UVC 102, 103: Dynamic flow control system with 2- or 3-way valve and energy monitoring, eValveco

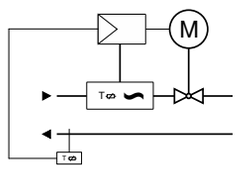
How energy efficiency is improved

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

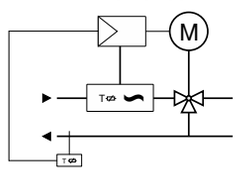
Features

- Pressure-independent variable flow control
- Dynamic hydronic balancing at full and partial load
- Energy monitoring
- Integrated flow measurement with feedback and temperature measurement
- Remote commissioning and troubleshooting
- With integrated LCD and operating panel
- Available as 2-way or 3-way ball valve version, DN15...DN50
- For variable-flow HVAC systems

UVC102



UVC103



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ValveDim app

Technical data

Electronic power supply		
	Power supply	U_V: 24 VAC (±20%) 50 Hz
	Rated power during continuous operation	2.5 W (3 VA)
	Power consumption when idle	1.0 W (1.5 VA)
	Peak inrush current	6.4 A [3 ms]
	Input signal	Y_1: 0…10 VDC Ri ≥ 60 kΩ
	Feedback signal[1)]	X_1: 0…10 VDC (max. 2 mA)
	Feedback signal resolution	Approx. 100 mV
Volume flow control		
	Setpoint adjustment	Analogue (Y_1) or via Modbus or operating panel
	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)]	±3% of actual value
	Minimum controllable flow	17…70 l/h
	Readiness for operation	5-10 minutes after switching on
Valve and actuator		
	Nominal pressure	PN16 (16 bar)
	Differential pressure Δp	Max. 2.4 bar
	Medium[4)]	Water (glycol-free)
	Media temperature	5 °C…90 °C
	Leakage rate in % of K_{VS}	0.001 %
	Operating noise (unloaded)[5)]	< 30 dB (A)
Temperature sensor		
	Measuring element	Pt500 as per EN 60751, Class B
Interfaces, communication		
	Bus connector	STP cable, 2 × double twisted

1) *In relation to the measured actual flow*
2) *Unit in [ ]: Factory setting*
3) *In relation to the measured actual flow*
4) *In accordance with VDI 2035 sheet 2*
5) *Measuring distance 1 m, actuator not under load*

BMS integration	Protocol	Modbus/RTU, slave
	Connection	RS-485 double twisted cable (with shared lead)
	Cable type	Shielded 2-core cable, STP or FTP
	Baud rate	9600, 19 200 or 38 400
	Terminating resistor	120 Ω both sides
Flow meter design		
	Housing material	Polypropylene, steel Water-bearing parts: Pressed brass DN 15 CW617N, DN 20 - 50 CW602N (DZR), bronze, EPDM seal, stainless steel, EN-JM1130 fitting as per EN1562
	LCD	Backlit liquid crystal display, 2 × 16 characters
Ambient conditions		
	Ambient temperature	10…45 °C
	Storage temperature	-20…50 °C
	Ambient humidity	Max. 90% rh, non-condensing
Standards, directives		
	Type of protection[6)]	IP54 (EN 60529), horizontal
CE conformity according to	EMC Directive 2014/30/EU	EN 61000-6-3 (2007) EN 61000-3-2 (2006) EN 61000-3-3 (1995) + am1 (2001) EN 61000-6-1 (2005)
	PED 2014/68/EU	Fluid group II, no CE label

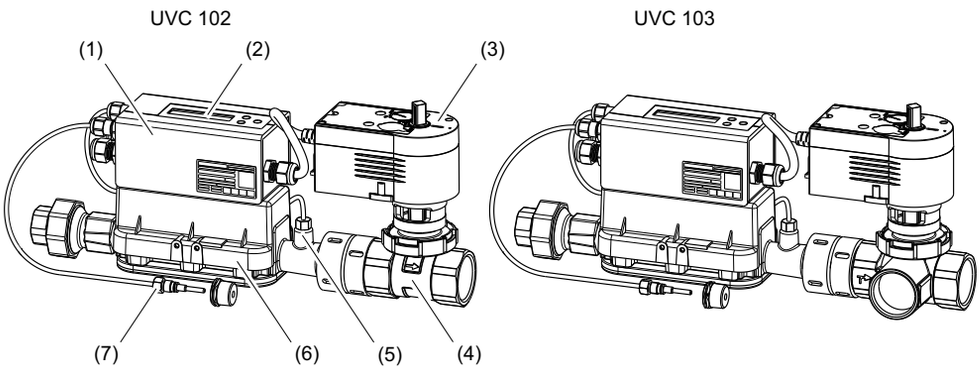
Overview of types

Type	Description	Weight
UVC102MF015	2-way ultrasonic energy regulating valve DN 15	3.5 kg
UVC102MF020	2-way ultrasonic energy regulating valve DN 20	5.1 kg
UVC102MF025	2-way ultrasonic energy regulating valve DN 25	5.2 kg
UVC102MF032	2-way ultrasonic energy regulating valve DN 32	5.5 kg
UVC102MF040	2-way ultrasonic energy regulating valve DN 40	6.8 kg
UVC102MF050	2-way ultrasonic energy regulating valve DN 50	7.5 kg
UVC103MF015	3-way ultrasonic energy regulating valve DN 15	3.6 kg
UVC103MF020	3-way ultrasonic energy regulating valve DN 20	5.1 kg
UVC103MF025	3-way ultrasonic energy regulating valve DN 25	5.4 kg
UVC103MF032	3-way ultrasonic energy regulating valve DN 32	5.7 kg
UVC103MF040	3-way ultrasonic energy regulating valve DN 40	7.1 kg
UVC103MF050	3-way ultrasonic energy regulating valve DN 50	8 kg

Description of operation

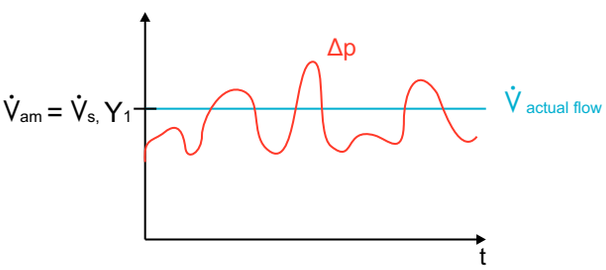
The UVC 102 / UVC 103 combines three functions in one system: a pressure-independent flow regulating valve, a shut-off valve and energy monitoring. It is used in variable-flow HVAC heating and cooling systems. With this combined function, the UVC 102/103 system replaces both a balancing valve and a regulating valve.

6) *See fitting instructions P100017043*



(1) Flow controller with Modbus interface
(2) LCD
(3) Rotary actuator for ball valve
(4) Ball valve
(5) Supply temperature sensor
(6) Ultrasonic flow sensor
(7) Return temperature sensor

The UVC 102/103 series is designed for automatic hydronic balancing and simultaneous real-time flow control. This means no additional balancing valves are required and the hydronic system is controlled independently of pressure fluctuations during full-load and partial-load operation without any additional devices.



Note
Correct flow control is only possible if there is sufficient system pressure.
To prevent cavitation, the static system pressure must be at least 1 bar. At static pressures below 1 bar, air bubbles can form in the system and accumulate in the measuring chamber. If this happens, the measurement is stopped and the actual value output is set to 0 m^3/h.

The UVC 102 / UVC 103 receives a setpoint, e.g. from an external controller or optionally via Modbus. The setpoint is internally converted into a flow rate setpoint. The target flow is achieved by adjusting the valve opening based on the comparison of the actual and target value. The actual flow is continuously monitored by the built-in ultrasonic flow sensor.
The UVC 102/103 series is available as a 2-way or 3-way ball valve with various flow ranges.

Flow rates

Type	Ball valve			Flow controller	
	DN	Δp[7]	K_{vs}[8]	Min.[9]	Max.[10]
UVC102MF015	15 mm	240 kPa	4.0 m^3/h	0.017 m^3/h	3.3 m^3/h
UVC102MF020	20 mm	240 kPa	6.3 m^3/h	0.024 m^3/h	5.7 m^3/h
UVC102MF025	25 mm	240 kPa	10.0 m^3/h	0.024 m^3/h	7.0 m^3/h
UVC102MF032	32 mm	240 kPa	16.0 m^3/h	0.042 m^3/h	10.5 m^3/h

[7] *Maximum closing pressure*
[8] *Actual flow rate of the valve at nominal stroke*
[9] *The minimum controllable flow is the minimum flow rate (other than zero) that can still be set and regulated.*
[10] *The maximum flow is reached at a differential pressure of 1 bar (100 kPa). The target flow can be set to a value that is equal to or less than the maximum flow*

Type	Ball valve			Flow controller	
	DN	Δp[7]	K_{vs}[8]	Min.[9]	Max.[10]
UVC102MF040	40 mm	240 kPa	25.0 m^3/h	0.07 m^3/h	15.0 m^3/h
UVC102MF050	50 mm	240 kPa	40.0 m^3/h	0.07 m^3/h	20.0 m^3/h
UVC103MF015	15 mm	240 kPa	4.0 m^3/h	0.017 m^3/h	3.3 m^3/h
UVC103MF020	20 mm	240 kPa	6.3 m^3/h	0.024 m^3/h	5.7 m^3/h
UVC103MF025	25 mm	240 kPa	10.0 m^3/h	0.024 m^3/h	7.0 m^3/h
UVC103MF032	32 mm	240 kPa	16.0 m^3/h	0.042 m^3/h	10.5 m^3/h
UVC103MF040	40 mm	240 kPa	25.0 m^3/h	0.07 m^3/h	15.0 m^3/h
UVC103MF050	50 mm	240 kPa	40.0 m^3/h	0.07 m^3/h	20.0 m^3/h

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 eValveco flow control system does not meet the conformity requirements of the Measuring Instruments Directive 2014/32/EU. The eValveco system cannot be used instead of a calibrated heat meter for the purposes of energy billing.
The system is not suitable for use in drinking water systems according to the directives 98/83/EC and 2015/1787/EU.

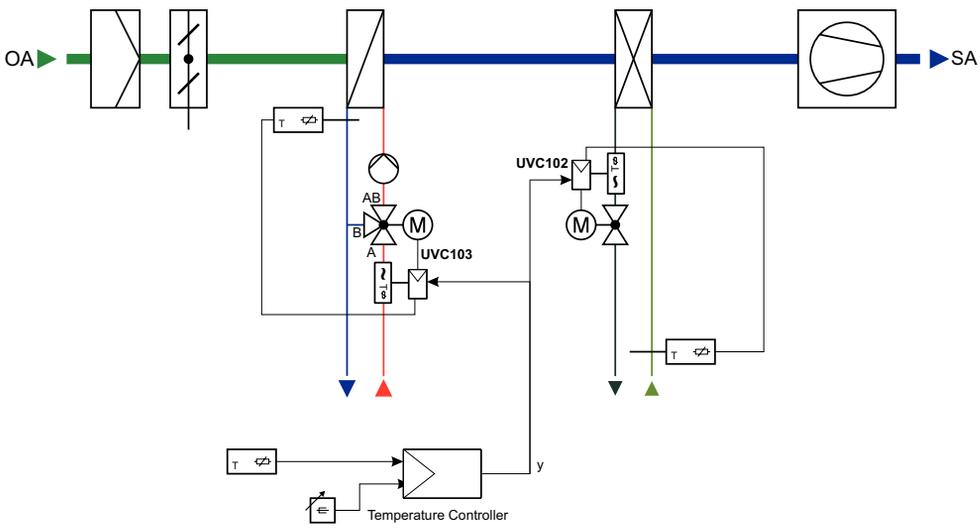
Valve design
SAUTER provides various tools for valve design and engineering:
- ValveDim smartphone app
- ValveDim PC program
- ValveDim slide rule

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

Application example

Power regulation of supply air heat exchangers
The power to be delivered to the heat exchanger is specified by the external control system using the flow rate setpoint $\dot{V}$ (sh = heating / sc = cooling) for the required volume flow in relation to the temperature difference between the supply and return temperatures. The SAUTER eValveco system determines the current power across the heat exchangers and returns the value as an output signal (analogue or Modbus) to the higher-level control system. This adjusts the volume flow $\dot{V}$ until the setpoint for the heating or cooling power has been reached.

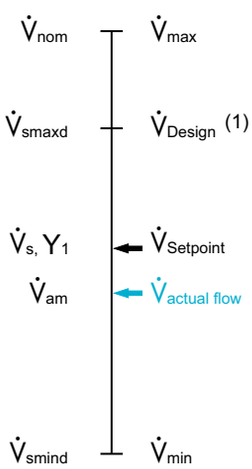
7) *Maximum closing pressure*
8) *Actual flow rate of the valve at nominal stroke*
9) *The minimum controllable flow is the minimum flow rate (other than zero) that can still be set and regulated.*
10) *The maximum flow is reached at a differential pressure of 1 bar (100 kPa). The target flow can be set to a value that is equal to or less than the maximum flow*



Operation

The UVC 102 / UVC 103 adjusts the flow to the required rate, independently of the system pressure.
With analogue activation, the required flow setpoint is specified by a 0…10 V signal from an external controller. Alternatively, the setpoint can be specified using the operator panel or a Modbus command.
The LCD and simple menu structure allow quick start-up and display of the flow rate and other important system parameters such as:

- $\dot{V}_{smaxd}$: Maximum controlled flow setting
- $\dot{V}_{smind}$: Minimum controlled flow setting
- $\dot{V}_{am}$: Current flow rate of the medium
- S_{am}: Current flow velocity of the medium



(1) Design volume flow

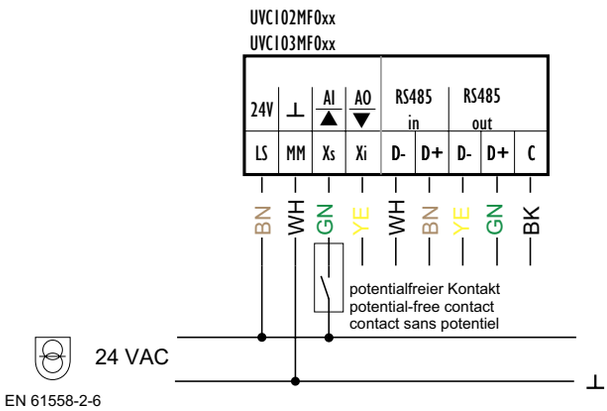
Volume flow limitation

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.

ON/OFF control with volume flow limitation

In addition to the variable flow control, the device can be activated via a potential-free contact (switch or relay). This allows the system to either be completely closed or operated at the parameterised maximum volume flow. In this case, the parameters must be set as follows:

- Y 1minh and Y 1minc to 1 V
- Y 1maxh and Y 1maxc to 1.5 V



EN 61558-2-6

Flush mode

When commissioned for the first time, the UVC 102 / UVC 103 is in flush mode, with the ball valve fully opened. It exits flush mode as soon as the setpoint is above 8 V or when this mode is deactivated using a Modbus command or the control panel.

If a fault occurs in the power supply before flush mode is deactivated, flush mode remains active also after the power returns.

If there is a power failure after flush mode has been completed, flush mode is deactivated after the power returns.

Temperature measurement

The UVC 102 and UVC 103 contain one Pt500 temperature sensor in the supply line and one in the return line. The measured temperatures can be read via Modbus or the LCD.

The temperature sensor T1 is integrated in the flow meter in the UVC 102 and UVC 103. The temperature sensor T2 must be mounted on site.

The temperature sensor is supplied with a free cable length of 2.0 m.

Note

In order to properly calculate the energy consumption, the temperature sensors must be correctly assigned to the supply and return lines using the variable T_{return}.

Energy monitoring

The UVC 102 / UVC 103 calculates the current thermal energy consumption and accumulates the total energy consumption during operation. The current thermal energy consumption is stored in the variable *PWR* (in watts).

To measure the total energy consumption, the current consumptions are integrated over time. The energy consumption[11)] is saved in a read-only variable every two hours:

- EnerHeat (SysType = heating)
- EnerCool (SysType = cooling)

It is not possible to reset the accumulated value.

The values are stored in a non-volatile memory. If there is a power failure in the installation, the values for the last two hours at most can be lost. The data memory is designed for a storage period of at least 5 years. When the memory is full, the value is reset to zero. With typical usage, the value is

11) *Possible units: watt hour (Wh) or British thermal units (BTU)*

read out yearly. A difference calculation is used to determine the energy consumption for the last time period.

Note
The system always saves the energy consumption in the “EnerHeat” or “EnerCool” variable based on the “ClimStatus” value.

Energy calculation

The thermal energy consumption is provided by the read-only variable *PWR*. *PWR* is proportional to the flow $\dot{v}_{am}$ and the difference between inflow and outflow temperatures $|T_{am2} - T_{am1}|$. The thermal output is calculated internally using the following formula:

$$PWR = \frac{\dot{V}_{am}}{3600} * c * \Delta T = \frac{\dot{V}_{am}}{3600} * c * |T_{am2} - T_{am1}|$$

$$PWR\ [W], \dot{V}_{am}\left[\frac{m^3}{h}\right], \Delta T\ [K]$$

$$\rho = 977.8\ \frac{kg}{m^3}\ (\rho\ Wasser\ @\ 70\ °C)$$

$$c = 4191\ \frac{J}{kgK}\ (c\ Wasser\ @\ 70\ °C)$$

Note
In the PWR variable, the value 0xFFF may be displayed under the following conditions:
- Energy consumption outside the measured value
- T_{am1} > 95 °C or T_{am2} > 95 °C (range exceeded)
- T_{am2} is not connected and T_{ext} = 0

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 Modbus.

Warning
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. For this reason, if the water temperature is outside the permissible range, the warning bit “b0” is set to 1 and “Err” appears on the display. It is deleted as soon as the temperature is back in the specified range.

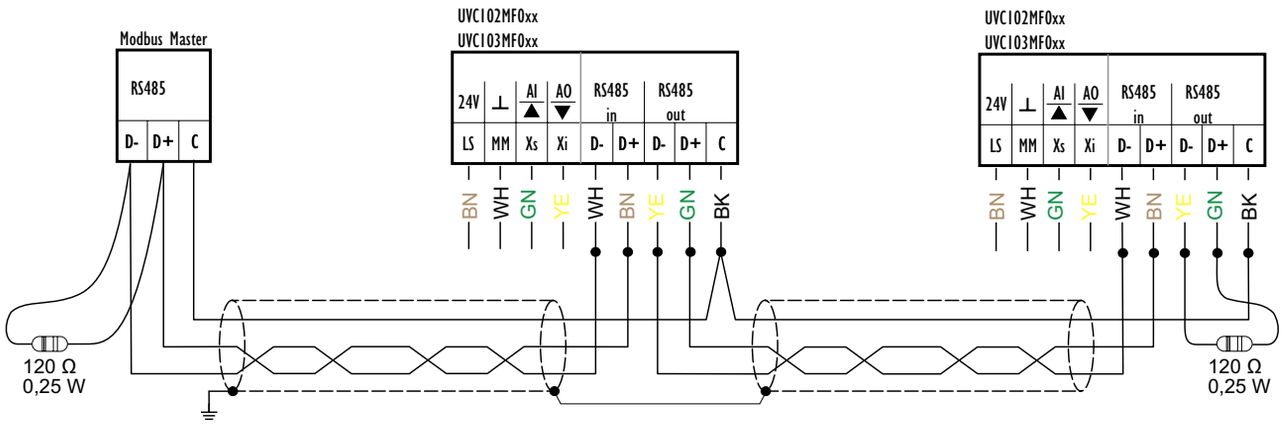
Note
If the required setpoint is between the closed ball valve position and the smallest possible opening, the controller alternately opens and closes the ball valve. In this case, the mean volume flow corresponds to the setpoint.

Errors
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

Modbus

The system is equipped with an RS-485 Modbus interface. All the Modbus parameters 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 4-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 shielding is to be earthed in the plant as follows:

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

Note
Faulty wiring can result in damage to the device.
All the devices in a network must be connected 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:

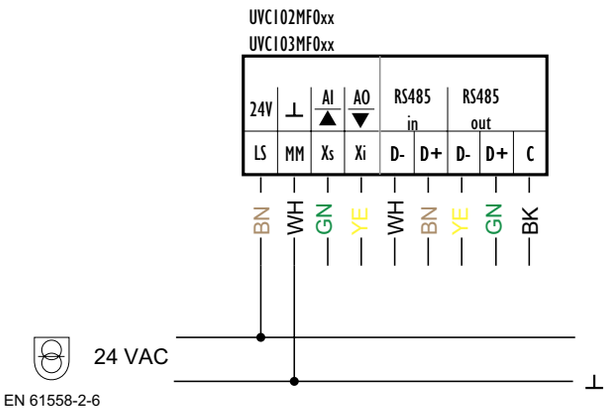
- Number of connected devices
- Cross-section of cable used

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.

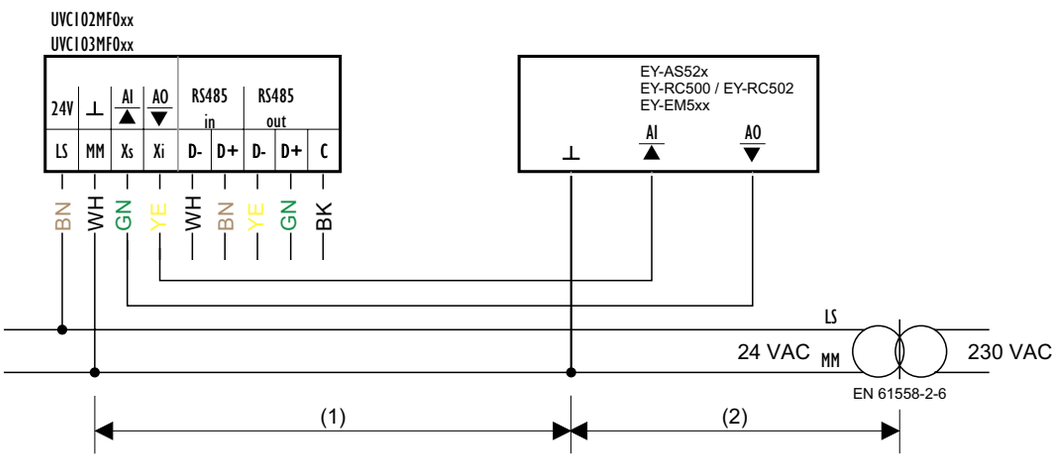
Connection diagram

Cable	Type	Function	Colour
1	LS	24 VAC	Brown (BN)
1	MM	Power supply ground	White (WH)
1	Xs (setpoint)	AI 0…10 V	Green (GN)

Cable	Type	Function	Colour
1	Xi (actual value)	AO 0…10 V	Yellow (YE)
2	Modbus RS-485 IN	D-	White (WH)
2	Modbus RS-485 IN	D+	Brown (BN)
2	Modbus RS-485 OUT	D-	Yellow (YE)
2	Modbus RS-485 OUT	D+	Green (GN)
2	Modbus	Power supply ground	Shielding



Connection diagram: Application with analogue actual value and setpoint



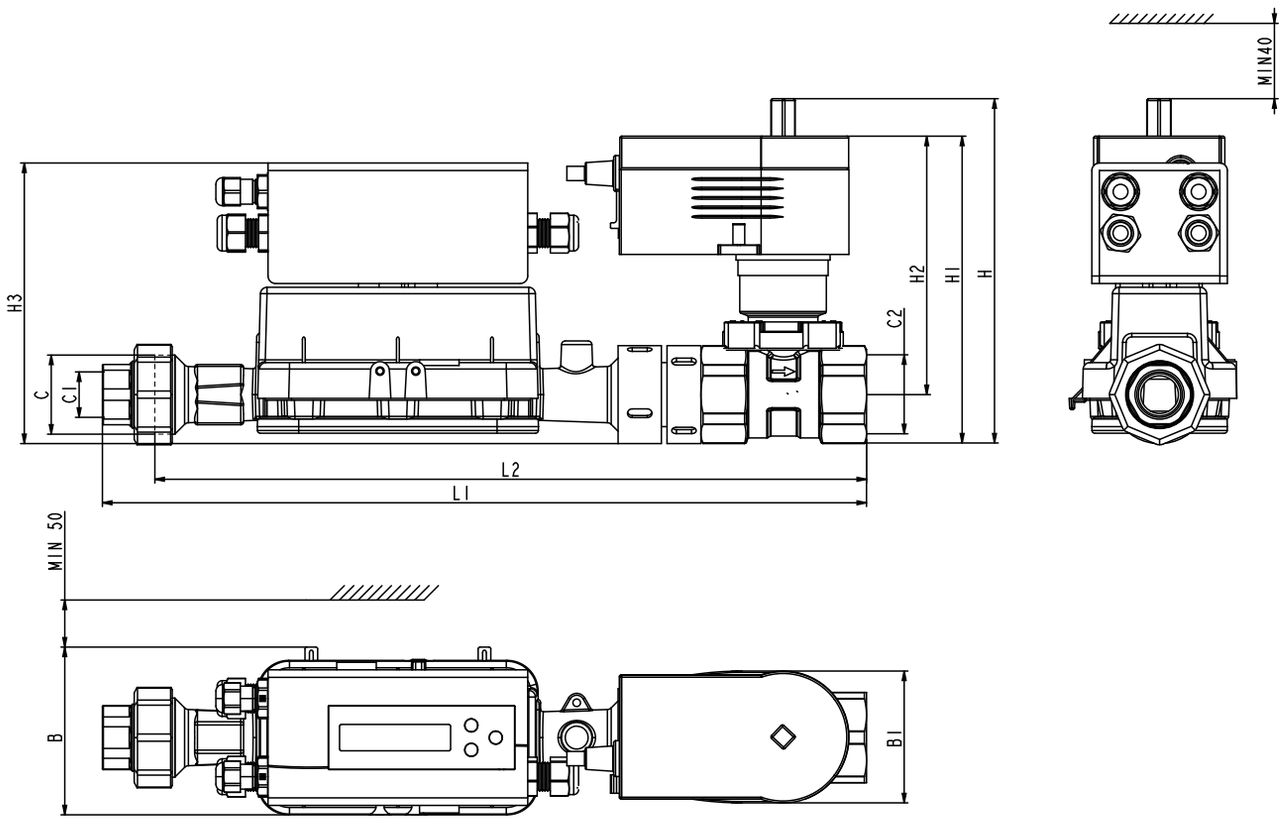
(1) Components with distance to power source

(2) Power source close to the controller

Dimensional drawings and table of dimensions

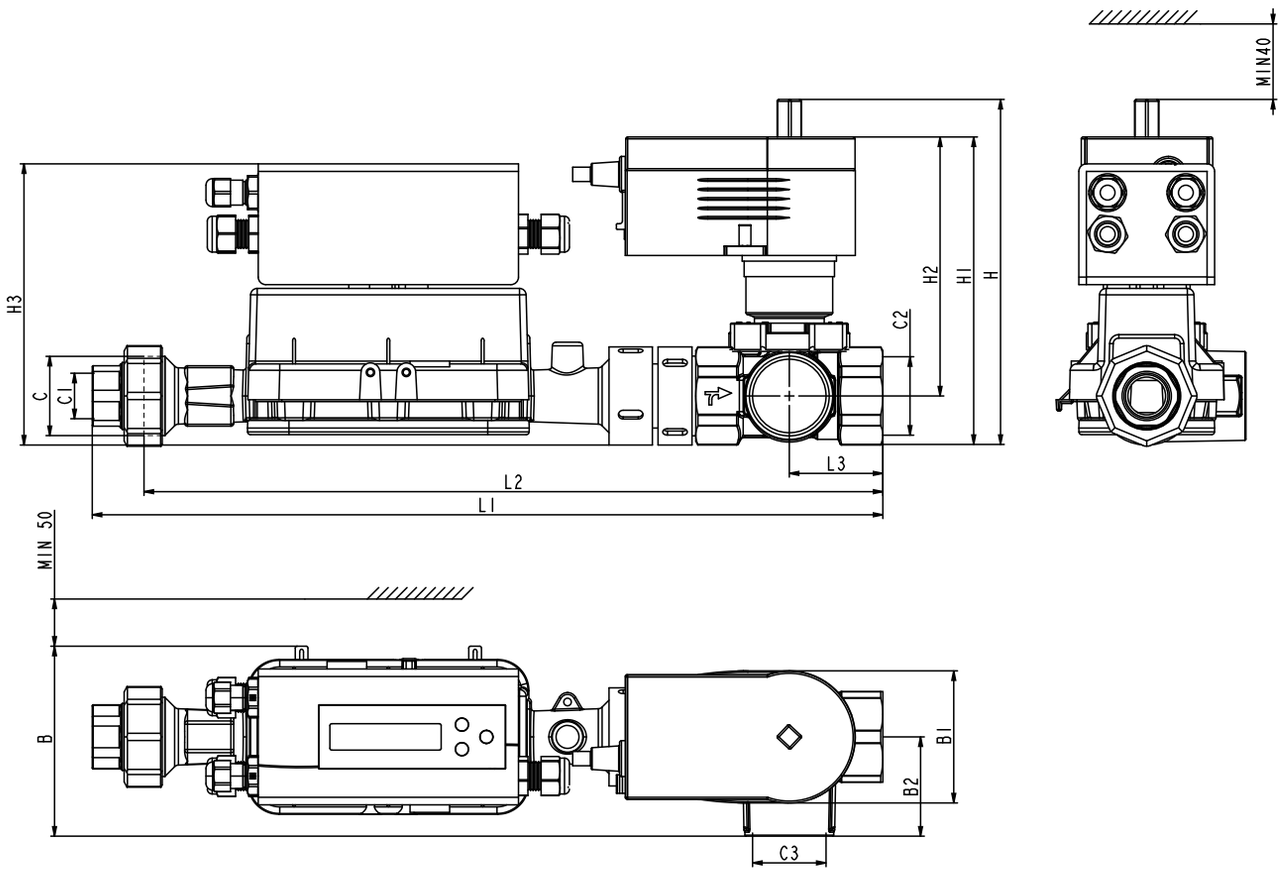
All dimensions in mm.

UVC 102



Type	DN [mm]	ISO 228-1	ISO 7/1		L1 [mm]	L2 [mm]	H [mm]	H1 [mm]	H2 [mm]	H3 [mm]	B [mm]	B1 [mm]
		C	C1	C2								
UVC102MF015	15	G 1"	Rp ½"	Rp ½"	328	304	173	153	131	107	86	70
UVC102MF020	20	G 1¼"	Rp ¾"	Rp ¾"	397	369	178	158	131	151	89	70
UVC102MF025	25			Rp 1"	404	376	181	161	134	151	90	70
UVC102MF032	32			Rp 1¼"	406	379	183	163	137	149	90	70
UVC102MF040	40	G 2"	Rp 1¼"	Rp 1½"	457	424	203	183	143	163	90	70
UVC102MF050	50			Rp 2"	475	442	216	196	156	163	90	70

UVC 103



Type	DN	ISO 228-1	ISO 7/1			L1	L2	L3	H	H1	H2	H3	B	B1	B2
	[mm]	C	C1	C2	C3	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
UVC103MF015	15	G 1"	Rp ½"	Rp ½"	Rp ½"	333	309	34	173	153	131	107	86	70	34
UVC103MF020	20	G 1¼"	Rp ¾"	Rp ¾"	Rp ¾"	399	372	37	178	158	131	151	89	70	37
UVC103MF025	25			Rp 1"	Rp 1"	412	385	45	181	161	134	151	93	70	45
UVC103MF032	32			Rp 1¼"	Rp 1¼"	419	393	53	183	163	137	149	101	70	53
UVC103MF040	40	G 2"	Rp 1¼"	Rp 1½"	Rp 1½"	465	432	57	202.7	183	143	163	105	70	57
UVC103MF050	50			Rp 2"	Rp 2"	490	457	69	216	196	156	163	117	70	69

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