UVC 106: Dynamic flow control system with 6-way ball valve, eValveco

How energy efficiency is improved

The SAUTER eValveco flow control system is the energy-efficient solution for variable flow control

Features

- Patented pressure-independent, variable flow control (EP 2307938)
- Integrated flow measurement with feedback
- Easy integration into every building management system
- Variable flow rate setpoint for heating and cooling modes
- For climate ceilings with changeover (4-pipe)
- Integration into the building management system via BACnet MS/TP or Modbus/RTU with RS-485 interface

UVC106MF0*5

UVC106BF0*5

Technical data

Electronic power supply

	Power supply	24 VAC, ±20%, 50 Hz
	Rated power during continuous operation	3 W (4 VA)
	Power consumption when idle	1.5 W (2 VA)
	Peak inrush current	5 A [3 ms]
	Input signal	X_S: 0…10 VDC (0.17 mA), split-range 0.5…4.5 VDC heating 5.5…9.5 VDC cooling $R_i \geq 60$ kΩ
	Feedback signal[1]	X_i: 0…10 VDC (max. 2 mA)
	Feedback signal resolution	Approx. 100 mV

Parameters

	Setpoint adjustment	Analogue (Y_1) or via Modbus/RTU or BACnet MS/TP
	Type of sensor	TTM ultrasonic sensor, no moving parts
	Unit of measurement[2]	[m^3/h], l/s, l/min, gpm (UK), gpm (US)
	Measuring accuracy	±3% of actual value
	Minimum controllable flow[3]	3 l/h
	Readiness for operation	3…5 minutes after switching on
Valve and actuator	Nominal pressure	PN16
	Differential pressure Δp[4]	Max. 2 bar (200 kPa)
	Medium[5]	Water (glycol-free)
	Media temperature	5…90 °C
	Leakage rate in % of K_{vs}	0.001 %
	Control characteristic	Equal-percentage (factory setting) or linear
	Operating noise (unloaded)[6]	< 30 dB (A)

Interfaces, communication

	Interface	STP cable, 1 × 2-wire, twisted
BMS integration	Protocol	Modbus/RTU, slave (MF) or BACnet MS/TP (BF)
	Connection[7]	RS-485, 2-wire, twisted (with shared lead)
	Cable type	Shielded 2-core cable, STP or FTP

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ValveDim app

[1] *In relation to the measured actual flow.*

[2] *Unit in [ ]: Factory setting*
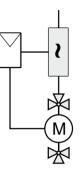
[3] *In relation to the measured actual flow*

[4] *No minimum differential pressure required*

[5] *In accordance with VDI 2035 sheet 2*

[6] *Measuring distance 1 m, actuator not under load*

[7] *Not electrically isolated*

Baud rate[8]	9600, 19200, 38400 baud
Terminating resistor	At both ends 120 Ω

Construction

Power cable	PVC cable, 7 × 0.5 mm^2 (length 1 m)
Housing material	Flow sensor: ABS Actuator: Flame retardant plastic 6-way ball valve: CW617N Flow meter: CW617N
Connection	DN 15 ISO228/1: 5 × G½" + 1 × G¾" (male thread) DN 25 ISO228/1: 6 × G1" (male thread)

Ambient conditions

Ambient temperature	10…45 °C
Storage temperature	-20…50 °C
Ambient humidity	Max. 85% rh, non-condensing

Standards and directives

	Type of protection[9]	IP54 (EN 60529), horizontal
CE conformity according to	EMC Directive 2014/30/EU	EN 61000-6-1 (2007) EN 61000-6-3 (2007) (A1: 2011 / AC: 2012)
	PED 2014/68/EU	Fluid group II, no CE label (Art. 4.3)

Overview of types

Type	Description	Protocol	Flow range	K$_{vs}$ value	Weight
UVC106MF015	Flow control valve with 6-way ball valve, DN 15	Modbus/RTU	0…1400 l/h	1.4 m^3	2.5 kg
UVC106BF015	Flow control valve with 6-way ball valve, DN 15	BAC-net MS/TP	0…1400 l/h	1.4 m^3	2.5 kg
UVC106MF025	Flow control valve with 6-way ball valve, DN 25	Modbus/RTU	0…2500 l/h	2.5 m^3	4 kg
UVC106BF025	Flow control valve with 6-way ball valve, DN 25	BACnet MS/TP	0…2500 l/h	2.5 m^3	4 kg

Accessories

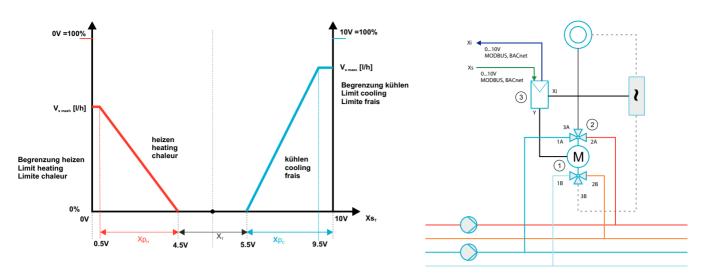| Type	Description
0560284015	Screw fitting in brass, flat-sealing, female thread/male thread for DN 15
0560284025	Screw fitting in brass, flat-sealing, female thread/male thread for DN 25
0560332015	Strainer in gun metal (bronze), −10…150 °C, mesh aperture 0.5 mm, DN 15
0560332025	Strainer in gun metal (bronze), −10…150 °C, mesh aperture 0.8 mm, DN 25

Description of operation

The eValveco (UVC 106) dynamic electronic flow control valve is used in variable flow HVAC systems. It is designed for climate ceilings or fan coil units with a switchover between heating and cooling mode (4-pipe systems).

The system is used for automatic hydronic balancing in the full and partial load ranges, and for real-time flow control. It thus replaces a static balancing valve and a control valve or ball valve.

The UVC 106 receives a setpoint from the external room temperature controller. This setpoint can be specified as an analogue value (0...10 V) or digitally via the communication protocol. In order to allow specification of a setpoint via a room operating unit, a split-range unit signal for regulating the heating sequence (0.5...4.5 V) and the cooling sequence (5.5...9.5 V) is required.

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[8] *Factory setting: 38400 baud, 8 data bits, even parity, 1 stop bit*

[9] *See fitting instructions P100017045*

The setpoint from the room temperature controller is converted into a flow setpoint in the UVC 106 (3). The integrated ultrasonic flow meter has no moving parts and continuously measures the actual flow rate. The internal control loop adjusts the flow rate independently of pressure fluctuations (e.g. in the partial load range) via the position of the regulating ball valve (2) via the ball valve actuator (1) until the measured flow rate corresponds to the required setpoint. This ensures maximum comfort with minimum energy consumption for the user.

The maximum flow setpoints for the heating and cooling modes are set separately using Modbus or BACnet parameters.

- $\dot{V}s_{maxC}$: maximum flow rate for the cooling
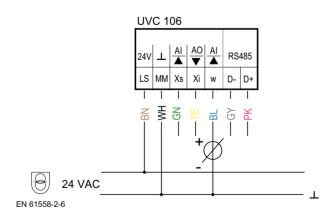- $\dot{V}s_{maxH}$: maximum flow rate for the heating

For rinsing the system, 0.5 V can be specified for the heating sequence and 9.5 V for the cooling sequence. This opens the ball valve completely.
An analogue or digital output signal can be used for function monitoring or feedback to the building management system.
The input w (= Y_2) can be use for digitalising any 0...10 V signal (e.g. dew point sensor). In the UVC 106, this signal is available from firmware version v4.06.16 or higher. The subsequent processing of the signal must take place on a higher level, e.g. in an automation station.
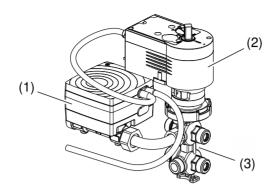
Volume flow limitation
The system provides parameters for minimum and maximum volume flow limits. The limitation ensures that the flow does not go over or under these values in any operating case. The system completely opens or closes the ball valve as long as the minimum or maximum value is not reached. This means the position of the ball valve always depends on the prevailing system pressure.

System structure

The dynamic flow control system consists of three main components:

(1)   Flow measuring unit
(2)   Rotary actuator for the 6-way ball valve
(3)   6-way ball valve

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the "Description of operation" section.

All related product regulations must also be adhered to. Changing or converting the product is not admissible.
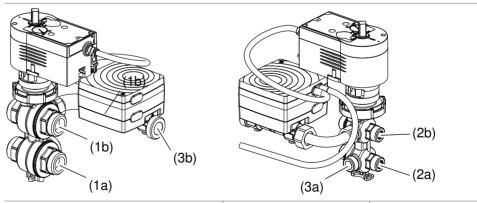
Improper use

The dynamic flow control system is designed for the dynamic flow control in control circuits with water (glycol-free). The device may not be installed outdoors or modified.

The eValveco flow control system does not meet the conformity requirements of the Measuring Instruments Directive 2014/32/EU.

The system is not suitable for use in drinking water systems according to the directives 98/83/EC and 2015/1787/EU.

Engineering and fitting notes

Supply and return of the UVC 106

	Supply	Return
Cooling ❄	1a	1b
Heating ♨	2a	2b
Terminating elements	3a	3b

Pressure relief function

These 6-way ball valves are equipped with an internal pressure relief function.

A change in the media temperature (closed valve position, 45°) in the heated/chilled ceiling can cause positive pressure or negative pressure. This could possibly damage the heated/chilled ceiling. The pressure relief function prevents this damage because the pressure in the heated/chilled ceiling is balanced with the pressure via the supply line of sequence 1 (heating sequence).

Note

The following must be considered when checking the pressure: When the consumer is connected the pressure check can be carried out at a 0° or 90° angle of rotation of the 6-way ball valve. In the 45° middle position it must be considered that the consumer is loaded with pressure via sequence 1 (heating sequence). This is caused by the pressure relief function integrated in the 6-way ball valve.

Without a connected consumer the test medium flows via sequence 1 (heating sequence) in the 45° position (6-way ball valve closed). This is caused by the pressure relief function integrated in the 6-way ball valve. It is possible to check the circuits separately. In the 90° position sequence 1 (heating sequence) can be checked and in the 0° position sequence 2 (cooling sequence). Before the sequence changeover, the circuit already checked must be made pressure-free. Or the connections to the consumer must be closed for the duration of the pressure check.

With the 6-way ball valve, the system can be modified to a 4-pipe system.

The UVC 106 receives a setpoint from the room operating unit via a control signal (split range 0...10 V). This setpoint is converted internally for the flow rate setpoint. The integrated flow meter continuously measures the actual flow rate. The internal control loop adjusts the position of the control valve until the measured flow rate corresponds to the required setpoint.

The eValveco electronic flow control valve regulates the flow rate independently of potential pressure fluctuations in the system in the direction of a specific setpoint. The flow rate is defined by an external analogue control signal (0...10 V) that is generally output by a room operating unit. This split-range signal is used to control the heating (0.5...4.5 V) and the cooling (5.5...9.5 V).

Valve design

SAUTER provides various tools for valve design and engineering:

• ValveDim smartphone app

• ValveDim PC program

• ValveDim slide rule

You can find the tools under the link www.sauter-controls.com/en/performance/valve-calculation/ or scan the QR code

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Error handling

Self-test

When it is switched on, the device performs a self-test and checks the program and data memory. If one of these checks fails, an error bit is set depending on the type of error. This can be read via the communication protocol.

NOTICE!

Because of the way the ultrasonic sensor measures volume flow, defects in the hydraulic system lead to measurement error and malfunctions because they impair the ultrasonic measurement. If the measuring system detects air bubbles in the hydraulic circuit, fault mode is activated and the actual volume flow value is set internally to 0. After removing the bubbles causing the problem, for example by activating flush mode or increasing the pump pressure, the measurement automatically returns to normal mode and fault mode is deactivated.

▶The required water quality (see VDI 2035) and absence of bubbles must always be maintained.

NOTICE!

If the system is operated outside the valid temperature range, it cannot achieve its guaranteed accuracy. This may result in irreparable damage to the product. If the water temperature is outside the valid temperature range, warning bit "b0" is set to 1. The warning bit is deleted as soon as the temperature is back in the specified range.

▶Always operate the system within the valid temperature range.

> **Note**
> If the required setpoint is between the closed ball valve position and the smallest possible opening, the controller alternately opens and closes the ball valve. In this case, the mean volume flow corresponds to the setpoint.

Error bit: MF type

In the event of a system error, the following information is provided:
- b0: Error in CRC check during boot process.
- b1: EEPROM area error while booting.
- b2: Invalid variable: This bit is set when a variable outside the valid range is entered. It is reset as soon as the variable is entered in the correct range.
- b3: Conflict on changeover switching: This bit is set if Y_{1h} and Y_{1c} are both higher than their respective minimum values Y_{1minh} and Y_{1minc}.
- b4 and b5: unused, reserved for future use
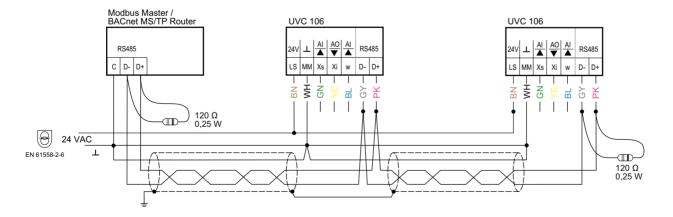
Error: BF type
Analogue input object 9

Value	Name	Explanation
1	CRC Error	Internal error, contact the manufacturer
2	EE	Internal error, contact the manufacturer
4	Parameter error	At least one invalid parameter has been written via BACnet. Once the parameters are correctly written, the error will be automatically reset.
8	Changeover	Error during changeover
16	Not used	Error code reserved for future use
32	Not used	Error code reserved for future use
64	Not used	Error code reserved for future use
128	ADC calibration	ADC calibration not performed
266	Range error	The ranges of $Y_{1h\,/\,1c}$ are incorrectly defined in split range systems
512	No flow sensor	The connection to the flow sensor is interrupted

System integration

The system is equipped with an RS-485 interface. Depending on the product version, the Modbus or BACnet MS/TP protocol is available on the interface. The Modbus parameters and BACnet MS/TP objects are listed in the manual P100017780.

RS-485 bus connection

The max. admissible bus length depends on the cable type used and the correct termination with terminating resistors. In general, a 2-wire shielded cable with twisted wire pairs must be used. Use of one of the following cable types is recommended:
- Lapp cable UNITRONIC® BUS LD 2170204
- Lapp cable UNITRONIC® BUS LD FD P 2170214
- Belden 9842
- Belden 3106A

- Belden 3107A

Observe the correct polarity of all signals. The cable shield of the entire bus line must be connected continuously, and connected to protective earth as directly as possible at one location. The cable length is max. 8 cm in order to achieve optimum resistance to interference. The shielding is to be earthed in the plant as follows:

- Shielding earthed at one end is suitable for protection from electrical interference, e.g. from overhead power lines, static charges etc.
- Shielding earthed at both ends is suitable for protection from electromagnetic interference, e.g. from frequency converters, electric motors, coils etc.

NOTICE!

Faulty wiring can result in damage to the device.

►Connect all devices in a network to the same power supply.

For Ethernet CAT-5 cables and J-Y(ST)Y cables, a bus length of up to 500 m is possible. The length of the bus line is limited by the following parameters:
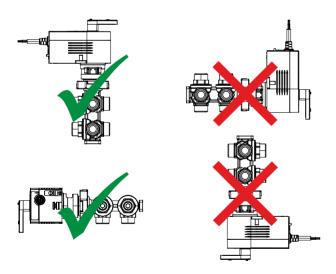
- Number of connected devices
- Cross-section of cable used

In the case of RS-485 interfaces, the bus wiring must follow line topology. Star, tree or branch topologies are not recommended. The devices do not have internal terminating resistors. Therefore, a terminating resistor of 120 Ω (0.25 W) must be connected at the start and end of the bus line, parallel to the D+/D− data lines.
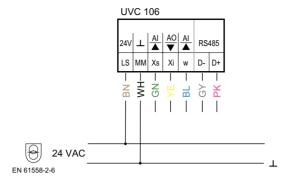
Fitting position

NOTICE!

Condensate or dripping water entering the actuator can damage it.
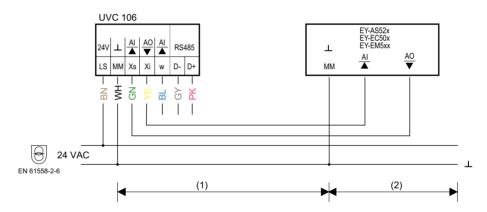
►Do not fit the 6-way ball valve in a suspended position.

Connection diagram

UVC 106

24V	⊥	AI ▲	AO ▼	AI ▲	RS485	
LS	MM	Xs	Xi	w	D-	D+

BN WH GN YE BL GY PK

24 VAC

EN 61558-2-6

⊥

Type	Function	Colour
LS	24 VAC	Brown (BN)
MM	Power supply ground	White (WH)
Xs (setpoint)	0...10 V	Green (GN)
Xi (actual value)	0...10 V	Yellow (YE)
w = Y_2 (AI on Modbus register / BACnet AI object)	0...10 V	Blue (BL)
Modbus / BACnet MS/TP RS-485	D−	Grey (GY)
Modbus / BACnet MS/TP RS-485	D+	Pink (PK)

Connection diagram: Application with analogue actual value and setpoint

UVC 106

24V	⊥	AI ▲	AO ▼	AI ▲	RS485	
LS	MM	Xs	Xi	w	D-	D+

BN WH GN YE BL GY PK

EY-AS52x
EY-EC50x
EY-EM5xx

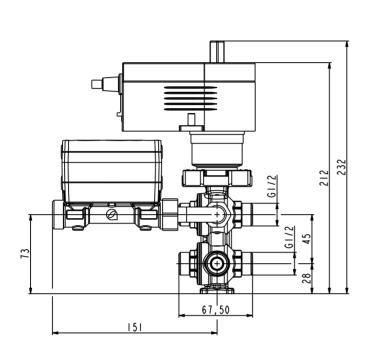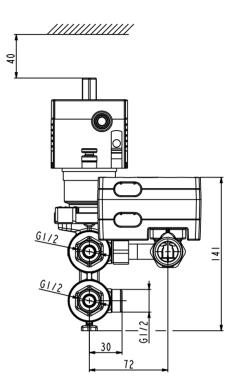| ⊥	AI ▲	AO ▼
MM		

24 VAC

EN 61558-2-6

⊥

(1)   (2)

(1)   Components with distance to power source

(2)   Power source close to the controller

Dimension drawings

All dimensions in mm.

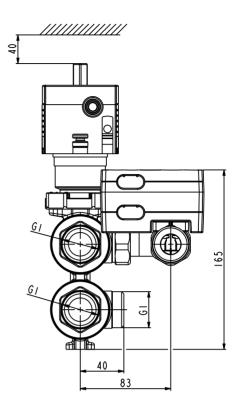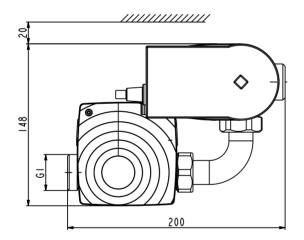### UVC106*F015

UVC106*F025

Accessories

05602840**	DN	b1 (mm)	b2 (mm)	G1 (inch) ISO 228-1	G2 (inch) ISO 7-1	L (mm)	H1 (mm)	H2 (mm)
	15	10	10	G ½	Rp ½	46	26	30
	25	14	14	G 1	Rp 1	60	40	46

05603320**	DN	b (mm)	c (mm)	G (inch) ISO 228-1	L (mm)	H (mm)
	15	12	38	G ½	54	27
	25	16	53	G 1	79	41