

OpenAir™

VAV Compact Controller KNX / PL-Link

G..B181..KN



VAV Compact Controller 5 / 10 Nm with KNX communication

- GDB181..KN with 5 Nm nominal torque
- GLB181..KN with 10 Nm nominal torque
- Operating voltage AC 24 V
- KNX S-Mode, LTE-Mode, and PL-Link
- For plants with variable or constant air-volume flow
- Actual values for volume flow, damper position and differential pressure
- Operating modes for volume flow control or position control

Type summary

| Product no. | Stock no. | Torque | Packaging unit | Operating voltage | Power consumption | Manual adjuster | Position feedback |
|--------------|-------------|--------|-----------------------|-------------------|--------------------------------------------|-----------------|-----------------------------|
| GDB181.1E/KN | S55499-D134 | 5 Nm | 1 Stk. | AC 24 V | 1 VA / 0,5 W 3 VA / 2,5 W ¹⁾ | Yes | True Position Potentiometer |
| GDB181.1EMKN | S55499-D505 | | 18 Stk. ²⁾ | | | | |
| GLB181.1E/KN | S55499-D134 | 10 Nm | 1 Stk. | | | | |
| GLB181.1EMKN | S55499-D263 | | 18 Stk. | | | | |

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

¹⁾ Actuator rotates

²⁾ Contains additional 18 pcs. ASK78.12 shaft adapters

Ordering (Example)

| Product no. | Stock no. | Description | Amount |
|--------------|-------------|----------------------------|--------|
| GDB181.1E/KN | S55499-D134 | VAV Compact Controller KNX | 1 |

Equipment combinations

| Product no. | Stock no. | Description | Doc. number / reference |
|-------------|-------------|---------------------------------------------|-------------------------|
| AST20 | S55499-D165 | Handheld tool for commissioning and service | A6V10631836 |
| AST22 | S55499-D373 | USB/PPS2 Interface Converter | A6V11236956 |
| ACS931 | Software | PC Software for OEMs | N5853 |
| ACS941 | Software | PC Software for Service | N5854 |

Software versions

VAV Compact Controllers series G and newer are designed for using ETS device profile v2.x, however ETS device profile v1.x is supported for backward compatibility reasons.

| Firmware / software version | Series E | Series F | Series G | Series H |
|-----------------------------|-------------------|-------------------|-----------|-----------|
| Production period | 10/2011 – 03/2014 | 03/2014 – 01/2017 | 01/2017 | 01/2020 |
| Bus module FW version | 4.16 | 4.18 | 4.24 | 4.25 |
| ETS device profile v1.x | supported | supported | supported | supported |
| ETS device profile v2.x | not supported | not supported | supported | supported |

Product documentation

| Title | Topic | Document ID |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------|
| VAV Compact Controllers KNX / PL-Link – Technical Basics | Detailed information about the VAV compact controllers with KNX / PL-Link communication | P3547 |
| Mounting Instruction VAV Compact Controllers KNX / PL-Link | Mounting / installation instruction for VAV compact controllers KNX / PL-Link 5 / 10 Nm | M3547 |

How to obtain documentation and product-related software

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

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

The ETS device profile can be downloaded at the following Internet address:

<http://siemens.com/hvac-td>

The ACS931 and ACS941 softwares can be downloaded at the following Internet address:

<https://support.industry.siemens.com>

Limitations

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

Safety

⚠ Caution

National safety regulations

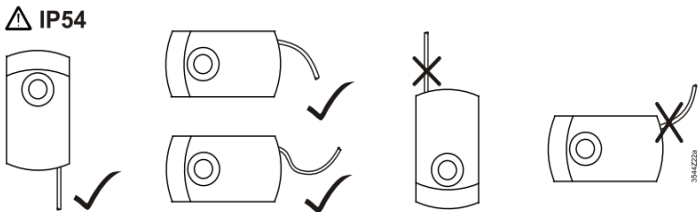
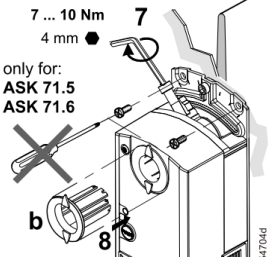
Failure to comply with national safety regulations may result in personal injury and property damage.

- Observe national provisions and comply with the appropriate safety regulations.

Mounting

- Do not open the damper actuators.
- Do not use the accessory mounting holes for fixation of the damper actuators.

Mounting positions

| IP54 protection in following mounting positions | Accessory mounting holes ¹⁾ |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>⚠ IP54</p> |  <p>7 ... 10 Nm 4 mm ● 7</p> <p>only for: ASK 71.5 ASK 71.6</p> <p>b 8</p> <p>Cf. mounting instr. M3547</p> |


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

Maintenance

The damper actuators are maintenance-free.

Disconnect the electrical connections from the terminals if you want to work at the device.

Disposal

| | |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>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.</p> <ul style="list-style-type: none"> • Dispose of the device through channels provided for this purpose. • Comply with all local and currently applicable laws and regulations. |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Push-button operation

| Activity | Push-button operation | Confirmation |
|---------------------------------------|-------------------------|------------------------------------------|
| Enter / leave addressing mode | Press button < 1s | LED turns red or turns off |
| Reset to factory settings | Press button > 20s | LED flashes orange until device restarts |
| PL-Link connection test ¹⁾ | Press key >2s and < 20s | LED flashes 1x orange |

¹⁾ Function or part of the function available in PL-Link operation only

LED colors and patterns

| Color | Pattern | Description |
|--------|----------|------------------------------------------------------------------------------------------------------------------------------|
| Off | --- | Fault free operation or device not powered |
| Green | steady | Connection test successful ¹⁾ |
| Orange | flashing | a) Factory reset in progress b) When a connection test was triggered: wait ¹⁾ |
| Red | steady | a) Device is in programming/addressing mode b) When a connection test was triggered: Connection test failed ¹⁾ |

¹⁾ Function or part of the function available in PL-Link operation only

Addressing and bus test with push button

The VAV compact controllers can be set into addressing/programming mode by push-button:

- Press push button (>0.1s and <1s)
- KNX bus wiring OK → LED turns red until addressing/programming is finished
- KNX bus wiring not OK → LED stays dark

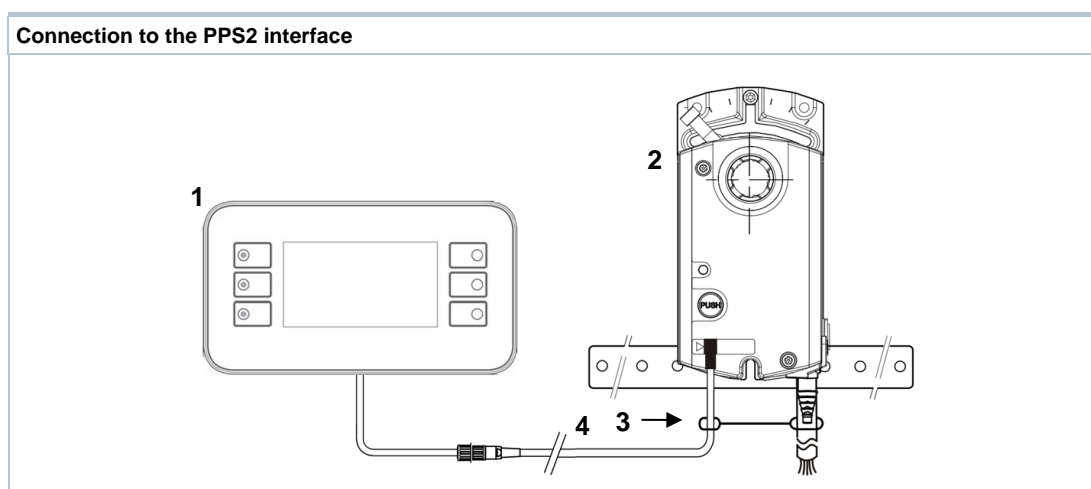
Reset with push button

The VAV compact controllers can be reset to the OEM default values by push-button:

- Press push button > 20s → LED flashes orange → Device restarts

PPS2 programming interface (with AST20 or AST22)

For OEM factory programming or commissioning / maintenance tasks directly at the VAV compact controller, a suitable tool (cf. equipment combinations) can be connected to the PPS2 interface.

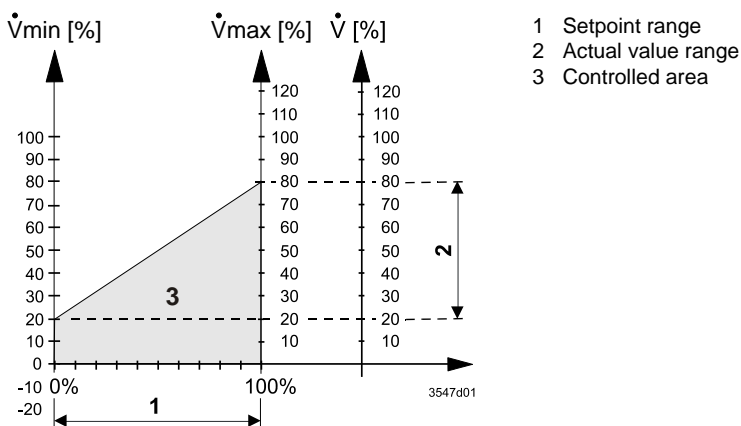


- 1 AST20 (or PC with ACS931 / ACS941 over AST22)
- 2 G..B181.1E.. or ASV181.1E/3
- 3 Strain release strip
- 4 Connection cable (7-pin)

Operating modes

Volume flow control (VAV or CAV)

Variable air volume (VAV) control: the operating point is determined by the setpoint value and the V_{min} / V_{max} settings (cf. diagram below). Constant air volume (CAV) control is achieved by sending a constant setpoint or by setting $V_{min} = V_{max}$.



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”.

Commissioning and parameterization

Parameterization of the VAV application

VAV application parameters are set by the OEM over the PPS2 interface (using ACS931 or AST20). Some of them can be adjusted during commissioning, operation, or maintenance and are accessible over a bus connection alternatively.

| Parameter | Range | Description | Factory settings |
|---------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Operating mode | VAV / POS | VAV: setpoint = volume flow 0...100% POS: setpoint = damper position 0...100% | VAV |
| Opening direction | CW (R) / CCW (L) | Opening direction of air damper | CW (R) |
| Adaptive positioning | Off / On | Adaption of actual (if mech. limited) opening range to position feedback 0...100% ¹⁾ Off = No adaption / On = Pos. adaption | Off |
| V_{min} | -20...100% | Minimum air volume flow, rel. to V_{nom} | 0 % |
| V_{max} | 20...120% | Maximum air volume flow, rel. to V_{nom} | 100 % |
| V_{nom} | 0...60'000 m ³ /h | Nominal air volume flow ²⁾ | 100 m ³ /h |
| Box coefficient (V_n) | 1...3.16 | VAV box characteristic value, defined by the OEM | 1.00 |
| Altitude / Elevation asl. | 0...5000m in 500m steps | Correction factor for diff. pressure sensor (select n*500m value closest to local altitude) | 500 m |

¹⁾ Adaptation must not be activated while a device jam is present

²⁾ Value used for displaying / not used for volume flow control loop

Parameterization of the KNX integration

KNX integration parameters are checked or set during engineering and commissioning in the ETS engineering tool.

| Parameter | Range | Description | Factory settings |
|--------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Tab card "standard" | | | |
| Operating mode | VAV / POS | VAV: setpoint = volume flow 0...100% POS: setpoint = damper position 0...100% | VAV |
| Adaptive positioning | On / Off | Adaption of actual (if mech. limited) opening range to position feedback 0...100% ¹⁾ Off = No adaption / On = Pos. adaption | Off |
| Altitude / Elevation asl. | 0...5000m in 500m steps | Correction factor for diff. pressure sensor (select n*500m value closest to local altitude) | 500 m |
| Backup timeout | 0..60 min 0 min = disabled | Time interval to detect communication interruption. If disabled, the actuator drives to the last received setpoint until a new setpoint is received. | 30 min. |
| Backup mode | Backup position Keep last position | Actuator behavior when the communication timeout has been exceeded (no setpoint received within the defined time interval). <ul style="list-style-type: none"> ▪ Backup position: Actuator drives to defined position ▪ Keep last position: Actuator keeps position without flow control | Backup position |
| Backup position | 0...100% | Position the damper drives to in case of communication interruption | 50% |
| Tab card "advanced" | | | |
| Hysteresis (COV) volume flow | 1...20% | Threshold for the relative volume flow. COV below this value are not sent over the bus. | 1% |
| Min. repetition time volume flow | 10...900 s | Minimum waiting time until a COV above the hysteresis threshold is sent over the bus | 10 s |
| Hysteresis (COV) damper position | 1...20% | Threshold for the damper position. COV below this value are not sent over the bus | 1% |
| Min. repetition time damper position | 10...900 s | Minimum waiting time until a COV above the hysteresis threshold is sent over the bus | 10 s |
| Override position 1 ²⁾ | 0...100% | Damper position which can be triggered by the corresponding group object | 0% |
| Override position 2 ²⁾ | 0...100% | Damper position which can be triggered by the corresponding group object | 100% |
| Write Vnom | On / Off | If active, the group object for Vnom is writable (OEM parameter protection applies), otherwise it is read-only. | Off |
| Write Opening Direction | On / Off | If active, the group object for the opening direction is writable (OEM parameter protection applies), otherwise it is read-only. | Off |

¹⁾Adaptation must not be activated while a device jam is present

²⁾Override position 1 has priority over Override position 2

Group Objects Table

| Nr. | Name in ETS | Object function | Flags | | | | | Data point type KNX | | | Unit | Range |
|-----|------------------------------------|-----------------|-------|---|---|---|---|---------------------|-----------------|---------|-------------------|--------------------------------------|
| | | | C | R | W | T | U | ID | DPT_Name | Format | | |
| 1 | Fault information | Transmit | 1 | 1 | 0 | 1 | 0 | 219.001 | _AlarmInfo | 6 Byte | --- | cf. Description next page |
| 2 | Fault state | Transmit | 1 | 1 | 0 | 1 | 0 | 1.005 | _Alarm | 1 bit | --- | 0 = No alarm 1 = Alarm |
| 3 | Fault transmission | Receive | 1 | 0 | 1 | 0 | 1 | 1.003 | _Enable | 1 bit | --- | 0 = Disable 1 = Enable |
| 4 | Setpoint | Receive | 1 | 1 | 1 | 0 | 1 | 5.001 | _Scaling | 1 Byte | % | 0...100% |
| 5 | Damper position | Transmit | 1 | 1 | 0 | 1 | 0 | 5.001 | _Scaling | 1 Byte | % | 0...100% |
| 6 | Volume flow relative ¹⁾ | Transmit | 1 | 1 | 0 | 1 | 0 | 5.001 | _Scaling | 1 Byte | % | 0...100% |
| | | Transmit | 1 | 1 | 0 | 1 | 0 | 8.010 | _Percent_V16 | 2 Bytes | % | -327.68...327.67% |
| | | Transmit | 1 | 1 | 0 | 1 | 0 | 5.004 | _Percent_U8 | 1 Byte | % | 0...255% |
| 7 | Volume flow absolute ¹⁾ | Transmit | 1 | 1 | 0 | 1 | 0 | 9.009 | _Value_Airflow | 2 Bytes | m ³ /h | -670 760...670 760 m ³ /h |
| | | Transmit | 1 | 1 | 0 | 1 | 0 | 14.077 | _Volume_Flux | 4 Bytes | m ³ /s | 0...(2 ³² -1) |
| 8 | Fault | Transmit | 1 | 1 | 0 | 1 | 0 | 1.005 | _Alarm | 1 bit | --- | 0 = No alarm 1 = Alarm |
| 9 | Overridden | Transmit | 1 | 1 | 0 | 1 | 0 | 1.002 | _Bool | 1 bit | --- | 0 = False 1 = True |
| 10 | Override position 1 | Receive | 1 | 1 | 1 | 0 | 1 | 1.003 | _Enable | 1 bit | --- | 0 = Disable 1 = Enable |
| 11 | Override position 2 | Receive | 1 | 1 | 1 | 0 | 1 | 1.003 | _Enable | 1 bit | --- | 0 = Disable 1 = Enable |
| 12 | Balancing mode | Receive | 1 | 1 | 1 | 0 | 0 | 1.003 | _Enable | 1 bit | --- | 0 = Disable 1 = Enable |
| 13 | Vmin | Receive | 1 | 1 | 1 | 0 | 1 | 8.010 | _Percent_V16 | 2 Bytes | % | -327.68...327.67% |
| 14 | Vmax | Receive | 1 | 1 | 1 | 0 | 1 | 8.010 | _Percent_V16 | 2 Bytes | % | -327.68...327.67% |
| 15 | Vnom | Read-only | 1 | 1 | 0 | 0 | 0 | 9.009 | _Value_Airflow | 2 Bytes | m ³ /h | -670 760...670 760 m ³ /h |
| 16 | Opening direction | Read-only | 1 | 1 | 0 | 0 | 0 | 1.012 | _Invert | 1 bit | --- | 0 = Not Inverted 1 = Inv. |
| 17 | Diff. pressure ¹⁾ | Read-only | 1 | 1 | 0 | 0 | 0 | 9.006 | _Value_Pres | 2 Bytes | Pa | 0...670 760 Pa |
| | | Read-only | 1 | 1 | 0 | 0 | 0 | 14.058 | _Value_Pressure | 4 Bytes | Pa | 0...(2 ³² -1) |
| 18 | Coefficient | Read-only | 1 | 1 | 0 | 0 | 0 | 14.* | 4-Byte Float | 4 Bytes | --- | 0...3.16 |
| 19 | OEM-Reset | Receive | 1 | 0 | 1 | 0 | 0 | 1.017 | _Trigger | 1 bit | --- | 0, 1 = Trigger |

¹⁾ For some group objects, alternative data point types (DPT) can be selected in ETS. The first entry indicates the default setting.

Group Objects Description

- 1 Fault information If group object #3 "fault transmission" is set to "on", the following faults can be transmitted if they occur. In that case, group object #2 value changes to "alarm".

| Error | Group obj. #1 | Description | Resolution |
|--------------------------------|-------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device jammed | XX 00 0A 03 0C 05 | Target position can't be reached due to blockage. | Remove blockage (visual inspection required) or invert Opening direction if it is set wrongly. When done, switch on adaptive positioning if mechanical limits are intended. |
| Backup mode entered | XX 01 01 02 0C 05 | Actuator is in backup mode (cf. respective parameter setting) | Actuator leaves Backup mode when receiving a setpoint. |
| Pressure sensor tubes inverted | XX 01 0A 01 0C 05 | Pressure sensor measures the lower pressure on the input marked with "+". | Correct the tubes connection |
| Pressure sensor malfunction | XX 01 0A 01 0C 05 | Malfunction of internal communication to dp sensor (200 ms timeout) | 1) Check tubes connection, or 2) reboot device, or 3) replace device |
| Operating hours notification | XX 01 0A 04 0C 05 | Appears after a cumulated motor running time of 365 days | Check device status and control loop sensitivity |

- 2 Fault state Indicates whether the actuator is in fault state. If yes, read out group object #1.
- 3 Fault transmission Enabling/ disabling the fault transmission. Fault transmission is disabled by default; therefore, no faults are transmitted from the actuator over the KNX bus.
- 4 Setpoint Setpoint 0...100% for volume flow or position, depending on the operating mode.
- 5 Damper position Relative damper position 0...100%. An opening range less than 0...90° can be normalized to 0...100% if adaptive positioning is set to "on".
- 6 Volume flow relative Volume flow relative to the settings of Vnom, Vmin, and Vmax.
- 7 Volume flow absolute Volume flow in m³/h or m³/s depending on the selected data type.
- 8 Fault Same function as group object #2 (available for compatibility reasons).
- 9 Overridden Indicates whether the VAV controller is in override control either by a programming tool connected to the HMI or by objects #10 / #11.
- 10 Override position 1 When the object is triggered, the actuator drives to the override position 1 defined by the respective ETS parameter.
- 11 Override position 2 When the object is triggered, the actuator drives to the override position 2 defined by the respective ETS parameter.
- 12 Balancing mode When the object is triggered, the actuator drives to Vmax for air balancing purposes.
- 13 Vmin Minimum air volume flow relative to Vnom.
- 14 Vmax Maximum air volume flow relative to Vnom.
- 15 Vnom Nominal air volume flow (absolute).
- 16 Opening direction Opening direction of the air damper.
- 17 Diff. pressure Actual value of the differential pressure over the VAV box measuring cross.
- 18 Coefficient VAV box characteristic value to map a nominal differential pressure to the corresponding nominal volume flow.
- 19 OEM-Reset Resets all parameters to the value specified by the OEM.

Technical data

| Power supply | | |
|---------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------|
| Operating voltage | G..B181.1E.. | AC 24 V \pm 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) 125 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° \pm 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 | 2 x 0.75 mm ² |
| Service interface | Terminal strip | 7-pin, grid 2.00 mm |
| Communication | | |
| Communication protocol | Connection type | KNX-TP (galvanically isolated) |
| | Bus load | 5 mA |
| 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 | EN60730-x | |
| Electromagnetic compatibility (Application) | For residential, commercial and industrial environments | |
| | GDB181.1E/KN | GLB181.1E/KN |
| EU Conformity (CE) | A5W00003842 ¹⁾ | A5W00000176 ¹⁾ |
| Uk Conformity (UKCA) | A5W00198029A ¹⁾ | A5W00198019A ¹⁾ |
| RCM Conformity | A5W00003843 ¹⁾ | A5W00000177 ¹⁾ |
| UL, cUL | AC 24 V | 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 |

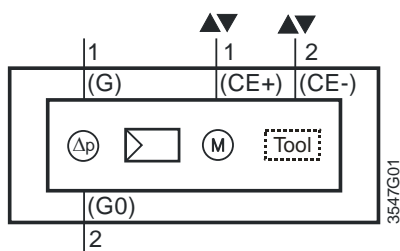
¹⁾ The documents can be downloaded from <http://siemens.com/bt/download>

Diagrams

Internal diagrams

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

G..B181..KN



Tool = Configuration and maintenance interface
(Series E and later: 7-pin connector)

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 / green sheathing | | | |
| 1 | red (RD) | CE+ | KNX CE+ |
| 2 | black (BK) | CE- | KNX CE+ |

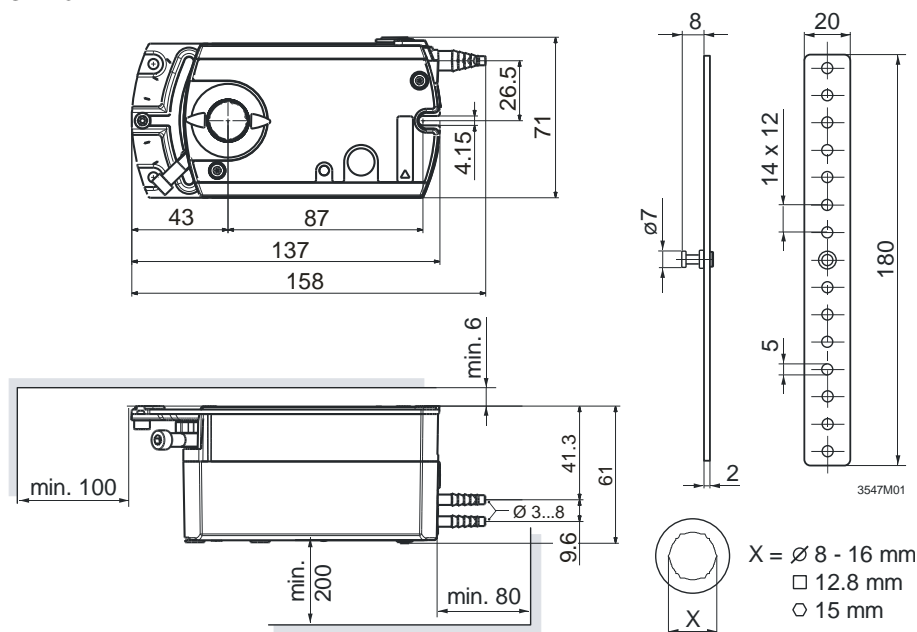
Note

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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