

OpenAir™

VAV compact controller BACnet MS/TP

G..B181.1E/BA



VAV compact controllers 5 / 10 Nm with BACnet MS/TP communication

- GDB181.1E/BA Operating voltage AC 24 V, 5 Nm
- GLB181.1E/BA Operating voltage AC 24 V, 10 Nm

Features

- For plants with constant or variable air volume flow control:
 - Supply air control or extract air control
 - Supply and extract air control with ratio control 1:1, or ratio control for positive or negative pressure
- AC 24 V operating voltage
- Quasi-static sensor 0..300 Pa operating range
- 5 and 10 Nm torque
- BACnet MS/TP communication, BTL listed
- Volume flow control or position control
- UL listed

VAV compact controllers are not suitable for environments where the air is saturated with sticky or fatty particles or contain aggressive substances.

Functions

| Function | Description |
|-----------------------------------|---|
| BACnet MS/TP communication | BACnet MS/TP (RS-485), galvanically separated |
| Functions | <ul style="list-style-type: none"> - Setpoint 0..100% - Actual values for volume flow, position and differential pressure - Volume flow or position control - Override control Open / Close / Min / Max / Stop - Setpoint monitoring and backup mode |
| Supported baudrates | 9.6, 19.2, 38.4, 57.6, 78.4, 115.2 kbaud |
| Termination | 120 kΩ electronically switchable |
| BACnet profile | B-ASC (Application-specific controller) |

Type summary

| Product no. | Stock no. | Operating voltage | Positioning signal | Power consumption | Posit. time | Manual adjuster | Position feedback |
|---------------------|-------------|-------------------|--------------------|--|-------------|-----------------|-----------------------------|
| GDB181.1E/BA | S55499-D168 | AC 24 V | BACnet MS/TP | 1 VA / 0.5 W 3 VA / 2.5 W ¹⁾ | 150 s | Yes | True position potentiometer |
| GLB181.1E/BA | S55499-D169 | | | | | | |

Please refer to data sheet **N4698** for information on accessories and spare parts.

¹⁾ Actuator rotates

Ordering (Example)

| Product no. | Stock no. | Description | Quantity |
|--------------|-------------|----------------------------------|----------|
| GDB181.1E/BA | S55499-D168 | VAV compact controller BACnet | 1 |

The manufacturer of VAV box units (OEM) generally configures and assembles VAV compact controllers. VAV control core parameters are therefore protected against unauthorized changes after production. For configuration and maintenance the service tools AST20 (handheld tool) or ACS931 / ACS941 (PC tool, to be used with AST22) are available.

Equipment combinations

| Product no. | Stock no. | Description | Doc. type | Doc. number |
|-------------|-------------|---|-----------|-------------|
| AST20 | S55499-D165 | Handheld tool for commissioning and service | Datasheet | A6V10631836 |
| AST22 | S55499-D373 | USB/PPS2 Interface Converter | Datasheet | A6V11236956 |
| ACS931 | | PC tool for commissioning and service (OEM version) | Datasheet | N5853 |
| ACS941 | | PC tool for commissioning and service (Service version) | Datasheet | N5854 |

Product documentation

| Title | Topic | Document ID |
|--|--|-------------|
| VAV compact controllers BACnet MS/TP | Detailed information about the VAV compact controllers with BACnet MS/TP communication | A6V10631864 |
| Installation Instruction VAV Modbus / BACnet | Mounting / installation instruction | A6V10523083 |
| BACnet PICS | BACnet Protocol Implementation Conformance Statement | A6V10644636 |

Related documents such as environmental declarations, CE declarations, etc., can be downloaded at the following Internet address:

<http://siemens.com/bt/download>

HMI (Human-machine interface)

For a more detailed description of the device status, functions and error messages, please refer to the Technical Basics documentation A6V10631864.

Push-button operation

| Activity | Push-button operation | Confirmation |
|--|----------------------------|--|
| Display current address (in reverse order) | Press button < 1s | Current address is displayed |
| Enter push-button addressing mode | Press button > 1s and < 5s | Red LED shines (release button before LED gets dark) |
| Reset to factory settings | Press button > 10s | Orange LED flashes |

LED colors and patterns

| Color | Pattern | Description |
|--------|-----------------|--|
| Green | steady | Start-up |
| | 1s on / 5s off | Fault free operation ("life pulse") |
| | flashing | Bus traffic |
| Orange | 1s on / 5s off | Backup mode entered |
| Red | Steady | Mechanical fault / device jammed |
| | flashing fast | Sensor error: Pressure tubes interchanged or „Invalid configuration“ |
| | flashing slowly | Sensor error: Internal read error |
| | 1s on / 5s off | Internal error |

Resetting the device by push button

The VAV compact controllers can be reset by push-button:

1. Press button for >10s → LED starts flashing **orange**
2. Release button while LED still flashes → LED keeps flashing for 3s
3. After those 3s → LED shines **red** (reset), then **green** (start-up).

A factory reset by push-button leads to a reset of all parameters as described in the section "Settings and operating mode" to the OEM default values. Since these values can be set by the OEM, they are not necessarily the same as the Siemens factory settings.

All other parameters, especially the bus parameters, are reset to Siemens factory settings.

VAV compact controllers can also be reset by the VAV handheld tool AST20 or over bus. Please refer to the corresponding operating manual / technical basics.

Push-button addressing

Display current address (digits in reverse order)

The BACnet address can be set without a separate tool by using the push-button and LED.

To display the current address, press button <1s.

| Colors | | |
|--------------------------|--|---------------------------|
| 1-digits: red | 10-digits: green | 100-digits: orange |
| Example for address 124: | | |
| LED | | |
| Note | The address is entered and shown in reverse order. | |

Set new address (digits in reverse order)

1. **Enter addressing mode:** press button > 1s until LED shines **red**, then release button (before LED gets dark).
2. **Enter digits:** press button n-times → LED flashes per button press (feedback).
Colors: 1-digits: **red** / 10-digits: **green** / 100-digits: **orange**
3. **Store digits:** press button until LED shines in color of following digits – release button,
4. **Save address:** press button until LED shines **red** (confirmation) → release button.
An address can be stored at any time, i.e. after setting the 1-digits, or after setting the 1- and the 10-digits.
5. Entered address is repeated one times for confirmation.

Note: If button is released before LED shines red, the address is discarded.

Examples

Set address "124":

1. Enter addressing mode
2. Set 1-digits: Press button 4-times → LED flashes **red** per button press
3. Store 1-digits: press button until LED shines **green** – release button
4. Set 10-digits: Press button 2-times → LED flashes **green** per button press
5. Store 10-digits: press button until LED shines **orange** – release button
6. Set 100-digits: Press button 1-times → LED flashes **orange** per button press
7. Store address: press button until LED shines **red** – release button
→ address is stored and displayed 1x for confirmation

Set address "50":

1. Enter addressing mode
2. Skip 1-digits: Hold button pressed until LED shines **green** – release button
3. Set 10-digits: Press button 5-times → LED flashes **green** per button press
4. Store address (skip 100-digits): hold button pressed until LED shines **red** – release button
→ address is stored and displayed 1x for confirmation

Set address "5":

1. Enter addressing mode
2. Set 1-digits: Press button 5-times → LED flashes **green** per button press
3. Store address: press button until LED shines **red**
→ address is stored and displayed 1x for confirmation

Settings and operating mode

Parameterization

The OEM generally provides the basic configuration to VAV compact controllers, especially the parameter Vn and the opening direction. The setting of all other parameters depends on the actual application and can be obtained from the ventilation planner or similar.

The following parameters must be checked or set prior to commissioning:

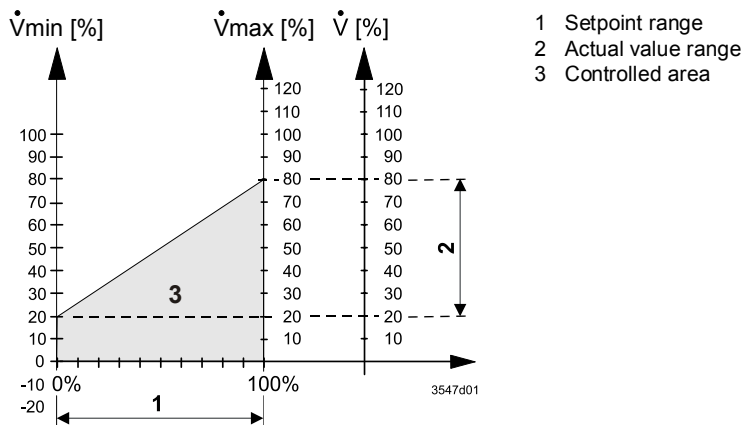
| Parameter | Range | Description | Factory setting |
|----------------------|---|---|-----------------------|
| Operating mode | VAV (flow ctrl.) / POS (position ctrl.) | Interpretation of setpoint VAV = setpoint commands volume flow [%] POS = setpoint commands damper position [%] | VAV |
| Opening direction | CW (R) / CCW (L) | Opening direction of air damper | CW (R) |
| Adaptive positioning | Off / On | Adaption of actual opening range to position feedback Off = No adaption / mapping 0°..90° → 0..100 % On = Pos. adaption / mapping e.g. 0°..60° → 0..100 % | Off |
| Vmax | 20...120% | Maximum air volume flow | 100 % |
| Vmin | -20...100% | Minimum air volume flow | 0 % |
| Vnom | 0...60'000 m ³ /h | Nominal air volume flow ¹⁾ | 100 m ³ /h |
| Vn | 1...3.16 | Characteristic value for the air volume flow; set by the manufacturer (OEM) | 1 |
| Altitude | 0...5000m in 500m steps | Altitude level correction factor for differential pressure sensor (select n*500m value closest to real altitude) | 500 meters |

Please refer to technical basics **A6V10631864** for more explanation.

¹⁾ Value used for displaying / not used for volume flow control loop

Variable air volume (VAV) control

The operating point is determined by the setpoint value and the V_{min} / V_{max} settings.



Constant air volume (CAV) control

A constant air volume flow can be achieved by sending a constant setpoint value.

Position control

The VAV compact controllers can be operated as damper actuators, i.e. using the 0..100% setpoint as position damper setpoint, by setting the operating mode parameter to "POS".

Engineering and commissioning

Engineering

Engineering mainly consists of implementing the data model into a VAV application, especially sending the setpoint from the supervisory controller to the VAV compact controller, and receiving the actual values (flow and position) for monitoring and optimization. System limitations of BACnet MS/TP apply, especially number of devices per segment and cable lengths depending on the baudrate.

Commissioning

Two basic workflows are supported:

- Full or partial configuration (bus configuration and optionally VAV parameters configuration) by a tool (AST20 or ACS941),
- Full or partial configuration over bus, usually using addressing by push-button, with subsequent configuration over bus.

Commissioning workflow 1: Full or partial configuration by tool

When using the AST20 handheld tool or the ACS931 / ACS941 PC tool, all bus and VAV parameters can be set.

- Connect AST20 or ACS931 / ACS941 (for PC tools, use AST22 interface converter) to the VAV compact controller and navigate to the bus configuration menu,
- Set bus parameters as desired,
- Optionally make changes on VAV parameters.

Note

With AST20, all parameters can be set using the mass configuration function. The bus parameters are included in the mass configuration function. It can be selected that the address is automatically incremented with each programmed VAV compact controller. ACS931 / ACS941 supports saving and loading of parameter sets.

Commissioning workflow 2: Configuration over bus (full or partially)

The devices can be configured over bus (not using a separate configuration tool like in workflow 1) if the factory settings allow for a connection between a BACnet programming tool (e.g. a BACnet browser) and peripheral devices.

Preconditions:

- No address must be present on the bus in more than one instance.
- Baudrate and format must match with the settings of the programming tool.

→ Option A, full configuration over bus: Only one device at a time is connected to the bus and powered up. The device is then accessed by the BACnet programming / configuration tool (using the default address) and the address and other parameters are set to the definitive values.

→ Option B, partial configuration over bus: All devices are powered up and connected to the bus before commissioning. Then all devices must have different addresses (using the push-button addressing method described above).

Notes

Safety

⚠ Caution

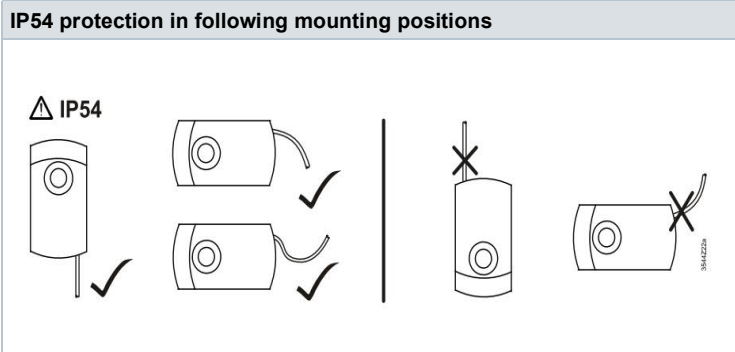

National safety regulations

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.

Mounting

Mounting positions

| IP54 protection in following mounting positions | Accessory mounting holes ¹⁾ |
|--|---|
|  |  |

⚠ ¹⁾ Not to be used for fixation of the actuator, use anti-rotation-bracket instead.

Maintenance

The VAV compact controllers are maintenance-free.

Mounting:

- Do not open the VAV compact controllers
- Do not use the accessory mounting holes for fixation of the VAV compact controllers
- If necessary, disconnect electrical connections from the terminals

The VAV compact controllers must be correctly adjusted to the VAV box before commissioning.

Disposal



The device is considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Warranty

Technical data on specific applications are valid only together with Siemens products listed under "Equipment combinations". Siemens rejects any and all warranties in the event that third-party products are used.

Note

When using the actuators in connection with components of other manufactures, correct functioning must be ensured by the user, and Siemens will assume no responsibility.

Technical data

| Power supply | | |
|-------------------|------------------|---|
| Operating voltage | G..B181.1E/.. | AC 24 V ± 20 % (SELV) or AC 24 V class 2 (US) |
| Frequency | | 50/60 Hz |
| Power consumption | at 50 Hz | |
| | Actuator holds | 1 VA / 0.5 W |
| | Actuator rotates | 3 VA / 2.5 W |

| Function data | | |
|---|--------------------------------|---|
| Positioning time for nominal rotation angle | G..B181.1E/.. | 150 s (50 Hz) 120 s (60 Hz) |
| Nominal torque | GDB.. | 5 Nm |
| | GLB.. | 10 Nm |
| Maximum torque | GDB.. | < 7 Nm |
| | GLB.. | < 14 Nm |
| Nominal / maximum rotation angle | | 90° / 95° ± 2° |
| Direction of rotation | Adjustable by tool or over bus | Clockwise (CW) / Counter-clockwise (CCW) |

| Connection cables | | |
|-------------------|--|--------------------------|
| Cable length | | 0.9 m |
| Power supply | Number of cores and cross-sectional area | 2 x 0.75 mm ² |
| Communication | Number of cores and cross-sectional area | 3 x 0.75 mm ² |
| Service interface | Terminal strip | 7-pin, grid 2.00 mm |

| Communication | | |
|------------------------|---------------------|---|
| Communication protocol | BACnet MS/TP | RS-485, galv. separated |
| | Number of nodes | Max. 32 |
| | Address range | 0...128 Default: 1 |
| | Transmission format | 1-8-N-1 |
| | Max. master | 1...127 Default: 127 |
| | Device object ID | 0...4193404 Default: 10000 |
| | Baudrates (kBaud) | Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 Default: Auto |
| | Termination | 120 Ω electronically switchable Default: Off |

Please refer to the PICS A6V10644636 ¹⁾ for a detailed description of the BACnet implementation

| Degree of protection | | |
|----------------------|---|------|
| Degree of protection | Degree of protection acc. to EN 60529 (see mounting instruction) | IP54 |
| Safety class | Safety class acc. to EN 60730 | III |

| Environmental conditions | | |
|--------------------------|---------------------------|----------------|
| Applicable standard | | IEC 60721-3-x |
| Operation | Climatic conditions | Class 3K5 |
| | Mounting location | Indoors |
| | Temperature general | 0...50 °C |
| | Humidity (non condensing) | 5...95 % r. F. |
| Transport | Climatic conditions | Class 2K3 |
| | Temperature | -25...70 °C |
| | Humidity | 5...95 % r. h. |
| Storage | Climatic conditions | Class 1K3 |
| | Temperature | -5...45 °C |
| | Humidity | 5...95 % r. h. |

| Directives and Standards | | |
|--|---------|---|
| Product standard | | EN 60730-x |
| Product family standard | | EN 50491-3, EN 50491-5 General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) |
| Building automation and control systems (BACS) - Part 2 Hardware | | EN ISO 16848-2 |
| Electromagnetic compatibility (Application) | | For residential, commercial and industrial environments |
| EU Conformity (CE) | | GDB181.1E/BA |
| | | GLB181.1E/BA |
| RCM Conformity | | A5W00003842 ¹⁾ |
| | | A5W00000176 ¹⁾ |
| UL, cUL | AC 24 V | GDB181.1E/BA |
| | | GLB181.1E/BA |
| | | A5W00003843 ¹⁾ |
| | | A5W00000177 ¹⁾ |
| | | UL 873 http://ul.com/database |

| Environmental compatibility | |
|-----------------------------|--|
| | The product environmental declaration A6V10209938 ¹⁾ contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal). |

| Dimensions / Weight | | |
|-----------------------|--------------------------------------|-----------------------|
| Weight | Without packaging | 0.6 kg |
| Dimensions | | 71 x 158 x 61 mm |
| Suitable drive shafts | Round shaft (with centering element) | 8...16 mm (8...10 mm) |
| | Square shaft | 6...12.8 mm |
| | Min. drive shaft length | 30 mm |
| | Max. shaft hardness | <300 HV |

| Air volume flow controller | | |
|--|--|-------------|
| Type | 3-position controller with hysteresis | |
| V _{max} , adjustable | resolution 1% / factory setting 100% | 20%...120% |
| V _{min} , adjustable | resolution 1% / factory setting 0% | -20%...100% |
| V _n = f(dp _n), adjustable | resolution 0.01 / factory setting 1.00 | 1.0...3.16 |

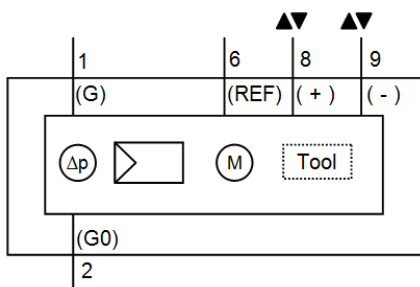
| Differential pressure sensor | | |
|---|---------------------------------------|-------------------------------|
| | Connection tubes (Interior diameter) | 3...8 mm |
| | Measuring range | 0...500 Pa |
| | Operating range | 0...300 Pa |
| Precision at 23 °C, 966 mbar and optional mounting position | Zero point | ± 0.2 Pa |
| | Amplitude | ± 4.5 % of the measured value |
| | Drift | ± 0.1 Pa / Year |
| | Max. permissible operating pressure | 3000 Pa |
| | Max. permissible overload on one side | 3000 Pa |

¹⁾ The documents can be downloaded from <http://siemens.com/bt/download>

Internal diagrams

The VAV compact controller is supplied with two prewired connecting and communication cables.

G..B181.1E/BA



Tool = Configuration and maintenance interface (7-pin)

Power supply and communication cables

| Core designation | Core color | Terminal code | Description |
|---|-------------|---------------|------------------------|
| Cable 1: Power / black sheathing | | | |
| 1 | red (RD) | G | System voltage AC 24 V |
| 2 | black (BK) | G0 | System neutral AC 24 V |
| Cable 2: Communication / blue sheathing | | | |
| 6 | violet (VT) | REF | Reference |
| 8 | grey (GY) | + | Bus (BACnet MS/TP) |
| 9 | pink (PK) | - | Bus (BACnet MS/TP) |

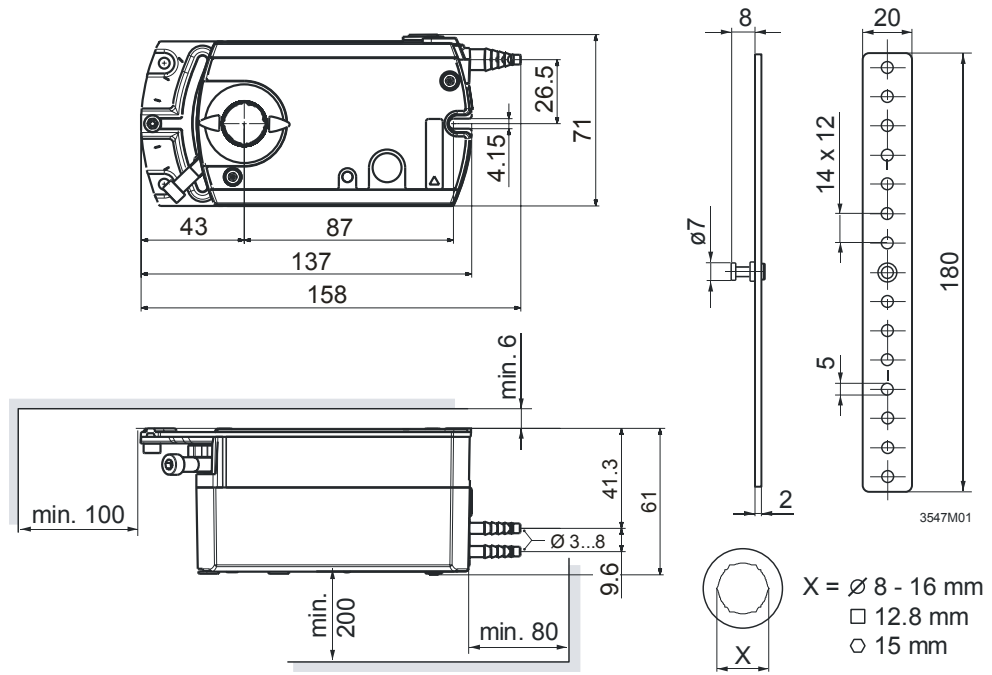
Note

The operating voltage at terminals G and G0 must comply with the requirements under SELV or PELV.

Safety transformers with twofold insulation as per EN 61558 required; they must be designed to be on 100 % of the time.

Dimensions

G..B181.1E/..



Measurements in mm

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