Knowledge is Power

Belimo Energy Valve™

A two-way pressure independent control valve that optimizes, documents and proves water coil performance.

Valve Innovations

Hardware Packaging
- All inclusive: 2-way valve, actuator, coil optimization logic, embedded temperature sensor and remote temperature sensor with well, water flow meter, DDC communication

Coil Optimization Logic
- Pressure independent valve response
- Delta T Manager™
- BTU, BTU/h power calculation

Energy Data
- BTU, BTU/h, water flow, coil Delta T
- Power curve & Delta T curve data
- Daily trend data storage (13 months)

DDC Integration
- Analog, BACnet MS/TP, TCP/IP, MP

Tools
- Laptop with standard IP browser interface via ethernet cable for parameterization
- ZTH-2 US hand held parameterization tool

Table of Contents

Features / Benefits
Belimo Energy Valve

A look inside the Belimo Energy Valve:

The Energy Valve combines ALL of the following components:

- Belimo CCV (Characterized Control Valve).
- Electromagnetic flow sensor.
- Advanced control options including Belimo Delta T Manager.
- Supply and return water temperature sensors, for energy management.
- BACnet MS/TP or BACnet IP network communication.

The Energy Valve is a pressure independent valve that optimizes, documents and proves water coil performance. The Energy Valve is a two-way pressure independent valve using the Electronic Pressure Independent Valve (ePIV) platform that measures the coil energy using an embedded electromagnetic flow sensor, water supply and return temperature sensors.

The Energy Valve uses the Belimo Delta T Manager™ algorithm that monitors the coil performance and optimizes the available energy of the coil. The Energy Valve has standard analog signal and feedback wiring and communicates data to the DDC system via BACnet MS/TP, BACnet IP and TCP/IP. The actuator stores all the coil performance data such as Delta T and energy usage. All the coil performance data, stored trends and control functions can be sent to the BAS via the data network.

Energy Optimization

- Improve coil Delta T by utilizing Belimo Delta T Manager mode to match the installed characteristic of the coil.
- Save pump distribution energy by eliminating coil overflow.
- Improve plant performance by improving chiller or boiler efficiency.
- Reduce unwanted chiller or boiler staging by improving plant Delta T.

Planner / Consultant

- Achieve coil performance that follows the calculated design flow rates exactly.
- Benchmark installed coil efficiency characteristic (power curve and Delta T curve).
- Compare installed benchmark to coil manufacturer's performance data to identify installation anomalies such as piping problems or clogged coils.

Control Contractor

- Simplified valve sizing and selection, no Cv calculations required.
- Provides data to the BAS enabling continuous commissioning of coils which allows customized control strategies. Use diagnostics to achieve Green design criteria and continuous commissioning requirements.

Installer

- Compact foot print requires only 5x diameter straight pipe run leading to the flow meter section.

Commissioning Agent/Balancer

- Provides the rated flow, initial coil baseline efficiency data and installed coil efficiency data. This data can be used by the Commissioning Agent and Balancer to ensure that every coil is performing at its optimum BTU/h output and Delta T.
- Compare installed benchmark to future coil performance to identify fouling, external dirt and fin degradation.
- Document and benchmark current as well as subsequent coil performance data to meet green designs.

Owner

- Offers better comfort, less maintenance costs and valuable coil performance data. The system saves energy costs by reducing the power consumption of pumps and chilled water plants by optimizing coil operation.
- Provides coil performance data that will allow continuous re-commissioning of the coil over its lifetime.

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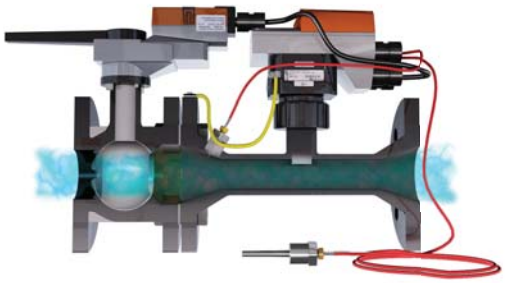
BELIMO

How the Belimo Energy Valve Optimizes Coil and thus System Performance

A look inside the Belimo Energy Valve:

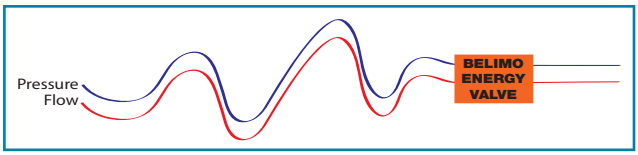
The Energy Valve combines ALL of the following components:

- Belimo CCV (Characterized Control Valve).
- Electromagnetic flow sensor.
- Advanced control options with Belimo Delta T Manager.
- Supply and return water temperature sensors, for energy management.
- BACnet MS/TP or BACnet IP network communication.

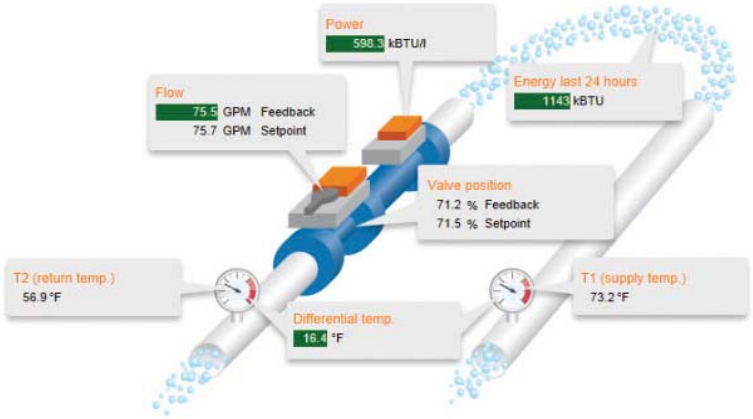


The Energy Valve is a pressure independent characterized control valve that optimizes, documents, and proves water coil performance.

Flow Control



Accurate and automatic flow control are achieved through the Energy Valve's electromagnetic flow sensor and patented characterizing disc, which has high rangeability and turndown ratio. The equal percentage characteristic of the disc decreases "hunting" and stabilizes system output through small, incremental changes in water flow during the first 10 to 30 degrees of valve opening—where control is most critical. Automatic flow control is enabled through the combination of an accurate flow sensor and powerful algorithm that modulates the control valve to maintain the exact flow.



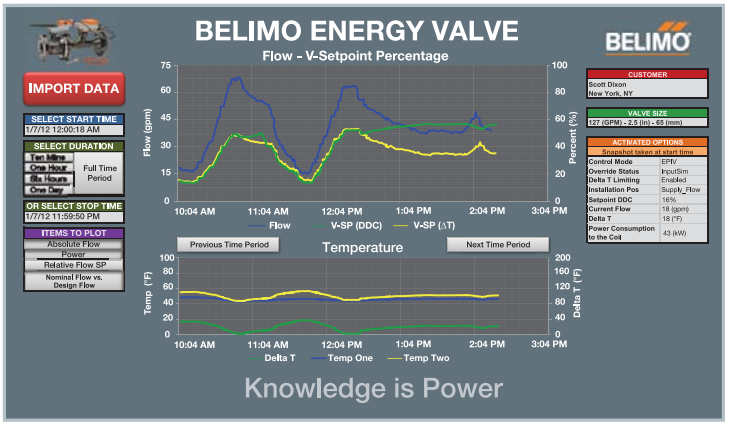
Monitoring & Adjustment

In addition, the Belimo Delta T Manager continuously monitors the coil Delta T and compares this value with the desired Delta T value or setpoint. For example in a cooling application, if the actual Delta T is below the setpoint, the valve will reduce flow to bring Delta T back to the desired setpoint. Once the appropriate Delta T is re-established, the valve control resumes it's normal operating mode taking its signal from the DDC controller.

The software within the actuator can monitor and trend all sensed or calculated data. This data is archived for 13 months and is accessible via a personal computer or laptop. These data values include water flow, return and supply water temperature, power, energy, and more.

Trending & Diagnostics

All of the data that the Energy Valve continuously collects is reported back to the BAS, where it can be accessed for virtually unlimited trending and diagnostics. For example, a downward trend in the coil power output could signal that the coil is in need of servicing.



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Set-Up

		2-WAY VALVE
NON-SPRING RETURN STAYS IN LAST POSITION	**ARB… Series** **GRB… Series**	**NC*:** Valve Closed-will open as voltage increases.

*Feedback signal is always NC

Valve is set up at the factory based on customer needs, see ordering example on page 6.

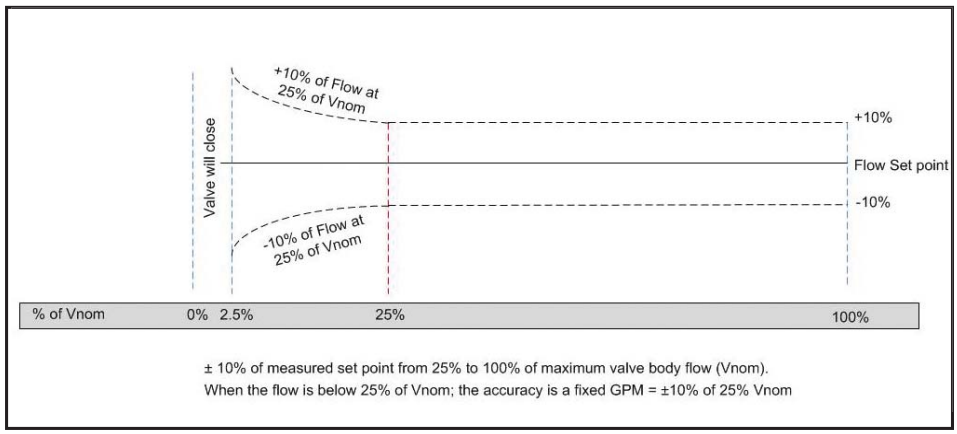
Flow Tolerance

Flow control tolerance:

- ±10% of V'nom.

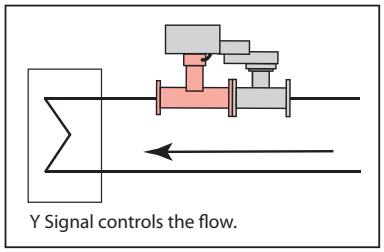
Flow measurement tolerance:

- ±2% of V'nom.

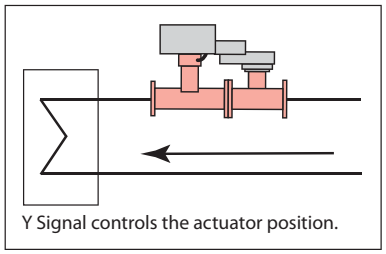


Functionality

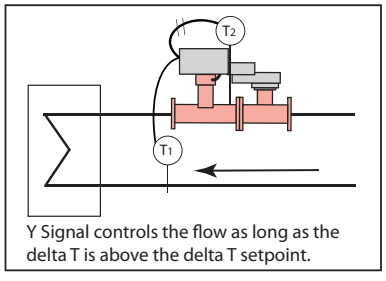
The Belimo Energy Valve offers different control options which can be selected using the web interface.


Y Signal controls the flow.

Characterized Position Control
The position of the actuator can be controlled with the Y-Signal. The Energy Valve will then work like a normal pressure dependent valve. The actuator is positioned based on the DDC control signal.

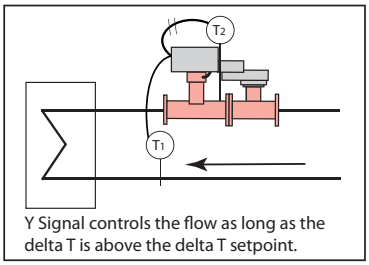

Y Signal controls the actuator position.

Pressure Independent Flow Control
The flow is controlled with the Y-Signal. The Energy Valve works like an ePIV. The valve senses any change in flow and modulates the actuator to maintain the flow setpoint based on the DDC control signal.



Y Signal controls the flow as long as the delta T is above the delta T setpoint.

Pressure Independent Flow + Delta T Manager
The Flow is controlled with the Y- Signal. The Energy Valve works like an ePIV but if the measured Delta T is lower than the defined min. Delta T regardless of the control signal Y the maximum flow will be limited by the Delta T Manager logic.



Y Signal controls the flow as long as the delta T is above the delta T setpoint.

Characterized Position Control + Delta T Manager
The position of the actuator can be controlled with the Y-Signal. The Energy Valve works like a pressure dependent valve. If the measured Delta T is lower than the defined min Delta T, regardless of the control signal Y, the maximum flow will be limited by the Delta T Manager logic.

Powered by Belimo SharedLogic Technology
Powered by Optimum Energy™

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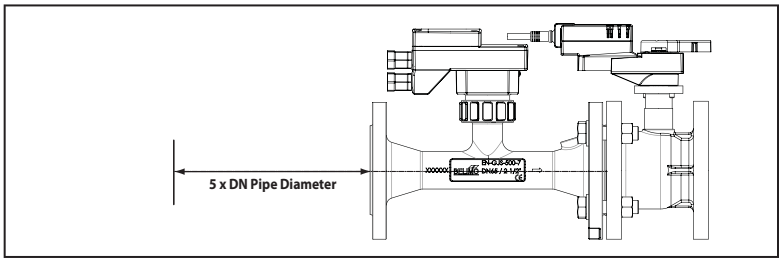
Installation

Inlet Length

The Energy Valve requires a section of straight pipe on the valve inlet to guarantee sensor accuracy. This section should be at least 5 pipe diameters long with respect to the size of the valve.

DN65 5 x DN = 12.5" [317 mm]
DN80 5 x DN = 15" [381 mm]
DN100 5 x DN = 20" [508 mm]
DN125 5 x DN = 25" [635 mm]
DN150 5 x DN = 30" [762 mm]

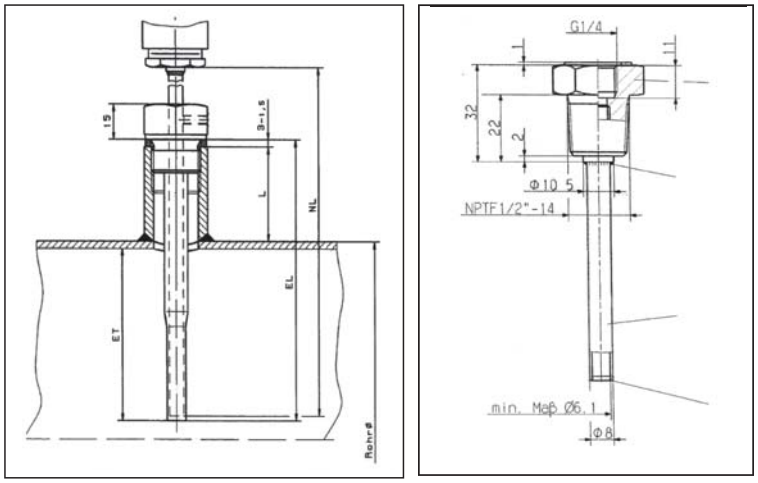


Output Length

No requirements for outlet length.
Elbows can be installed directly after the valve.

Remote Sensor Installation:

A thermo well is provided with the remote temperature sensor. The well should be installed on the pipe prior to installing the remote temperature sensor. The remote temperature sensor should be installed on the opposite pipe entering the coil from where the Energy Valve is installed.
A 1/2" NPT female union should be welded on the pipe to allow the installation of the thermo well.



How to build the remote well

The valve is provided with a 32 ft [10m] temperature sensor cable. The valve uses a signal loss compensation based on cable length, this is why it is important to only cut the wire to the specified length. Cutting the wire to a different length will cause inaccuracies on the Energy calculations.
If the cable is cut, the new length needs to be configured on the valve. The cable can be cut to the following lengths:

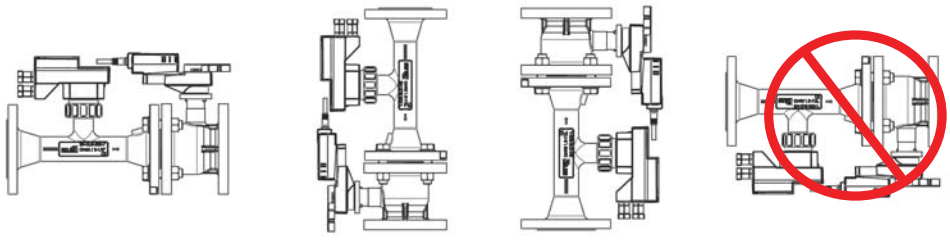
4.9 ft [1.5m]
9.8 ft [3m]
16.4 ft [5m]

The new cable length will need to be set in web-view.

IN	DN [mm]	EL	ET	L max.
2 ½"	65	3.66" [93]	2.36" [60]	1.18" [30]
3"	80	3.66" [93]	2.36" [60]	1.18" [30]
4"	100	3.66" [93]	2.36" [60]	1.18" [30]
5"	125	3.66" [93]	2.36" [60]	1.18" [30]
6"	150	3.66" [93]	2.36" [60]	1.18" [30]

Orientation

Energy Valves 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.



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Actuator, Temperature & Flow Sensor Removal ⚠

The actuator, embedded temperature sensor and the flow sensor can be removed from the valve if needed. All the components (actuator, temperature sensors and flow sensor) should be removed together.

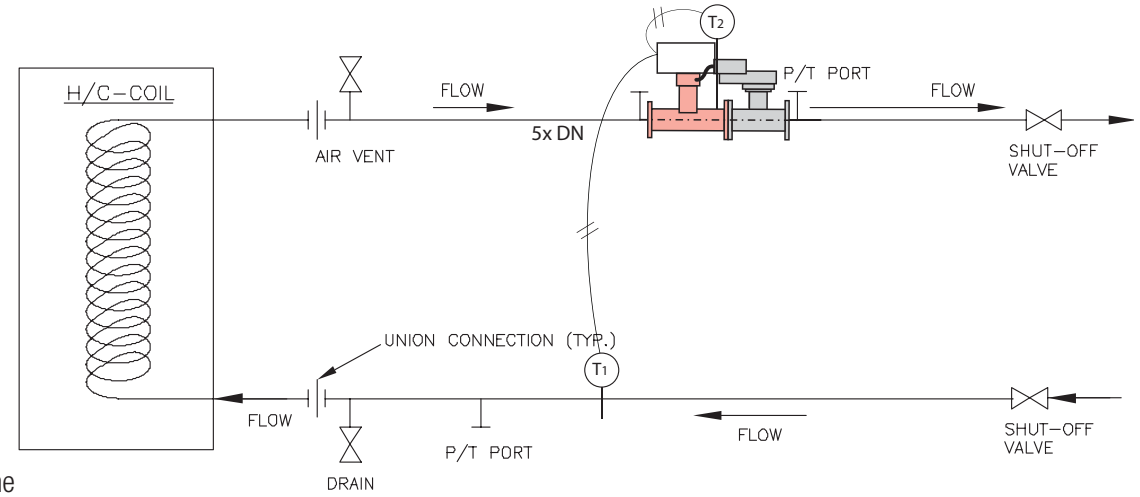
The sensor wires should not be disconnected from the actuator. Both temperature sensors can be removed without draining the system; each temperature sensor is in a thermo well.

IMPORTANT: The flow sensor is directly embedded in the flow sensor housing. To remove flow sensor, system must be relieved of pressure, drained and or closed directly upstream and downstream of the valve. The sensor unit and valve bodies should not be disassembled and or lifted by the actuator or flow sensor. Disassembly and or lifting by the actuator or flow sensor will damage and void warranty.

Hand tighten flow sensor when assembling onto the housing. Tools are not required. Ensure the o-ring gaskets are in place.

Piping

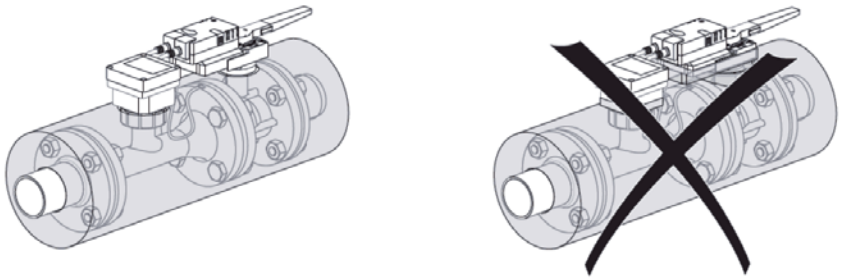
The Energy Valve is recommended to be installed on the return side of the coil. This diagram is for typical applications only. Consult engineering specification and drawings for particular circumstances. Install provided thermal well on the other side of the coil (T1). P/T ports are recommended on either side of the valve and the supply side of the heat transfer device to allow for pressure/flow measurement/calculation.



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. The Energy Valve cannot be piped in a parallel orientation.

Insulation

The insulation should be below the actuator.



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EV	250S	-127	+ARB	24	-65
ENERGY VALVE	**Valve Size**	**Flow Rate**	**Actuator Type**	**Power Supply**	**Valve Size**
2-way Flanged	250 = 2½" 180 = 3" 100 = 4" 125 = 5" 150 = 6" S = Stainless Steel Ball and Stem	127 GPM Refer to table on page 7	Non-Spring Return ARB GRB	24 = 24 VAC/DC	65 mm 80 mm 100 mm 125 mm 150 mm

Ordering Example

1 Choose the valve actuator combination.

EV250S-127+ARB24-65 **+NC** **+Tagging (if needed)**

2 Specify preference or configuration.

3

Set-Up Options Using the Ordering Tool		
Application Valve size Installation position Media Concentration of frost additive Cable length remote temp. sensor	**Configuration Control Function** Control mode Range control signal Control signal characteristic	**Configuration Limiting Function** Limiting function status
User Language Temp. unit Flow unit Power unit Energy unit	**Configuration Temperature** Ignore delta T smaller than	**Configuration Feedback Function** Feedback information Range feedback signal Set max flow

4 Does order require tagging?

Tagging:
Valves may be tagged per customer specification. ($10.00 charge per tag)

Example:
AHU-1
FCU-2

Part number for tagging:
99981-00101

5 Complete Ordering Example: EV250S-127+ARB24-65

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Energy Valve
Stainless Steel Ball, ANSI 125 Flange

Application

Water-side control of heating and cooling systems for AHUs and any water coil. Equal Percentage: Heating / cooling applications.

Mode of Operation

The Energy Valve is a pressure independent control valve that optimizes, documents and proves water coil performance.

Product Features

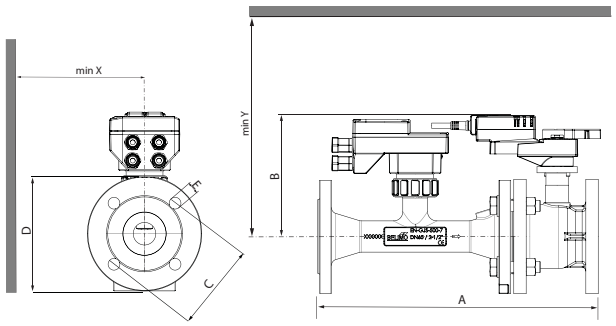
Constant flow regardless of pressure variations in the system improves chiller Delta T, preventing energizing additional chillers due to low Delta T. Simplified valve sizing and selection, no Cv calculations required.

Valve Specifications

Service	chilled or hot water, 60% glycol max (closed loop/steam not allowed)
Flow characteristic	equal percentage
Controllable flow range	75° rotation
Rangeability	100:1
Size	2½", 3", 4", 5", 6"
Type of end fitting	pattern to mate with ANSI 125 flange
Materials	
Body	cast iron - GG25 and ductile iron - GGG50
Ball	stainless steel
Seat	PTFE
Characterizing disc	stainless steel
Packing	2 EPDM O-rings, lubricated
Body pressure rating	according to ANSI 125, standard class B
Media temp. range	14°F to 248°F [-10°C to 120°C]
Maximum sound level	70 dBA
Conductivity	min. 20uS/cm
Leakage	0%
Differential pressure range(ΔP)	5 to 50 psid
Inlet length required in front of valve	5x DN
Ambient humidity range	
Actuator	<95% RH non-condensing
Sensor	<95% RH non-condensing
System	<95% RH non-condensing
Flow control tolerance	±10% of the setpoint from 25% to 100% of maximum valve body flow (V'nom). When the flow is below 25% of the V'nom; the accuracy is a fixed GPM = ±10% of 25% V'nom.
Flow measurement tolerance	±2% of the measured flow from 25% to 100% of maximum valve body flow (V'nom)*. When the flow is below 25% of the V'nom; the accuracy is a fixed GPM = ±2% of 25% V'nom.
Temperature sensors	32 ft. [10m] PT1000 insertion senors Thermal well ½ NPT
Rated impulse voltage	actuator/sensor: 0.8 kV (in accordance with EN 60730-1)
Power supply for the flow sensor	actuator is powered by the sensor
Remote temperature sensor length	
Standard	10 m
Optional	1.5, 3, 5 m

Valve Nominal Size		Weights
Inches	DN [mm]	Pounds [kg]
2½"	65	52 [23.6]
3"	80	63 [28.7]
4"	100	89 [40.5]
5"	125	120 [54.7]
6"	150	154 [70.0]

Dimensions



Valve Nominal Size		Dimensions (Inches [mm])						
In.	DN [mm]	A	B	C	D	E	min X	min Y
2½"	65	17.9" [454]	7.6" [193]	5.5" [140]	7.29" [185]	0.75" [19]	5.91" [150]	12.24" [311]
3"	80	19.7" [499]	7.6" [193]	6.07" [154]	7.9" [201]	0.75" [19]	5.91" [150]	12.24" [311]
4"	100	22.91" [582]	8.3" [211]	7.5" [190.5]	9" [229]	0.75" [19]	6.50" [165]	8.98" [228]
5"	125	25.2" [640]	9.4" [239]	8.5" [215.9]	10" [254]	0.84" [21]	7.09" [180]	10.24" [260]
6"	150	30.2" [767]	9.4" [239]	9.5" [241.3]	11" [279]	0.84" [21]	7.09" [180]	10.24" [260]

Available Flow Rates

	Valve Nominal Size		Type	Actuator Type
GPM Range	Inches	DN [mm]	2-way Flanged	Non-Spring Return
90-127*	2.50	65	EV250S-127	ARB24-65
133-180*	3	80	EV300S-180	ARB24-80
195-317*	4	100	EV400S-317	ARB24-100
335-495*	5	125	EV500S-495	GRB24-125
515-713*	6	150	EV600S-713	GRB24-150

* V'nom value

*(68°F [20°C], no glycol).
±6% of measured flow from 25% to 100% of maximum valve body flow (V'nom). When the flow is below 25% of V'nom, the accuracy is a fixed GPM= ±6% of 25% V'nom.

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Operation

The actuator is electronically protected against overload.

The ARB and GRB series 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.

Non-Spring Return Actuators ARB Series, GRB Series

Actuator Specifications	
Power supply	24 VAC ± 20% 24 VDC ± 10%
Electric frequency	60 Hz only
Power consumption	
AR Series	6.5 W
GR Series	9 W
Transformer sizing	20 VA (class 2 power source)
Electrical connection	18 GA, plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3 ft. [1 m] cable
Overload protection	electronic throughout 0° to 90° rotation
Operation range Y	2 to 10 VDC (default) VDC variable
Control	proportional
Input impedance	100 kΩ (0.1 mA), 500Ω
Feedback	0 to 10 VDC (default), VDC variable
Torque	
AR Series	180 in-lb [20 Nm]
GR Series	360 in-lb [40 Nm]
Direction of rotation	electronically variable
Fail-safe position	none
Manual override	external push button
Running time normal operation	90 seconds
Running time fail-safe	none
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]
Noise level	<45dB(A) at 90 seconds
Servicing	maintenance free
Quality standard	ISO 9001
Weight	
ARB Series	2.65 lb [1.2 kg]
GRB Series	4.85 lb [2.2 kg]

Wiring Diagrams

INSTALLATION NOTES

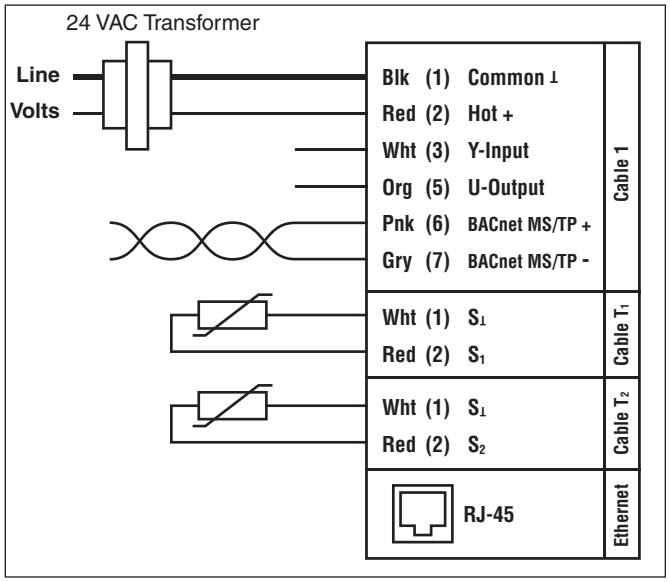
1. Provide overload protection and disconnect as required.
2. ***CAUTION** Equipment damage!*
   Actuators may be connected in parallel.
   Power consumption and input impedance must be observed.
3. Actuators may also be powered by 24 VDC.
4. Actuators are provided with color coded wires.
   Wire numbers are provided for reference.

APPLICATION NOTES

- The ZG-R01 500Ω resistor may be used.

***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.



System Ground

In cases where the valve body is electrically isolated from the water pipe, an earth ground should be installed in order for the sensor to work properly. Earth ground can be connected directly on the sensor body. A connection point is provided on the flange of the sensor body.

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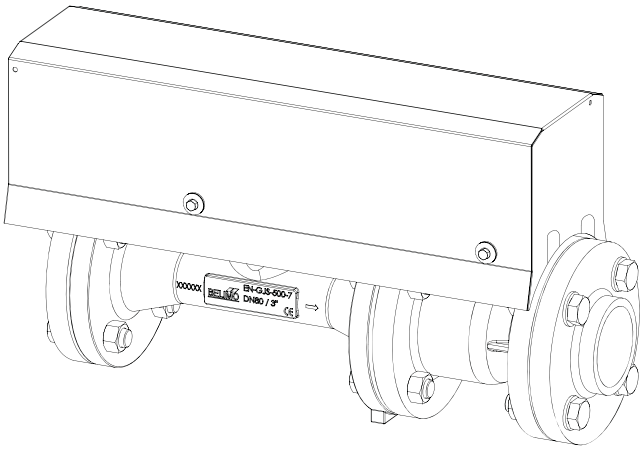

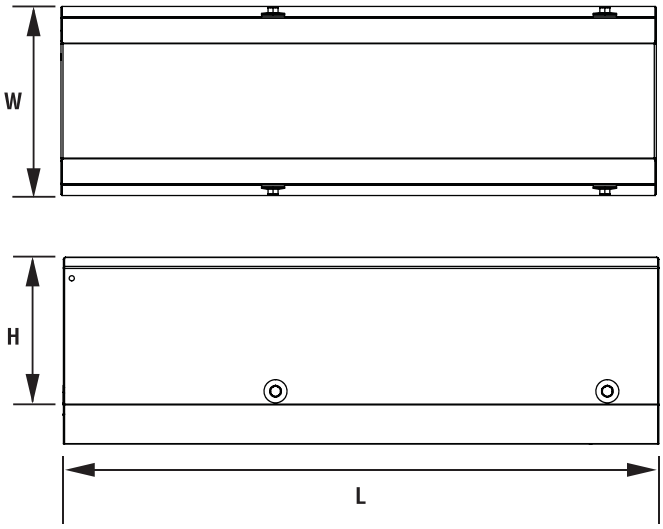

Application

The ZS-EPIV-EV weather shield provides moderate protection for valves which are mounted outdoors. The housing allows for easy mounting over the actuator and provides protection for the actuators in outdoor applications.

Specifications	
Cover	low carbon steel
U shaped mounting bracket	low carbon steel
Collar connecting mount	low carbon steel
Actuator shield	low carbon steel
Mounting screw	steel
Grommet	silicon rubber

Part Number	Valve Size (inches)
ZS-EPIV-EV-80	2 ½" (DN65), 3"(DN80)
ZS-EPIV-EV-150	4" (DN100), 5"(DN125), 6"(DN150)

Part Number	L	W	H
ZS-EPIV-EV-80	22-5/16"	7-1/8"	7"
ZS-EPIV-EV-150	29-9/16"	7-1/8"	6 ¾"

Parts List

U Shaped Mounting Brackets
Collar Connecting Mounts
Actuator Shield
Mounting Screws
Grommets

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Date: January 9, 2012

Vendor Name: BELIMO Automation AG
Product Name: P..W..EV-BAC
Product Model Number: N/A
Application Software Version: 1.10.1 Firmware Revision: 1.0.2 BACnet Protocol Revision: 1.4

Product Description:

The device is a characterized control valve (CCV) with adjustable flow rate, sensor-operated flow control and monitoring of power and energy. The set-point, configuration parameters and feedback values are communicated via BACnet/IP or BACnet MS/TP.
The commissioning of the device (BACnet Device Address, IP Address settings, Foreign Device settings, MS/TP) is done via the integrated web-server.

BACnet Standardized Device Profile (Annex L):

☐ BACnet Operator Workstation (B-OWS)
☐ BACnet Advanced Operator Workstation (B-AWS)
☐ BACnet Operator Display (B-OD)
☐ BACnet Building Controller (B-BC)
☐ BACnet Advanced Application Controller (B-AAC)
☑ BACnet Application Specific Controller (B-ASC)
☐ BACnet Smart Sensor (B-SS)
☐ BACnet Smart Actuator (B-SA)

List all BACnet Interoperability Building Blocks Supported (Annex K):

Data Sharing - ReadProperty-B (DS-RP-B)
Data Sharing - ReadPropertyMultiple-B (DS-RPM-B)
Data Sharing - WriteProperty-B (DS-WP-B)
Device Management - DynamicDeviceBinding-B (DM-DDB-B)
Device Management - DynamicObjectBinding-B (DM-DOB-B)
Device Management - DeviceCommunicationControl-B (DM-DCC-B)

Segmentation Capability:

☐ Able to transmit segmented messages Window Size _____
☐ Able to receive segmented messages Window Size _____

Standard Object Types Supported:

Object-Type	Supported	Dynamically Creatable	Dynamically Deletable	Optional Properties Supported	Writable Properties
Analog Input	☑	☐	☐	Description	
Analog Output	☑	☐	☐	Description	Present_Value
Analog Value	☑	☐	☐	Description	Present_Value
Binary Value	☑	☐	☐	Description Active_Text Inactive_Text Relinquish_Default Priority_Array	Present_Value
Device	☑	☐	☐	Description	Object_Identifier Object_Name Location APDU_Timeout Number_Of_APDU_Retries
Multi-state Value	☑	☐	☐	Description State_Text Relinquish_Default Priority_Array	Present_Value
Multi-state Output	☑	☐	☐	Description State_Text Relinquish_Default Priority_Array	Present_Value

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Energy Valve
BACnet Protocol Implementation Conformance Statement

BELIMO

Data Link Layer Options:

☑ BACnet IP, (Annex J)
☑ BACnet IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7)
☐ ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s) _____
☑ MS/TP master (Clause 9), baud rate(s): 115K,76.8K, 38.4K,19.2K,9.6K
☐ MS/TP slave (Clause 9), baud rate(s): _____
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s): _____
☐ Point-To-Point, modem, (Clause 10), baud rate(s): _____
☐ LonTalk, (Clause 11), medium: _____
☐ BACnet/ZigBee (ANNEX O)

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)
☐ Yes ☑ No

Networking Options:

☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP
☐ BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No
Does the BBMD support network address translation? ☐ Yes ☐ No

Character Sets Supported:

☑ ISO 10646 (UTF-8) ☐ IBM/Microsoft DBCS ☐ ISO 8859-1
☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS X 0208

Supported BACnet Objects:

Read Only Objects	
AI1	Relative Position in %
AI2	Absolute Position in °
AI10	Relative Flow in %
AI11	Absolute Flow in l/min
AI12	Absolute Flow in m3/h
AI13	Absolute Flow in gpm
AI20	Temperature 1 (remote) in °C
AI25	Temperature 1 (remote) in °F
AI21	Temperature 2 (embedded) in °C
AI26	Temperature 2 (embedded) in °F
AI22	Delta Temperature in °C
AI27	Delta Temperature in °F
AI30	Power in kW
AI35	Power in kBTU/h
AI31	Cooling Energy in kWh
AI36	Cooling Energy in kBTU
AI32	Heating Energy in kWh
AI37	Heating Energy in kBTU
AI101	Nominal Flow in l/min
AI102	Nominal Flow in gpm

Writable Objects	
AO1	Setpoint Relative in %
MO1	Override Control
	1 – None/Auto
	2 - Open
	3 - Close
	4 - Vmax
	5 - V'nom
	6 – Stop
AV100	Vmax : Flow Limit in %
MV100	Control Mode
	1 - Position Control
	2 - Flow Control
MV101	DeltaT Limitation
	Off - Disabled
	On - Enabled
AV103	DeltaT Setpoint in °C
AV104	DeltaT Setpoint in °F

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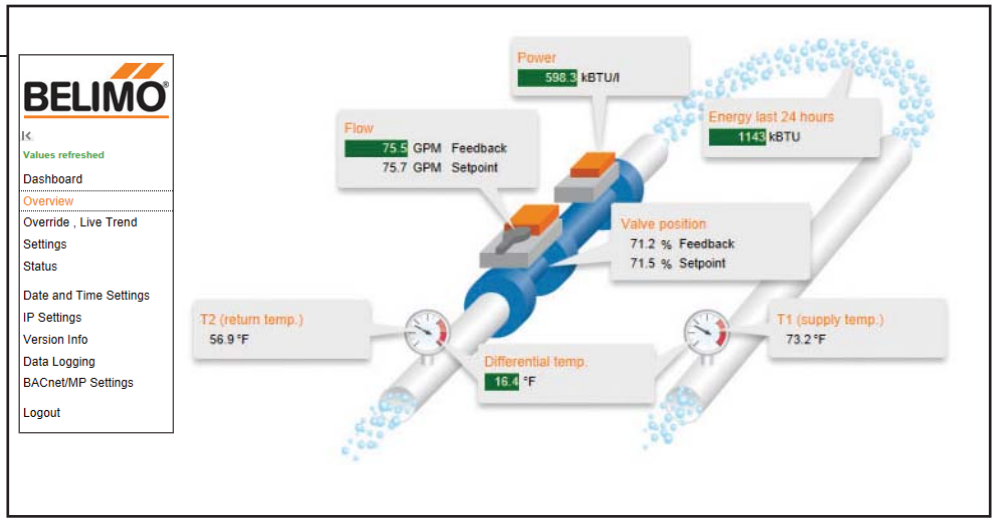
The Energy Valve web view is a graphical user interface accessed via a network or internet to set up, calibrate and change the parameters of the Belimo Energy Valve. The web view consists of the following page views:

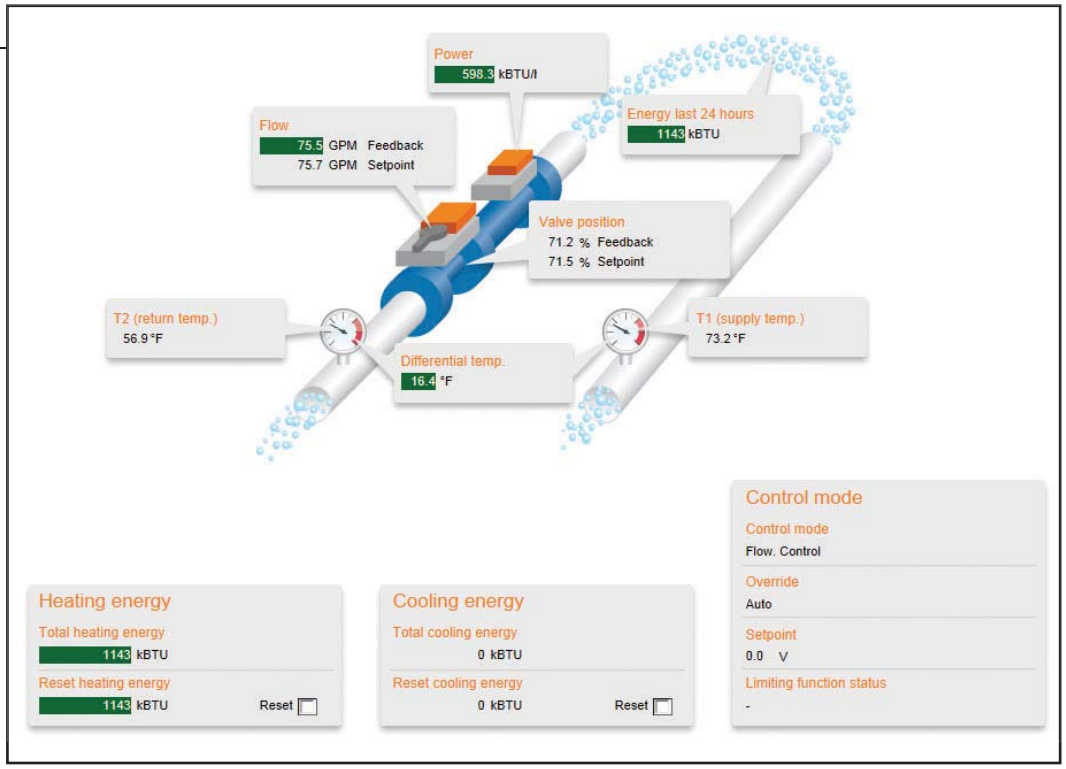
Dashboard

The Dashboard view is a snapshot of essential real time data with navigation ability to additional pages.



Overview

The Overview is a snapshot of essential real time data with addition of heating/cooling energy and current control mode.



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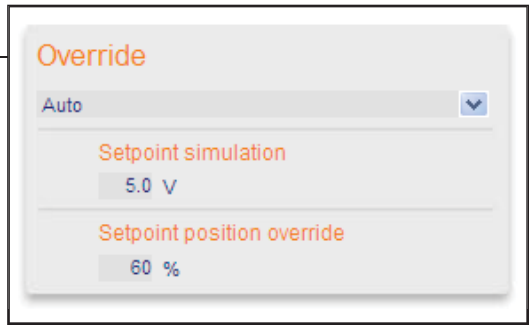
Override

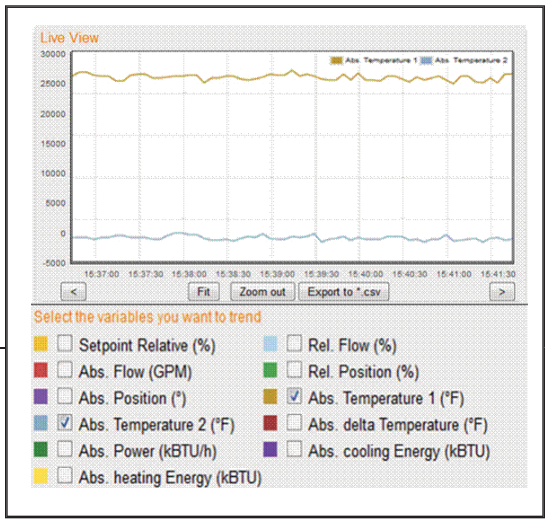


The Override area provides access to:

- Override
- Auto (Default)
- Open
- Close
- Vmax
- Motor Stop
- V'nom
- Setpoint Simulation

  When using the override option, consider the relationship between voltage and equal percent flow characteristic
- Setpoint Position Override

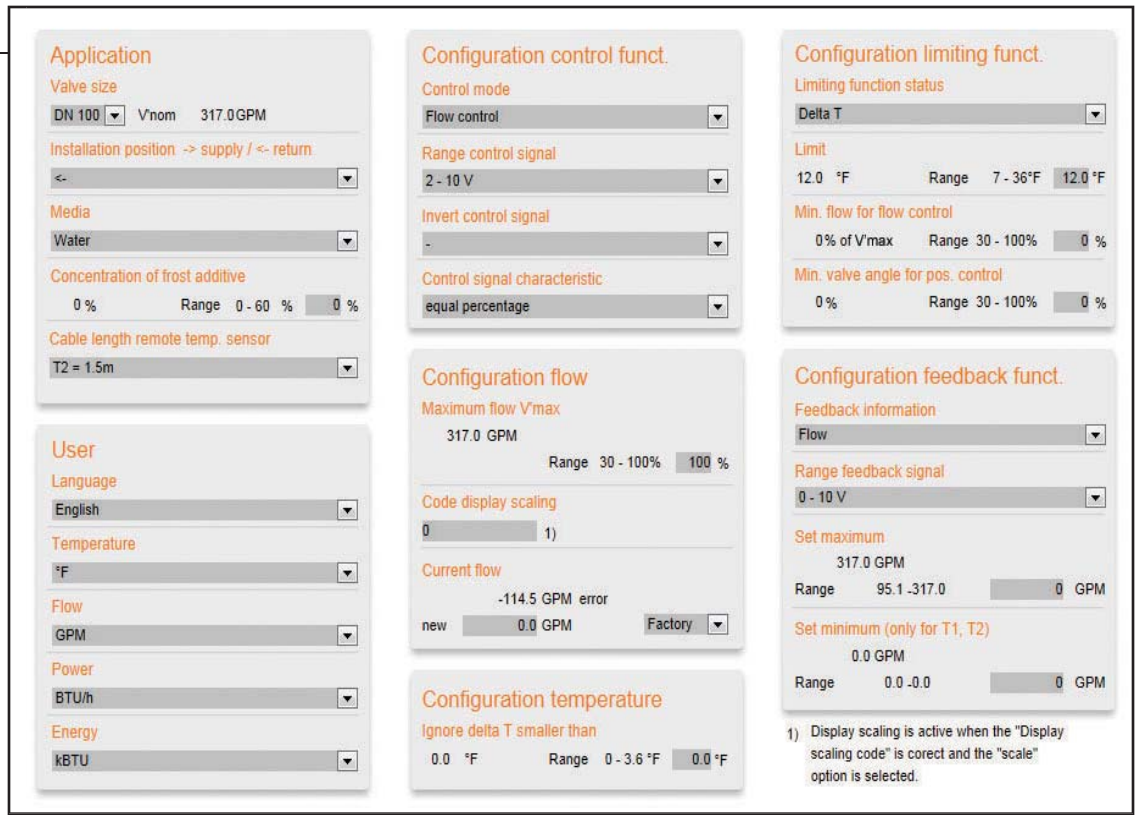
  Entered as a % of Vmax



Live Trending of selectable parameters.

Settings

The main page to access the settings of the energy valve.



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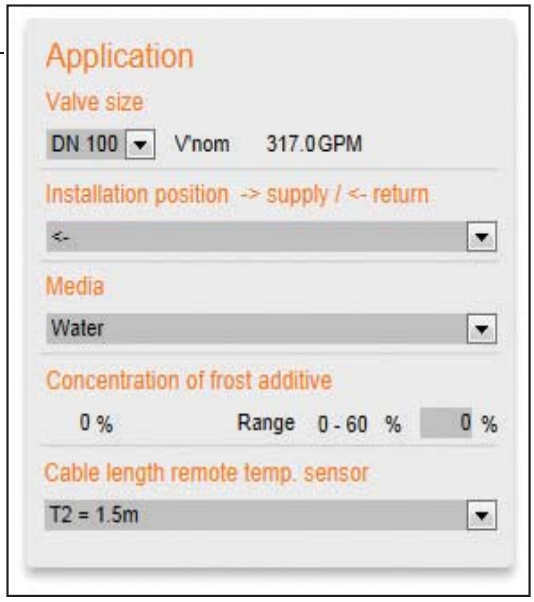
Application



Valve Size

- DN 65 – DN150
- This section should not be changed since it corresponds to the size of the valve. Only to be used when replacing an actuator with a non configured one out of the box.

Installation Position

- Select this option based on the actual installation of the valve
    - <- Valve installed on the return pipe of the coil
    - -> Valve installed on the supply pipe of the coil

Media

- Select the type of media used:
    - Water
    - Monoethylenglycol
    - 1.2 Polypropylenglycol

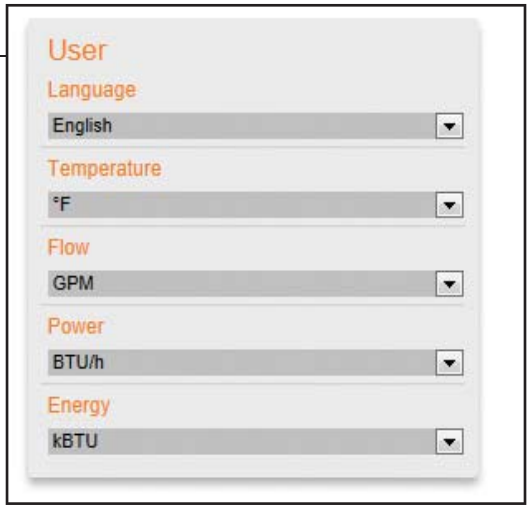
Concentration of Frost additive

- Define the concentration of frost additive or glycol in the media:
    - Valid Range 0-60%

Cable length remote temp. Sensor (T2)

- The Energy Valve leaves the factory with a 10 meter cable. If the cable has to be cut it can only be cut in the following length. Please configure the length on the WEBview:
    - 1.5 -10 Meters

User



Language

- Deutsch
- English (Default)

Temperature

- °F (Default)
- °C

Flow

- M3/h
- l/s
- l/min
- l/h
- GPM (Default)

Power

- W
- kW
- BTU/h
- kBTU/h (Default)
- Ton

Energy

- kW/h
- MW/h
- kBTU (Default)
- Ton/h

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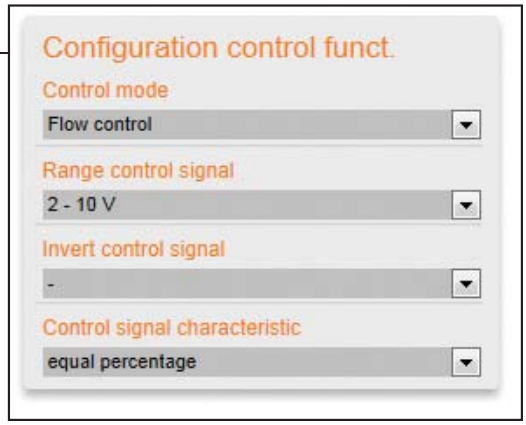
Configuration Control Funct.



Control Mode

- Pos. control
  - On this mode the valve will operate as a pressure dependent valve similar to a CCV or a globe valve
- Flow control
  - On this mode the valve will work as a pressure independent valve similar to an ePIV

Range Control Signal

- 0.5 – 10 VDC
- 2 – 10 VDC (Default)

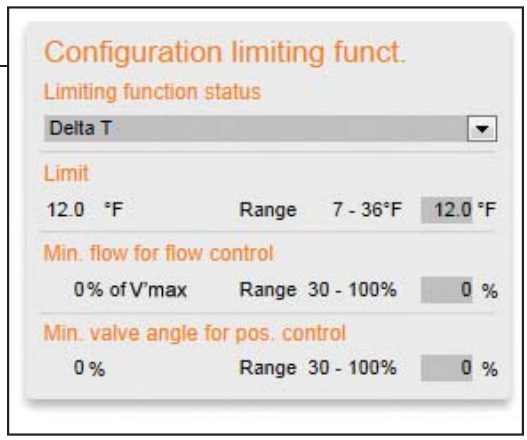
Invert Control Signal

- NO (Normally Open)
- NC (Normally Closed)- Default

Control signal characteristic

- Equal percentage (default): use this mode when controlling a heating or cooling coil
- Linear: Use this mode when controlling any device different than heating or cooling coil.

Configuration Limiting Funct.



Limiting Function Status

- None: Select this option to disable the Delta T Manager algorithm
- Delta T: Select this option to enable the Delta T Manager algorithm

Limit

- This section defines the Delta T setpoint.
- Valid Range 7-36°F (absolute)
- If valve is entered outside valid range, Delta T Manager will not operate
- This is only valid if the Delta T Manager is enabled.

Minimum Flow for Pressure Independent Mode

- When the valve is working in Pressure Independent mode this property will prevent the Delta T Manager to get active below this flow
- Valid Range: 30-100% of V'nom
- This is only valid if the Delta T Manager is enabled.

Minimum Valve Angle for Position Control

- When the valve is working in pressure dependent mode this property will prevent the Delta T Manager to get active below this valve position
- Valid Range: 30-100% of valve position
- This is only valid if the Delta T Manager is enabled.

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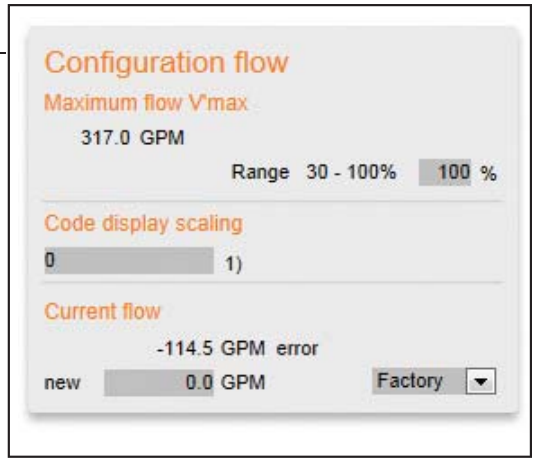
Configuration Flow



Maximum Flow Vmax [% of V'nom]

- This is a set value based on the coil GPM capacity, change this value to fit the coil size.
- Valid Range 30-100% of V'nom
    - V'nom: is the nominal flow of the valve or its high flow limit

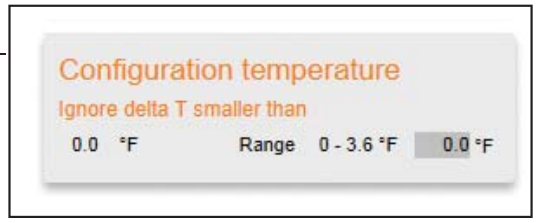
Code Display Scaling

- Code required to be able to rescale the flow feedback, please contact Belimo tech support for details

Current Flow

- This is used to match the flow feedback signal with the balancer's external flow meter measurement.
- When performing a flow feedback rescaling, follow this procedure:
    - Override the Valve to Vmax and wait for the flow to be stable
    - Measure the flow with an external flow meter
    - On the new box enter a flow value to match the flow feedback with the balancers measured flow
    - Release the override and then override the valve again to the new Vmax.
    - The flow feedback and the external measured flow should match, if not please repeat the procedure.
- Rescale/factory: shows if the feedback has being scaled or not. Rescale is scaled; Factory is not. If the flow feedback is too far from measurement please verify that the flow feedback has not being scaled, since this can introduce errors.

Configuration Temperature Sensor



- This is used to ignore Power/Energy calculations below this value.
- Valid Range 0°F - 3.6°F
- 0°F Default
- Normally used for troubleshooting

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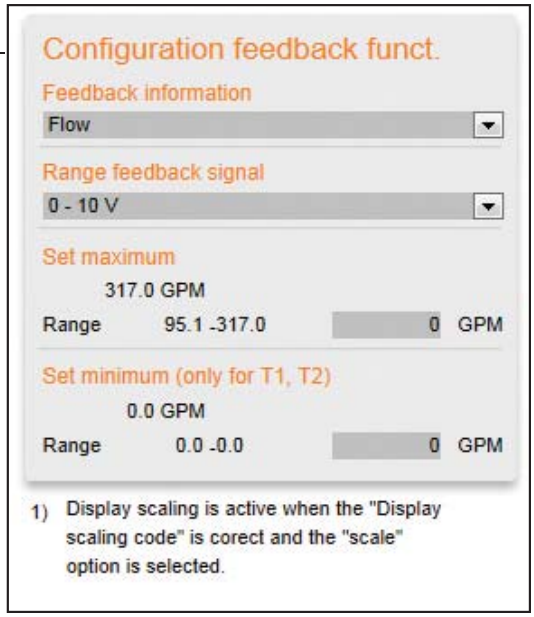
Configuration Feedback Funct.



Feedback Information

- Flow (Default)
- Power
- T Supply
- T Return
- Delta T
- Valve Position

Range feedback signal

- 0-10 VDC (Default)
- 0.5-10 VDC
- 2-10 VDC

Set Maximum

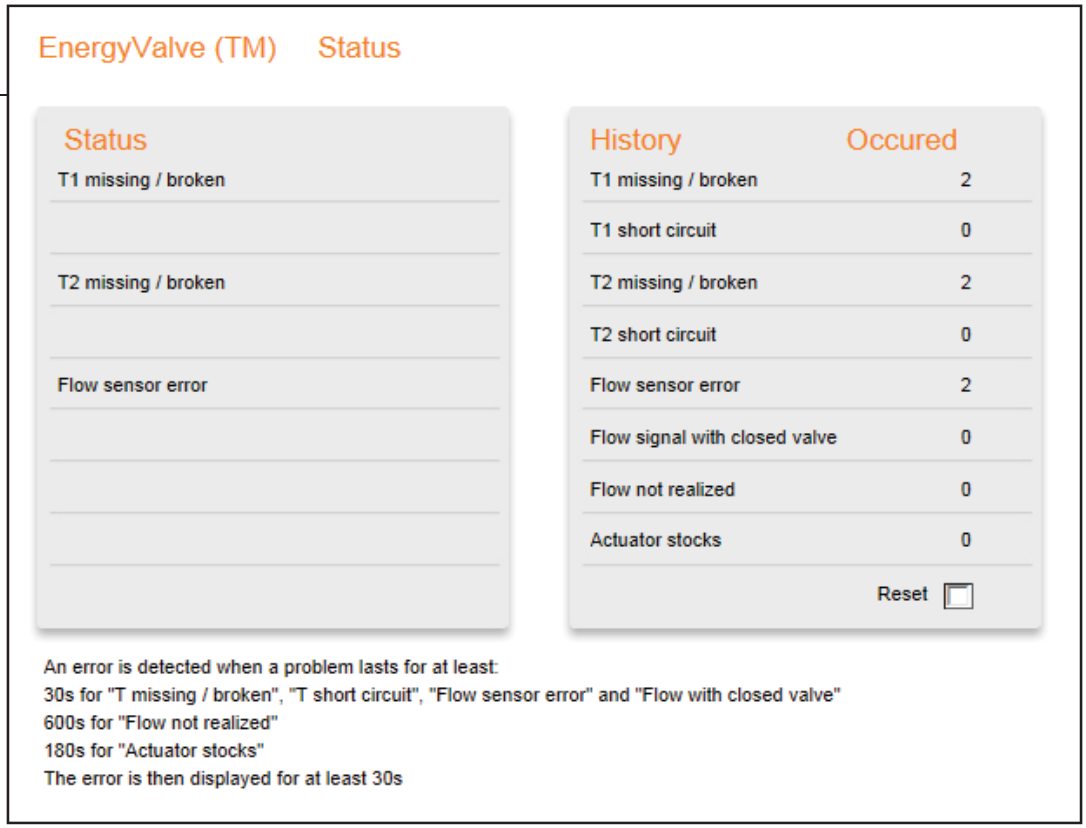
- To adjust the Analog range to a certain measurement range resolution

Set minimum (only for T1, T2)

- 32°F as 0 VDC but if there is a heating application; may need to lift 0 VDC to 122°F to have a better resolution for the temperature feedback.

Status

Identifies current operation and error history



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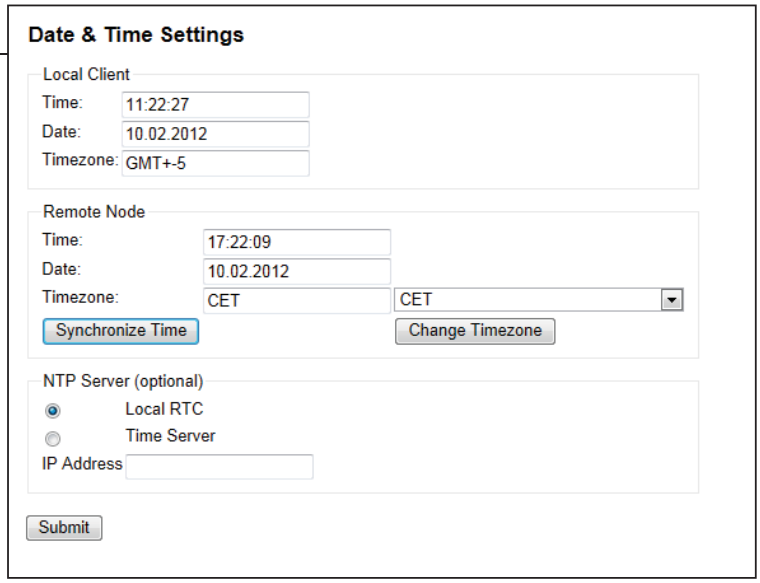
Date and Time

Configure local time zones

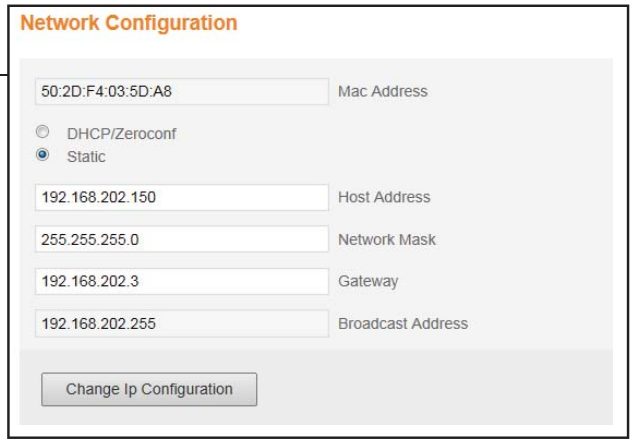
- Click “Synchronize Time” to match the computer connected to the actuator



IP Settings

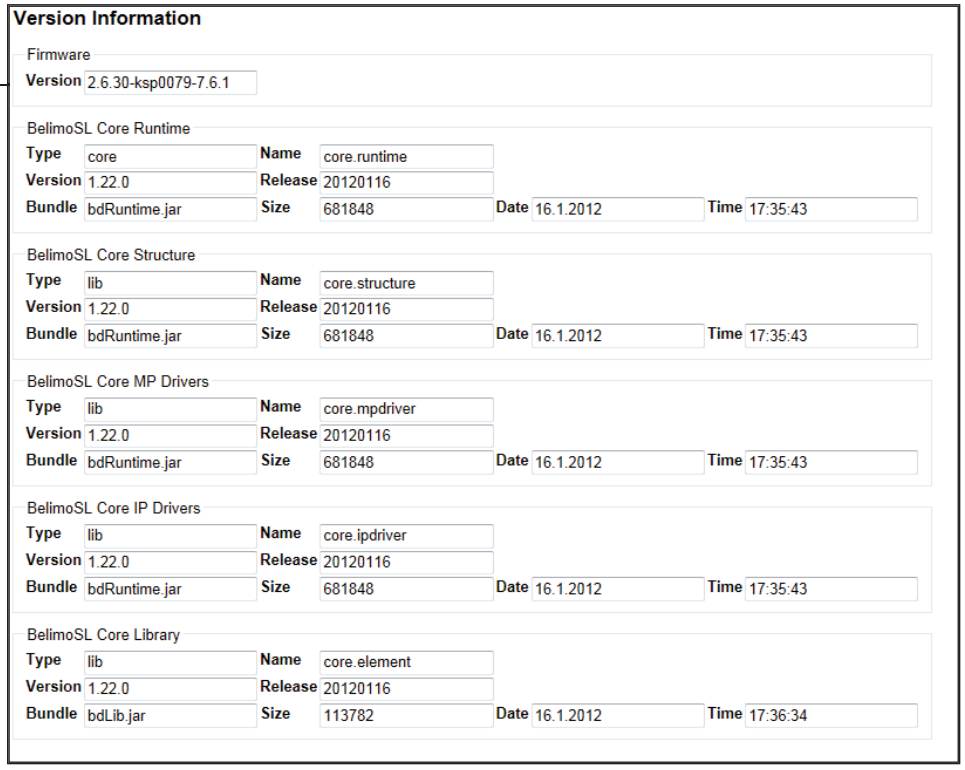
Configure

- DHCP
- Network Protocol
- Belimo cannot recover IP address if changed



Version Info

Displays current software version



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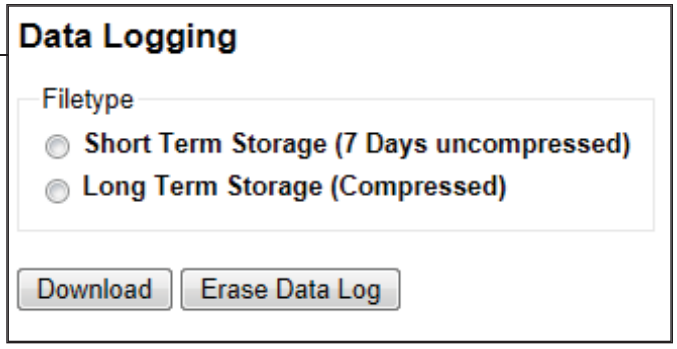
Data Logging

Data Extract

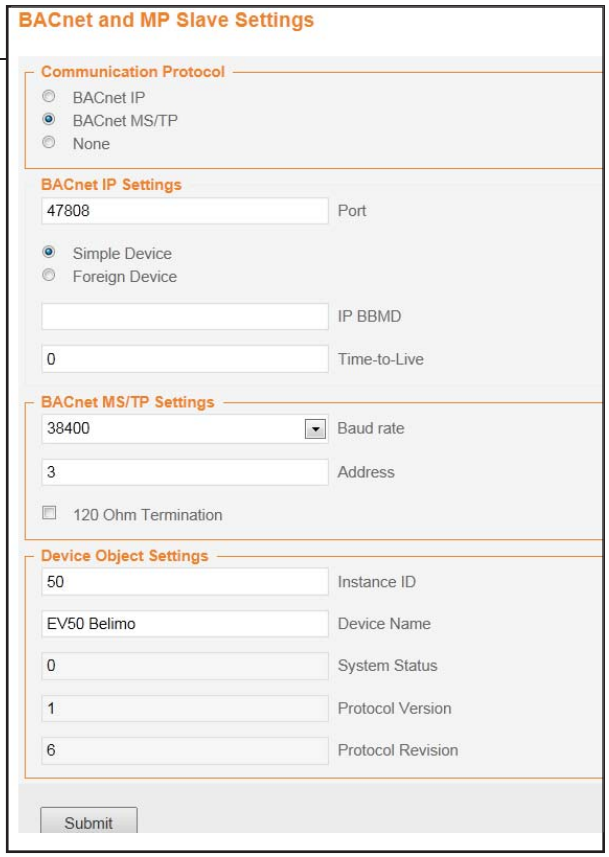
- Select time frame for exporting data to .csv format
- Data can be directly imported into Excel analysis tool
- Short term data is captured every 30 seconds
- Long term data is captured every 2 hours



BACnet Settings

Define

- Configure Protocol
- Configure IP and Device settings



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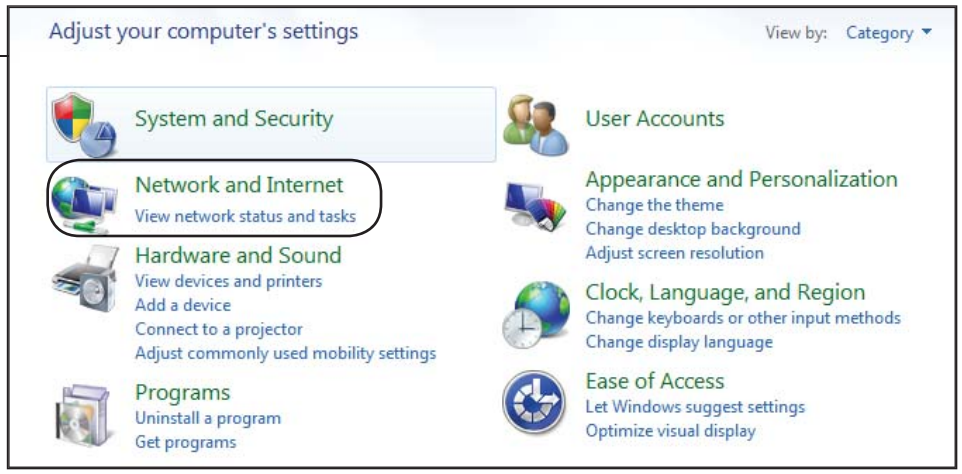
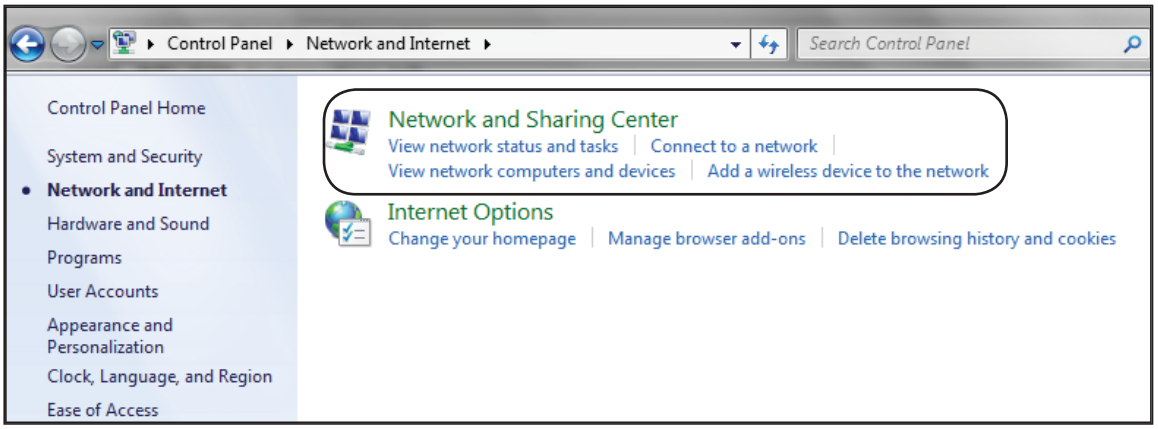
Connecting to the Actuator

- Using Windows 7, access the Network and Internet Settings from the control panel





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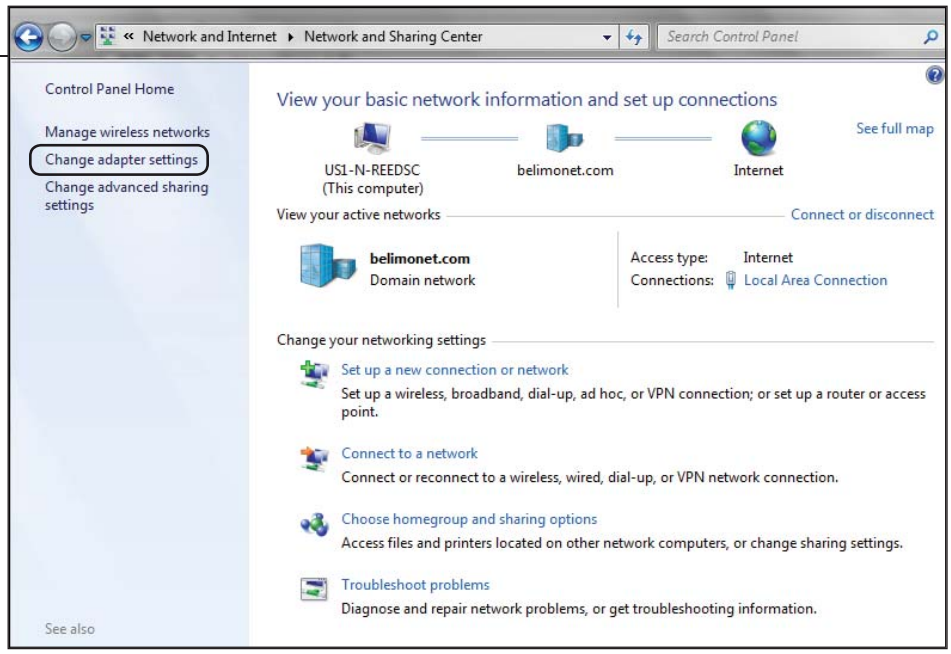
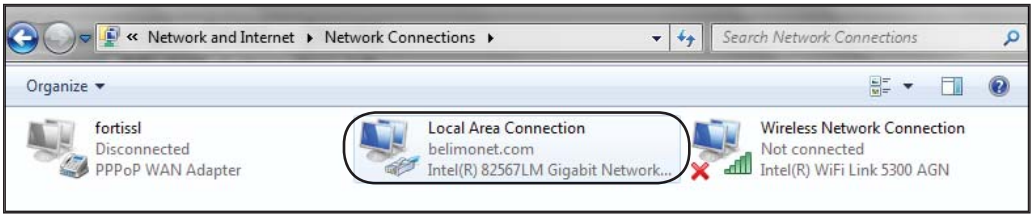
Connecting to the Actuator

- Change adapter settings
- Change local area connection



- Right click for Properties menu



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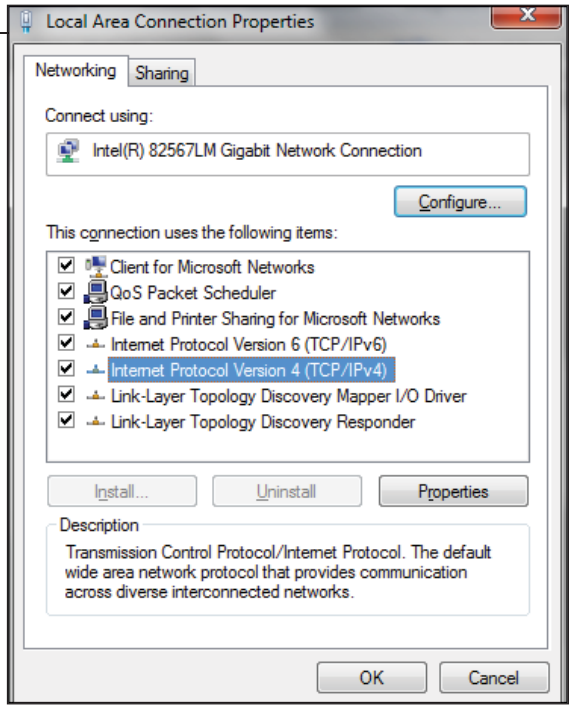
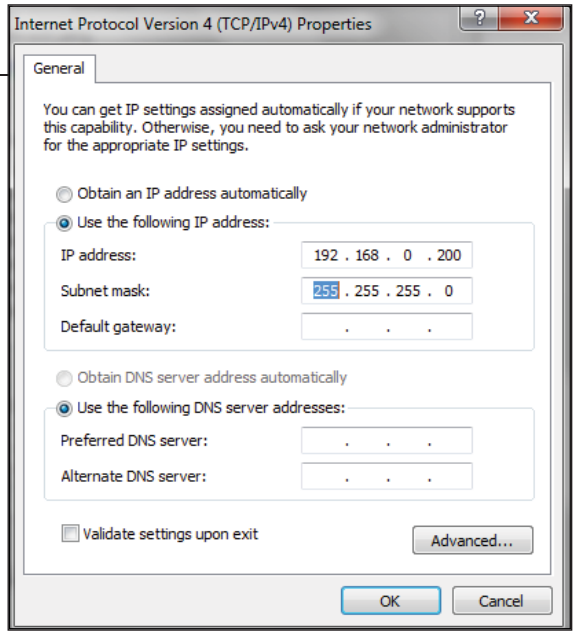
Access the IP Address

- Select Internet Protocol Version 4 (TCP/IPv4)
- Open the Properties window



Change the IP Address

- Select Use the following IP address
- Enter IP Address shown on the right
- Hit the Tab key and the Subnet mask will populate
- Click OK



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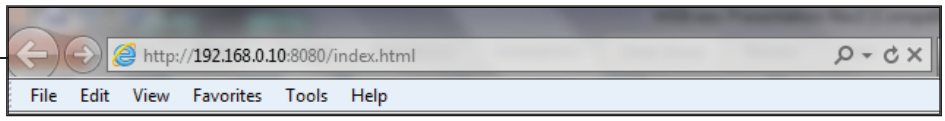
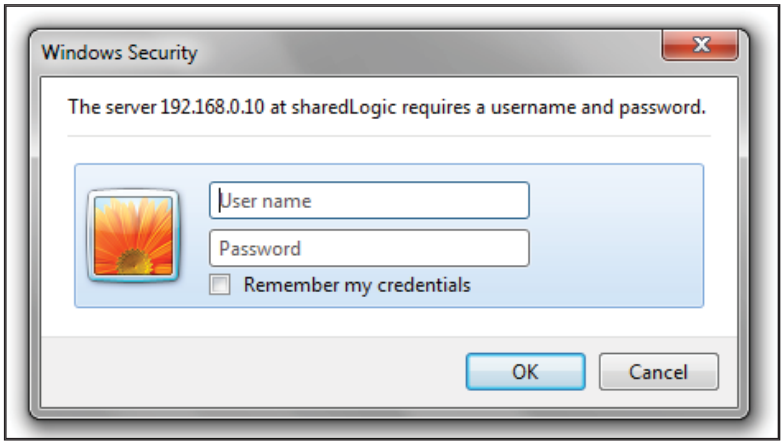
Access the Actuator



- Open Internet Explorer and enter the following address: http://192.168.0.10:8080/index.html
- 192.168.0.10 is the standard IP-Address of the Actuator
- Access to the actuator is protected by the user name and password
- Belimo cannot recover IP address if changed



Login and User Access

- 3 User Name choices having specific read/write access

Username:	**Guest**	**maintenance**	**admin**
Password:	**guest**	**belimo**	**Contact Belimo Tech Support**
Web View Page			
Dashboard	Read*	Read*	Read*
Overview	Read	Read / Write	Read / Write
Override, Live Trend	Read	Read / Write	Read / Write
Settings	Read	Read	Read / Write
Status	Read	Read / Write	Read / Write
Date and Time Settings	-	Read	Read / Write
IP Settings	-	Read	Read / Write
Version Info	-	Read*	Read*
Data Logging	Read	Read	Read / Write
BACnet Settings	View	View	Read / Write

*No “Write” function available

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The ZTH-2 is a tool created to easily adapt the flow settings for the Energy Valve in the field. It directly connects to the Belimo actuator.

CONNECTION PROCESS:

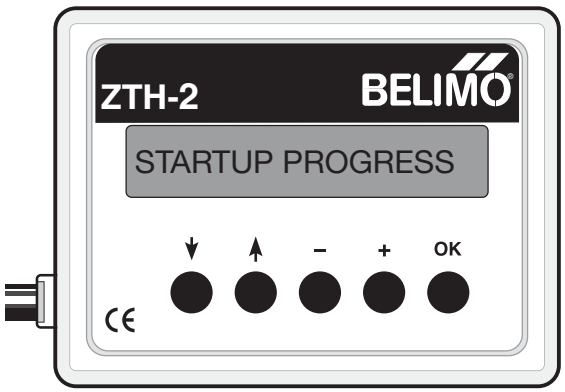
ARB, GRB Series
Use the interface on the top of the actuator. Quarter turn to lock in place. Connect the other end of the cable into the ZTH-2. The actuator must be powered for the ZTH-2 to function.(Leave all of the wires of the actuator installed.)

Technical Information

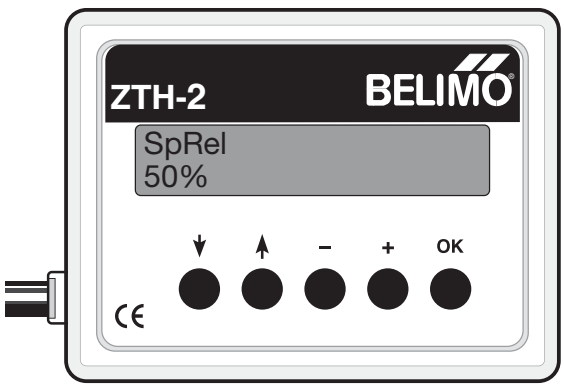
Supply	24 VAC/DC
Communication	PP
Used with actuator types	ARB24 GRB24

RE-PROGRAMMING PROCESS:

Initial Screen
When connected the display will show “Startup Progress” this process will take approximately 30 seconds.



Screen 1
Start Energy Valve process by pressing the down arrow. The first screen displays setpoint relative in % (SpRel). Press the down arrow to advance.



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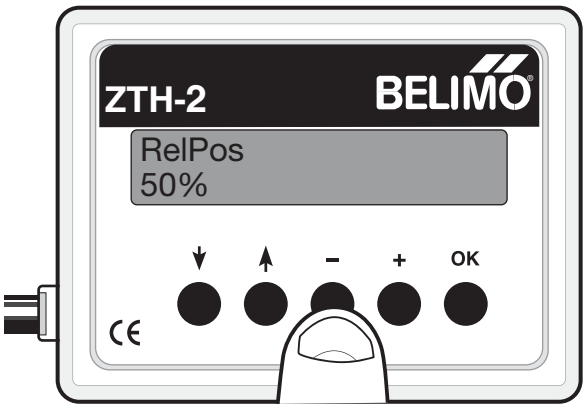
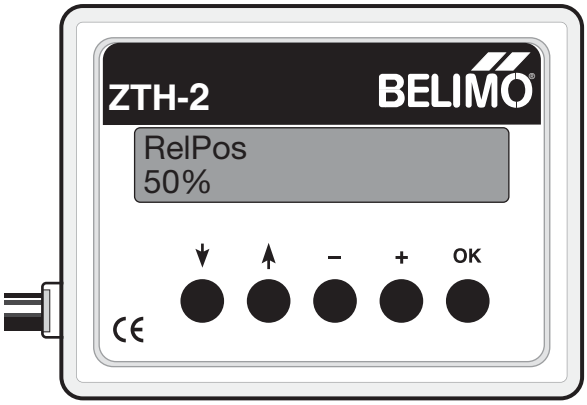
Function

↑↓ Advances through the displays.
+ - Changes the read, write parameters.
OK Saves the change.



Move through the displays. The chart below shows the complete list.



ZTH-2 SETTINGS

Settings	Capability
Relative Setpoint in %	Read only
Relative Position in %	Read only
Relative Flow in %	Read only
Absolute Flow in GPM, l/min or m3/h	Read only
Temperature 1 (remote) in °F or °C	Read only
Temperature 2 (embedded) in °F or °C	Read only
Delta Temperature in °F or °C	Read only
Power in kW or kBTU/h	Read only
Cooling Energy in kWh or kBTU	Read only
Heating Energy in kWh or kBTU	Read only
Override	Read/Write
Set Point Position Override in %	Read/Write
Mode (control signal)	Read/Write
Mode Y Invert (control signal)	Read/Write
Vmax in %	Read/Write
Display Scaling Code	Read/Write
Display Scaling Value Flow Ref Meas in GPM	Read/Write
Display Scaling Trigger	Read/Write
Control Mode	Read/Write
Delta T Limit (enable/disable)	Read/Write
Energy Valve Installation Pos.	Read/Write

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RESCALING PROCEDURE OVERVIEW

During flow verification it is possible to have a different reading from an external calibrated flow measuring instrument compared to the flow feedback received from the Energy Valve sensor. The ZTH-2 can be used to rescale the Energy Valve feedback signal to match the reading from the external calibrated instrument.

Example

Valve Configuration: V'nom: 127 GPM (Maximum capacity of the valve)
Vmax: 110 GPM (Coil size, the valve should already be configured for this setting prior this procedure).

During flow verification the valve is overridden from the DDC controller to its maximum GPM (10 VDC, Vmax: 110 GPM). Use the ZTH-2 to verify the flow, for this example it should be 110 GPM. If the valve position is 100% and the flow is not achieved, the flow must be increased from the pump.
Using an external calibrated instrument measure flow and compare it to the ZTH-2 reading. For this scenario lets say that the instrument reading is 120 GPM. Based on this reading, the Energy Valve needs to be rescaled to reflect the same value measured by the external instrument.

CALIBRATION INSTRUCTIONS

Step 1 Rescaling the Valve

1. Using the ZTH-2 scroll down to the Override setting, override the valve to Vmax (100%). by selecting override and selecting OK. (**Fig. 1**)
2. Wait for the flow to stabilize then compare measurement of the external calibrated instrument.
3. Using the ZTH-2 scroll to the DspSc Code (Display scaling code) setting and enter code 1234 if the code is not present. (**Fig. 2**)
4. Scroll down to DspSc. FlwRefMeas (Display Scaling Value Flow Reference Measurement) this will be the value to match to the external calibrated instrument. Change the DsSpSc. FlwRefMeas value to match the reading of the external calibrated instrument which in the example above is 120 GPM.(**Fig. 3**)
5. Scroll down to DspSc Trigger (Display Scaling Trigger) and set to on. (**Fig. 4**)

Figure 1

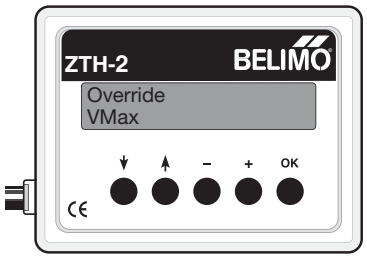


Figure 2

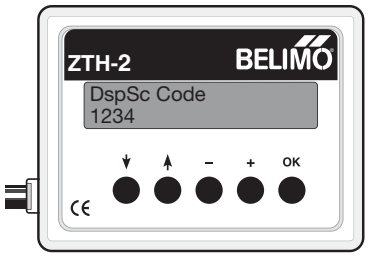


Figure 3

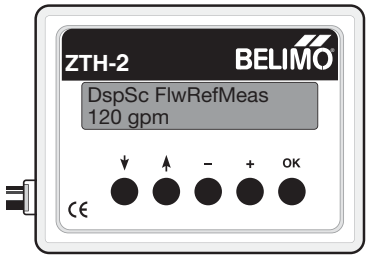
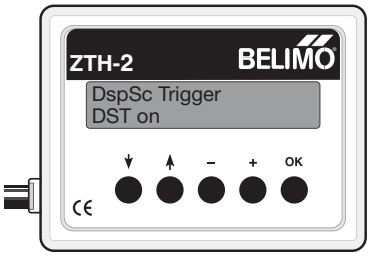


Figure 4



Step 2 Verification

- Using the ZTH-2 scroll up to the Override setting, and select the auto setting to release the Vmax override.
- Override the valve again to Vmax (100%) to verify on the Absolute flow setting on the ZTH-2 that the flow and external calibrated instrument match. If not repeat steps 2 and 3.
- If the flow matches using the ZTH-2 scroll up to the Override setting, and select the auto setting to release the Vmax override.

Note: the DDC signal will need to be re-scaled by the operator based on the new value for Vmax

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Functionality Comparison
Web View, BACnet, ZTH-2

Value	Web View	BACnet	ZTH-2
Relative Position in %	Read Only	Read Only	Read Only
Absolute Position in °	Read Only	Read Only	Read Only
Relative Flow in %	Read Only	Read Only	Read Only
Absolute Flow in l/min	Read Only	Read Only	Read Only
Absolute Flow in m3/h	Read Only	Read Only	Read Only
Absolute Flow in gpm	Read Only	Read Only	Read Only
Temperature 1 (remote) in °C	Read Only	Read Only	Read Only
Temperature 1 (remote) in °F	Read Only	Read Only	Read Only
Temperature 2 (embedded) in °C	Read Only	Read Only	Read Only
Temperature 2 (embedded) in °F	Read Only	Read Only	Read Only
Delta Temperature in °C	Read Only	Read Only	N/A
Delta Temperature in °F	Read Only	Read Only	N/A
Power in kW	Read Only	Read Only	Read Only
Power in kBTU/h	Read Only	Read Only	Read Only
Cooling Energy in kWh	Read Only	Read Only	Read Only
Cooling Energy in kBTU	Read Only	Read Only	Read Only
Heating Energy in kWh	Read Only	Read Only	Read Only
Heating Energy in kBTU	Read Only	Read Only	Read Only
Setpoint Relative in %	Read/Write	Read/Write	Read Only
Override Control			
1 – None/Auto	Read/Write	Read/Write	Read/Write
2 - Open	Read/Write	Read/Write	Read/Write
3 - Close	Read/Write	Read/Write	Read/Write
4 - Vmax	Read/Write	Read/Write	Read/Write
5 - Vnom	Read/Write	Read/Write	Read/Write
6 – Stop	Read/Write	Read/Write	Read/Write
Vmax : Flow Limit in %	Read/Write	Read/Write	Read/Write
Control Mode			
1 - Position Control	Read/Write	Read/Write	Read/Write
2 - Flow Control	Read/Write	Read/Write	Read/Write
DeltaT Limitation			
Off - Disabled	Read/Write	Read/Write	Read/Write
On - Enabled	Read/Write	Read/Write	Read/Write

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TROUBLESHOOTING

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-2. • 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 data sheet 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.
The valve does not close	ON	Static on the last position	-	• The actuator is out of service. • The valve is clogged with debris.	• If the actuator is out of service send the actuator and the sensor back to Belimo, please do not disconnect the assembly. • Override the valve to closed position if the valve does not move manually. Close valve from stem then clear any debris.

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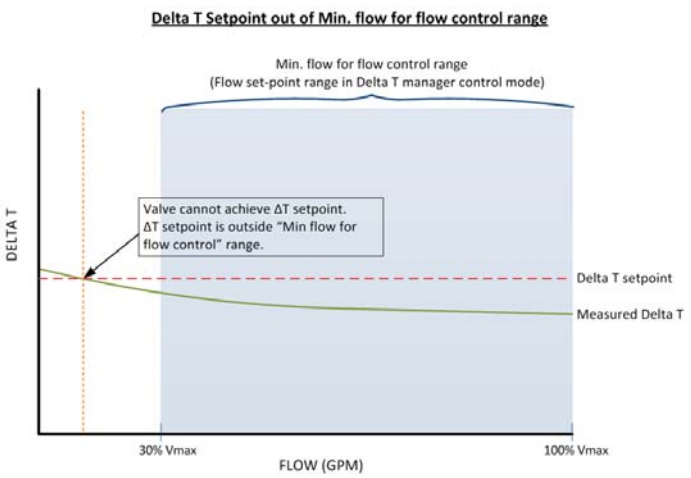
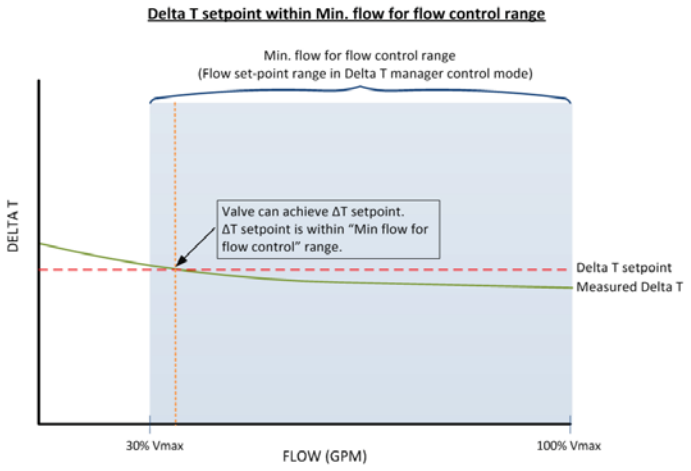
Coil Scenarios

The following scenarios illustrate how the system and Energy Valve will react under these conditions. These conditions described below are only applicable when the Delta T Manager is enabled and active. In conditions that are not ideal min. flow for flow control should be adjusted to limit the Delta T Manager setpoint.

Scenario	System/Energy Valve Response
Too High/ Too Low Supply Water Temp (SWT)	(Cooling Application) water temp. above coil range or integrated economizer
	(Heating Application) water temp. below coil range or integrated economizer
Air Temp (across coil)	Not enough heat transfer due to similar temperatures
DT across coil	Drops
Room	Does not achieve setpoint
DDC	Commands valve to open
DT manager	Commands valve to close
DT manager (Min. flow for flow control)	Commands valve as low as Min. flow for flow control setpoint. The Delta T Manager Min. flow set point is operator adjustable
Low air flow across coil	Air flow below required for coil
Air Flow (across coil)	Not enough for optimum heat transfer
DT across coil	Drops
Room	Setpoint achieved, but may not be entirely due to coil heat transfer
DDC	Valve is at setpoint, no new command
DT manager	Commands valve to close
DT manager (Min. flow for flow control)	Commands valve as low as Min. flow for flow control setpoint. The Delta T Manager Min. flow set point is operator adjustable





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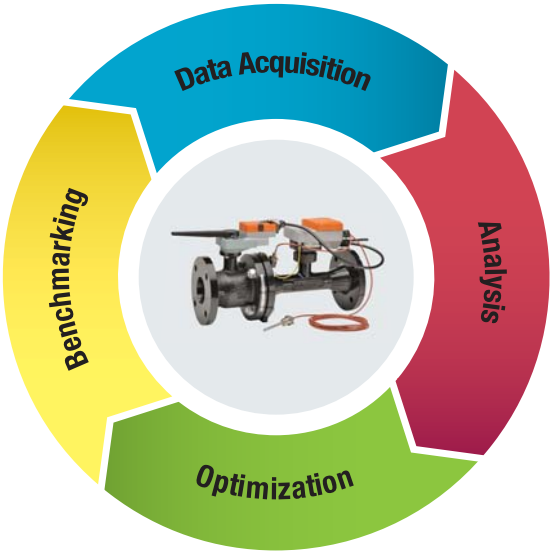
One solution, so many benefits!

Hydronic systems cannot truly be optimized unless equipment inefficiencies are eliminated.

The Energy Valve not only keeps owners and/or operators informed of coil performance, it has built-in Belimo Delta T Manager that helps operators analyze and fine tune performance under any and all conditions. Once these problems are eliminated, the opportunities for system wide optimization open up. At that point, owners, engineers, and contractors realize a host of benefits enables through the Belimo Energy Valve:



- **Combat Low Delta T.** The risk of Low Delta T (the most common culprit of major system inefficiencies) is dramatically reduced or eliminated.
- **Enhanced Energy Optimization.** Owners capitalize on optimization strategies such as variable flow pumping without risking occupant comfort.
- **Improved Commissioning.** Start-up commissioning as well as retro-commissioning is greatly simplified.
- **Better System Maintenance.** Operators are much more informed about coil performance and thus better able to schedule preventive maintenance measures.
- **Green Certifications.** The Belimo Energy Valve's ability to analyze, document and optimize performance data to the BAS contributes toward satisfying credit EAc5: Measurement and Verification under LEED.
- **More Effective Control.** Engineers are able to implement more advanced control strategies by taking advantage of the data logging provided at individual coils.
- **Smaller Equipment.** Buildings are able to meet comfort demand with smaller, less expensive piping and equipment.

The Energy Valve is based on Belimo patent and patent pending technology:
- US-Patent: 6,039,304: Ball valve with modified characteristics.
- US-Patent Pending: 2011/0153089: HVAC actuator comprising a network interface, data store and a processor.
- US-Patent Pending: 2009/0009115: Control of sensor less and brushless DC-Motor.

The Energy Valve incorporates additional technology to provide Delta T management – Powered by Optimum Energy™.

5 YEAR WARRANTY

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