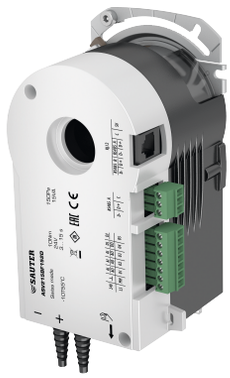
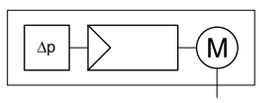
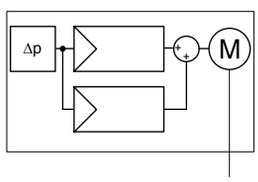
ASV215BF152*: VAV compact controller for laboratory and pharmaceutical applications



ASV215BF152D





How energy efficiency is improved

Allows demand-based volume flow control in order to optimise energy consumption in ventilation systems. Differential pressures of at least 1 Pa can be controlled to allow minimal volume flows at the lowest duct pressure and energy consumption

Features

- Controlling the return air in fume cupboards and controlling the supply and return air in laboratories, clean rooms, hospital wards and operating theatres using a VAV box or a damper and flow probe
- Static measurement of differential pressure based on the capacitive method of measurement
- Zero point can be calibrated using software
- Adjustable end values of the differential pressure measuring range[1)]
  - 50...150 Pa
  - 100...300 Pa
- Can be used for measuring in areas with dirty or contaminated return air
- Brushless DC motor guarantees minimum energy consumption and a long service life
- Electromechanical torque-based switch-off for safe operation
- Extremely simple installation due to self-centring shaft adapter
- Disengageable gear unit for manual adjustment and positioning of damper
- Easy programming of the following applications using SAUTER CASE Components:[2)]
  - Volume flow control
  - Room pressure control
  - Duct pressure control
  - Flow control for fume cupboards
- Efficient control algorithm for fast control loops
- Integrated second control loop for:[3)]
  - Room-pressure control: can be ideally combined with EGP 100 with symmetrical measuring range
  - Fume-cupboard control ideally combined with SVU 100, SGU 100 and FCCP 200
- 2 x RS-485 bus interface on RJ12 and connection terminal
  - Up to 31 subscribers in a segment with SLC (SAUTER Local Communication) protocol
  - Communication within network via BACnet MS/TP[4)]
  - Integration of EY-RU 3** digital room operating units
  - FCCP 200 display and alarm unit for fume-cupboard control or room monitoring
- Input and output signals for integrating:
  - Setpoints and actual values
  - Analogue output
  - Priority control via switching contacts

Technical data

Power supply		
	Torque	10 Nm
	Power supply[5)]	24 V~, ±20%, 50...60 Hz 24 V=, -10%/+20%
Power consumption at nominal voltage 50/60 Hz (~/=) after 3 s running time	Power consumption during operation	Approx. 19 VA/10 W (10 Nm) Approx. 20 VA/11 W with FCCP 200
	Power consumption when idle[6)]	Approx. 6 VA/2 W
Parameters		
	Torque	10 Nm

1) *Available measuring ranges depending on hardware/type*
2) *Application support depending on hardware and software version in CASE VAV manual*
3) *Application support depending on hardware and software version in CASE VAV manual*
4) *Support of BACnet MS/TP interface*
5) *24 V=: Analogue inputs that are not connected are rated 0 V. The nominal torque is achieved within the specified tolerances.*
6) *Holding torque approx. 5 Nm*

	Holding torque[7)]	2 Nm
Integrated damper actuator	Angle of rotation[8)]	90°
	Running time for 90°[9)]	3...15 s
	Admissible dimensions of damper shaft	Ø 8...16 mm, □ 6.5...12.7 mm
	Admissible damper shaft (hardness)	Max. 300 HV
	Surge-voltage resistance	500 V (EN 60730)
	Operating noise	< 49 dB (A) at 3 s
Δp sensor	Measuring range Δp (gain = 1) Pressure range, types D / E[10)]	0...150/300 Pa
	Linearity error	2% FS
	Time constant	0.1 s
	Influence of position[11)]	Typically ±1 Pa
	Reproducibility	0.2% FS
	Zero point stability	0.2% FS (at 20 °C)
	Admissible positive pressure	±10 kPa
	Admissible operating pressure p_{stat}[12)]	±3 kPa
	Low-pressure connections[13)]	Ø i = 3.5...6 mm
Ambient conditions		
	Operating temperature	0...55 °C
	Storage and transport temperature	-20...55 °C
	Admissible humidity	< 85% rh, no condensation
Inputs/outputs		
	Analogue inputs[14)]	0...10 V (R_i = 100 kΩ)
	Digital inputs[15)]	Closed 1 V=, 1 mA, open > 2 V=
	Analogue outputs[16)]	0...10 V, load > 10 kΩ max. cable length 30 m max. adm. external voltage ±24 V
	Digital output	0.3 A at 24 V ~/=
Interfaces and communication		
	RS-485 not electrically isolated	115 kBaud
	Communication protocols[17)]	SAUTER Local Communication (SLC), BACnet MS/TP, ¼ load
	Access method	Master/slave
	Topology	Line
	Number of participants[18)]	31 (32) with SLC
	Bus termination	120 Ω (both ends)
Construction		
	Weight	0.8 kg
	Fitting	Self-centring spindle adapter
Standards and directives		
	Type of protection	IP00, IP30 (EN 60529) (with protection set)
	Protection class	III (EN 60730)

7) *Current-free holding torque by means of interlocking in gear unit*
8) *Maximum rotation angle 102° (without end stop)*
9) *Running time can be set via software*
10) *Available measuring ranges depending on hardware/type*
11) *Zero adjustment recommended during commissioning*
12) *Short-term overload; zero adjustment of sensor is recommended*
13) *Recommended hardness of tubing < 40 Sha (e.g. silicone)*
14) *Depending on the application, can be parameterised as an analogue input or output using SAUTER CASE Components*
15) *Digital inputs for external potential-free contacts (gold-plated recommended)*
16) *Depending on the application, can be parameterised as an analogue input or output using SAUTER CASE Components*
17) *Available protocols switched using software*
18) *One participant is always also the parametering tool, hence the maximum number of 31 connectible devices*

Conformity	Machine directive 2006/42/EC, appendix II 1.B
EMC Directive 2014/30/EU	EN 61000-6-1, EN 61000-6-3, EN 61000-6-4, EN 61000-6-2

Overview of types

Type	Measuring range Δp
ASV215BF152D	0...150 Pa
ASV215BF152E	0...300 Pa

Accessories

Type	Description
0372301001	Spindle adaptor for squared end hollow profile (x 15 mm), pack of 10 pcs.
XAFP100F001	Flow probe to measure the air volume in ventilation ducts
0300360001	USB connection set
0297867001	Reference pressure container
0430360100	IP30 protection set
0430360200	Replacement LP connector
0372129001	Torsion protection

Description of operation

The ASV 215 is a VAV compact controller for the supply- and return-air control in fume cupboards and the supply- and return-air control in laboratories, clean rooms, hospital wards and operating theatres. The ASV 215 may only be used for the intended purposes stated here.
The pressure difference generated at an orifice plate or Pitot tube is recorded by a static differential pressure sensor and converted to a flow-linear signal. An external command signal $c_{qV.s}$ is limited by the parameterised minimum and maximum settings and compared to the actual volume flow r_{qV}. Based on the measured control deviation, the actuator moves the damper on the VAV box until the volume flow across the measuring point reaches the required level. Without an external command signal, the volume flow setpoint corresponds to parameter $\dot{v}_{min}$ (factory setting). The application and internal parameters are configured using the SAUTER CASE Components PC software. The software allows you to configure the compact controller specifically for the application and to set the necessary parameters in bus mode.

ASV 2*5 connection

Block	Signal	ASV 215BF152
1	LS	Power supply
	MM	System ground
	01	AI/AO 0...10 V
	02	AI/AO 0...10 V
	03	AI/AO 0...10 V
	04	DI/DO
	05	DI
2	06	RS-485 D-A
	07	RS-485 D+A
	08	RS-485 Common
3 RJ-12	06	RS-485 D-B
	05	RS-485 D+B
	04	RS-485 D-A
	03	RS-485 D+A
	02	C_{out}
	01	5 $V=_{out}$

Example application VAV.10.101.M

The VAV compact controller is shipped from the factory with the following default configuration. The inputs and outputs are preconfigured according to the table.

Connection assignment (factory setting). Application VAV10.101.M

Connection	Function	Designation	Setting range
01	External command variable	cqV.s	0…10 V (0…100% $\dot{V}_{nom}$)
02	Setpoint shift	cqV.p.ad	5 V ± 5 V Ξ ± 100% $\dot{V}_{nom}$
03	Volume flow actual value	rqV	0…10 V (0…100%) $\dot{V}_{nom}$
04	Priority control	cqV.p.1 (actuated condition)	Closed 1 V=, 1 mA Open > 2 V=
05	Priority control	cqV.p.2 (actuated condition)	Closed 1 V=, 1 mA Open > 2 V=

Volume flow characteristics

To configure the device, the design data of the VAV box must be loaded to the actuator using the SAUTER CASE Components software. At least the following data is required for this:

	Box DN	Box C factor	$\dot{V}_{n\ AT}$	$\dot{V}_{nom}$	$\dot{V}_{max}$	$\dot{V}_{min}$
Unit	mm	l/s - m^3/h	l/s - m^3/h	l/s - m^3/h	l/s - m^3/h	l/s - m^3/h

Setting the operating volume flows

The following functions are available for operating the VAV controller:

Volume flow control setting ranges

Function	Volume flow / damper position	Maximum setting ranges	Recommended setting ranges
Damper closed	Damper fully closed		0° damper position
$\dot{V}_{min}$	Minimum	$\dot{V}_{1Pa}$[19)]…$\dot{V}_{max}$	10…100% $\dot{V}_{max}$
$\dot{V}_{max}$	Maximum	$\dot{V}_{1Pa}$…$\dot{V}_{nom}$	10…100% $\dot{V}_{nom}$
$\dot{V}_{mid}$	Intermediate position	$\dot{V}_{max}$ > $\dot{V}_{mid}$ > $\dot{V}_{min}$	10…100% max
Damper open	Damper fully open		90° damper position
$\dot{V}_{nom}$	Nominal volume flow		Specific value, depending on box type, air density and application
$\dot{V}_{int}$	Internal setpoint	$\dot{V}_{1Pa}$…$\dot{V}_{nom}$	10…100% $\dot{V}_{nom}$

Functions of the ASV with VAV.10.101.M

Analogue input (AI 01)

VAV controller command signal

The $\dot{V}_{min}$ and $\dot{V}_{max}$ values, which must be configured using the software, provide lower and upper limits for the command signal cqV.s.

Analogue input/output (AI/AO 02)

For the analogue input and output terminal AI/AO 02, an input function or one of two output functions can be selected.

Volume flow setpoint shift cqV.p.ad

The setpoint for the volume flow is defined at output AI 01. A room-pressure controller, for example, or the setpoint shift of the VAV compact controller, is controlled by the input signal of terminal AI 02. The input signals can be 0…10 V, 0…100% or user-defined ±100%.

Flow control deviation -eqV.s

Output AO 02 can be used for notification if the volume flow deviates from the command variable cqV.s. The current control deviation can be recorded as a voltage. If the setpoint is equal to the actual value, the output voltage is 5 V.

19) *Volume flow that generates a differential pressure of 1 Pa*

Note
Half slope (±100%, 0.05 V/% compared to 0.1 V/%) results in double the neutral zone (= green zone Ξ no alarm) for alerting.

Damper position rPhi
Output AO 02 can also be changed to indicate the current damper position using CASE Components. The working range of the damper-actuator combination can be scaled freely as 0...100% from a minimum of 0 V to a maximum of 10 V.

Analogue output (AO 03)

Volume flow actual value rqV
The current volume flow (actual value rqV) via the VAV box can be recorded at terminal AO 03. The value is 0…100% of the set nominal volume flow $\dot{V}_{nom}$. If no specific volume flow is entered for the system, $\dot{V}_{nom}$ corresponds to the value $\dot{V}_{nAT}$ set by the box manufacturer, which can usually be found on the type plate of the VAV box. In general, the actual value signal of the volume flow is used for the following functions:

- Displaying the volume flow on the building management system station; room air balancing in the laboratory.
- Master/slave application: The actual value signal of the master controller is specified as a setpoint for the slave controller.

Digital input (DI 04/05) cqV.p.1/cqV.p.2
Priority control can be implemented using the available digital inputs. Individual functions can be selected easily using the software. The digital inputs can be operated with normally-closed contacts or normally-open contacts. A mixture of NC and NO contacts can be used.

Feedback for damper position, differential pressure and actual volume flow
Three measured variables are generally available as feedback from the volume flow control loop via the SLC bus: damper position, volume flow and differential pressure. These values can be read using the SAUTER CASE Components software in *Online Monitoring* mode.

Applications and functions of ASV
You can find detailed information on all possible applications in the “CASE VAV 2.2 application description manual” (D100184112). The parameterising of these applications and their functions using the CASE VAV software is described in the “SAUTER CASE Components / Parameterisation of the VAV compact controller ASV*15 manual” (P100015524 A).

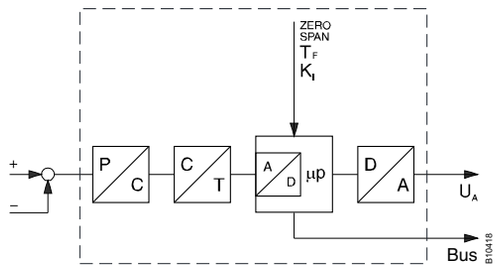
Intended use

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.

Sensor technology

The measuring element in the VAV compact controller is a static twin-membrane sensor with PCB technology. Because of its symmetrical structure with two, principally independent, measuring cells, the sensor is compensated for installation in any position. The differential pressure acting on it is evaluated using a differential, capacitive measuring principle. Its unique design means it has high measuring accuracy for differential pressures down to < 1 Pa, making it ideal for precise regulation of volume flows with a differential pressure of 1 Pa. This enables the operator to set very low $\dot{V}_{min}$ values for reduced mode in order to save energy.
The static measuring principle means that the sensor can also be used for measuring pumped media containing dust or chemicals.

Block diagram of sensor



The filter time constant *Sensor damping* can be set in increments from 0…5.22 s using the SAUTER CASE Components software to stabilise the sensor measuring signal when there are highly fluctuating pressure signals. The zero point can be adjusted if necessary using calibration.

Operating in SLC mode

The VAV compact controller is equipped with an RS-485 interface that is not electrically isolated. The baud rate used is 115.2 kbit/s and is a fixed setting. The SAUTER Local Communication (SLC) protocol specifies the master-slave bus access method, with a maximum of 31 devices permitted in a network segment. The SAUTER CASE Components software is used to parameterise every individual device and to configure the devices within the network segment.

Operating in BACnet MS/TP mode

After the parameterisation of the VAV compact controller, the bus protocol can be changed from SLC to BACnet MS/TP using SAUTER CASE Components. In the BACnet MS/TP mode, the baud rate can be set to 9.6 kbit/s, 19.2 kbit/s, 38.4 kbit/s, 57.6 kbit/s, 76.8 kbit/s or 115.2 kbit/s. In the BACnet MS/TP mode, the device can only be addressed via BACnet objects. To make changes in the parameterisation, the device must be set to the SLC mode again.
This is performed via a function in the CASE VAV module of the SAUTER CASE Components software or by disconnecting the device from the power and restarting it while pressing down the gear release lock.

Note
It is not admissible to operate actuators in mixed mode in the SLC and BACnet MS/TP modes within a network segment.
All the devices must be switched over at the same time using the function in the CASE VAV module.

BACnet MS/TP protocol implementation

BACnet device profile

Product	Device profile
ASV215BF152	BACnet Application Specific Controller (B-ASC)

Supported BIBBs

Product	Supported BIBBs	BIBB name
ASV215BF152	DS-RP-B	Data Sharing-ReadProperty-B
	DS-RPM-B	Data Sharing-ReadPropertyMultiple-B
	DS-WP-B	Data Sharing-WriteProperty-B
	DM-DDB-B	Device Management-DynamicDeviceBinding-B
	DM-DDC-B	Device Management-DeviceCommunicationControl-B

Supported standard objects

Product	Object type	Variable	Deletable
ASV215BF152	Analog Value	Yes	No
	Device	No	No
	Binary Value	Yes	No
	Multi-state Value	Yes	No

Note
The available BACnet objects depend on the application selected; see SAUTER BACnet PICS ASV2x5 Volume Flow Compact Controller manual (D100332918).

Data Link Layer options

Product	Data Link	Options
ASV215BF152*	MS/TP Slave	9600, 19200, 38400, 57600, 76800, 115200

Device Address Binding

Product	Supports static binding
ASV215BF152*	Yes

Network options

Product	Supports static binding
ASV215BF152*	No

Character set

Product	Supported character set
ASV215BF152*	ANSI X3.4

Functions of CASE VAV

The VAV controller can be configured using the SAUTER CASE Components software. This software is included in SAUTER CASE Suite. This software tool can be used to configure all the values required for operation by means of a convenient user interface. The connection set for parameterising is available as an accessory.
The following functions are available:

- Easy configuration of complex applications
- Saving of device configurations
- Configurable unit range
- Summary screen for quick view of the main parameters
- Integrated access to system diagram and wiring diagram
- Service function for rapid troubleshooting
- Online monitoring of main operating parameters

Fitting notes

The actuator can be installed in any position (including a hanging position). It is plugged directly onto the damper spindle and clipped to the anti-torsion device. The self-centring spindle adapter protects the damper spindle. The damper actuator can be easily detached from the damper spindle without removing the anti-torsion device.
The angle of rotation can be limited on the device to between 0° and 90° and continuously adjusted between 5° and 80°. The limit is fixed using a set screw directly on the actuator and the limit stop on the self-centring spindle adapter. This spindle adapter is suitable for Ø 8...16 mm and □ 6.5...12.7 mm damper spindles.

CAUTION!
The housing must not be opened.

For feedback of the operating status it is a good idea to display the actual value signal (volume flow) on the operating station of the management system.
Specific standards such as IEC/EN 61508, IEC/EN 61511, IEC/EN 61131-1 and -2 were not taken into account. Local requirements regarding installation, use, access, access rights, accident prevention, safety, dismantling and disposal must be observed. Furthermore, installation standards EN 50178, 50310, 50110, 50274, 61140 and similar must be observed.

Outdoor installation

If installed outside of buildings, the devices must be additionally protected from the weather.

Wiring

Power supply

To ensure trouble-free operation, the following cable cross-sections and lengths are required for the 24 V power supply and the ground wire.
All devices within a network segment must be supplied by the same transformer, or if multiple transformers are being used they must be connected in-phase on one side. The power supply must be wired in a star connection with cable lengths not exceeding those in the table below (*1 device* column).

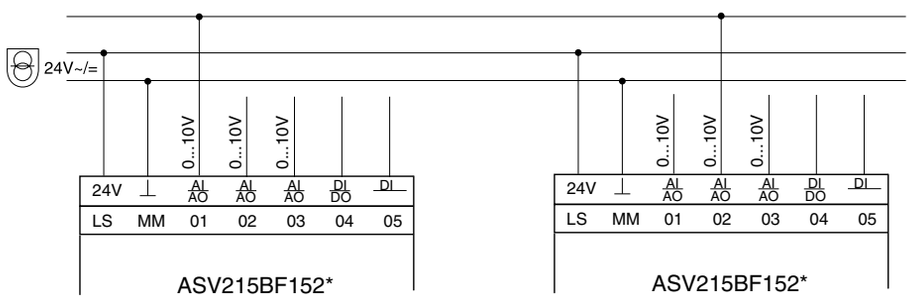
Maximum cable lengths (in m) per number of devices, AC/DC mode

Conductor cross-section	1 device	Max. 8 devices	Max. 16 devices
0.5 mm²	40	5.0	2.5
0.75 mm²	60	7.5	3.8
1.00 mm²	80	10.0	5.0
1.50 mm²	120	15.0	7.5

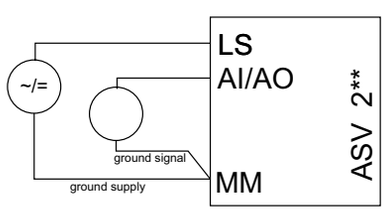
Analogue inputs that are not connected are rated 0 V.
The cable lengths specified here are recommended values that may differ depending on the usage conditions.

Analogue signals

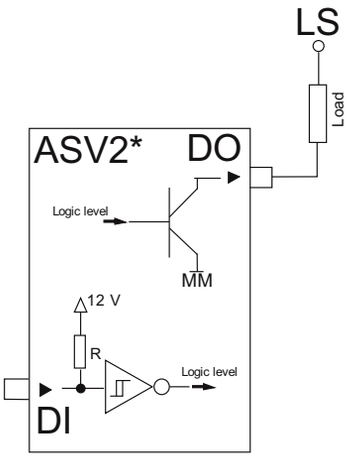
Analogue and digital signals are connected using connection terminals. For trouble-free operation, the ground cable for actuators that are linked to each other for signal exchange must be connected to each other.
Analogue outputs/feedback signals from two or more controllers may not be connected together.
To minimise errors on the command signal when using parallel connection, it is recommended to use star wiring for the ground and signal cables.



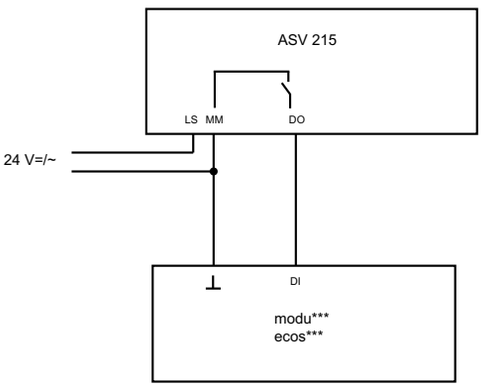
Separation of ground, power supply and signal



Digital inputs and outputs



Connection of DO ASV to DI AS, RC

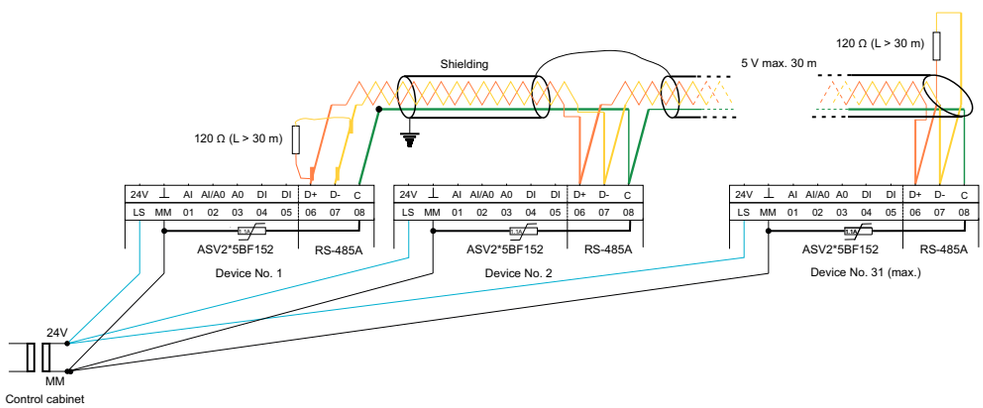


The MM terminal of the ASV 2** to be connected must be connected to the ground of the ecos500 and the modu525.

RS-485 bus connection

The C08 terminals of all controllers must be connected to each other and to the same potential. The wiring must be implemented purely as a line topography (daisy chain). Spur lines are not permitted; if they cannot be avoided for installation engineering reasons, they may not be more than 3 m long. The digital outputs (DO) of the ASV 2** are not compatible with the inputs of the EY-EM 5***. On these devices the digital inputs (DI) switch against voltage (15 V).

Connection diagram (SLC bus connection)



The length of the bus wiring is limited by the following parameters:

- Number of connected devices
- Cable cross-section

CAUTION!
Faulty wiring can result in damage to the device.

The following table is valid for twisted-pair wiring:

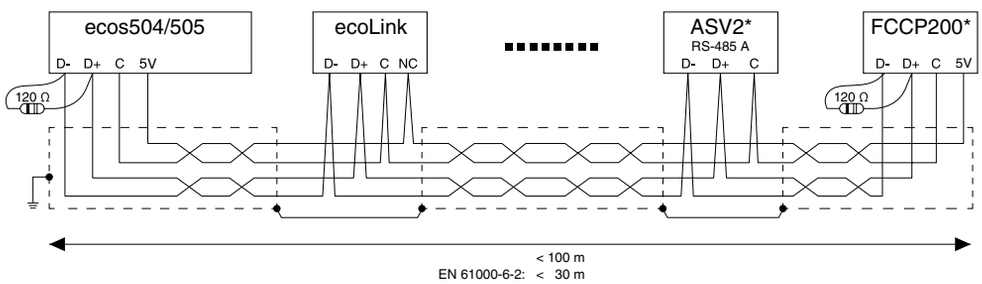
Twisted-pair wiring

Conductor cross-section	Number of devices	Max. cable length
0.20 mm²	31	> 30 m (bus termination required)

When using shielded cables, the shielding must be earthed in the installation:
- 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.).

We recommend using twisted-pair wiring.

Connection diagram (SLC bus connection) EY-RC504



Connection of ecoLink and ASV2/FCCP200**

Note
The use of ecoLink510 (EY-EM510) is not possible.

Possible combinations of devices on an ecos504 bus line:

	Max.	Combination options				
ASV2x5BF1xx	12	12	8	4	8	6
EY-RU3xx	4	–	4	4	–	–
FCCP200	4	–	–	–	–	4
ecoLink module	8	–	–	4	4	2
Total RS-485 channel	12	12	12	12	12	12

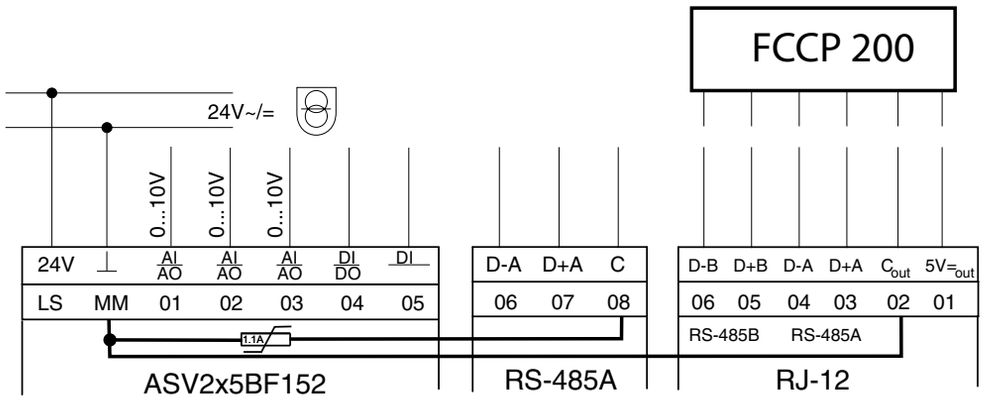
Additional technical information

The upper section of the housing with the cover contains the electronic components and the sensor. The lower section of the housing contains the brushless DC motor, the maintenance-free transmission, the gear-release lever and the spindle adapter.
The actuators must not be mechanically connected in parallel.
Any connections that are not used must be isolated and may not be grounded.

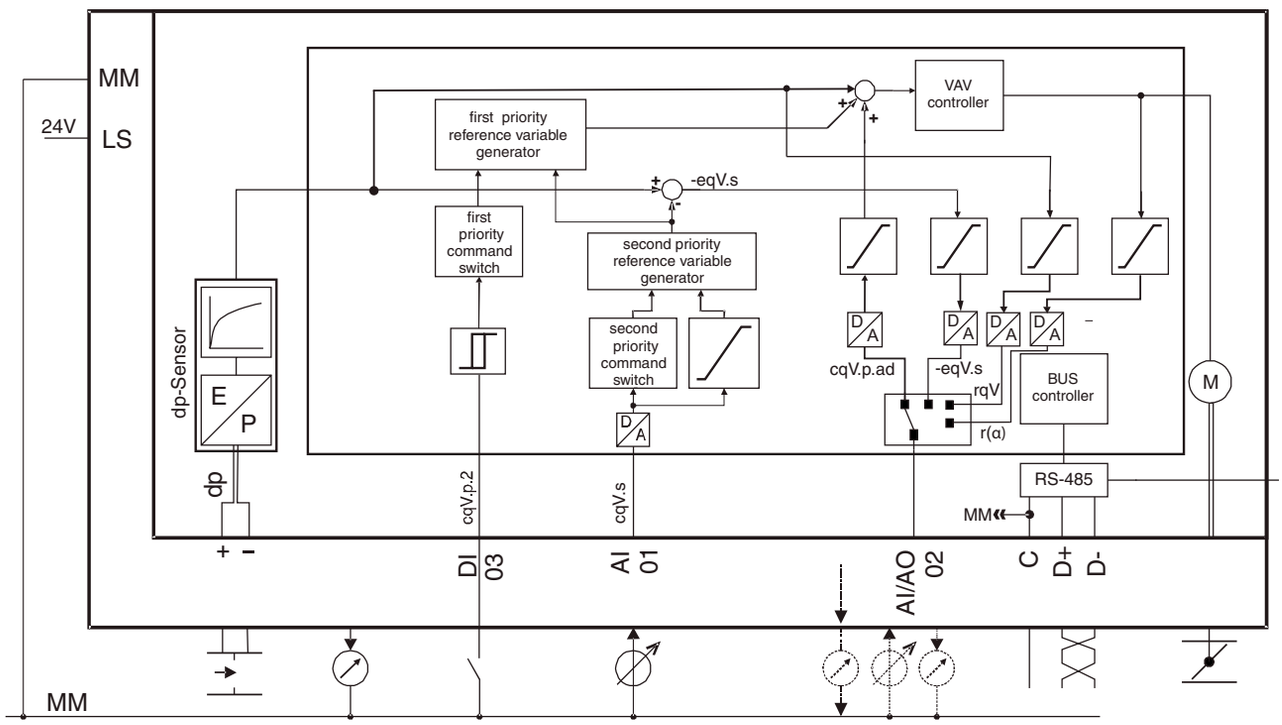
Disposal

When disposing of the product, observe the currently applicable local laws.
More information on materials can be found in the Declaration on materials and the environment for this product.

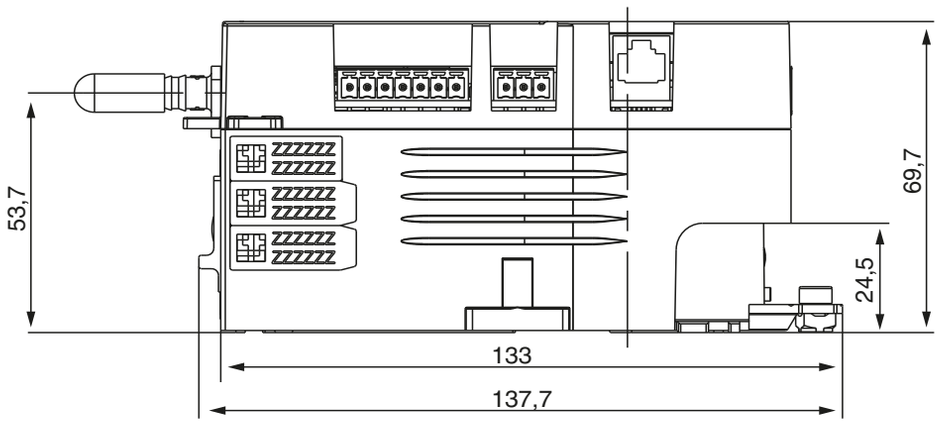
Connection diagram

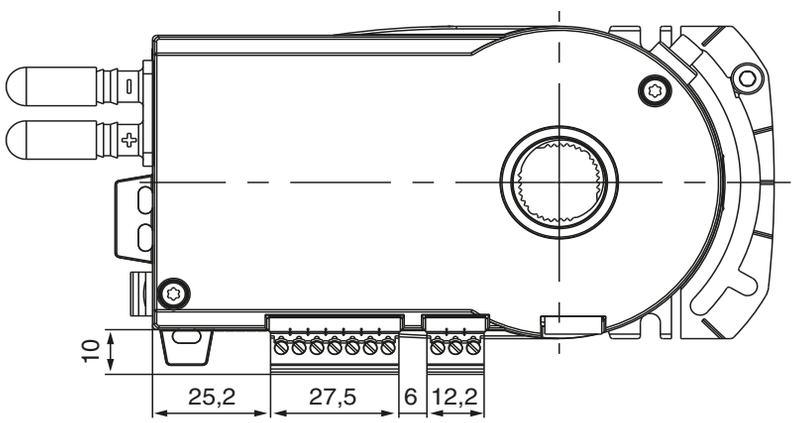


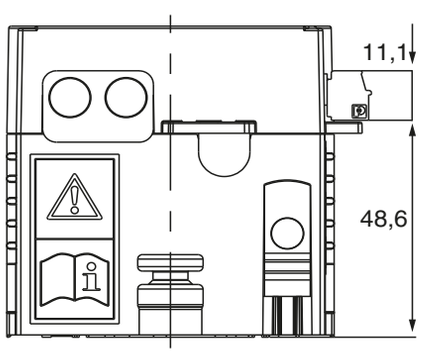
Block diagram for VAV.10.101.M (factory setting)



Dimension drawing

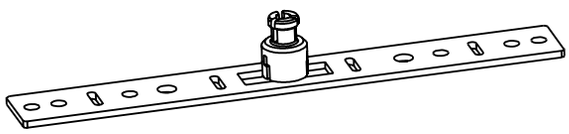




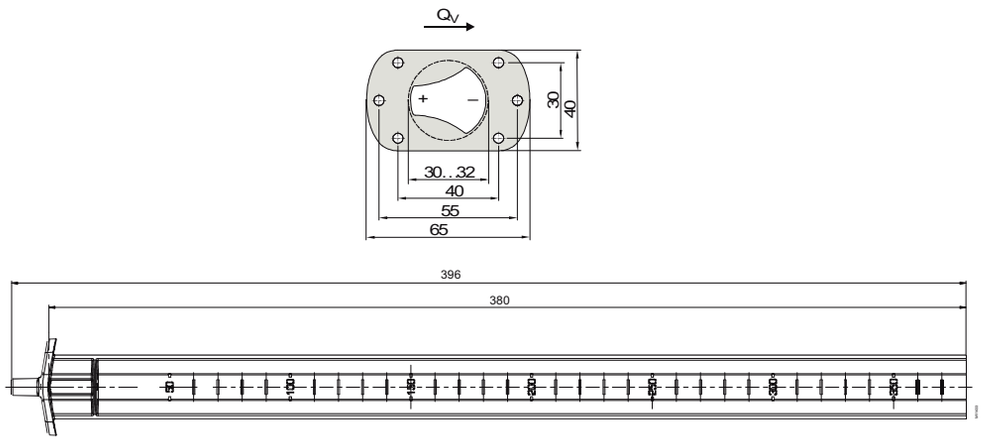


Accessories

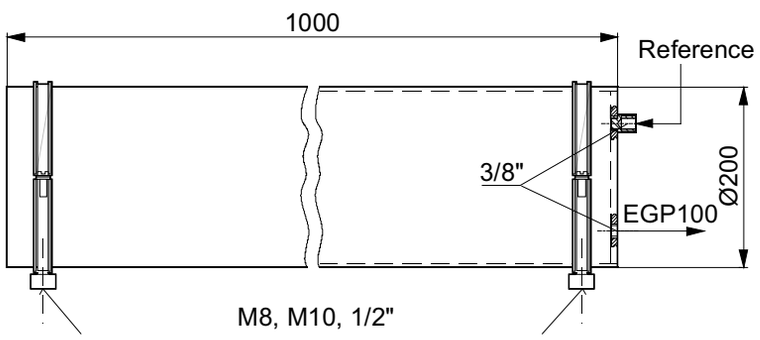
Anti-torsion device 0372129001 (provided)



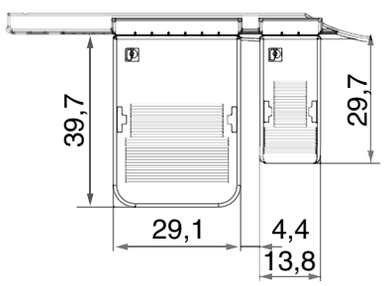
Flow probe to measure the air volume in ventilation ducts XAFP100F001



Reference pressure container 0297867001



IP30 protection set 0430360100



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