SIEMENS

Intelligent Valve - Control valve with integrated energy measurement

EVF..

Intelligent Valve – control valve with integrated energy data acquisition for heating, ventilation and air conditioning systems. Sensor based flow control.

- Flanged valves EVF..:
  - 2.5- to 5-inch
  - Nominal maximum volume flow 38 to 500 GPM
  - ANSI 125 flange connection
- System integration in building control technology over BACnet IP
- Ultrasonic volume flow measurement at measuring accuracy ± 2% for water and ± 6% for water-ethylene glycol mixtures
- Temperature measurement with paired immersion temperature sensors

Use

The Intelligent Valve is a 2- flanged dynamic control valve with volume flow, temperature and power measurement for heating, ventilation, and air conditioning systems.

The valve can be integrated as analog (DC 0/2...10 V or 4...20 mA) or digital (BACnet IP) into the temperature control loop. All process data (volume flow, power, primary flow and return temperature, etc.) can still be read out digitally even if integrated as analog.

The Intelligent Valve also has local limitation and optimization functions that support energy-efficient system operation.

Digital integration in the building automation and control system is easily done as a native BACnet object in Siemens Desigo systems using ABT Site and the associated libraries. Integration into non-Siemens Desigo systems is done manually as a generic BACnet object and the Intelligent Valve configured with either the ABT Go or Climatix mobile apps.

The Intelligent Valve has three control functions:

- Dynamic control valve
- Differential pressure controller
- Secondary flow temperature controller

Volume flow limitation and energy acquisition are available at any time in all three control functions.

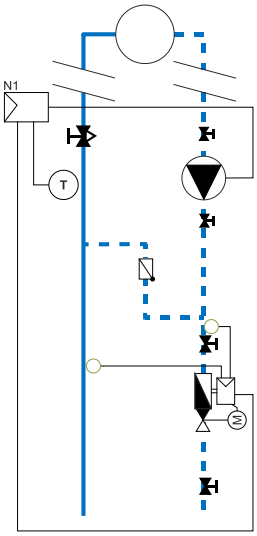
Intelligent Valve as a **dynamic control valve**

In this control function, the Intelligent Valve is part of a temperature control circuit and receives a setpoint from an automation station that depending on the control mode, it interprets as valve position, volume flow, or output and controls accordingly.

The example to the right depicts this based on a circuit for chilled ceilings.

Automation station [N1] controls the flow temperature of the chilled ceiling circuit by demand and specifies the setpoint of 0 to 100% on the Intelligent Valve. This can occur in analog (0 to 100% = DC 0 to 10V) form or remotely over BACnet IP.

The Intelligent Valve follows this setpoint and sets, for example, in volume flow control mode, the appropriate volume flow.

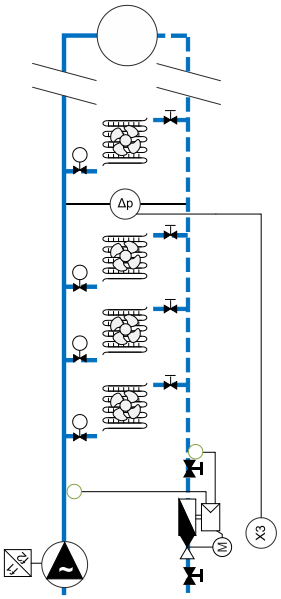


Intelligent Valve as a **differential pressure controller**

The Intelligent Valve can act as a differential pressure controller for a section of the system.

In this control function, the Intelligent Valve controls independently of an automation station. Using an auxiliary differential pressure sensor [X3], it acquires the present differential pressure in the system section and adjusts the valve position resulting in a constant differential pressure.

In this control function, the Intelligent Valve does not receive an external setpoint, but rather controls to a fixed local setpoint that the user sets with either ABT Go or Climatix mobile apps.



Intelligent Valve as **secondary flow temperature controller**

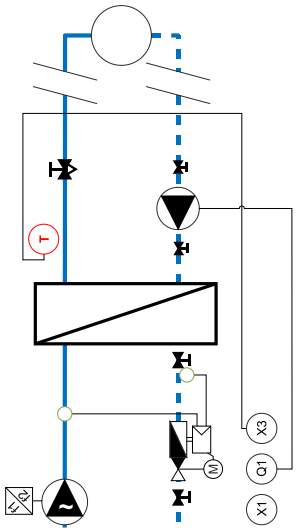
In this control function, the Intelligent Valve assumes the role of the automation station.

Using an auxiliary secondary flow temperature sensor [X3], it acquires the flow temperature and controls to the present temperature setpoint by adjusting the volume flow.

Possible sensor types at [X3] are passive sensors with sensing elements LG-Ni-1000, DIN-Ni-1000 or Pt1000 (385/EU).

The temperature setpoint can be preset externally via BACnet IP or analog at [X1] (0 to 10V = 32 to 212°F [0 to 100°C]).

The secondary pump is released by relay [Q1] as soon as the setpoint for secondary flow temperature is > 32°F (0°C).

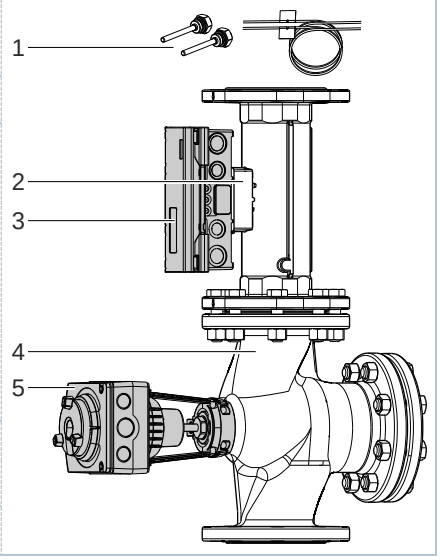


Technical design

Basic design

The Intelligent Valve combines four main functions:

- Exact, continuous volume flow measurement with an ultrasonic flow sensor
- Precise temperature measurement using paired Pt1000 temperature sensors
- Precise volume control using a control valve with a high-resolution actuator
- Dynamic hydronic balancing, power and energy calculations, storage of cumulated flow and energy data as well as network integration via a central control unit

Temperature sensor pair (with thermowells)	1	
Ultrasonic flow sensor	2	
Intelligent Valve controller – Sensor interface – Dynamic volume flow control – Power and energy measurement – Storage of cumulated flow and energy data – Network integration	3	
Flow control valve	4	
High-resolution actuator	5	

Volume flow is acquired continuously in the ultrasonic flow sensor and provided to the Intelligent Valve controller, where the controller applies it as the actual value for control or limitation by guiding the control valve position until the volume flow actual value for the applicable setpoint is achieved.

Control modes as a dynamic control valve

The Intelligent Valve supports three control modes in this control function:

- Volume flow control
- Position control
- Power control

Volume flow limitation is active on all control modes.

Volume flow control

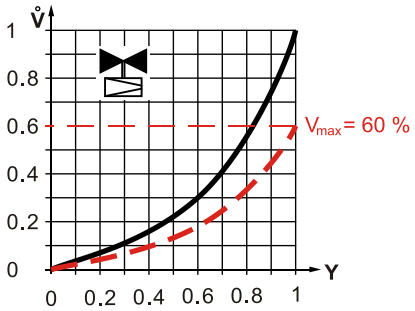
In the basic configuration, the Intelligent Valve operates as an electronic PICV *(*pressure-independent control valve). This control mode is referred to as volume flow control. The positioning signal is proportional to the volume flow to be controlled (setpoint 0% = closed; setpoint 100% = $\dot{V}_{100}$). The setpoint range reflects new limit values (setpoint 0 % = $\dot{V}_{min}$, setpoint 100% = $\dot{V}_{max}$), if volume flow limitation ($\dot{V}_{min}$ and/or $\dot{V}_{max}$) is activated. In volume flow control, the flow characteristic curve can be adapted to the heat exchanger's transfer behavior.

2 characteristic curves are available:

Equal percentage, optimized in the opening range (factory setting)

Recommended for heating and cooling registers, where the transfer characteristic is unknown.

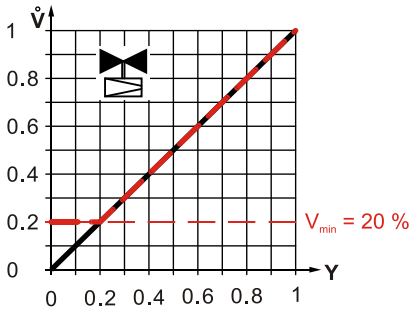
– – –: Modified characteristic curve with volume flow maximum limitation at 60 %



Linear

Recommended for plate heat exchangers water/water circuits.

– – –: Cut characteristic at the volume flow minimum limitation



In the event of volume flow maximum limitation, the curve always adapts to the entered limitation setpoint (example for equal percentage curve).

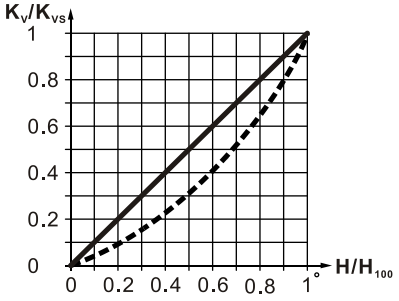
During volume flow minimum limitation, the characteristic is cut off below the minimum flow (example for a linear characteristic curve).

Position control

The control valve position is proportional to the setpoint (setpoint 0% = closed; setpoint 100% = H_{100}) – whereby the limitation to the applicable maximum volume flow ($\dot{V}_{100}$ or $\dot{V}_{max}$) remains active.

Dynamic volume flow control is inactive in position control mode and the Cv (k_{VS}) valve characteristic curve is not electronically modified.

The Cv (k_{VS}) valve characteristic curve is derived by combining the control valve or control ball valve characteristic and the resistance characteristic of the flow sensor.



Power control

The design output is the reference variable. It is defined by:

- Design volume flow $\dot{V}_{max}$
- Design temperatures $T_{VL, design}$ and $T_{RL, design}$

Design output = c × design volume flow × difference of the design temperatures

$\dot{Q}_{design} \sim \dot{V}_{max} \times (T_{VL, design} - T_{RL, design})$

whereby $\dot{Q}_{max}$ is the output limitation in %, relating to the design output of the consumption (heat exchanger).

The setpoint for the output for control is interpreted by referencing the output limitation – (Y = 0…100 % $\dot{Q}_{max}$; 0% = closed; 100 % = $\dot{Q}_{max}$),

The "Sizing" section provides a table of the output values for water at typical temperature differences (Sizing as dynamic control valve).

The volume flow maximum limitation ($\dot{V}_{100}$ or $\dot{V}_{max}$) also remains active in power control mode. In power control, the dynamic volume flow control is inactive, since any undesired change in volume flow automatically results in a change in output, which is controlled anyway.

The flow characteristic curve is not relevant to power control.

Operating limits and other features

Nominal volume flow and minimum required differential pressure

The Intelligent Valve has, as does any dynamic valve, a nominal flow $\dot{V}_{100}$ by build design that may not be exceeded during operation. A minimum differential pressure (Δp_{min}) is required to achieve nominal volume flow; it is calculated from the Intelligent Valve Cv (k_{VS}) value. In contrast to mechanical valves, the electronic volume flow control on the Intelligent Valve remains active below the minimum differential pressure – so that the network is always optimally balanced.

The Intelligent Valve supports different limitation functions:

- Volume flow maximum limitation
- Volume flow minimum limitation
- Output maximum limitation
- Return temperature min./max. limitation
- ΔT-limitation – limitation of the difference between the flow and return temperature
- Adapted volume flow maximum limitation

Volume flow maximum limitation

We recommend activating the volume flow maximum limitation if the design volume flow for the partial system (heating coil/cooling coil/heat exchanger) as controlled by the Intelligent Valve, is lower than the nominal flow of the Intelligent Valve. In volume flow control mode, the set volume flow $\dot{V}_{max}$ – which can be anywhere between 30 to 100% of the nominal volume flow – is interpreted as the 100% setpoint. It only serves as the limitation value in the other control modes.

Volume flow minimum limitation

The volume flow minimum limitation achieves a minimum flow through the controlled partial system where this appears to be appropriate. The limitation is, of course, pressure independent so that there is no over or under-supply as the local differential pressure changes.

Output maximum limitation

In contrast to volume flow limitation, the output limitation adapts dynamically to the temperature distribution in the system. Therefore, power control is more suitable for critical users than volume flow limitation.

Return temperature min./max. limitation

Modern, high-efficiency output generators must have sufficient low/high return temperatures to achieve their output numbers/degree of efficiency. With an Intelligent Valve, you can precisely limit the return temperature value as needed by the given system.

A return temperature maximum limitation is available if the Intelligent Valve is used in a heating application; a return temperature minimum limitation is available in a cooling application.

The setting is made in two steps:

1. Enable the function
2. Set the limitation
   - Factory setting for maximum limitation

     104°F (40°C); setting range = 32 to 212°F (0 to 100°C)
   - Factory setting for minimum limitation

     50°F (40°C); setting range = 32 to 212°F (0 to 100°C)

ΔT-limitation

In systems where the flow temperature cannot be maintained at a constant level – for example, due high swings in load or insufficient generation capacity – limiting the difference between the flow and return temperature is an alternative to absolute return temperature limitation. ΔT-limitation ensures that the consumer is not supplied with more output than the consumer can process.

The setting is made in two steps:

1. Enable the function
2. Set the limitation
   - Factory setting ΔT-limitation

     42.8°F (6°C); setting range = 32 to 104°F (0 to 40°C)

Adapted volume flow maximum limitation (Adaptive Flow Optimizer)

Enabling the adapted volume flow maximum limitation is a good idea in systems where the design volume flow and power in the part of the partial system controlled by the Intelligent Valve (heating coil/cooling coil/heat exchanger) are unknown or will regularly change in the future due to expansion of the system or changes of use. This limitation avoids– both in the full load and partial load range – excessive volume flow demands from the controller, as can occur at sudden swings in load or switch-on processes.

The adapted volume flow maximum limitation functions as a moving maximum filter and calculates the adapted maximum limitation value from the measured volume flow values of the last four days. Short-term increases are limited to this adapted maximum limitation value. Longer-term increases (lasting more than three hours) lead to a gradual upwards adjustment of the adapted maximum limitation value.

The setting is made by enabling the function. A setpoint is not needed.

Backup mode

The backup mode specifies the device behavior in case of loss of communication, cable breakage or setpoint failure. If the setpoint is invalid for a configurable period of time, the backup mode determines the device's reaction.

This feature can be configured in three different ways:

- The valve is closed in backup mode.
- The device follows the last available setpoint.
- The device follows a predetermined setpoint.

As soon as a valid setpoint is available again, the backup mode stops.

Not all features are available to each control mode. The following features are available based on control mode:

	Dynamic control valve			**Differential pressure controller**	**Secondary flow temperature controller**
	Position control	**Volume flow control**	**Power control**		
Setpoint	External			Internal	External
Volume flow maximum limitation	Always active				
Volume flow minimum limitation	Selectable				
Output maximum limitation	-		Always active	-	-
Return temperature limitation	Selectable			-	Selectable
ΔT-limitation	Selectable			-	Selectable
Adapted volume flow maximum limitation	Selectable			-	Selectable
Backup mode	Selectable			-	Selectable

Media

The Intelligent Valve can be used with all nominal sizes in hydronic circuits with chilled/hot water. For a continuous range of the maximum volume flow of 38 to 500 GPM, use in applications with water-ethylene glycol mixtures with glycol concentrations between 20 to 35% is also possible.

Sizing

Sizing as dynamic control valve with water and water/glycol

As a pressure-independent solution, it is generally easy to size the Intelligent Valve. If the volume flow is already a known variable, simply select the corresponding valve. The electronic volume flow controller ensures that the valves always achieve the specific nominal volume flow. However, the nominal volume flow cannot be exceeded.

We recommend selecting the valves so that the maximum volume flow $\dot{V}_{max}$ must be preset to a value of 30 to 90%, just in case a somewhat higher volume flow is required during installation than was originally calculated.

Product Numbers

Flanged Intelligent Valve

Orderable Part Number	In	$\dot{V}_{100}$	$min\dot{V}_{max}$	Δp_{V100}	Δp_{V50}	Δp_{max}	Δp_s	p_s	Cv
		[GPM]		[PSI]					[Cv]
Normally Closed									
EVF4U20U0250	2.5	125	38	5.2	1.3	87 [1]	232	217	56
EVF4U20U0300	3	185	56	5.2	1.3			174	81
EVF4U20U0400	4	315	95	5.2	1.3			232	142
EVF4U20U0500	5	500	150	10.1	2.6				157
Normally Open									
EVF4U21U0250	2.5	125	38	5.2	1.3	87 [1]	232	217	56
EVF4U21U0300	3	185	56	5.2	1.3			174	81
EVF4U21U0400	4	315	95	5.2	1.3			232	142
EVF4U21U0500	5	500	150	10.1	2.5				157

Orderable Part Number	Operating voltage	Positioning signal	Positioning time
Normally Closed	AC/DC 24V	DC 0 to 10V DC 2 to 10V 4 to 20 mA	30s 120s
EVF4U20U0250			
EVF4U20U0300			
EVF4U20U0400			
EVF4U20U0500			
Normally Open			
EVF4U21U0250	AC/DC 24V	DC 0 to 10V DC 2 to 10V 4 to 20 mA	30s 120s
EVF4U21U0300			
EVF4U21U0400			
EVF4U21U0500			

In = Line size

$\dot{V}_{100}$ = Volume flow through a fully open valve

$min\dot{V}_{max}$ = The smallest possible preset volume flow through a fully open valve

Δp_{V100} = Required minimum differential pressure to guarantee nominal flow $\dot{V}_{100}$

Δp_{V50} = Pressure over the fully opened valve at 50 % of nominal flow

Δp_{max} = Maximum permissible differential pressure over the valve control path, valid for the entire positioning range of the valve-actuator unit

Δp_s = Maximum permissible differential pressure (closing pressure) at which the valve-actuator unit securely closes against the pressure

p_s = Permissible operational pressure

[1] The maximum permissible differential pressure of 87 PSI requires some safety measures:

- The volume flow limitation to V_{100} must always be adhered to, even in manual operation.
- Flushing with 87 PSI and a **completely open** valve is not permitted. During flushing the flow sensor is to be replaced by a spacer during flushing.
- Cavitation must be avoided: the static pressure downstream of the valve must be at least as high as the differential pressure.

Scope of delivery

The Intelligent Valve is supplied as a complete set consisting of:

Flanged EVF..
Intelligent Valve controller
Actuator
Flow sensor
Control valve
Flange adapters set
Temperature sensor pair including thermowells

Spare parts

Orderable part number	Model	Description
S55845-Z260	ASE4U10U	Intelligent Valve Controller
S55845-Z213	AVF4E065	Ultrasonic flow sensor for 2.5-inch Intelligent Valve
S55845-Z214	AVF4E080	Ultrasonic flow sensor for 3-inch Intelligent Valve
S55845-Z215	AVF4E100	Ultrasonic flow sensor for 4-inch Intelligent Valve
S55845-Z216	AVF4E125	Ultrasonic flow sensor for 5-inch Intelligent Valve
ALF4U0250	ALF4U0250	Flange adapter set for 2.5-inch Intelligent Valve
ALF4U0300	ALF4U0300	Flange adapter set for 3-inch Intelligent Valve
ALF4U0400	ALF4U0400	Flange adapter set for 4-inch Intelligent Valve
ALF4U0500	ALF4U0500	Flange adapter set for 5-inch Intelligent Valve
S55845-Z230	EZU10-10025	Temperature sensor pair Pt1000
EZT-S100U	EZT-S100U	Temperature sensors thermowell set
S55150-A142	SAX61.03/HR	Valve actuator 800 N, 20 mm stroke, AC/DC 24 V, modulating 0…10 V Highly accurate positioning signal, only for use with Intelligent Valve EVF.., 2.5- and 3-inch (DN 65 and DN 80)
S55150-A146	SAV61.00/HR	Valve actuator 1600 N, 40 mm stroke, AC/DC 24 V, modulating 0…10 V Highly accurate positioning signal, only for use with Intelligent Valve EVF.., 4- and 5-inch (DN 100 and DN 125)

Notes

Safety notes

Comply with the following safety notes to protect life, limb, and property.

The safety notes in the document include the following elements:

- Symbol for hazard
- Signal word
- Type and source of hazard
- Consequences in the event the hazard occurs
- Measures or prohibitions to prevent the hazard

Symbol for hazard

This is the symbol for hazard. It warns you of **Risks of injury**.
Comply with all measures designated by this symbol to prevent injury or death.

Additional hazard symbols

These symbols indicate general hazards, type of hazard, possible consequences, measures and prohibitions, a sample of which is displayed in the following table:

General hazard

Potentially explosive atmospheres

Voltage/electrical shock

Laser light

Battery

Heat

Signal word

The signal word classifies the hazard as defined in the following table:

Signal word	Danger level
DANGER	'DANGER' identifies a dangerous situation, that **results directly in death or serious injuries**, if you do not avoid this situation.
WARNING	'WARNING' identifies a dangerous situation, that **can result in death or serious injuries**, if you do not avoid this situation.
CAUTION	'CAUTION' identifies a dangerous situation, that **can result in minor or moderate injuries**, if you do not avoid this situation.
NOTE	'*NOTE*' identifies a possible situation that may cause damage if not observed. '*NOTE*' does not reference possible injury.

Depiction of risk of injury

Notes on risk of injury is depicted as follows:

	⚠ **WARNING**
	Type and source of hazard Consequences in the event the hazard occurs ● Measures/prohibitions to prevent the hazard

DEPICTION for possible damage to property

Notes on possible damage to property is depicted as follows:

	NOTICE
	Type and source of hazard Consequences in the event the hazard occurs ● Measures/prohibitions to prevent the hazard

Safety

	⚠ **CAUTION**
	National safety regulations Failure to comply with national safety regulations may result in personal injury and property damage. ● Observe national provisions and comply with the appropriate safety regulations.

Qualified personnel

	NOTICE
	Qualified personnel! Improper installation may override safety measures that a lay person may not recognize. ● Specialized knowledge of heating and air conditioning systems is required for installation. ● Only properly trained personnel may install the equipment. ● Prevent access to lay persons, especially children.

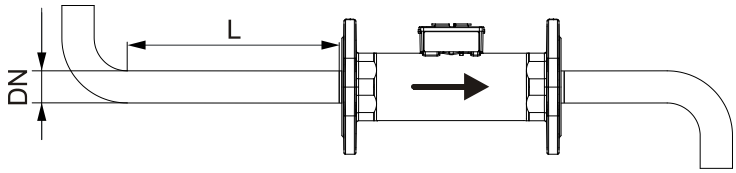
Only persons who can reasonably be expected to reliably conduct the work may actually perform the tasks. Do not permit persons whose reactions may be impaired, for example, by drugs, alcohol, or medications to perform the tasks.

HVAC specialist

HVAC specialists are persons capable of performing the mechanical work on heating and air conditioning systems and to independently recognize and avoid hazards due to their technical training, knowledge and experience as well as their knowledge of applicable standards and regulations.

HVAC specialists are specially trained for the work environment where they are active and know the relevant standards and regulations.

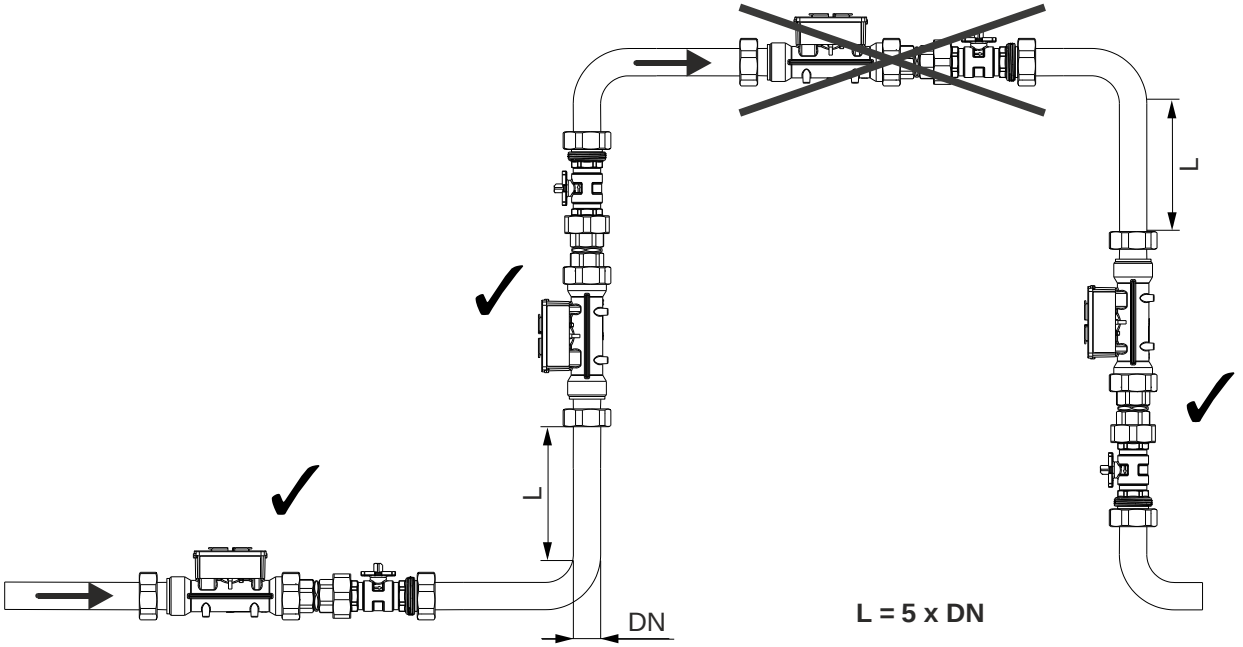
A straight inlet section of L ≥ 5 × line size in inches (DN) must be maintained upstream of the flow sensor to guarantee the indicated measurement and control accuracy.



L ≥ 5 x DN

The indicated flow direction (arrow on the flow sensor and valve body) must be correct; the Intelligent Valve cannot otherwise be operated!

Do not install it at the highest point on the loop since air bubbles may otherwise collect in the flow meter.



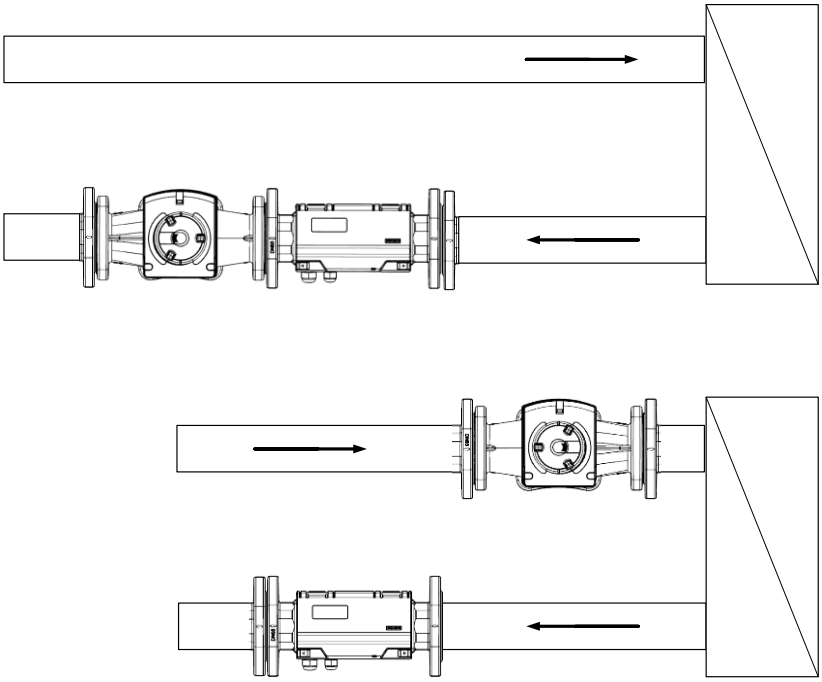
L = 5 x DN

The rule is: Measure first, then control – in other words, the flow sensor must always be mounted upstream of the control valve in a compact installation.

The Intelligent Valve must be installed in the return for optimum performance. The components are subject to less wear and tear due to the lower temperatures.

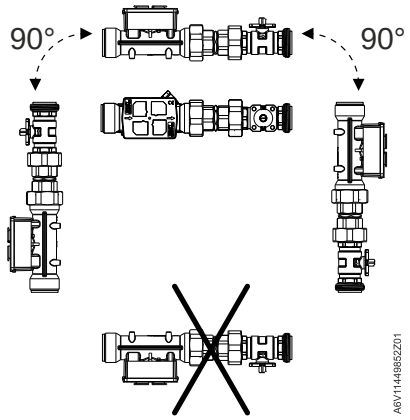
We recommend installing a filter or strainer in the supply line to the heat exchanger. This increases the reliability and life cycle of the Intelligent Valve.

The flow sensor and control valve can be installed separately:



The Intelligent Valve is assembled at the mounting location. No adjustments, except for configuring with ABT Go or Climatix mobile apps, nor special tools are required. Separate mounting instructions are included with the valve and flow sensor.

Mounting positions



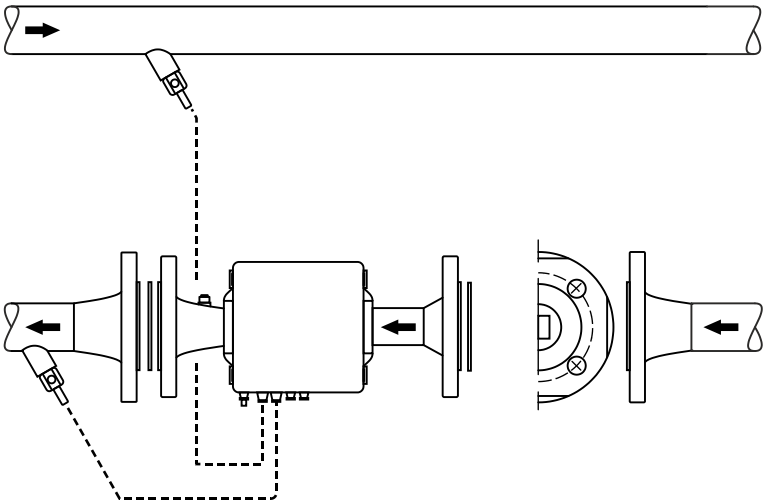
Mount the flow sensor in the return if the media temperatures exceed 90°C. If not possible, mount the Intelligent Valve controller remotely from the flow sensor.

Mounting the temperature sensors

Flanged valves **EVF..**

The EVF.. flanged valves include the temperature sensors EZU10-10025 for installing in the thermowells EZT-S100U (also included).

Welding sleeves must be planned on the construction side – installation example with protective pocket.



The device has only a simple user interface.

Siemens ABT Go or Climatix mobile apps are used to commission the device.

ABT Go and Climatix Mobile Apps

Siemens ABT Go and Climatix mobile apps are available in iOS and Android versions in the corresponding app stores and can be used on smartphones and tablets. They connect directly over WLAN. The Intelligent Valve's own WLAN button activates the device's WLAN access point.

The following are the most important setting parameters for commissioning the Intelligent Valve:

Parameter	Value range	Description	Factory setting	Access level
Valve design	2-port valve.	Selection for controlling a 2-port	2-port valve.	Measuring and control technician
Control function	• Dynamic control valve • Differential pressure controller • Secondary flow temperature controller		Dynamic control valve	Measuring and control technician
Control mode	• Volume flow control • Position control • Power control	See Control modes as dynamic control valve [→ 5]	Volume flow control	Measuring and control technician
$\dot{V}_{max}$	30 to 100%	Maximum volume flow applicable to all control modes. It is used for hydronic balancing of the consumer. Can be set in ABT Go or Climatix mobile apps in the units GPM.	Active 100 %	Installer
$\dot{V}_{min}$	2.5 to 20%	Minimum volume flow applicable to all control modes. Can be set in ABT Go or Climatix mobile apps in the GPM.	Inactive	Installer
Setpoint source	• Analog (terminal) • BACnet IP (remote) • Local	Selection whether to interpret input X1 as the setpoint, whether it originates from a BACnet network, or whether it is set (e.g. in the event of differential pressure control) locally to a fixed value.	Analog (terminal)	Measuring and control technician
Setpoint signal type	• 0 to 10V • 2 to 10V • 4 to 20 mA	Signal type at input X1	0 to 10V	Measuring and control technician
Actual value parameter	• Position • Volume flow 0 to V_{100} • Power • Supply (Primary) temperature • (Primary) Return temperature • Temperature difference supply (flow)/return	Selection whether the analog signal on output X2 represents the valve position or volume flow. In the event of volume flow, 0...V_{100} = 0 to 100%.	Deactivated	Measuring and control technician
Actual value signal type	• 0 to 10V • 2 to 10V • 4 to 20 mA	Signal type pending at output X2	-	Measuring and control technician
Flow characteristics	• Linear • Equal percentage	The flow characteristic flow can be selected in the volume flow control mode.	Equal percentage	Measuring and control technician

User interface on the device

Service LED [1]

- Indicates the operating state (see table below)

Service button [2]

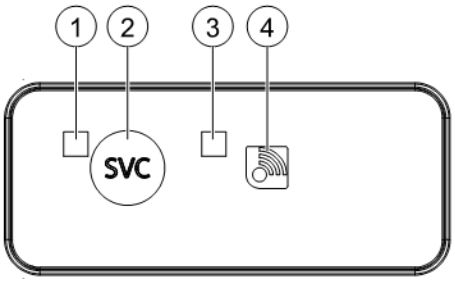
- Trigger wink
- Override setpoint and set $\dot{V}_{max}$ for 10 minutes (press for 3 to 6s)
- Start flow test (press for 6 to 8s)

Communication LED [3]

- Indicates the communication state (see table below)

WLAN button [4]

- Enable integrated WLAN Access Point for 10 min (press for ca. 0.5s)

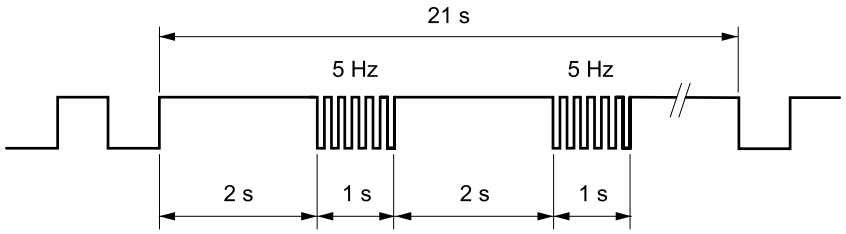


- Reset device to factory settings
  - Press both buttons ([2], [4]) at the same time for 10 to 15s: The LEDs ([1], [3]) slowly flash orange for 10 s
    You can cancel the process during these 10 seconds by releasing the buttons.
  - After flashing for 10 s, the LEDs flash quickly for ca. s and the reset is triggered by releasing the buttons.
  - The controller returns to normal operation without resetting if you continue to press the buttons.

!	***NOTICE***
	All configurations, network settings, commissioning parameters, and passwords are set to factory settings! ● This action cannot be cancelled nor reversed.

Service LED			SVC
Color	**Blinking pattern**		**Description**
	On	**Off**	
White	Continuous	-	Device starting up
Green	0.5 s	0.5 s	Device in configuration mode
	4.75 s	0.25 s	Normal operation
	0.25 s	0.25 s	Stop local forced control
Blue	0.5 s	0.5 s	Local forced control – Flow test
Yellow	0.5 s	0.5 s	Local forced control – Continuous volume flow $\dot{V}_{max}$
Red	0.5 s	0.5 s	Fault input/output or component: ● Flow sensor – Wrong direction of flow – Air in sensor – Sensor connection faulty ● Temperature sensors – Damaged cable – Short circuit ● Actuator – Blocked – Faulty connection ● Setpoint input terminal – Faulty connection – Invalid signal
	2 s / 5 Hz	- / 5 Hz	Flashing to wink command for physical device identification [1)]
	Continuous	-	Fault
Orange	0.5 s	0.5 s	Reset to factory settings being prepared
	0.1 s	0.1 s	Reset to factory settings is triggered
-	-	-	Undervoltage

1)



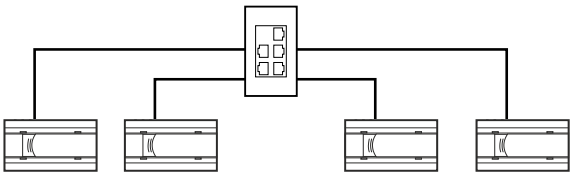
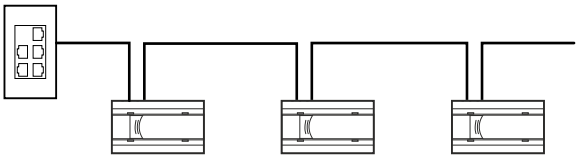
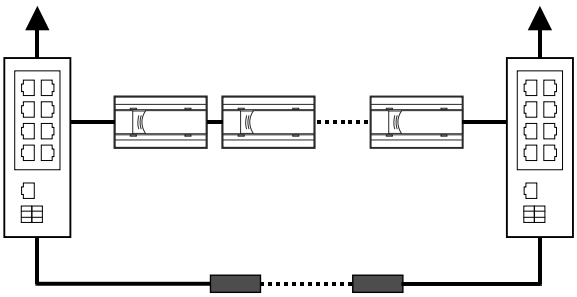
Communication LED			
Color	**Blinking pattern**		**Description**
	On	**Off**	
-	-	-	● No communication ● Ethernet cable unplugged ● Device starting up
Blue	0.5 s	0.5 s	WLAN enabled
	Continuous	-	WLAN data transmission
Green	0.5 s	0.5 s	TCP/IP communications error – IP address not available
	Continuous	-	TCP/IP data transmission [1]
Orange	Continuous	-	Modbus connected and configured – no data transmission via EIA-485
	0.5 s	0.5 s	Active communication via EIA-485
	0.5 s	0.5 s	Reset to factory settings being prepared [2]
	0.1 s	0.1 s	Reset to factory settings is triggered

[1] With a daisy chain layout, it is only possible to check if a neighbour device is connected – the chain to the switch/router is not ensured and may even be broken.

[2] Applies only if SVC LED also flashes synchronously.

Network integration BACnet IP

The Intelligent Valve can be integrated over TCP/IP in a BACnet IP network.
The device supports:

● Star topologies	
● Line topologies (daisy chain)	
● Ring topologies – Note here that network switches with "Rapid Spanning Tree Protocol (RSTP)" are used.	

In the case of a daisy chain, it is recommended not to use more than 10 devices per chain.

A complete list of supported BACnet data points is included in the document "Intelligent Valve – BACnet Objects" (See *Product documentation*).

Siemens ABT Go or Climatix mobile apps configures the network parameters (IP address, subsegment, and so on.).

Maintenance

EVF.. control valves are maintenance-free.

Disposal

The device is considered an electronic device for disposal in terms of the European Directive and may not be disposed of as domestic waste.

- Use only designated channels for disposing the devices.
- Comply with all local and currently applicable laws and regulations.

Warranty service

Intended use

⚠ WARNING

Intended use

Improper use can result in injury as well as damage to the product or system.

- Siemens product may only be used with user cases set forth in the catalog and associated technical documentation.
- User-related technical data are only guaranteed in connection with the products listed in this document. Siemens rejects any and all warranties in the event that third-party products are used.
- Trouble-free and safe product operation presupposes transport, storage, setup, mounting, installation, commissioning, operation, and servicing as intended.
- You must comply with permissible ambient conditions. Comply with all notes in the associated documentation.

Exemption from liability

The content of this document was reviewed to ensure it matches the hardware and firmware described herein. Nevertheless, differences may occur so that we are unable to fully guarantee a complete match. The information provided in this document is reviewed on a regular basis and any required corrections are added to the next edition. We always welcome suggestions on how to improve documentation.

Open Source Software (OSS)

Software license overview

These devices use Open Source Software (OSS); see the OSS document on the specific controller type and VVS.

All Open Source Software components used in the product (to include copyrights and licensing agreement) are available at http://siemens.com/bt/download.

Firmware version	OSS document		Controller
	Document ID	Title	
FW01.19.xxxxx	A6V13095123	Readme OSS "Intelligent Valve", V3.0	ASE4U10E
FW01.18.xxxxx	A6V12343374	Readme OSS "Intelligent Valve", V2.0	
FW01.17.xxxxx			
FW01.16.xxxxx	A6V11676101	Readme OSS "Intelligent Valve", V1.2	

Firmware version	OSS document		Controller
	Document ID	Title	
FW01.15.xxxxx			
FW01.14.xxxxx			
FW01.13.xxxxx			

Cyber security disclaimer

Siemens provides a portfolio of products, solutions, systems and services that includes security functions that support the secure operation of systems, systems, machines and networks. In the field of Building Technologies, this includes building automation and control, fire safety, security management as well as physical security systems.

In order to protect systems, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art security concept. Siemens' portfolio only forms one element of such a concept.

You are responsible for preventing unauthorized access to your systems, systems, machines and networks which should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. Additionally, Siemens' guidance on appropriate security measures should be taken into account. For additional information, please contact your Siemens sales representative or visit https://www.siemens.com/global/en/home/company/topic-areas/future-of-manufacturing/industrial-security.html.

Siemens' portfolio undergoes continuous development to make it more secure. Siemens strongly recommends that updates are applied as soon as they are available and that the latest versions are used. Use of versions that are no longer supported, and failure to apply the latest updates may increase your exposure to cyber threats. Siemens strongly recommends to comply with security advisories on the latest security threats, patches and other related measures, published, among others, under https://www.siemens.com/cert/en/cert-security-advisories.htm.

Technical data

Dimensions and weight
See Dimensions.

Power supply		2.5- and 3-inch (DN 65 to 80)	4- and 5-inch (DN 100 to 125)
Operating voltage		AC 24V ~ ±20 % (19.2...28.8V ~) DC 24V ⎓ ±20 % (19.2...28.8V ⎓)	
Frequency		50/60 Hz	
Power consumption including connected field devices			
	Operation	6.25 W	8 W
	Normal position	3.5 W	3.5 W
	Sizing	14 VA	16 VA
Power consumption ASE4U10E			
	Operation	3.5 W	
	Normal position	2 W	
	Sizing	6 VA (controller without actuator!)	
Internal fuse		Irreversible	
External fusing of supply line		• Fuse slow 6 to 10A • Circuit breaker: Max. 13 A, type B, C, D per EN 60898 • Power source with current limitation of max. 10A	

Interfaces	
Ethernet	Plugs: 2 × RJ45, screened Interface type: 100BASE-TX, IEEE 802.3 compatible Bitrates: 10/100 Mbps, autosensing Protocol: BACnet over UDP/IP
USB (2.0)	Plug: Micro-B Data rate: 1.5 Mbps and 12 Mbps No galvanic isolation to ground
L-bus	Baud rate: 2.4 kBaud Bus power: 10 mA Short-circuit proof: protection against faulty wiring at max. AC 24V

Function data

Control valve		
Nominal flow		See Product Numbers
Adjustable flow as [%] of V_{100}		30 to 100%
Permissible media		Chilled and hot water, water with ethylene glycol ≤ 35 %
Control accuracy		
	Water	±5%
	Water with ethylene glycol	±10%
Medium temperature		34 to 248°F (1 to 120°C)
Operating pressure p_s		See Product Numbers
Differential pressure Δp_{max} / Δp_s		See Product Numbers
Flow characteristic curve (Control mode "Volume flow control")		Selectable (linear, equal percentage)
Leakage rate		ANSI Class IV (0.01%)
Mounting position		Upright to horizontal
Valve body		Cast iron
Blank flange		
Valve stem, seat, ball		Stainless steel
Stem sealing gland		EPDM

Actuator	**2.5- and 3-inch (DN 65 to 80)**	**4- and 5-inch (DN 100 to 125)**
	SAX61.03/HR	**SAV61.00/HR**
Positioning time (at the specified nominal stroke)	30 s	120 s
Positioning force	800 N	1600 N
Nominal stroke	20 mm	40 mm

Flow measurement		
Ultrasonic volume flow measurement		Yes
Measuring accuracy		
	Water	±2 % (25 to 100% V_{100})
	Water with ethylene glycol	±6 % (25 to 100% V_{100}) [1)]
Minimum flow measurement		0.8% of V_{100}
Flow sensor material		
	DN 65	Brass
	DN 80	Nodular cast iron EN-GJS-500
	DN 100 to 125	Brass

1) Verified with Antifrogen® N by Clariant.

Temperature measurement		
Measuring accuracy absolute temperature		±1.1 °F at 68°F (±0.6 °C at 20°C) ±1.44 °F at 140°F (±0.8 °C at 60°C) (Pt1000 EN60751, class B)
Measuring accuracy temperature difference		±0.2 K at ΔT = 20 K
Resolution		0.15°F (0.085°C)
Thermowells for temperature sensors		
	Permissible operational pressure	363 PSI
	Material	Stainless steel

Inputs

The inputs are protected against incorrect wiring AC/DC 24V.

Setpoint signal input, analog (input X1) in control functions "Dynamic control valve"			
Type	**Range (over range)**	**Resolution**	**Input resistance (R_{in})**
AI 0 to 10V	0 to 10V (-1 to 11V) DC 0 to 10V = 0 to 100%	1 mV	100 kΩ
AI 0 to 10 V	2 to 10V (1 to 11V) DC 2 to 10V = 0 to 100%	1 mV	100 kΩ
AI 4 to 20 mA	4 to 20 mA (0 to 20 mA) 4 to 20 mA = 0 to 100%	2.3 µA	<460 Ω
Open connection: Negative voltage -3.1 V (line failure detection)			

Setpoint signal input, analog (input X1) in control function "Secondary flow temperature controller"			
Type	**Range (over range)**	**Resolution**	**Input resistance (R_{in})**
AI 0 to 10V	0 to 10V (-1 to 11V) DC 0.1 to 10V = 1 to 100°C	1 mV	100 kΩ
AI 0 to 10V	2 to 10V (1 to 11V) DC 2 to 10V = 0 to 100°C	1 mV	100 kΩ
AI 4 to 20 mA	4 to 20 mA (0 to 20 mA) 4 to 20 mA = 0 to 100°C	2.3 µA	<460 Ω
Open connection: Negative voltage -3.1V (line failure detection)			

Position feedback actuator, analog (Input U)			
Type	**Range (over range)**	**Resolution**	**Input resistance (R_{in})**
AI 0 to 10V	0 to 10V (-1 to 11V)	1 mV	100 kΩ
Open connection: Negative voltage -3.1V (line failure detection)			

Temperature measurement for power measurement, analog (Inputs B7, B26)		
Type	**Range (over range)**	**Resolution**
AI Pt1000 (385/EU)	-40 to 150°C (-45 to 160°C) -40 to 302°F (-49 to 320°F)	85 mK 0.153 °F

Temperature measurement, analog (Input X3) in control functions "Secondary flow temperature controller"		
Type	**Range (over range)**	**Resolution**
AI Pt1000 (385/EU)	-40 to 150°C (-45 to 160°C) -40 to 302°F (-49 to 320°F)	85 mK 0.153°F
AI (LG-)Ni1000		55 mK 0.099 °F

Temperature measurement, analog (Input X3) in control functions "Secondary flow temperature controller"		
Type	**Range (over range)**	**Resolution**
AI Ni1000 DIN		45 mK 0.081 °F

Voltage measurement, analog (Input X3) in control functions "Differential pressure controller"			
Type	**Range (over range)**	**Resolution**	
AI 0 to 10V	0 to 10V (-1 to 11V)	1 mV	100 kΩ
AI 0 to 10V standard	0 to 100% (-10 to 110%)	1 mV	
Open connection: Negative voltage -1.5 V, 8 µA (line failure detection)			

Flow measurement, digital (Input DU)
Use only the flow sensors specified in the data sheet.

Outputs

The outputs are protected against short circuiting and incorrect wiring AC/DC 24V.

Position feedback, analog (output X2)			
Type	**Range (over range)**	**Resolution**	**Output current / output impedance**
AO 0 to 10 V	0 to 10V (0 to 10.5V)	11 mV	Max. 1 mA
AO 4 to 20 mA	4 to 20 mA (4 to 20 mA)	22 µA	<650 Ω

Signal output actuator, analog (Output Y)			
Type	**Range (over range)**	**Resolution**	**Output current**
AO 0 to 10 V	0 to 10V (0 to 10.5V)	11 mV	Max. 1 mA

Switching output relay Q1 (connection terminals Q13, Q14)	
Type	Relay
Switching voltage	AC 24V/DC 30V
Permissible load current	100 mA

Supply for field devices (outputs V ≂)	
Output voltage	AC/DC 2 V
Permissible load current	10A
Protection against overload	None

WLAN interface		
Interface type		Wireless access point
Supported standards		IEEE 802.11b/g/n
Frequency band		2.4 GHz
WLAN channels		3
Transmission power		17 dBm
Distance (unobstructed field)		Min. 5 m (16 ft)
Device pairing		Activation/deactivation with service button Automatic switch off after 10 minutes if no WLAN client is connected.
Default SSID and WLAN password		
	SSID	<Part number>_<Series no.>
		Example:

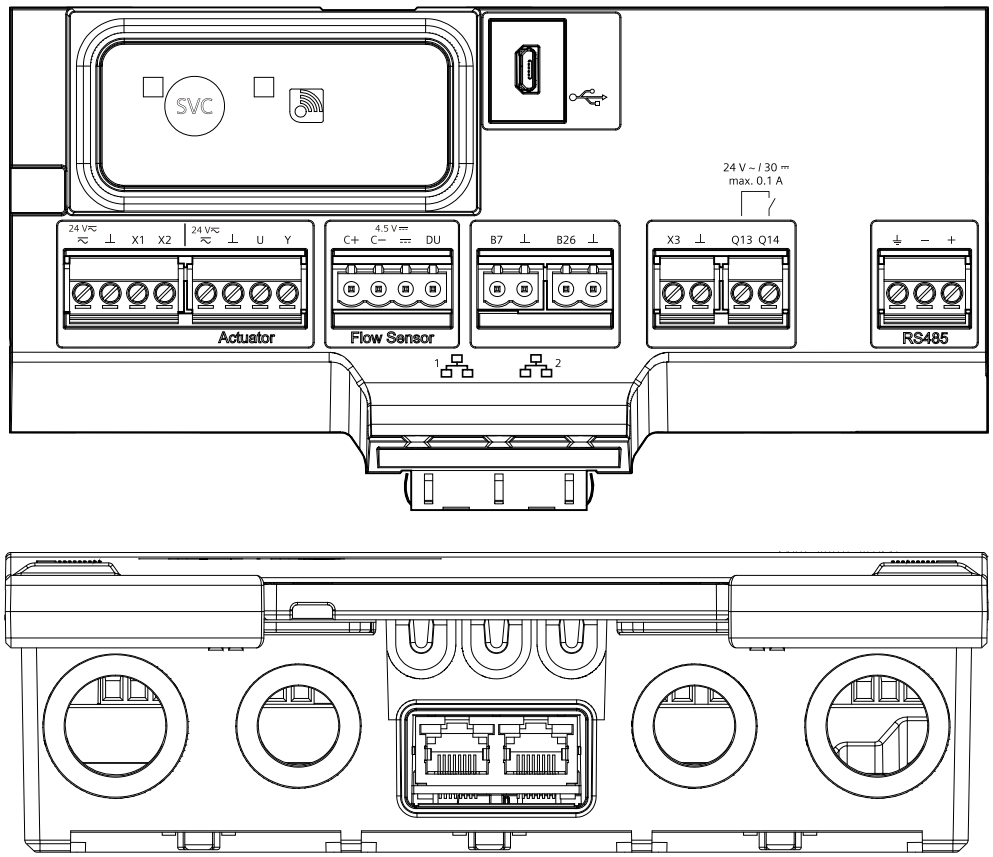
<table>
<tr><th colspan="4">WLAN interface</th></tr>
<tr><td rowspan="4"></td><td rowspan="4"></td><td colspan="3">
</td></tr>
<tr><td>[1]</td><td>ASN</td><td>ASE4U10U</td></tr>
<tr><td>[2]</td><td>Date/series letter/series no.</td><td>20181204A0000001000</td></tr>
<tr><td></td><td>SSID</td><td>ASE4U10U_0000001000</td></tr>
<tr><td>Password</td><td colspan="3">12345678
Password is preset and cannot be changed</td></tr>
</table>

Conformity

Ambient conditions		
Operation		as per EN 60721-3-3
	Climatic conditions	Class 3K5
	Mounting location	Indoors (weather-protected)
	Temperature (general)	23 to 131°F (-5 to 55°C)
	Humidity (non-condensing)	5 to 95% r.h.
Transportation		as per EN 60721-3-2
	Climatic conditions	Class 2K3
	Temperature	-13 to 158°F (-25 to 70°C)
	Humidity	< 95% r.h.
Storage		Per IEC 60721-3-1
	Climatic conditions	Class 1K5
	Temperature	23 to 131°F (-5 to 55°C)
	Humidity	5 to 95 % r.h.
Max. media temperature when mounted on valve		248°F (120°C)

Directives, standards and approvals		
Product standards UL/cUL		
	SAX61.03/HR and SAV61.00/HR	UL 873 and (cUL) CSA C22.2 No. 24
	ASE4U10U	UL 916 and (cUL) CSA C22.2 No. 205
WiFi Product standards		
	US	47 CFR Part 15 – B: 2021
	Canada	ICES – 003: 2020

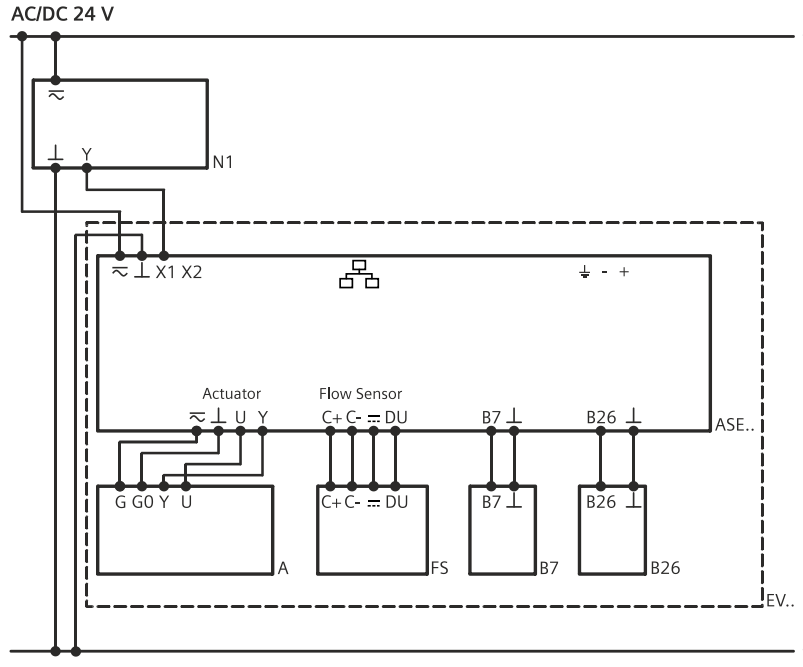
Connection terminals



Connecting thread	Description	Terminal
1, 2 Ethernet	2 × RJ45 interface for 2-port Ethernet switch	
	Power SELV/PELV AC/DC 24V	≂
	System zero	⊥
	Setpoint input Intelligent Valve: DC 0/2 to 10V; 4 to 20 mA (Passive or active temperature sensor in the control function “Outside temperature-dependent flow temperature controller”)	X1
	Actual value output Intelligent Valve: DC 0/2 to 10V; 4 to 20 mA	X2
USB	USB interface	
Actuator	Field supply AC 24 V for actuator	≂
	System zero	⊥
	Position feedback actuator DC 0 to 10V	U
	Positioning signal actuator DC 0 to 10V	Y
Flow sensor	L-bus potential	C+
	L-bus neutral (Galvanically insulated)	C-
	Power flow sensor (DC 4.5V)	⎓
	Pulse input	DU
Inputs analog	Passive temperature input	B7
	System zero	⊥
	Passive temperature input	B26
	System zero	⊥
	Universal input (DC 0 to 10V / passive temperature sensor input)	X3
	System zero	⊥
Outputs	Switching output AC 24V; DC 30V; 0,1A	Q13
		Q14
RS485	Not applicable	
Service	Service button	SVC
Display	Operation LED	
Com/WLAN	WLAN button	
Display	Communication LED	

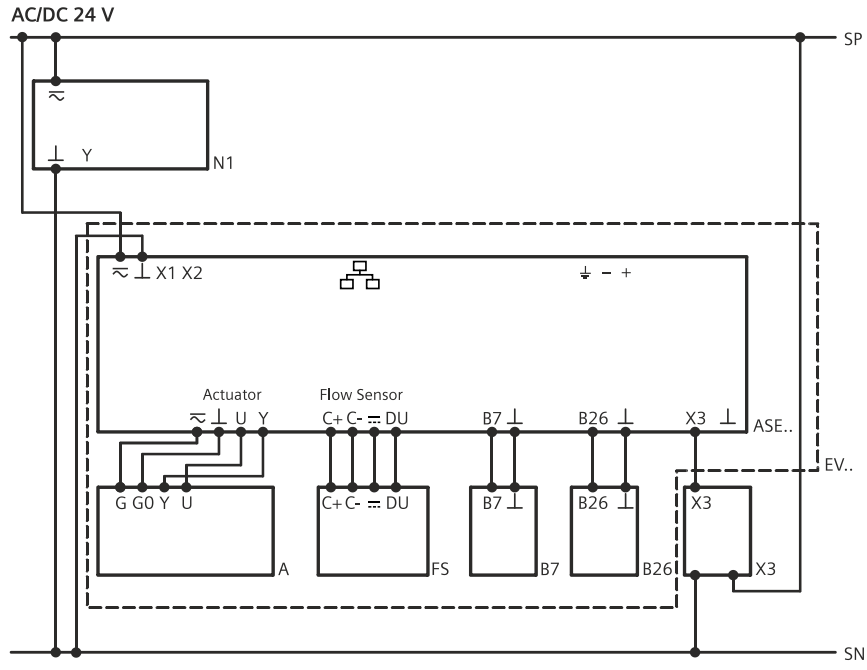
Connection diagram

For the control function “Dynamic control valve” – Analog setpoint source terminal



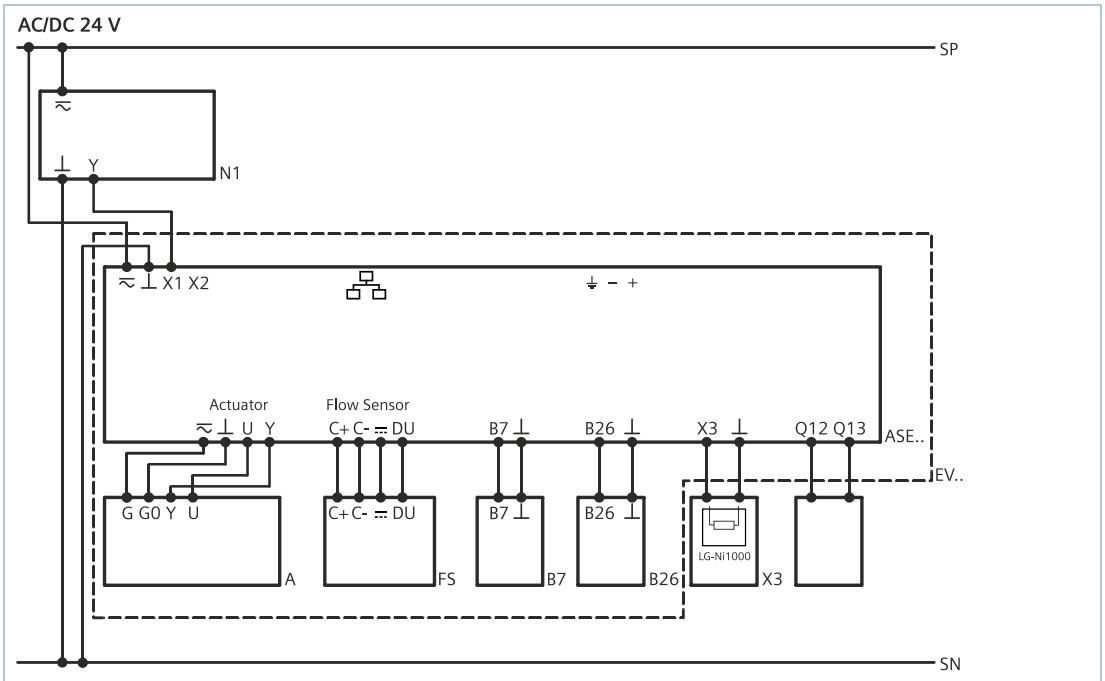
N1	Automation station	FS	Flow sensor
ASE..	Intelligent Valve controller	B7	Temperature sensor blue
A	Actuator (for example, SAX61.03/HR)	B26	Temperature sensor red

For the control function “Differential pressure controller” – Setpoint internal



N1	Automation station	B7	Temperature sensor blue
ASE..	Intelligent Valve controller	B26	Temperature sensor red
A	Actuator (for example, SAX61.03/HR)	X3	Differential pressure sensor (for example, QBE3000-D2.5)
FS	Flow sensor		

For the control function “Secondary Flow Temperature Controller” – Setpoint source terminal

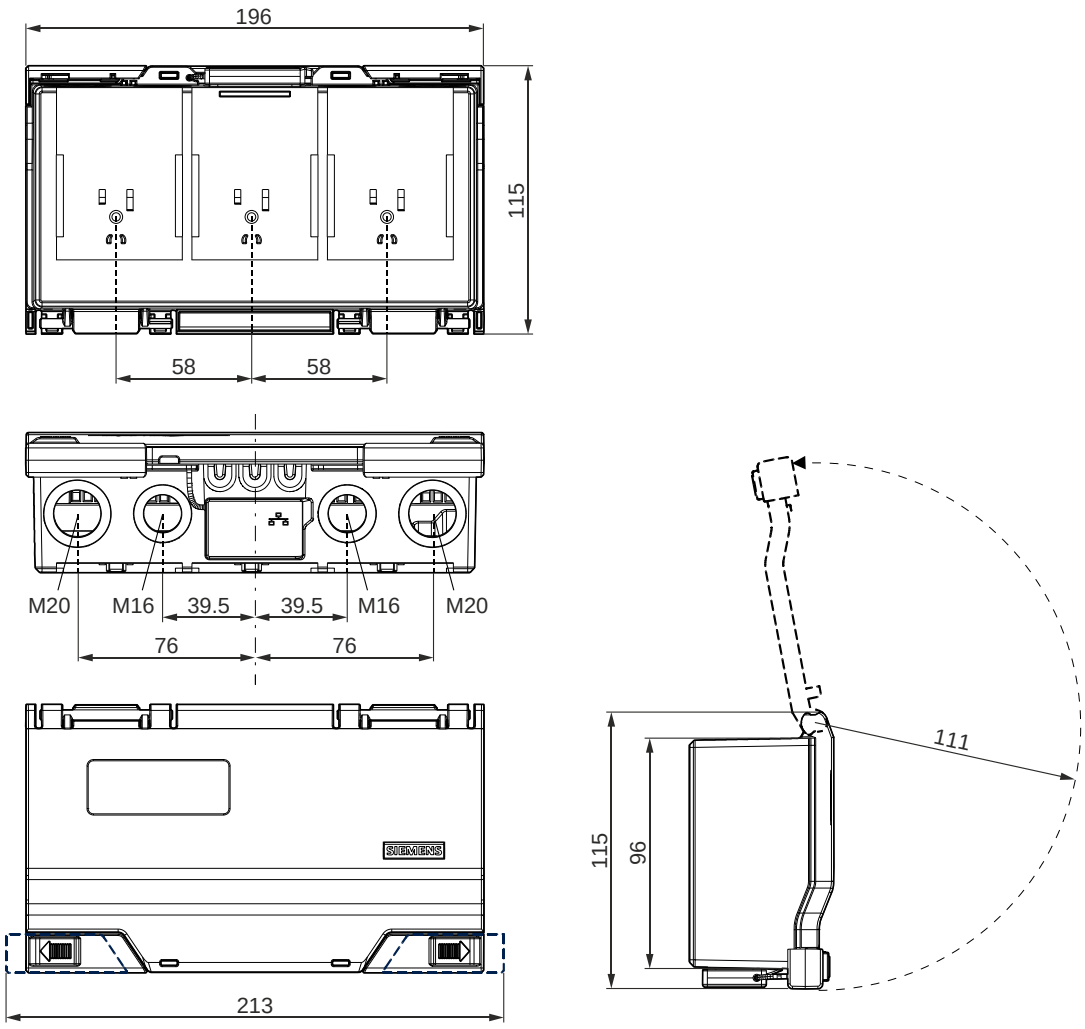


N1	Automation station	B7	Temperature sensor blue
ASE..	Intelligent Valve controller	B26	Temperature sensor red
A	Actuator (for example, SAX61.03/HR)	X3	Temperature sensor, passive – secondary flow temperature (for example, QAD26.220) [1)]
FS	Flow sensor	Q12/Q13	Binary output for pump release

1) Temperature sensors are not included; they must be ordered separately.

Dimensions

Intelligent Valve controller, ASE4U10U

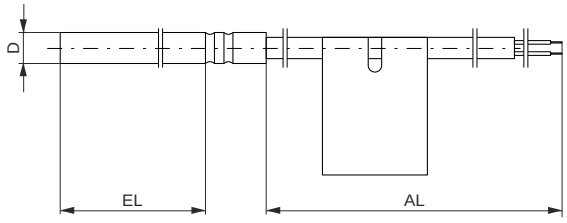


Dimensions in mm

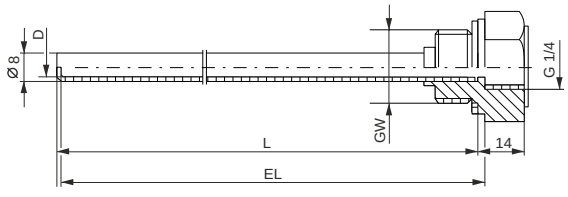
lb	kg
1.1	0.5

Temperature sensors EZU.., protective pockets EZT..

EZU10-10025



EZT-S100U

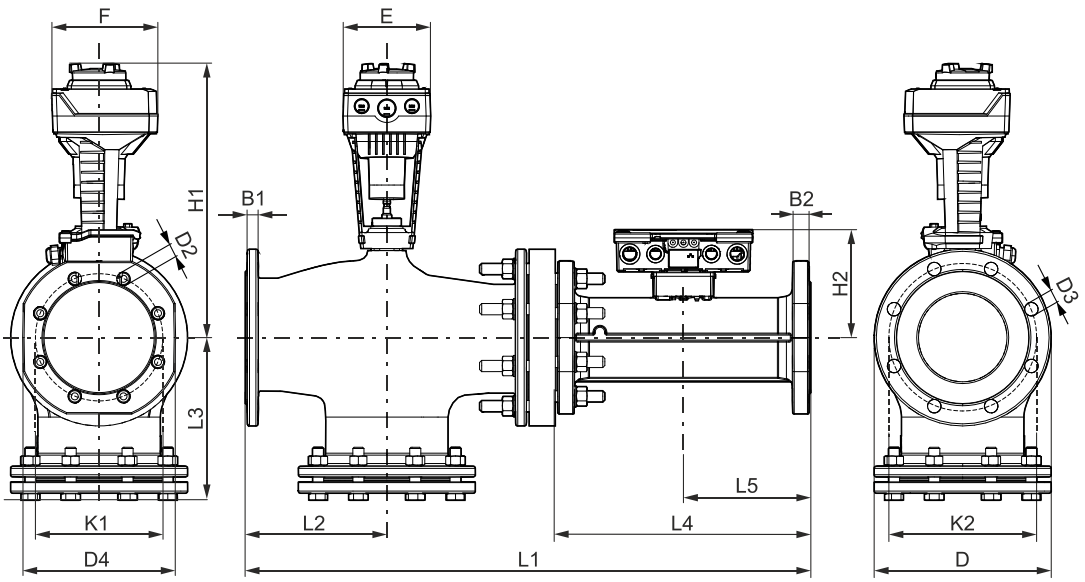


Dimensions in inches (mm)

Temperature sensors						Protective pockets					
Type	**D**	**EL**	**G**	**AL**		**Type**	**D**	**EL**	**L**	**GW**	**SW**
EZU10-10025	0.24 (6)	3.64 (92.5)	-	98.4 (2500)		EZT-S100U	0.25 (6.2)	3.94 (100)	3.64 (92.5)	G ½	1.06 (27)

Flanged, EVF

2.5 to 5-inch (DN 65 to125)



Dimensions in inches (mm)

Valve type	B1	B2	D	D3	E	F	H1	H2	K2	L1	L2	L3	L4	L5	lb (kg)
EVF4U20U0250	0.69 (17.5)	0.75 (19)	7.0 (178)	8 × 5/8-11	4.88 (124)	5.9 (150)	15.25 (387)	5.35 (136)	5.5 (140)	25.2 (640)	5.5 (140)	5.0 (125)	11.8 (300)	5.9 (150)	127.8 (58)
EVF4U21U0250							15.63 (397)					4.88 (123)			129.8 (58.9)
EVF4U20U0300	0.75 (19)		7.5 (190.5)				15.8 (402)	5.63 (143)	6.0 (152.5)	26.1 (663)	5.88 (149)	5.63 (142)			154.2 (70)
EVF4U21U0300							16.44 (417.5)					5.3 (135)			155.2 (70.4)
EVF4U20U0400	0.94 (24)	0.91 (23)	9.0 (229)	16 × 5/8-11			17.7 (450)	6.10 (154)	7.5 (190.5)	30.55 (776)	7.0 (178)	6.63 (168)	14.2 (360)	7.1 (180)	248.5 (112.7)
EVF4U21U0400							17.65 (448)					6.3 (160)			259.5 (113.2)
EVF4U20U0500	0.94 (24)		10.0 (254)	8 × 3/4-10			18.15 (461)		8.5 (216)	32.44 (824)	7.88 (200)	7.5 (185)			305.6 (138.6)
EVF4U21U0500							18.6 (472)					7.0 (178)			306.6 (139.1)

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