Measure and Control Instantly

Belimo Energy Valve 4

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Table of Contents

Component Identification

Overview

Ultrasonic flow meter with temperature and glycol compensation is wet calibrated to obtain published accuracy specifications. The Belimo Energy Valve 4 is now an IoT device with a suite of cloud based services which can benchmark coil performance, analyze glycol concentration, store energy data, send alerts and commission for optimal performance.

The Energy Valve 4 is a pressure independent valve that measures and manages coil energy by using an embedded ultrasonic flow meter, along with supply and return water temperature sensors. The Energy Valve 4 also has the patented Power Control and Belimo Delta T Manager™ logics built-in that monitors coil performance and optimizes the available energy of the coil by maintaining the Delta T. In addition to the standard control signal DDC and feedback wiring, it communicates its data to the Building Management System (BMS) via BACnet MS/TP or BACnet IP as well as Modbus RTU and Modbus TCP/IP. The built-in web server collects up to 13 months of data that can be downloaded to external tools for further optimization.

Components
The Belimo Energy Valve 4 consists of a characterised control valve, an actuator and a thermal energy meter with a logic and a sensor module. The logic module provides the power supply, the communication interface and the NFC connection of the energy meter. All relevant data are measured and recorded in the sensor module. This modular design of the energy meter means that the logic module can remain in the system if the sensor module is replaced.

Flow Tolerances
Flow Measurement Tolerance +2% of the actual Flow.
Flow Control Tolerance of +5% of the actual Flow.
V'nom = flow rating of valve as listed in catalog.
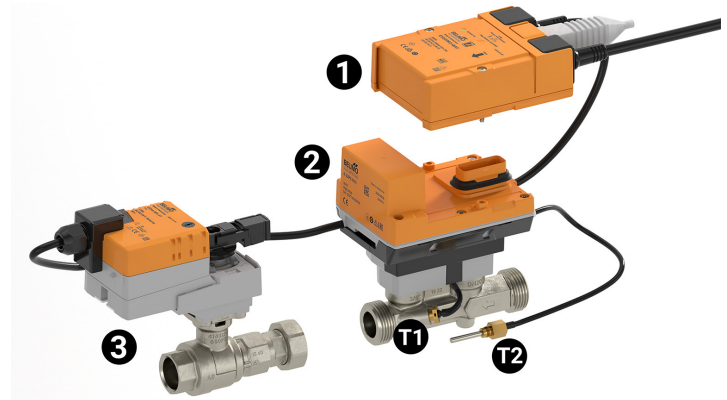
❶ Logic module
❷ Sensor module
❸ Characterized control valve with actuator
T1 Integrated temperature sensor
T2 External temperature sensor

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Product Structure
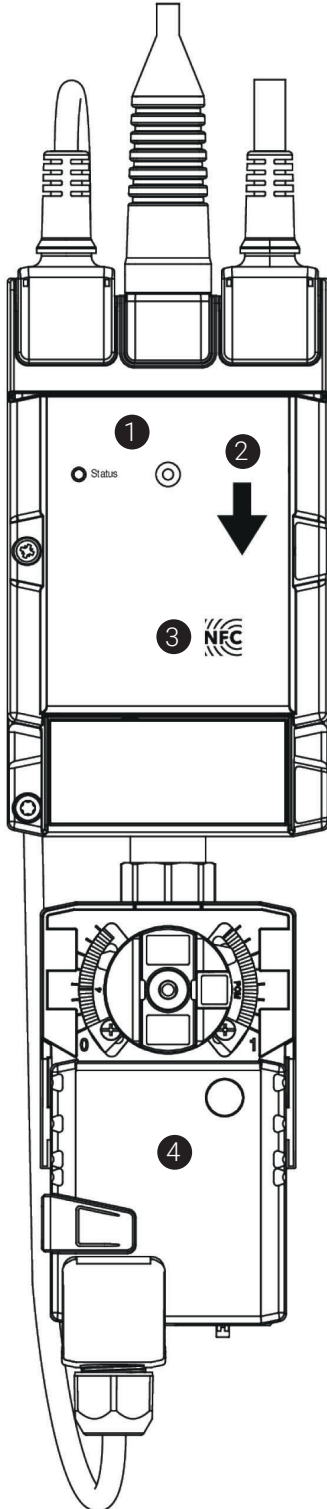
❶ **LED-Display green**
On: In operation (Power ok)
Off: No Power
Flashing: Action needed with Belimo Assistant-App

❷ **Flow direction**

❸ **NFC-Interface**

❹ **Operating button**

Product Range

Mode of Operation
The Energy Valve is an energy metering pressure independent control valve that optimizes, documents, and proves water coil performance.

Product Features
Measures Energy: using its built-in electronic flow sensor and supply and return temperature sensors.
Controls Power: with its Power Control logic, providing linear heat transfer regardless of temperature and pressure variations.
Manages Delta T: by solving Low Delta T Syndrome. In addition, it reduces pumping costs while increasing chiller/boiler efficiency by optimizing coil efficiency.

Actuator Specifications

Control type	modulating
Manual override	LR, NR, AR, AKR
Electrical connection	3 ft. [1 m] cable with ½" conduit fitting

Valve Specifications

Fluid	chilled or hot water, 60% glycol max
Sizes	½", ¾", 1", 1¼", 1½", 2"
End fitting	NPT female
Materials	
Body	
Valve	forged brass, nickel plated
Sensor housing	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Characterizing disc	Tefzel
Fluid temp range	14...250°F [-10...+120°C], 39...250°F [4...120°C] (EV200H)
Body pressure rating	360 psi (½...2")
Close-off pressure	200 psid (½...2")
Differential pressure range (ΔP)	see technical documentation
Communication	BACnet IP, BACnet MS/TP, listed by BTL, web server, Modbus RTU/IP, Belimo MP-Bus, analog
Remote temperature sensor length	9.8 ft. [3 m]
Leakage	0%
Rangeability	100:1

	Valve Nominal Size		Type	Suitable Actuators	
GPM Range	Inches	DN [mm]	2-way	Non Fail-Safe	Electronic Fail-Safe
1.65...6.6*	½	15	EV050	LRX-E (N4)	AKRX-E (N4)
2.7...11*	¾	20	EV075	LRX-E (N4)	AKRX-E (N4)
4.5...18.2*	1	25	EV100	LRX-E (N4)	AKRX-E (N4)
7.1...28.5*	1¼	32	EV125	NRX-E (N4)	AKRX-E (N4)
11...44*	1½	40	EV150	NRX-E (N4)	AKRX-E (N4)
16.5...66*	2	50	EV200	ARX-E (N4)	AKRX-E (N4)
25...100*	2	50	EV200H**	ARX-E (N4)	AKRX-E (N4)

(NPT applies to GPM Range column)

5-year warranty   7-year warranty with cloud connectivity

*V'nom = Maximum flow for each valve body size.
** Fluid temperature range is 39...250°F [4...120°C]

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Installation

Piping

The Energy Valve 4 is recommended to be installed on the return side of the coil. This diagram illustrates a typical application. Consult engineering specification and drawings for particular circumstances.

Belimo recommends installing one strainer per system. If the system has multiple branches, it is recommended to install one strainer per branch.
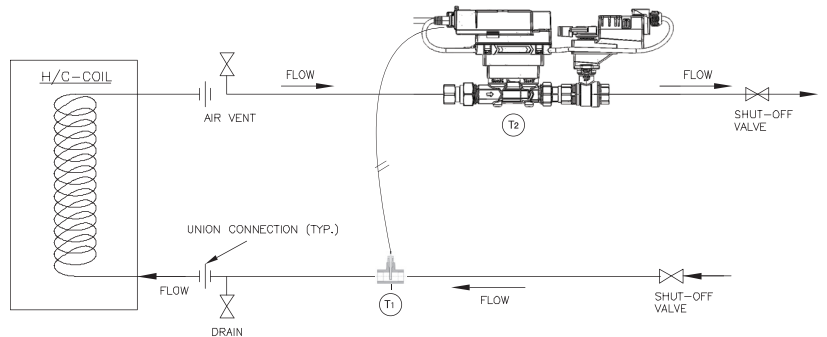
Installation

Inlet Length
The Energy Valve 4 requires a section of straight pipe on the valve inlet to achieve the flow accuracy specified. This section should be at least 5 pipe diameters long with respect to the size of the valve.

½" [DN15] 5 x nominal pipe size = 2.5" [64 mm]
¾" [DN20] 5 x nominal pipe size = 3.75" [95 mm]
1" [DN25] 5 x nominal pipe size = 5" [127 mm]
1¼" [DN32] 5 x nominal pipe size = 6.25" [159 mm]
1½" [DN40] 5 x nominal pipe size = 7.5" [191 mm]
2" [DN50] 5 x nominal pipe size = 10" [254 mm]

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

½" - 2" [DN15-DN50]

5x Nominal Pipe Size (NPS)

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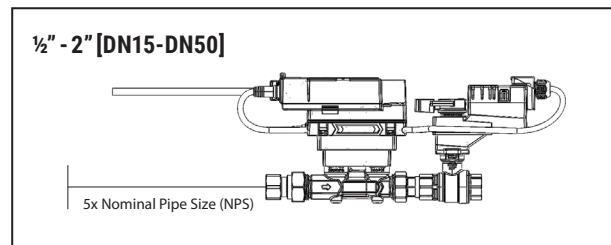
Control Mode
Sequence of Operation

Flow Control

To set the Energy Valve 4 to Flow Control, set the Control Mode to Flow Control in the Setting area of the Web View, under Configuration Control Function. Refer Web View settings table on page 22.

Flow Control Application
Use Flow Control to achieve pressure independent valve performance. The valve will react to changes in system pressure to match the flow setpoint from the controller.

Flow Control Sequence of Operation
The Energy Valve 4 uses its ultrasonic or magnetic flow meter and logic to throttle its characterized control valve (CCV) to maintain the flow set point. The valve will respond to the control signal DDC except when the current flow is within ±5% of the control signal DDC.
When the Delta T Manager is enabled, it will activate its logic when the actual ΔT drops 2°F below the dT Setpoint. It does that by throttling the valve close until the dT setpoint is reached. The Energy Valve 4 will resume its normal operation based on the control signal DDC when the control signal DDC drops 5% of V'max below the Delta T Manager's current flow. The Delta T Manager will not operate when the flow is below 25% of V'max. In addition, the Delta T Manager minimum flow will always be greater than 25% of V'max. The flow also needs to be above 25% of v'max for 5 minutes before the Delta T Manager will engage. 25% is the default however for specific applications it is possible to operate the Delta T Manager down to 10% of V'nom. This setting is available in Webview on the settings tab under the Delta T Management section.

The Energy Valve 4 is pressure independent over its entire throttling range with available differential pressure from 1-50 psid. When the available differential pressure is less than 5 psid, refer to the Flow Reduction Chart to verify adequate differential pressure to obtain desired V'max.

Power Control

To set the Energy Valve 4 to Power Control, set the Control Mode to Power Control in the Settings area of the Web View, under Configuration Control Function. Refer to Web View Settings table on page 22.

Power Control Application
Use Power Control to achieve a precise linear power output of the heat exchanger over its operating range. Power Control combines pressure independent valve performance with temperature independent coil performance. The valve will react to changes in system pressure and to changes in water differential temperature to match the power setpoint from the controller.

Power Control / Sequence of Operation
The Energy Valve 4 uses its ultrasonic or magnetic flow meter and logic to throttle its characterized control valve to maintain the power set point. The valve will respond to the control signal DDC except when the current power is within ±5% of the control signal DDC.
When the Delta T Manager is enabled, it will activate its logic when the actual ΔT drops 2°F below the dT setpoint. It does this by throttling the valve close until the dT setpoint is reached. The Energy Valve 4 will resume its normal operation based on the control signal DDC; when the DDC setpoint drops 5% of V'max below the Delta T Manager's current flow. The Delta T Manager will not operate when the flow is below 25% of V'max. In addition, the Delta T Manager minimum flow will always be greater than 25% of V'max. The flow also needs to be above 25% of v'max for 5 minutes before the Delta T Manager will engage. 25% is the default however for specific applications it is possible to operate the Delta T Manager down to 10% of V'nom. This setting is available in Webview on the settings tab under the Delta T Management section.

With Power Control, the Energy Valve 4 is pressure and temperature independent over its entire throttling range with available differential pressure from 1-50 psid. When the available differential pressure is less than 5 psid, refer to the Flow Reduction table on page 43 to verify adequate differential pressure to obtain desired V'max and associated P'max.

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Control Mode
Sequence of Operation

Position Control

To set the Energy Valve 4 to Position Control, set the Control Mode to Position Control in the Settings area of the Web View, under Configuration Control Function. Refer to the Web View Settings table on page 22.

Position Control Application
Use Position Control to achieve pressure dependent valve performance or to verify control response during installation, maintenance and troubleshooting. The flow meter will report actual flow at all valve positions.

Position Control Sequence of Operation
The Energy Valve 4 uses position feedback and logic to throttle its characterized control valve to maintain the valve position. The valve will respond to the control signal DDC except when the position is within ±5% of the control signal DDC.

Delta T Manager Options

To configure the Delta T Manager options, set the Configuration dT-Manager in the Settings area of the Web View. Refer to the Web View Settings table on page 22.
The Delta T Manager monitors the ΔT across the coil. When the ΔT drops below the set point, the Delta T Manager logic throttles the valve close to increase ΔT above the setpoint. When the Delta T Manager is enabled, it will activate its logic when the actual ΔT drops 2°F below the dT Setpoint. It does that by throttling the valve close until the dT setpoint is reached. The Energy Valve 4 will resume its normal operation based on the control signal DDC when the DDC setpoint drops 5% of V'max below the Delta T Manager's current flow. The Delta T Manager will not operate when the flow is below 25% of V'max. In addition, the Delta T Manager minimum flow will always be greater than 25% of V'max. The flow also needs to be above 25% of v'max for 5 minutes before the Delta T Manager will engage. Two Delta T Manager options are available: dT Manager and dT Manager Scaling. 25% is the default however for specific applications it is possible to operate the Delta T Manager down to 10% of V'nom. This setting is available in Webview on the settings tab under the Delta T Management section.

Control Mode
Sequence of Operation

dT Manager Application
Use dT Manager to assure circuit overflow is eliminated below the Delta T Limit Value. Limiting function can be applied to all Control Modes of operation; Flow, Power and Position. Belimo suggests using this mode with changing air mass flow rate.

Sequence of Operation
This logic when activated will limit the heat exchanger ΔT to a fixed dT setpoint by reducing valve flow. The dT setpoint is equal to the Delta T Limiting Value found in Web View settings.

dT Manager Scaling Application
This limiting function can be applied to all control modes of operation: flow and power. Building operators are assured circuit overflow is eliminated below the scaled (variable) dT setpoint. Belimo suggests using this mode with changing temperature of the inlet air flow or inlet water supply.

Sequence of Operation
This logic when activated will limit the heat exchanger ΔT to a scaled (variable) dT setpoint by reducing valve flow. The dT setpoint = (Delta T Limit Value /Flow Saturation Value)* (actual flow). The Flow Saturation Value found in Web View is a required setting for this logic.

Graphical dT Manager and dT Manager Scaling Operation
In the graphs shown below, the blue and red data points were captured by allowing the Energy Valve 4 to operate with the Delta T Manager disable and under normal operating conditions for a sufficient period to collect data ranging from light to full load. Unrestricted flow shown with blue data points occur when the dT manager is inactive. Restricted flow shown with red data points would be eliminated when dT Manager is active.
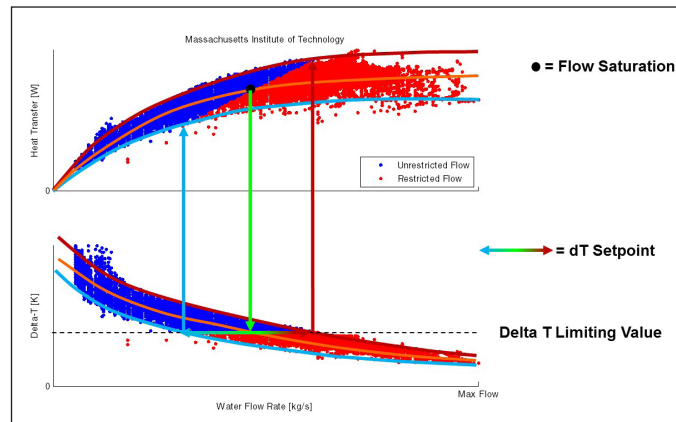
Typical Representation of dT Manager Function with Flow Control or Power Control
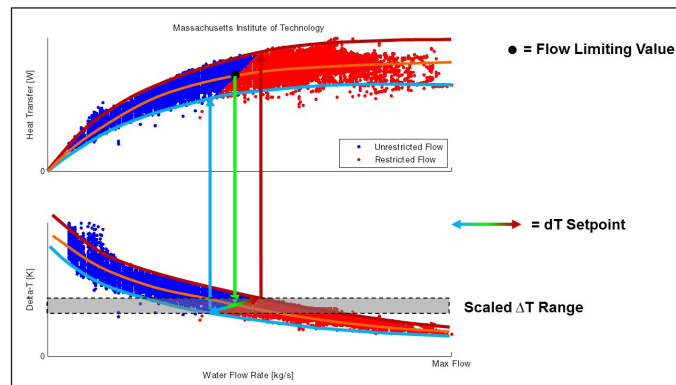
Typical Representation of dT Manager Scaling Function with Flow Control or Power Control

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Configuration of the Energy Valve 4

The Energy Valve 4 can be configured locally two different ways. It can be accomplished either using a smart phone with the Belimo assistant app or using the local web view interface via belimo.local:8080. The following chapter describes how to configure the Energy Valve 4 using the Belimo Assistant App first then followed by configuration using web view.

Configuring the Energy Valve 4 Using NFC and the Belimo Assistant App

The NFC logo on the Energy Valve 4 indicates that the device can be operated with the Belimo Assistant App.

Requirement:

Device must be powered see wiring section for connecting

NFC or Bluetooth-enabled smartphone

Belimo Assistant App (Google Play and Apple App Store)

NFC: Position the NFC-enabled smartphone on the thermal energy meter so that both NFC antennas of the smartphone and thermal energy meter are on top of each other.

Bluetooth: Connect the Bluetooth-enabled smartphone to the thermal energy meter via "Bluetooth NFC converter" ZIP-BT-NFC. Technical data and operating instructions can be found on the ZIP-BT-NFC data sheet.

NFC   **Bluetooth**

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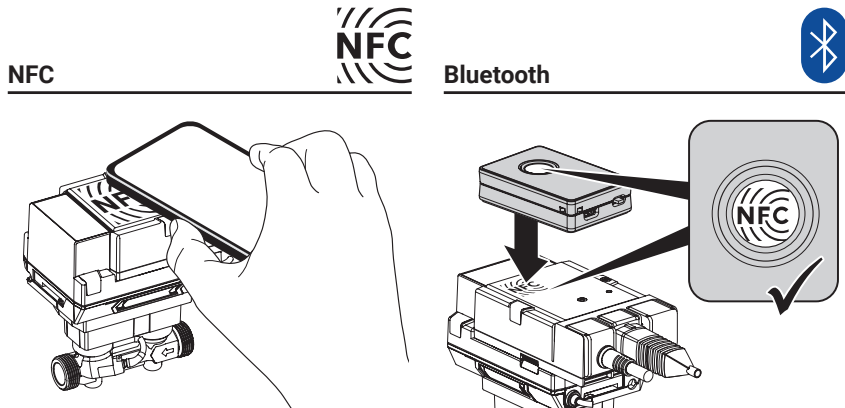
Configuration using Webview

The Energy Valve 4 Web View is a built-in web server that is used to configure the valve settings and view current and historical data. It can be accessed from a computer with a web browser. The Energy Valve 4 must be connected to a TCP/IP network.

Connecting the Energy Valve to Ethernet

To configure the Energy Valve 4 using Web View the Energy Valve 4 must be connected to a TCP/IP network. If connecting the Energy Valve 4 to a laptop computer directly using a **static** connection without connecting to a LAN, configure the laptop IP address to 192.168.0.200 before connecting to the Energy Valve 4. Then open a web browser and type in the following address in the web browser address bar: http://192.168.0.10:80

If connecting the Energy Valve 4 to a laptop computer directly using a **dynamic** peer to peer connection without connecting to a LAN, no laptop IP configuration is required, open a web browser and type in the following address in the web browser address bar: http://169.254.1.1

This address is printed on the side of the Energy Valve 4 actuator.

Compatible Browsers

Browsers must be capable of running Javascript.
· Internet Explorer 8 or newer
· Firefox 27 or newer
· Chrome 33 or newer
· Safari 5.17 or newer
· Android browser
· Windows Phone

EV4 ottbe test (22044-10014-022-028) pm 4 9

0.000 gpm Flow

0 % Valve position

75.0 °F Temp T2

0.0 kBT

86.0 °F Temp T1

Status	Control function	Setpoint DDC	Delta temperature	Delta T lim
Warning	Tool force Simulated Operation	0.0 % Source: BACnet / Modbus / MP	11.0 °F	standby dT Setpoint

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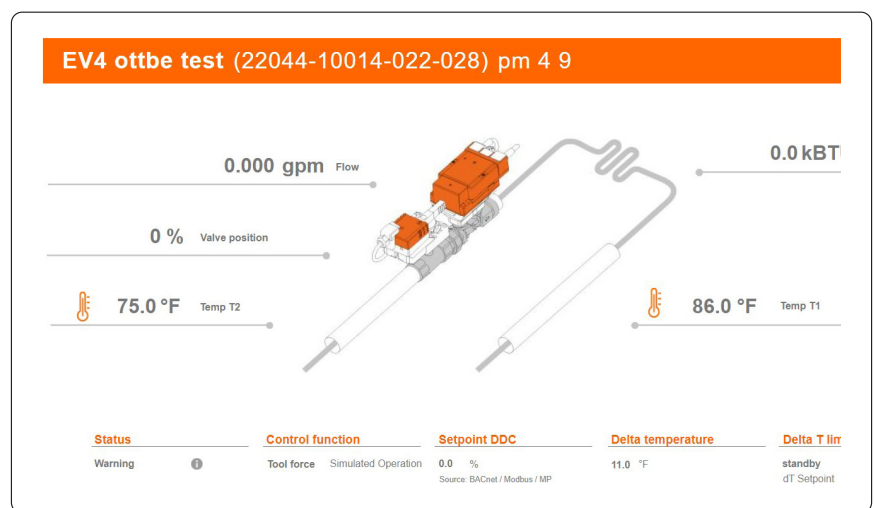
Webview

Login

- Access to the actuator is protected by the user name and password.

- Three default user types are available to login. Each user type has different security rights to the Web View. Refer to Web View user table below.
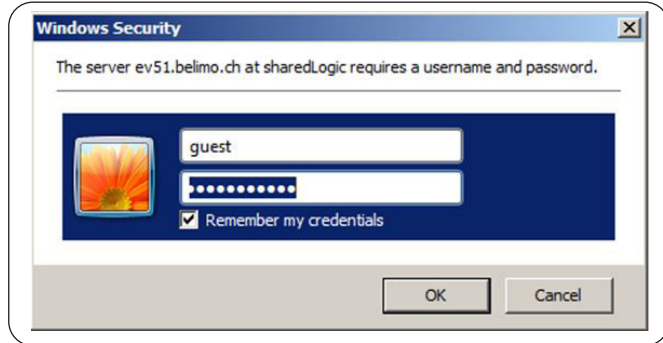
Web View User Table

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 and Trend Control	Read	Read/Write	Read/Write
Data Log Chart	Read	Read	Read/Write
Settings	Read	Read	Read/Write
Status	Read	Read/Write	Read/Write
Date & Time Settings	--	Read/Write	Read/Write
IP Settings	--	Read/Write	Read/Write
Version Information	--	Read/Write	Read/Write
Mobile	Read	Read	Read/Write
Data Logging	Read	Read	Read/Write
BACnet / MP Settings	Read	Read	Read/Write

*Password is case sensitive

Webview

The Energy Valve 4 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 4. The Web View consists of the following page views:

Overview

The overview page allows you to see the setpoint, flow, valve position, glycol percentage if activated, Delta T, and mode of operation. Double click on a heading item to see a historical trend of the data.
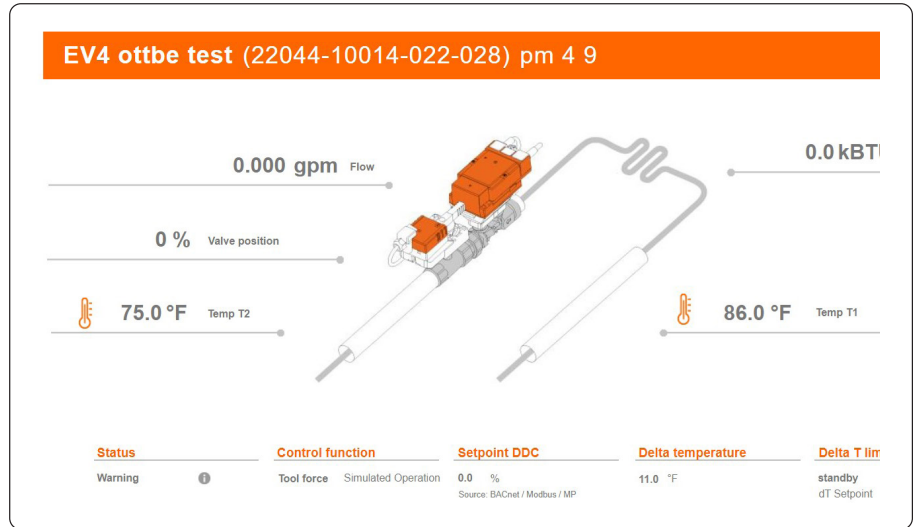
Data

An analytical view of the historical data with the ability to select the type of data to analyze; primarily used for maintenance and troubleshooting.

This view also, provides key performance indicators In addition this view also has the Delta T set point suggestion integrated. To calculate press the coil characteristic button below x axis.

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Webview

Status

Status provides an error count by type and time elapsed of last occurrence. More details provides additional information with informational buttons on the possible solution to the error.

These errors can be reset to zero and should be reset after commissioning to clear any errors that may have occurred due to the valve and system not being fully operational.

Description	
Media	OK
Flow sensor	OK
Power	OK
Sensor	OK
Actuator	OK
History	counter
Total errors seen	3 Show details

Settings

Access and adjust the operating settings.Refer to Web View Settings table on page 22.

EV4 ottbe test (22044-10014-022-028) pm 4 9

Belimo Energy Valve	3/4"	DN 20		Override	
Vnom	5.548 gpm	Pnom	171 kBTU/t	Simulated Operation	Simulated Operation
					time back to Auto 1 h 22 min

Startup Assistant   Commissioning Report

Settings Import   Settings Export

Configuration

Units

Temperature	°F
Flow	gpm
Power	kBTU/h
Energy	kBTU

Control settings

Control mode	Flow Control
Setpoint source	BUS
Additional sensor input mode	None
Additional temperature sensor	None

Application

Medium	Water
Installation position	Return
Actuator sync position	Sync at 0%

Maximum and limitation

Vmax	1.39 gpm
	Range 1.387 - 5.548
Vmin	

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Configuration Options

Date and Time Settings

Provides different ways to set the date and time. It allows the time to be entered manually, synchronized through a computer, or synchronized with a Time Server.
If BACnet communication is enabled, Local Client Date and Time will be automated through BACnet.

Local Client

11:36:31	Time
07.02.2017	Date
GMT-5	Timezone

Remote Node

17:35:38	Time
07.02.2017	Date
CET	Timezone

NTP Server (optional)
- ● Local RTC
- ○ Time Server

| | IP Address Timeserver |

[Synchronize Time]   [Submit]

IP Settings

To configure the valve communication on a TCP/IP network. It allows the valve to have a dynamic IP address (requires an active DHCP server) or a static IP address (requires an IP address, Network Mask and Gateway address from IT manager). The Broadcast address will be generated automatically.

The DNS Servers are listed here for default. If different are preferred they will need to be assigned by the customer IT infrastructure responsible for the Energy Valve 4 installation.

Network configuration

50:2D:F4:07:B8:B5	MAC address
○ DHCP/Zeroconf	
● Static/Zeroconf	
192.168.0.10	IP address
255.255.255.0	Network mask
192.168.0.1	Gateway
208.67.220.220	DNS nameserver 1
8.8.8.8	DNS nameserver 2
192.168.0.255	Broadcast address
169.254.1.1	ZeroConf Address

[Change IP configuration]

Version Information

Displays current software version.

Hardware

EV4	Type Code
22044-10014-022-028	Serial Number
2265649-450049	Sensor Module Serial Number
02049-30344-009-161-130	Actuator Serial Number
14127-00003	OC Module Material Number
imx6ull2-ksp0655-oc15	Platform

Software

13.3.0	Operating System Version
4.16.0	Core Software Version
01.00.0001 - [Co-uC]	Communication Module Firmware Version
system1	Active Boot Slot
01.00.0000	Flow Sensor Firmware Version

Application Model

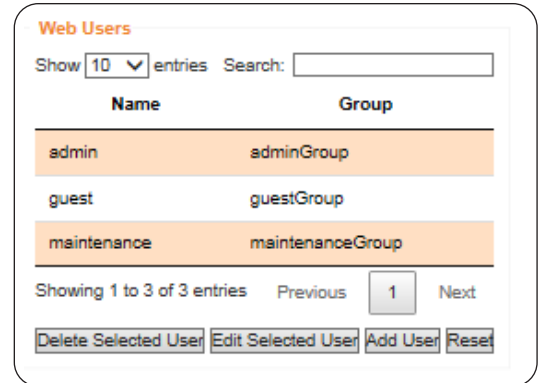| development | Model Name |
| EvHvacApplication.bcz | Model file name |
| 1.0.0 | Model version |

Data Logging

Location to download all the historical data in a spreadsheet (.csv) that can be uploaded to the Data Analysis Tool™ for further analysis. See Data Analysis Tool™ page.

Filetype

● Short Term Storage (31 Days uncompressed)
○ Long Term Storage (Compressed)

Filename

Default Datalog Configuration-2017-02-03.csv
Default Datalog Configuration-2017-02-04.csv
Default Datalog Configuration-2017-02-05.csv
Default Datalog Configuration-2017-02-06.csv
Default Datalog Configuration-2017-02-07.csv
Default Datalog Configuration-2017-02-08.csv
Default Datalog Configuration-2017-02-09.csv

[Download]   [Erase Data Log]   ☐ Select all files

User Administration

Add, delete and edit including password management for users. See Webview User table for User profiles.

Web Users

Show [10 ▾] entries   Search: [   ]

Name	Group
admin	adminGroup
guest	guestGroup
maintenance	maintenanceGroup

Showing 1 to 3 of 3 entries   Previous   [1]   Next

[Delete Selected User] [Edit Selected User] [Add User] [Reset]

Maintenance

Maintenance: Configuration Import /Export

This feature allows the Energy Valve 4 settings to be downloaded (export configuration) from one valve and imported to another valve via an XML file format. The valve size and actuator type need to be the same for this function.

Activation Codes: This feature is for uploading a code for additional features such as glycol monitoring. This code and pricing can be provided by Belimo Technical support.

Update: Last Update indicates the status of updates for security and operational performance.

No Updates applied – none of available have been executed.
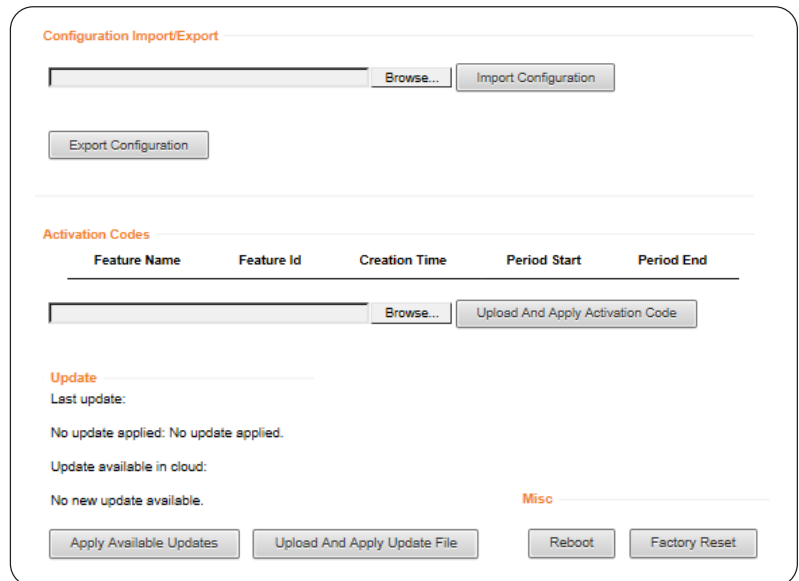Update available in cloud.
No new updates available
Apply Available Updates
Executes downloaded updates
Upload and Apply Update File
Downloads available updates and executes

Misc: Reboot - Performs the function of power cycling the actuator for a restart. Factory Reset restores the Energy Valve 4 actuator settings to settings when it left the Belimo factory.

Configuration Import/Export

[   ] [Browse...] [Import Configuration]

[Export Configuration]

Activation Codes

Feature Name	Feature Id	Creation Time	Period Start	Period End

[   ] [Browse...] [Upload And Apply Activation Code]

Update
Last update:

No update applied: No update applied.

Update available in cloud:

No new update available.   **Misc**

[Apply Available Updates] [Upload And Apply Update File]   [Reboot] [Factory Reset]

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BACnet, MP-Slave and Modbus Settings

This page is used to set the type of communication and settings for the Energy Valve 4. All BACnet configurations must be set prior to connecting to the BACnet network to avoid communication and settings problems.

- BACnet is a building automation communication protocol worldwide standard.
- MP is a Belimo protocol that allows for communication to multiple Belimo devices at the same time.
- Modbus is also a building automation communication protocol
- None is the default value, when selected the valve will not communicate via BACnet.

BACnet IP Settings

Port: The UDP port value defaulted to 47808

Simple/Foreign Device: A Simple Device requires communication only on its own IP subnet, or there is a BBMD device on its subnet to handle routing of broadcast messages between subnets. A Foreign Device communicates to devices on subnets other than its own and to do so, must register with a BBMD device on a remote subnet.

Instance ID: A unique ID number for the EV device object on the BACnet network (between 0 and 4194303). This is ***not*** a read only value.

Device Name: Name used to represent the device in the BACnet system.

Device Description: General detail of the device.

System Status: Indicates that the valve is operational. A read only value. 0 is operational, 1 is not operational.

Protocol Version and Revision: These are read only values to show the BACnet protocol version and revision that the communication software follows.

IP BBMD: IP address entered must be the address of the BBMD router on a different subnet.

Time to Live: The time in seconds between updated registrations with the BBMD router. If your BBMD router has a TTL setting, this value should match the router's.

BACnet MS/TP Settings

Baud Rate: The transmission speed within the MS/TP network. All devices on the same network must be set to the same baud rate. Available rates: 9600, 19200, 38400, 76800, 115200.

MAC: The MAC address on the MS/TP network. This number must be unique within the network. Available values range from 1 to 127.

Max Master: Max_Master must be large enough that all MS/TP MAC addresses are within it. If unsure, set to 127.

120 Ohm Termination: MS/TP networks require termination resistors on end-of-line devices. Turning on this setting will provide the required 120 Ohm termination on this BACnet device. Use this setting with great caution as adding termination resistance on a device in the middle of a network can cause significant network problems.

Instance ID: A unique ID number for the EV device object on the BACnet network (between 0 and 4194303). This is *not* a read only value.

Device Name: Name used to represent the device in the BACnet system.

System Status: Indicates that the valve is operational. A read only value. 0 is operational, 1 is not operational.

Protocol Version and Revision: These are read only values to show the BACnet protocol version and revision that the communication software follows.

MS/TP Device Load: The MS/TP interface on the Energy Valve 4 will create a 5/8 unit load on the network. This is a combination of local biasing resistors and a 1/8 load EIA-485 driver chip. Please keep this load figure in mind while determining network device limits and repeater requirements. For reference, the EIA-485 specification allows for a total of 32 device loads on a network without using repeaters. The transceiver is isolated, but the isolated reference is not exposed due to lack of pins 47K pull up resistors are connected from the isolated common to – and isolated 5v to + and is fail safe.

BACnet, MP-Slave and Modbus Settings

Communication Protocol
- ○ BACnet IP
- ● BACnet MS/TP
- ○ MP
- ○ Modbus TCP
- ○ Modbus RTU
- ○ None

BACnet MS/TP Settings

38400 ▾	Baud rate
3	MAC Address
127	Max Master
☐ 120 Ohm Termination	

Device Object Settings

4096	Instance ID
EV55 Demo	Device Name
DeviceDescription	Device Description
0	System Status
1	Protocol Version
12	Protocol Revision

[Submit]

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Modbus TCP Settings

TCP Unit ID: Each device in a network is assigned a unique unit address from 1 to 247.Default Value: 1

TCP Port: Modbus is a serial communications protocol for client-server communication between a switch (server) and a device in the network running Modbus client software (client), A client sends a message to a TCP port on the switch.

The listening TCP port 502 is reserved for Modbus communications. It is mandatory to listen by default on that port. However, some markets or applications might require that another port is dedicated to Modbus over TCP.

This is the case when interoperability is required with non =S=products, such as in Building Control. For that reason, it is highly recommended that the clients and the servers give the possibility to the user to parameterize the Modbus over TCP port number. It is important to note that even if another TCP server port is configured for Modbus service in certain applications, TCP server port 502 must still be available in addition to any application specific ports.

Keep Open timeout [seconds]: How long a device can take to respond before it is considered a timeout Default Value: 30 seconds

Modbus RTU Settings

Modbus Address: Each device in a network is assigned a unique unit address from 1 to 247.
Default Value: 1
Range: 1-247

Baud rate: The transmission speed within the Modbus RTU network. All devices on the same network must be set to the same baud rate.
Default Value: 38400
Range: 9600, 19200, 38400, 76800, 115200

Parity: The transmission format used by Modbus that indicates the start buts, data bits, parity and stop bits.
Default Value: 1-8-N-2
Range:
1-8-N-1 (1 start, 8 data, no parity, 1 stop bit)
1-8-N-2 (1 start, 8 data, no parity, 2 stop bit)
1-8-E-1 (1 start, 8 data, even parity, 1 stop bit)
1-8-O-1 (1 start, 8 data, odd parity, 1 stop bit)

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Cloud Settings

Datalog Service Connection Status: The status of the cloud connection.

Cloud Server: The address of the connected host Server.

Datalog and Task Mode: The connection to PUB nub status

MAC Address: The MAC address of the connected Energy Valve 4.

Datalog Service: Allows for data transfer between the Energy Valve 4 and the cloud.

Task Service: Allows for automatic updating of the Energy Valve 4 flow and Delta T setpoints based on data captured by the valve in the cloud.

Update Mode: Allows for automatic updating of the Energy Valve 4 flow and Delta T setpoints based on data captured by the valve in the cloud.

Log Levels: Status of Java Log and System Log levels

Disabled: No updates are downloaded.

Device_Controlled: Updates are shown on the Maintenance page in Webview and not installed automatically, they are offered.

Cloud_Controlled_Manual: The updates need to be released by the device owner in the cloud. The device installs the update immediately after release.

Cloud_Controlled Auto: The updates are released by Belimo and propagated to the devices. The device installs the update immediately after release.

Current owner: The individual that has current ownership of the device. This is typically the name of the user that configured the cloud settings and corresponds to the email address provided on initial set up.

Refresh Current owner: Simple refresh button to explicitly ask the cloud to tell us the current owner (for example after the product was transferred in the cloud).

New owner: Used when starting a transfer from a current owner (or no owner yet) to a new owner which requires pressing the Transfer device button after new owner is entered.

Additional Information: By clicking on the load button displays more ownership information and device details.

Connection Status: Runs a routine that will help troubleshoot connection to the Belimo cloud.

Connectivity Requirements: Customer provided Ethernet Cable Dedicated Internet Connection.

Requirements for Cloud Connection: Gateway IP Address that allows a route to the internet. In case of DNS restrictions: IP addresses of internal DNS servers.

Firewall rule to allow communication
Action: Pass / Allow
Address family: IPv4
Protocol: https over TCP
Source: IP address of device or subnet designated to EnergyValve devices
Destination: https://connect.g2bcc.com
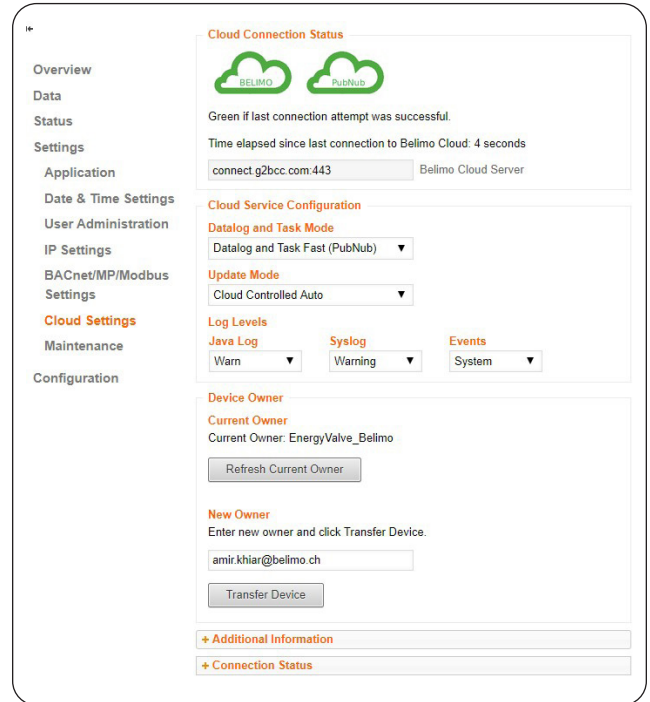
Communication details
Used protocol is https
Port of the server endpoint: 443
DNS address of cloud server:
https://connect.g2bcc.com

Field Programming and Commissioning Options

All Energy Valve 4 actuators can be field programmed with either the Belimo Assistant App or with an Ethernet cable connected to a computer with web browser to access the actuator's web page (Web View). Refer to the table below for a list of settings than can be changed in the field.

EV4 ottbe test (22044-10014-022-028) pm 4 9

Belimo Energy Valve	3/4" | DN 20		Override		
Vnom	5.548 gpm	Pnom	171 kBTU/t	Simulated Operation	Simulated Operation
					time back to Auto 1 h 22 m

Startup Assistant	Commissioning Report
Settings Import	Settings Export

Configuration

Units			Control settings	
Temperature	°F		Control mode	Flow Control
Flow	gpm		Setpoint source	BUS
Power	kBTU/h			
Energy	kBTU		Additional sensor input mode	None
			Additional temperature sensor	None

Application			Maximum and limitation	
Medium	Water		Vmax	1.39 gpr
			Range	1.387 - 5.548
Installation position	Return		Vmin	
Actuator sync position	Sync at 0%			

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Web View Settings

TAB	SETTING	FUNCTION	DEFAULT / RANGE
1. General Information	**Valve Size**	Defines the full flow cataloged capacity (V'nom) of the valve.	**(Default factory set to the valve size)** ½" – 6" [DN 15 – DN 150]
	Set Up Assistant	A set up routine that runs on first power up to assist the installer with configuring the valve. Can also be run again by selecting here and any changes made will be applied.	N/A
2. Functions	**Import/ Export**	Allows the export of valve settings and Import into another valve in XML Format.	N/A
	Comissioning Report	Generates a PDF of valve configuration settings for records.	N/A
3. Units	**Temperature**	Units: water supply, return, and delta T.	**Fahrenheit** Celsius, Kelvin
	Flow	Units: water flow rate through the valve.	**GPM** M3/s, M3/h, l/s, l/min, l/h
	Power	Units: thermal power through the valve.	**kBTU/h** W, kW, BTU/h, Ton
	Energy		**kBTU** J, kWh, MWh, kBTU, Ton H, MJ, GJ
4. Application	**Installation Position**	Identify the installed water service location of the valve and its embedded temperature sensor, or piped in series with the valve (T2). The sensor w/ longer cable is remote (T1) and will be assigned opposite the water service of the valve.	**Valve in Return Pipe** Valve in Supply Pipe
	Cable Length Remote Temp Sensor	Cable length selection (for proper operation do not cut cables). Remote sensor cable length settings adjusts wire resistance to accurately calculate thermal power and energy.	1/2" - 2" models **9.8ft. [3 M]** 4.9 ft. [1.5M] 2 1/2" - 6" models **32.8 ft. [10 M]** 16.4 ft. [5 M] 9.8 ft. [3 M] 4.9 ft. [1.5 M]
	Media	Water or water/glycol composition used to accurately calculate: flow, thermal power and energy.	**Water** Monoethylene Glycol Polyethylene Glycol

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Web View Settings Continued

TAB	SETTING	FUNCTION	DEFAULT / RANGE
5. Analog Feedback	**Feedback**	Actuator analog feedback signal output on wire #5 u-signal.	**Flow** Power, T supply T return, delta T Valve position
	Range	Actuator analog feedback linear signal range.	**2-10 V** 0.5-10 V 0-10 V
	Maximum	Setting to equate 10 VDC or maximum feedback information. Setting must match the DDC range maximum setting. The grey box is an entry field and not the actual measured feedback and will hold the last value entered in it. The factory setting on this is 0.	**Flow** **0 to V'Nom** Position 0 to 100% (0-90 deg.) Temperature 32°F to 212°F 0°C to 100°C Power 0 to P'nom
6. Override	**Override functions**	Override functions to move the valve to a particluar point or position which can be used for testing and commissoning purposes. All engaged overrides stop and go back to normal operation automatically after two hours.	
	Auto	Normal operation no override.	**Auto**
	Close	Moves actuator to close valve.	N/A
	Open	Moves actuator to open valve.	N/A
	V'nom	In flow control moves the actuator to full open position.	N/A
	V'max	In fow control moves the actuator to V'max setting.	N/A
	Motor Stop	Stops the valve at current position.	N/A
	P'Nom	In power control mode moves the actuator to P'nom position (full open).	N/A
	P'max	In Power control mode moves the actuator to P'max setting.	N/A
	Simulated operation	Engages simulation of flow and temperature that can be viewed on the overview page.	N/A

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Web View Settings

TAB	SETTING	FUNCTION	DEFAULT / RANGE
7. Control Settings	Setpoint Source	Defines how the BMS valve set point is sent to the acuator either analog on wire 3 or via BACnet, Modbus or MP).	**Analog** Bus (BACnet, Modbus, MP)
	Control Mode	Controlled variable assigned to the actuator control signal DDC, wire # 3.	**Flow Control** Power Control Position Control
	Invert Control Signal DDC	"No" valve modulates open when 10 VDC is received. "Yes" 10 VDC control signal DDC closes the valve.	**No** Yes
	Additional Sensor Input Mode	The Meter has the capability to add an additional sensor input to collect system data via wire	Range Active, Passive Switch
	Additional Temperture Sensor	Allows the selection of additional temperture sensor	None, PT1000, Ni1000EU, NTC10k2, NTC10k3
8. Maximum & Limitation	Vmax	Used with Flow Control mode, this is the maximum flow setting of the valve with a full flow output from the controller.	**V'Nom**
	Vmin	Used with Flow Control mode, this is the minimum flow setting of the valve to maintain a minumum flow rate for particualar applications.	30% - 100% of V'nom Defined by size in Webview
9. Delta T Manager	Delta T Limiting Function	Setting to disabled or enabled with limiting logic: dT Manger or dT Manager Scaling. Both use settings" Delta T Limiting Value" but only dT Manager Scaling uses the "Flow Saturation Value.	**Disabled = "-"** dT Manager dT Manager Scaling
	Delta T Limiting Value	Low limit parameter for dT setpoint: • For dT Manger this is the dT setpoint. • For dT Manager Scaling this will reset so the dT setpoint is scaled, or variable. Data Analysis Tool may be used to help determine value. The grey box is an entry field and not the actual measured Delta T and will hold the last value that is entered in it.	**10°F** 2°F to100°F 1.1°C to 55.5°C Default >30% of V'max Option >10% of V'nom
	Flow Saturation Value	Parameter used with dT Manager Scaling to reset the Delta T Limiting Value. When dT Manager Scaling is active: • If actual flow is less than this parameter the dT setpoint will be reset below the Delta T Limiting Value. • If actual flow is equal to this parameter the dT setpoint will be equal to Delta T Limiting Value. • If actual flow is greater than this parameter the dT setpoint will be reset above the Delta T Limiting Value. Data Analysis Tool may be used to help determine value.	(User defined) >30%-100% of V'max

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Troubleshooting

PROBLEM	FIELD OBSERVATIONS	POSSIBLE SOLUTION
Actuator will not move.	Green LED is not on or flashing.	Verify the power supply and control signal DDC are wired and operating correctly. If the actuator wiring is correct and the Green LED is not blinking the actuator has failed. Note: the LED is solid green while booting up.
	Green LED is flashing but the valve will not move.	Valve may have debris. Depress the black gear release button on the side of the actuator and use the override handle to clear any debris that may have clogged the valve. If the valve does not move, then remove the actuator from valve and try to manually operate the valve stem.
Actuator does not modulate with the control signal DDC as expected.	Valve throttles to either full open or closed.	Verify the hydronic circuit is filled, water is flowing, and isolation valves are opened. When Mode of Control is set to Flow or Power, any control signal DDC greater than 0.5 or 2 VDC means there is a flow command. The flow or power logic will open the valve to satisfy the demand. Delta T Manager may be active.
Valve is yielding low flow but cannot be commanded to the full flow setting.	Valve is partially open but will not move to a full open position with a full control signal DDC command.	If the Delta T Manager is enabled it may be regulating the ΔT. Disable Delta T Manager until the chiller or boiler is operating correctly.
Requested flow cannot be reached; actual flow is lower than commanded flow.	Valve is full open.	If the valve is fully open and flow feedback is 5% lower than flow set point this event is captured in the Status Summary in Web View. Increase the pump differential pressure to resolve low flow problems.
Flow measurements are not stable.	Air may be in the system.	Check for air in the system. Remove air from the system to solve the problem.
Flow Control, Power Control, and dT Manager Scaling are not working.	Flow calculation is 0 GPM.	See any flow error listed on the Status area of the Web View.
Temperature sensor does not work.	Web View Indication: -15°F > Temp. > 300°F -26°C > Temp. > 149°C	Remove remote sensor wires from the terminals and verify resistance with an ohm meter, replace if damaged. Below are typical PT 1000 readings: 176°F [80°C] = 1347 ohms 68°F [20°C] = 1078 ohms 50°F [10°C] = 1039 ohms
Device running slow when viewed in BACnet front end.	Device busy or slow.	Reduce the number of points being pulled in BACnet system and or reduce the polling rate.
Valve does not respond to analog control signal DDC.	2-10 analog control signal DDC is modulated but the actuator does not respond.	Once Object SpRel has been written to via BACnet the valve will no longer respond to analog control signal DDC. The only way to restore the valve responding to the analog control signal is to power cycle the actuator.
Flow Sensor does not work properly.	For ½"through 2" - Error byte communicates failure status.	Replace sensor.

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Glossary of Terms

ΔT
Measured differential temperature between water supply and return.

Analog
A linear signal from one device to another. It used to move or read values. It is used by a controller to modulate an actuator. Typical analog signal range is 2-10 VDC, 0-10 VDC, or 4-20 mA.

BACnet
A standard world-wide communication protocol that is used in building automation. BACnet uses two common communication mechanisms, BACnet IP which communicates over Ethernet networks. BACnet MS/TP communicates over 2 or 3-wire RS485 networks.

BMS (Building Management System)
A computer-based control system installed in buildings to control and monitor the building's mechanical and electrical equipment.

CCV
A Belimo patented ball valve that provides high rangeability, zero leakage, and high close-off.

DDC (Direct Digital Control)
A controller with software to operate control valves, dampers and other devices.

Delta T Limit Value
A setting used by the Delta T Manager to limit coil overflow.

Delta T Manager
A patented flow limiting logic applied to the Energy Valve 4 Control Modes.

dT Manager
An option in the Delta T Manager logic that produces a fixed dT setpoint.

dT Manager Scaling
An option in the Delta T Manager logic that produces a variably scaled dT setpoint.

delta T (ΔT)
The difference in the supply and return temperatures of a coil.

dT setpoint
The set point used by the Delta T Manager logic. When used with dT Manager it is a fixed setting. When used with dT Manager Scaling it becomes a calculated variable over a scaled range.

Flow Saturation Limit Value / Flow Saturation
A setting used with dT Manager Scaling to reset the Delta T Limiting Value and create a variable, dT setpoint.

Ghost Energy
Leaky control valves can create ghost heating and cooling demand and excess ventilation, which comes with a need to dehumidify or preheat. Also, there is ghost pumping for the additional chilled water and heating water flows along with ghost heating and cooling. A 1% leakage creates a 5 to 10% loss of energy.

MP-Bus (MP)
A Belimo communication protocol. The ZTH US tool uses this protocol to view and change actuator settings.

P'max
The maximum thermal power setting.

P'nom
The maximum thermal power of the heat exchanger.

V'max
The maximum valve flow setting.

V'nom
The maximum valve flow.

5

5-year warranty

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