

OpenAir™

VAV Compact Controller KNX / PL-Link

G..B181.1E/KN



VAV Compact Controller 5 / 10 Nm with KNX communication

- GDB181.1E/KN with 5 Nm nominal torque
- GLB181.1E/KN with 10 Nm nominal torque
- Operating voltage AC 24 V
- Supports KNX S-Mode, LTE-Mode, and PL-Link
- For plants with variable or constant air-volume flow

Functions

| Function | Description |
|----------------------|--|
| Communication | <ul style="list-style-type: none"> - KNX-TP, galvanically separated - Max. 256 nodes per line (with repeaters) - Busload 5 mA |
| Functions | <ul style="list-style-type: none"> - Setpoint 0..100% - Actual values for volume flow, damper position and differential pressure - Operating modes for volume flow control or position control - Override control with binary communication objects - Setpoint monitoring and backup mode |

For a detailed description of specific functions please refer to the product documentation P3547.

Type summary

| Product no. | Stock no. | Operating voltage | Positioning signal | Power consumption | Positioning time | Manual adjuster | Position feedback |
|---------------------|-------------|-------------------|--------------------|----------------------------|------------------|-----------------|-------------------|
| GDB181.1E/KN | S55499-D134 | AC 24 V | KNX-TP | 1 VA / 0,5 W | 150 s | Yes | Yes |
| GLB181.1E/KN | S55499-D135 | | | 3 VA / 2,5 W ¹⁾ | | | |

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

¹⁾ Actuator rotates

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. type | Doc. number |
|-------------|-------------|---|------------------|-------------|
| AST20 | S55499-D165 | Handheld tool for commissioning and service | Datasheet | A6V10631836 |
| | | | Operating manual | A6V10555077 |
| ACS931 | | PC Software for OEMs | Datasheet | N5853 |
| ACS941 | | PC Software for Service | Datasheet | N5852 |

Software versions

VAV Compact Controllers series G 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 |
|-----------------------------|-------------------|-------------------|-----------|
| Production period | 10/2011 – 03/2014 | 03/2014 – 01/2017 | 01/2017 |
| Bus module FW version | 4.16 | 4.18 | 4.24 |
| ETS device profile v1.x | supported | supported | supported |
| ETS device profile v2.x | not supported | not supported | supported |

| 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>

HMI (Human-Machine Interface)

For more detailed explanations on device states, functions, and error display please refer to the product documentation P3547.

Push-button operation

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

LED colors and patterns

| Color | Pattern | Description |
|--------|----------|--|
| Off | --- | Fault free operation or device not powered |
| Green | steady | Connection test successful ²⁾ |
| Orange | flashing | a) Factory reset in progress b) When a connection test was triggered: wait ²⁾ |
| Red | steady | c) Device is in programming/addressing mode d) When a connection test was triggered: Connection test failed ²⁾ |

²⁾ 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 by push-button:

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

All parameters which can be set by the OEM are reset to the OEM default values.

Parameterization of the VAV application

The OEM generally provides the basic configuration to VAV compact controllers, especially the parameters for nominal flow (V_{nom}), the opening direction, and the box coefficient (V_n). The setting of all other parameters depends on the actual application and is usually defined by the ventilation planner or the systems integrator.

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 |
| Vmin | -20... 100% | Minimum air volume flow | 0 % |
| Vmax | 20... 120% | Maximum air volume flow | 100 % |
| Vnom | 0...60'000 m ³ /h | Nominal air volume flow ³⁾ | 100 m ³ /h |
| Box coefficient (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 |

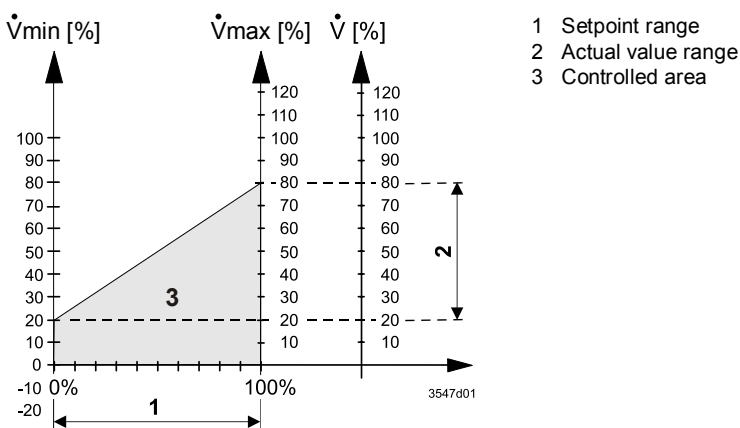
Please refer to technical basics **P3547** for more explanation.

³⁾ Value used for displaying / not used for volume flow control loop

Operating mode “Volume flow control”

Variable air volume (VAV) control

The operating point is determined by the setpoint value and the Vmin / Vmax settings.



Constant air volume (CAV) control

A constant air volume flow can be achieved by sending a constant setpoint value or by setting $V_{min} = V_{max}$.

Operating mode “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”.

Parameterization of the KNX bus integration

The following parameters are usually checked and set by the systems integrator to achieve the right level of bus traffic generated by the actuator or to define the behavior in case of communication interruption. Parameters in the group “advanced” can be left unchanged unless a special configuration is required.

Parameter group “Standard”:

| Parameter | Range | Description | Factory setting |
|----------------|---------------------------------------|--|-----------------|
| Backup timeout | 0..60 min 0 min = disabled | Time interval to detect communication interruption. If disabled, the VAV Compact Controller controls to the last received volume flow setpoint until a new setpoint is received. | 30 min. |
| Backup mode | Backup position Keep last position | VAV Compact Controller 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 value | 0..100% | Position the damper drives to in case of communication interruption | 50% |

Parameter group “Advanced”:

| Parameter | Range | Description | Factory setting |
|---|-----------|--|-----------------|
| Hysteresis (COV) ⁶⁾ 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 | 0..100% | Damper position to which the actuator drives if the associated group object is triggered (override priority) | 0% |
| Override position 2 | 0..100% | Damper position to which the actuator drives if the associated group object is triggered (override priority) | 100% |

⁶⁾ COV = Change of value

Safety

⚠ Caution**National safety regulations**

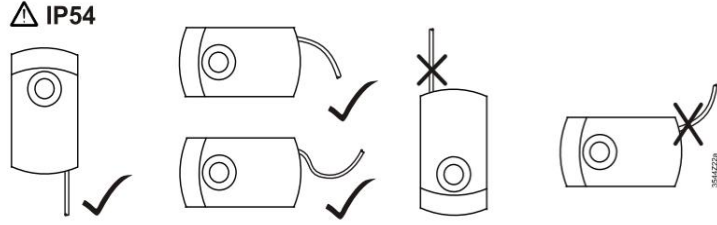
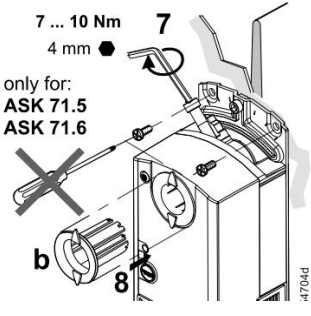
Failure to comply with national safety regulations may result in personal injury and property damage.

- 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 ⁷⁾ |
|---|--|
|  <p>⚠ IP54</p> |  <p>7 ... 10 Nm 4 mm</p> <p>only for: ASK 71.5 ASK 71.6</p> <p>Cf. mounting instr. M3547</p> |


⚠ ⁷⁾ 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 an electronics device for disposal in terms of European Directive 2012/19/EU 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. |
|---|--|

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.

KNX Group Objects

| Nr. | Name in ETS | Object function | Flags | | | | | Data point type KNX | | | | Range |
|-----|------------------------------------|-----------------|-------|---|---|---|---|---------------------|-----------------|---------|-------------------|---|
| | | | C | R | W | T | U | ID | DPT_Name | Format | Unit | |
| 1 | Fault information | Transmit | 1 | 1 | 0 | 1 | 0 | 219.001 | _AlarmInfo | 6 Byte | --- | [0...255] = Log Nr. [0...2] = Alarm priority [0...14] = Application area [0...4] = Error class [0...7] = Attributes [0...7] = Alarm status |
| 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 ⁵⁾ | 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 ⁵⁾ | 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 ⁵⁾ | Receive | 1 | 1 | 1 | 0 | 1 | 8.010 | _Percent_V16 | 2 Bytes | % | -327.68..327.67% |
| 14 | Vmax ⁵⁾ | 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 = Inverted |
| 17 | Diff. pressure ⁶⁾ | 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 |

⁵⁾ For technical reasons, values for Vmin / Vmax need to be entered with two trailing "0" in ETS5, i.e. to get Vmin = 5%, enter "500%" in ETS5. The same applies for read-back values.

⁶⁾ For some group objects, alternative data point types (DPT) can be selected in ETS. The first entry indicates the default setting.

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 (el. 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 |
| EU Conformity (CE) | | GDB181.1E/KN |
| | | GLB181.1E/KN |
| RCM Conformity | | A5W00003842 ¹⁾ A5W00000176 ¹⁾ |
| UL, cUL | AC 24 V | 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 |

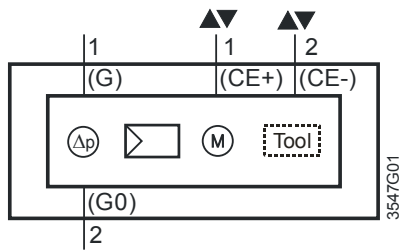
| Differential pressure sensor | | |
|---|---------------------------------------|-------------------------------|
| | Connection tubes (Interior diameter) | 3...8 mm |
| | Measuring range | 0...500 Pa |
| | Operating range | 0...300 Pa |
| Precision at 23 °C, 966 mbar and optional mounting position | 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. All interconnected devices must be connected to the same G0.

G..B181.1E/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+ |

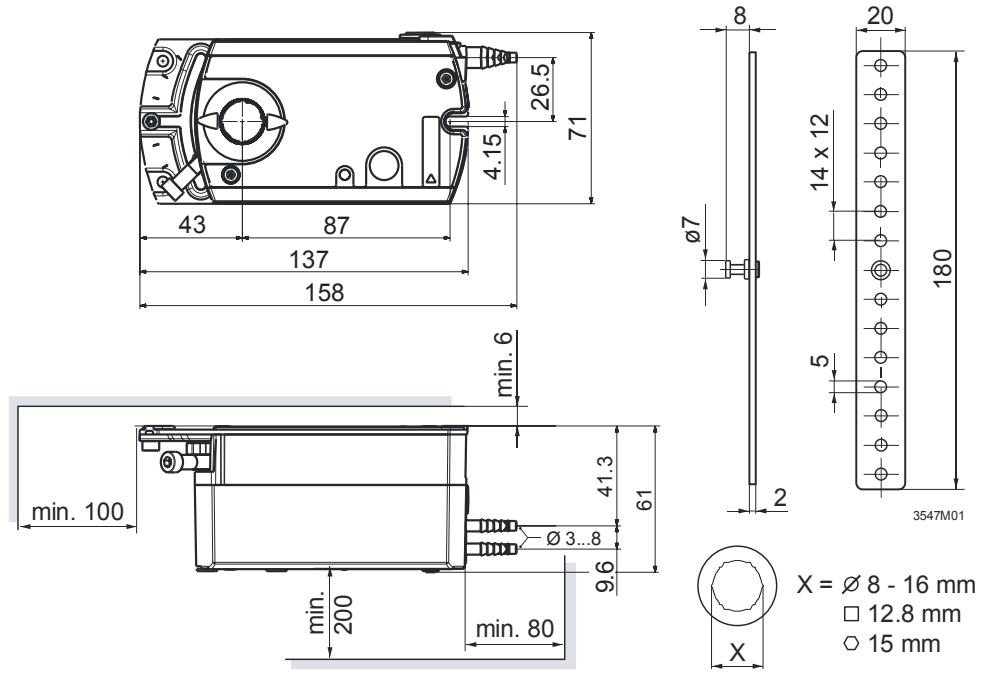
Note

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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