0001‘0011$_2$	0011‘1000‘1101‘0111$_2$

AbsFlow = 0000‘0000‘0001‘0011‘0011‘1000‘1101‘0111$_2$ = 1,259,73510 = **1259.735 l/h**

Math formula:
AbsFlow = (AbsFlow HighWord * 65,536) + AbsFlow LowWord
AbsFlow = (19 * 65,536) + 14,551 = 1,259,735 = **1259.735 l/h**

Deactivated registers

If a register is not supported by a device or by a device setting it is indicated with 65‘535 (1111‘1111‘1111‘1111$_2$).

All writeable registers on registers >100 are persistent and are **not** supposed to be written on a regular base.

Operation

No.	Address	Register		Access
1	0	Setpoint [%]		R / W
2	1	Override control		R / W
3	2	Command		R / W
4	3	Actuator type		R
5	4	Relative position [%]		R
6	5	Absolute position [°] [mm]		R
7	6	Relative volumetric flow [%]		R
8	7	Absolute volumetric flow [m^3/h]		R
9	8	Sensor value 1 [mV] [–]		R
10	9	–		–
11	10	Absolute volumetric flow in unit selected	LowWord	R
12	11		HighWord	
13	12	Setpoint analog [%]		R

Service

No.	Address	Register		Access
100	99	Bus termination		R
101	100	Series number 1st part		R
102	101	Series number 2nd part		
103	102	Series number 4th part		
104	103	Firmware version		R
105	104	Malfunction and service information		R
106	105	–		–
107	106	Max [%]		R / W
108	107	Sensor type 1		R / W
109	108	Bus fail position		R / W
110	109	Communication Watchdog		R / W
111	110	Nominal volumetric flow [m^3/h]		R
112	111	–		–
113	112	Nominal volumetric flow in unit selected	LowWord	R
114	113		HighWord	
115	114	–		–
116	115	–		–
117	116	Control Mode		R / W
118	117	Unit Selection Flow		R / W
119	118	Setpoint source		R / W

Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
1	0	Setpoint Setpoint for actuator between 0 and Max (No. 107)	0…10‘000 *Default: 0*	%	0.01	R / W
2	1	Override Control Override setpoint with defined values	0: None 1: Open 2: Close 3: Min 4: Mid 5: Max *Default: None(0)*	–	–	R / W
3	2	Command Initiation of actuator functions for service and test After command is sent, register returns to None(0) With Reset(4) all Malfunction and Service Information (Register No. 105) Information can be reset.	0: None 1: Adaption 2: Test 3: Sync 4: Reset *Default: None(0)*	–	–	R / W
4	3	Actuator Type	0: Actuator not connected 1: Air / Water **2: VAV / EPIV** 3: Fire 4: Energy Valve 5: 6way EPIV	–	–	R
5	4	Relative Position	0...10‘000	%	0.01	R
6	5	Absolute Position The unit depends on the device: [°] for actuators with rotary movement [mm] for actuators with linear movement	0...max angle / stroke	° mm	1 1	R
7	6	Relative volumetric flow Relative volumetric flow of Vnom	0...10‘000	%	0.01	R
8	7	Absolut volumetric flow	0...Vnom	m^3/h Pa	1	R
9	8	Sensor 1 Value Current value of sensor 1, depending on the setting of the Sensor 1 Type (Register No. 108) [mV] if Sensor 1 Type (Register No. 108) is Active(1) [0 / 1] if Sensor 1 Type (Register No. 108) is Switch(4)	0...65‘535	mV 0 / 1	1	R
10	9	–	–	–	–	–
11	10	Absolute volumetric flow Absolute flow in unit selected (Register No. 118) LowWord Lower 16 bit of 32 bit value	–	UnitSel	0.001	R
12	11	Absolute volumetric flow Absolute flow in unit selected (Register No. 118) HighWord Upper 16 bit of 32 bit value				
13	12	Setpoint Analog Shows the setoint in % if actuator is control by analog signal	0...10‘000	%	0.01	R

Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
100	99	Bus Termination Indicates if bus termination (120 Ω) is enabled Bus termination can be set with the configuration tools	0: inactive 1: active *Default: inactive(0)*	–	–	R / W
101	100	Series Number 1st part Each device has an unambiguous series number, which is either impressed on or glued to the housing The series number consists of 4 segments, although only parts 1, 2 and 4 are displayed on Modus Example: 00839-31324-064-008 1st part: 00839 2nd part: 31324 4th part: 008	–	–	–	R
102	101	Series Number 2nd part	–	–	–	R
103	102	Series Number 4th part	–	–	–	R
104	103	Firmware Version Firmware version of communication module Example: 302, Version 3.02	–	–	–	R
105	104	Malfunction and Service Information Value is bit-coded. More than one bit can be set to 1 All bits not mentioned in the enumeration are not used for this actuator range Mechanical travel increased: The actuator has been moved outside the adapted working range Actuator cannot move: Mechanical overload e.g. blocked actuator, etc. Internal activity: Actuator performs a test run, adaption, etc. Gear disengaged: The gear disengaged button is pressed Bus Watchdog triggered: Timeout for the Bus Watchdog expired	Bit1: Mech travel increased Bit2: Actuator cannot move Bit8: Internal activity Bit9: Gear disengaged Bit10: Bus Watchdog triggered	–	–	R
106	105	–	–	–	–	–
107	106	Vmax Max has to be ≥ 30%	3'000...10'000 *Default: 10'000*	%	0.01	R / W
108	107	Sensor 1 Type If Setpoint Source (Register 119) is analog (Hybrid mode) the sensor type 1 can be set to Active(1) in order to see the Setpoint Analog in mV	0: None 1: Active / Hybrid 2: – 3: – 4: Switch *Default: None(0)*	–	–	R / W
109	108	Bus Fail Position Modbus communication is not monitored as standard. In the event of a breakdown in communication, the actuator retains the current setpoint The bus implementation tracks the Modbus communication. If neither the Setpoint (Register No. 1) nor the Override Control (Register No. 2) is renewed before the Timeout for Bus Watchdog (Register No. 110) expires, the actuator controls to the Bus Fail Position Triggered bus watchdog is indicated in the Malfunction and Service Information (Register No. 105)	0: None / Last setpoint 1: Fast close 2: Fast open 3: Mid position (parameterized) *Default: None(0)*	–	–	R / W
110	109	Timeout for Bus Watchdog in s Time until Bus Fail will be detected. If Bus Watchdog = 0 then deactivated If Bus Fail Position (Register No. 110) different from 0, the Bus Fail Position becomes active after the Timeout for Bus Watchdog is expired	0...3'600 *Default: 0* *If Bus Fail Position (Register No. 110) not None(0), then* *Default: 120*	s	1	R / W

Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
111	110	Nominal volumetric flow	–	m^3/h	1	R
112	111	–	–	–	–	–
113	112	Nominal volumetric flow Vnom in unit selected (Register 118) LowWord Lower 16 bit of 32 bit value	–	UnitSel	0.001	R
114	113	Nominal volumetric flow Vnom in unit selected (Register 118) HighWord Upper 16 bit of 32 bit value				
115	114	–	–	–	–	–
116	115	–	–	–	–	–
117	116	Control Mode	0: Position control 1: Flow control	–	–	R / W
118	117	Unit Selection Flow	0: m^3/s 1: m^3/h 2: l/s 3: l/min 4: l/h 5: gpm 6: cfm *Default: m^3/h(1)*	–	–	R / W
119	118	Setpoint Source Analog: Setpoint from analog signal 0 ... 10 V on wire 3 Bus: Setpoint from Modbus (Register 1)	0: Analog 1: Bus *Default: Bus(1)*	–	–	R / W