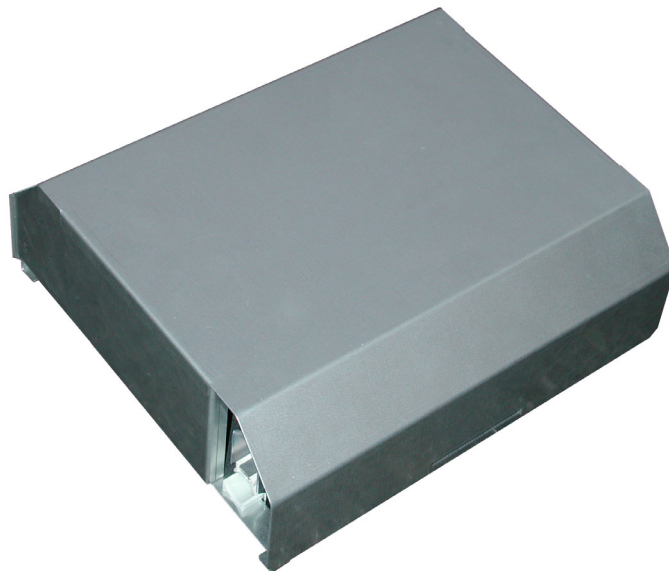




Room Group Controller GC10



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Room Group Controller GC10

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Room Group Controller GC10

Description

Product description

The group controller GC10 balances the setpoint values for the laboratory room air regulation (room supply air and room return air) decentralised and independently. This is done taking into account the requirements of the room air exchange rate according to DIN 1946, Part 7, which are freely parameterizable. The room negative pressure (of laboratories) or room positive pressure (of clean rooms) can be set, relative to the room return air or using a fixed offset (e.g. 300 m³/h).

The room negative pressure is determined by the following formula:

Room supply air = room return air * 0.9	Room negative pressure = 10%
Room supply air = room return air - 300	Offset = 300 m ³ /h

The room positive pressure is calculated by the following formula:

Room supply air = room	Room positive pressure = 10%
Room supply air = room return air + 300	Offset = 300 m ³ /h

With sufficient continued flow or overflow (e.g. on doors), an evaluation of the room supply air/room return air ratio in percent by calculation must be preferred to a fixed offset. To compensate for possible measuring imprecisions in the overall system of about 10% (e.g. low inflow and outflow distances), the ratio in percent should be about 10 ... 15%.

For airtight rooms, i.e., with insufficient continued flow or overflow, a fixed offset must be added (room positive pressure) or subtracted (room negative pressure).

For maintenance, service, retrofitting, etc., inspection openings in sufficient number and size must be provided on-site.

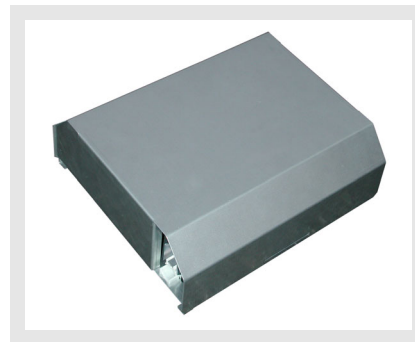
Room balancing in laboratories

The volumetric flows in laboratories dependent on demand change very rapidly (< 2 s) and must be adjusted in the room supply air and room return air at sufficient control speed. A prescribed room negative pressure and room positive pressure in the laboratory must be maintained reliably and unambiguously at any time. The SCHAKO group controller GC10 balances up to 10 connected consumers with respect to each of the actual values of the return air volumetric flow and calculates the sum and difference to a specified value. These setpoint values serve as default for the variable volumetric flow controllers VAV-A from SCHAKO, which control the required volumetric flow for the room supply air (sum) and the additional room return air (difference).

LON network

A LON network is possible as an option by means of the FTT-10A field bus module. It allows a low-cost connection room-by-room to a manufacturer-independent BCS. Each room takes up only one node of the LON network. The GC10 performs the router function for the laboratory room in question. This substantially reduces the number of required routers in a project.

Via the LON network, the GC10 can now perform the functions of a DDC substation. Added-up room balances (room supply air/room return air) are available at the BCS as Standard Network Variable Type (SNVT).



Building control system

The building control system can be integrated into the LON network at any point. Fault messages, day/night switchover room-by-room and actual values of the room supply and room return air are available via SNVTs.

Performance features

- Microprocessor-controlled monitoring system
- 10 analog inputs (return air actual values of the digesters / consumers) are added up and assigned to or more analog outputs (max. 4).
- Group formations are freely programmable. Any inputs (x) out of 10 (x = 1 to 10) can be assigned to any outputs (y) out of 4 (y = 1 to 4). Thus, a GC10 allows a maximum of 4 laboratory rooms to be controlled in terms of room ventilation (room supply air) if the total number of laboratory fume hoods is ≤ 10.
- Balancing the setpoint values for room supply air and an additional room return air (difference amount, relative to the freely programmable room air exchange rate)
- Decentralised independent balancing eases the stress on the building control system (BCS)
- 4 digital inputs for switchable consumers, room control panel (cancelling night operation), etc.
- 2 relay outputs for day/night switchover of the digesters and room collective fault message
- Optional extension to another 10 digital inputs for connecting individual fault messages of the digesters
- Optional internal transformer for 230V AC power supply and for reserving a 24 V power supply.
AC for a maximum of 4 connected VAV-A (variable volumetric flow controllers)
- Power failure proof saving of all system data in EEPROM
- Router functionality for laboratory room via LON300 field bus module, transceiver FT-X1 (FTT-10A)
- Inputs and outputs are freely programmable via the LON network and the added-up room balance and analog inputs Ain1 . Ain10 can be retrieved.

Room Group Controller GC10

Functional description

Room air control with room air group controller and I/O connection to the BCS

Room diagram 1 shows the wiring of up to 10 laboratory fume hoods (Ain1 to Ain10) by means of the group controller GC10. The group controller can drive up to four freely configurable volumetric flow controllers for room supply air/room return air (Aout1 to Aout4). The internal transformer (optional) provides the supply voltage 24V AC for a maximum of four volumetric flow controllers (VAV-A), simplifying planning and making this model more economical.

The analog inputs Ain1 to Ain10 are added up, allowing them to be combined to any groups assigned to analog outputs Aout1 to Aout4. Thus, any configurations become possible. Thus, for example, up to four laboratory rooms can be controlled by means of one room air volumetric flow controller each, and a maximum of 10 laboratory fume hoods can be controlled independently. As shown in room diagram 1, in addition to the room supply air, an additional room return air can also be configured.

In this case, the connection to the building control system (BCS) is performed in parallel via the input/output interface (optocoupler and relay). This can be effected easily by means of the optional additional terminal rows. The collective fault message is formed by series connection of the individual fault message contacts, and the day/night switchover is done in parallel to the input optocouplers of the individual laboratory fume hood controls.

This functionality requires at least one IY(St)Y 2x2x0.8 cable. If the optional room control unit RBG100 is also to be connected for cancelling night operation room-by-room, another 3x2x0.8 cable is required. This allows the functions day light, night light and Cancel night operation key to be implemented. When Cancel night operation for example for one night is requested, the BCS/DDC switches to day operation, which allows safe working (air exchange rate of 8) at the laboratory even at night.

For each function to be implemented, the BCS/DDC must reserve one digital input/output each.

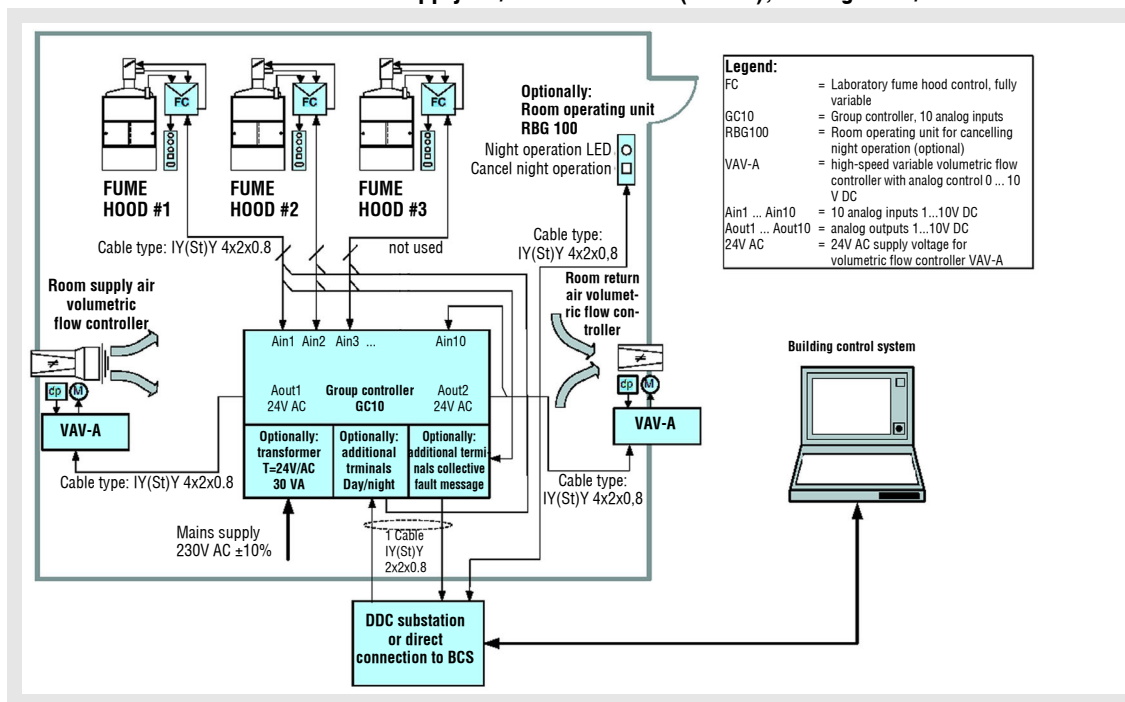
Table 1 illustrates the relationship between the function and the digital input/output of the controlling BCS/DDC.

Table 1:

Function	BCS/DDC digital input/output
Room collective fault message	Input
Day / night switchover room-by-room	Output
RBG 100: day light	Output
RBG 100: night light	Output
RBG 100: Cancel night operation key	Input

Room diagram 1

Room group controller GC10 with laboratory fume hood control FC500 and volumetric flow controller for room supply air/room return air (VAV-A), analog and I/O connection to the BCS



Room Group Controller GC10

Room air control with room air group controller and LON connection to the BCS

Room diagram 2 shows the wiring of up to 10 laboratory fume hoods (Ain1 to Ain10) by means of the group controller GC10. The group controller can drive up to four freely configurable volumetric flow controllers for room supply air/room return air (Aout1 to Aout4). The internal transformer (optional) provides the supply voltage 24V AC for a maximum of four volumetric flow controllers, simplifying planning and making this model more economical.

The analog inputs Ain1 to Ain10 are added up, allowing them to be combined to any groups assigned to analog outputs Aout1 to Aout4. Thus, any configurations become possible. Thus, for example, up to four laboratory rooms can be controlled by means of one room air volumetric flow controller each, and a maximum of 10 laboratory fume hoods can be controlled independently. As shown in room diagram 2, in addition to the room supply air, an additional room return air can also be configured.

LON network

A low-cost connection to the manufacturer-independent building control system (BCS) can be effected via the LON network using the optional LON field bus module LON300 (FTT-10A).

By extending the digital fault message inputs (optional), all individual fault messages of the connected digesters can be detected and sent to the building control system (BCS) via the LON network.

Thus, the GC10 can now perform the functions of a DDC station or a router.

The data available at the BCS as Standard Network Variable Type (SNVT) include the following:

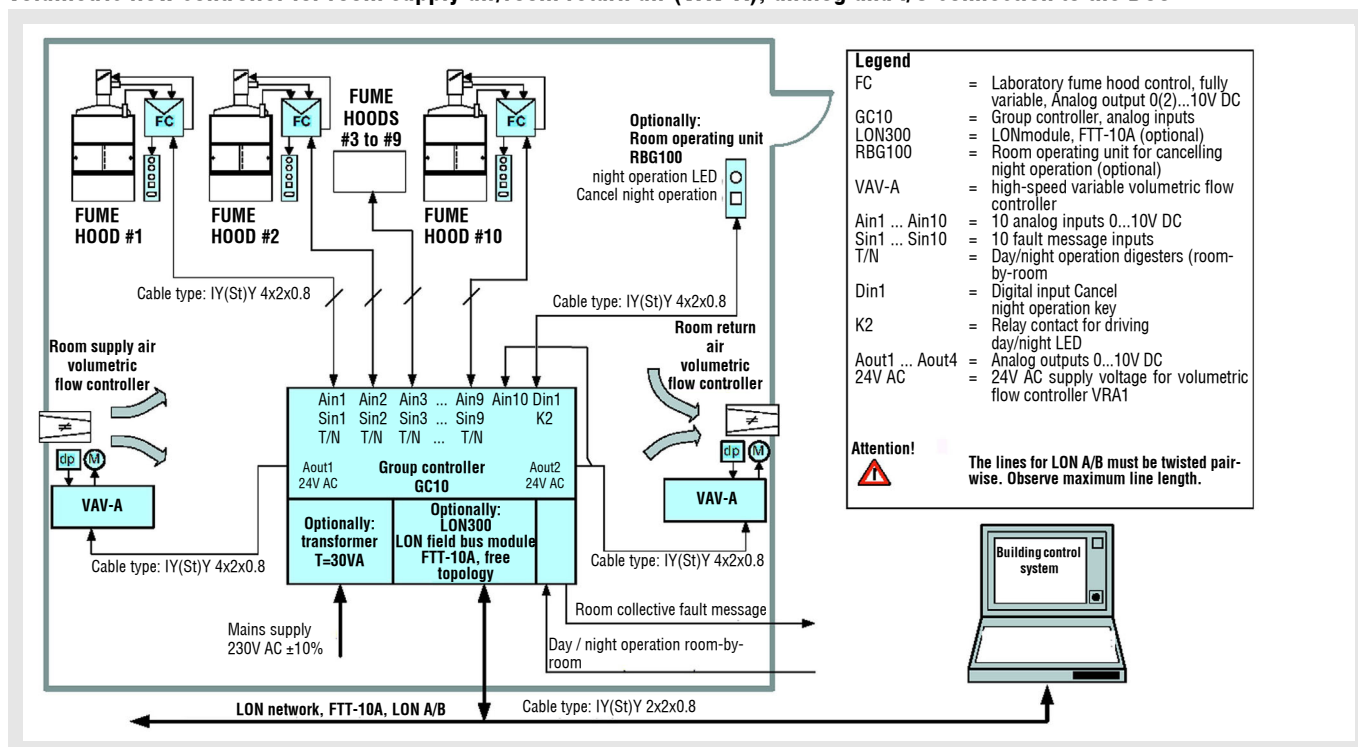
- Return air actual values of the digesters Ain1 .. Ain10 and other consumers
- Added-up room balances (room supply air/room return air)
- Individual fault messages of the laboratory fume hood controllers
- Day/night switchover of the laboratory fume hood controllers
- Control and data retrieval of the room operating unit

Extended functions such as remote maintenance can also be implemented. The day/night switchover and retrieval and comparison of the individual return air actual values makes it possible to check each laboratory fume hood for this function.

The room group controller GC10 combines the analog technology with the advantages of LON bus technology and offers a low-cost and safe room-by-room control and visualisation via the BCS.

Room diagram 2:

Room group controller GC10 with laboratory fume hood control FC500 and volumetric flow controller for room supply air/room return air (VAV-A), analog and I/O connection to the BCS



Room Group Controller GC10

Room air exchange rate

Laboratory rooms having several fume hoods and extractors require a complex room supply air and room return air control.

The room air exchange is defined in DIN 1946, Part 7, and is calculated by the following empirical formula:

$$25\text{m}^3/\text{h} \times \text{m}^2$$

25m^3 per hour of return air volumetric flow multiplied by the main useful area of the laboratory in m^2 .

This guarantees the room air exchange rate of 8 prescribed for day operation. For night operation, the reduced room air exchange rate of 4 is sufficient.

Apart from the room air exchange rate to DIN 1946, Part 7, the air volume balance, the protective pressure requirements (negative pressure in laboratories and positive pressure in clean rooms), the comfort criteria, temperature, humidity and air movement must also be observed.

High-speed volumetric flow controller

The high-speed variable return air control ($< 2\text{ s}$) via laboratory fume hoods requires a high-speed variable room supply air control ($< 3\text{ s}$).

The high-speed control times maintain the defined room negative pressure under all operating conditions.

This applies not only to the recovery of the return air volumetric flow by opening the laboratory fume hood front damper, but also to the

reduction of the return air volumetric flow by closing the front damper or by external switchover to the reduced-flow operation (night reduction).

Minimum room air exchange

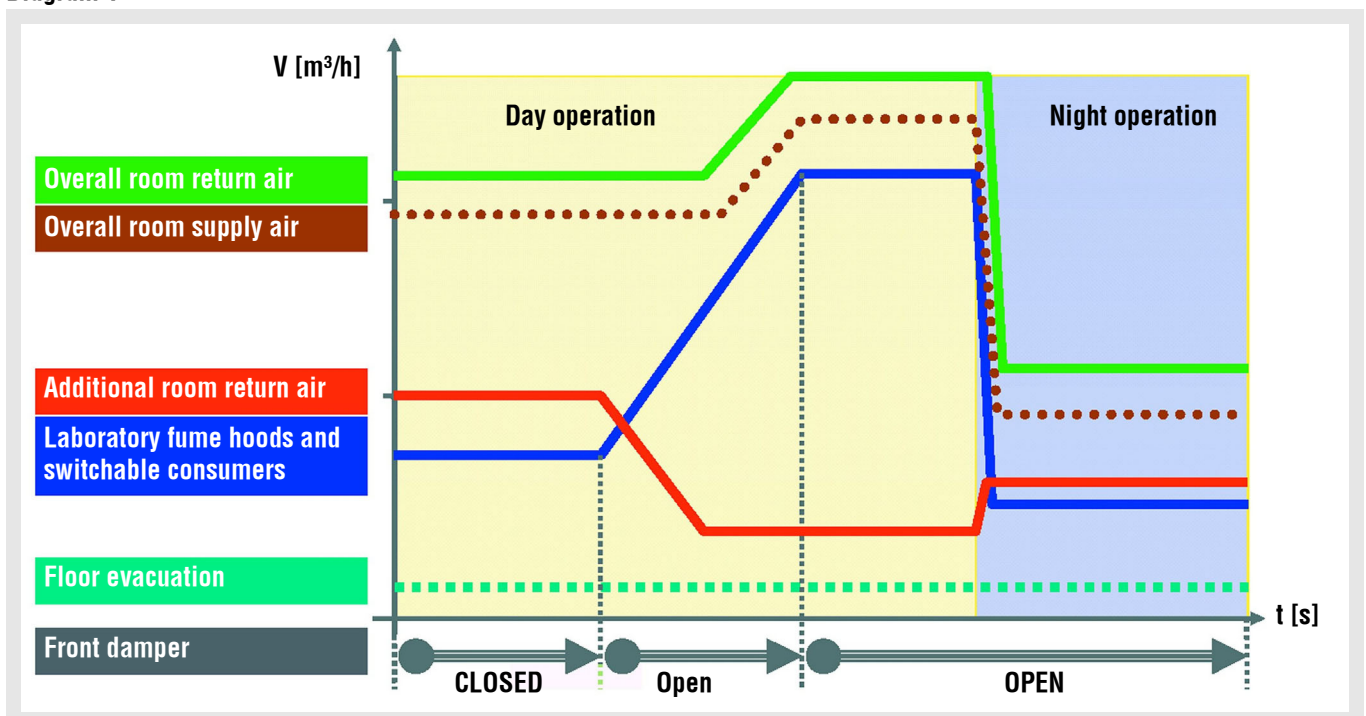
When a defined minimum room air exchange must be maintained, but this exchange cannot be achieved by the evacuation units alone (laboratory fume hoods and other consumers), an additional volumetric flow controller will be required for the room return air. The additional room return air controller will always regulate the difference between the return air of the evacuating units caused by the technical operation and the requested minimum return air volumetric flow via the group controller GC10.

The room supply air is supplied as a function of the room return air. The negative pressure of the room is achieved by supplying only about 90% (parameterizable) of the room return air to the laboratory room as supply air.

Diagram 1 shows the addition of the overall room return air, the additional supply of the overall room supply air, the increase in the return air of the laboratory fume hoods and switchable consumers, for example by opening the front dampers, and the decrease in the opposite direction of the additional room return air (difference to the minimum room air exchange). Thus, the minimum room air exchange is always kept constant and only increased when the return air demand of the laboratory fume hoods and the switchable consumers increases further.

During night operation, the room air is controlled to a fixed reduced value, independently of the front damper position of the laboratory fume hoods.

Diagram 1



Room Group Controller GC10

Room air control with room group controller

Room diagram 3 shows the wiring of up to 10 laboratory fume hoods (Ain1 to Ain10) by means of the group controller GC10. The group controller can drive up to four freely configurable volumetric flow controllers for room supply air/room return air (Aout 1 to Aout 4). The internal transformer (optional) provides the supply voltage 24V AC for a maximum of four volumetric flow controllers (VAV-A), simplifying planning and making this model more economical.

The analog inputs Ain1 to Ain10 are added up, allowing them to be combined to any groups assigned to analog outputs Aout1 to Aout4. Thus, any configurations become possible. Thus, for example, up to four laboratory rooms can be controlled by means of one room air volumetric flow controller each, and a maximum of 10 laboratory fume hoods can be controlled independently. As shown in room diagram 3, in addition to the room supply air, an additional room return air can also be configured.

As shown in room diagram 3, up to four laboratory rooms can be controlled by means of one room air volumetric flow controller each, and a maximum of 10 laboratory fume hoods can be controlled independently.

By extending the digital fault message inputs (optional), all individual fault messages of the connected digesters can be detected and sent to the building control system (BCS) via the LON network.

LON network

A low-cost connection to the manufacturer-independent building control system (BCS) can be effected via the optional extension using the LON field bus module LON300 (FTT-10A).

Thus, the room group controller GC10 can now perform the functions of a DDC substation or a router.

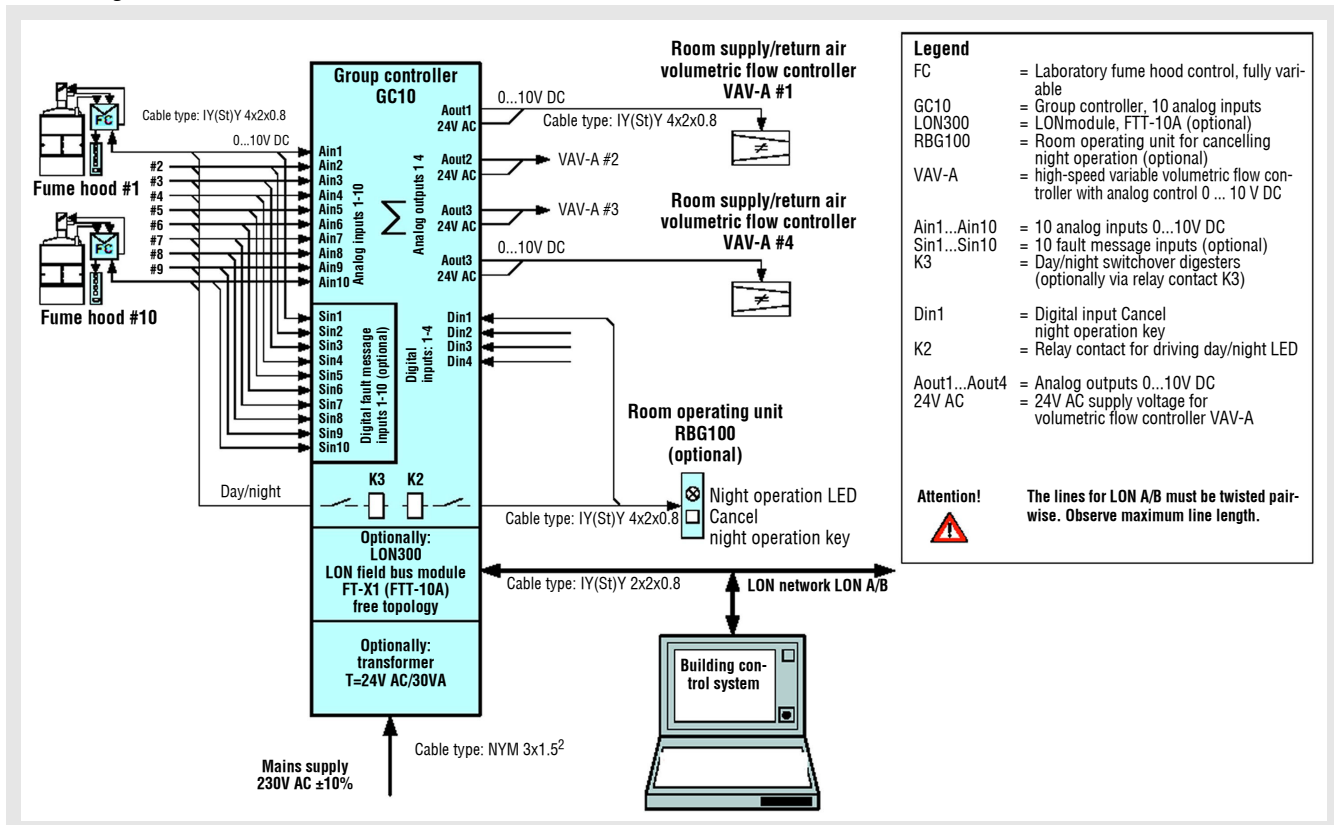
The data available at the BCS as Standard Network Variable Type (SNVT) include the following:

- Return air actual values of the digesters and other consumers
- Added-up room balances (room supply air/room return air)
- Individual fault messages of the laboratory fume hood controllers
- Day/night switchover of the laboratory fume hood controllers
- Control and data retrieval of the room operating unit

Extended functions such as remote maintenance can also be implemented. The day/night switchover and retrieval and comparison of the individual return air actual values makes it possible to check each laboratory fume hood for this function.

The room group controller GC10 combines the analog technology with the advantages of LON bus technology and offers a low-cost and control and visualisation room-by-room via the BCS.

Room diagram 3: Room air control



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Room group controller cascading

Room diagram 4 shows the wiring of up to 19 laboratory fume hoods (Ain1 to Ain9) by means of the group controller GC10#1 and (Ain1 to Ain10) by means of the group controller GC10#2. The analog output Aout1 of GC10#2 is connected to the analog input Ain10 of GC10#1. The internal transformer (optional) provides the supply voltage 24V AC for a maximum of four volumetric flow controllers, simplifying planning and making this model more economical.

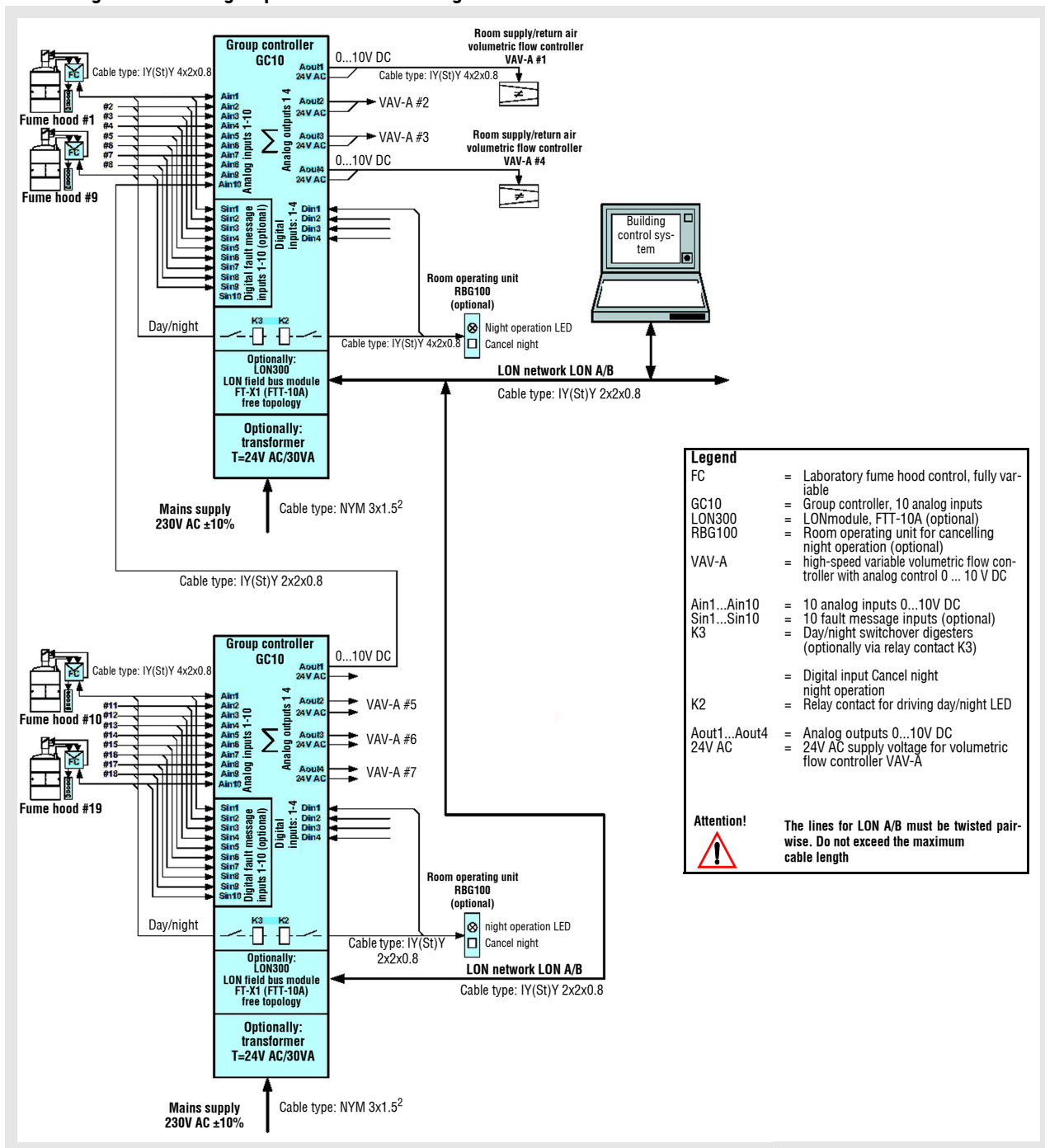
19 laboratory fume hoods distributed over 1 to 7 volumetric flow controllers (room supply air/return air). Cascading of additional group controllers increases the number of analog inputs by 9 and the number of analog outputs by three for each additional group controller GC10.

Any group formations can be parameterized.

When parameterized accordingly, the available configurations include the following:

The LON network guarantees the low-cost functionality of a DDC substation or a router.

Room diagram 4: Room group controller cascading



Room Group Controller GC10

Technical Data

◆ General	
Rated voltage	
Mains supply	230V AC/50/60Hz/+ -15%
Internal transformer	24V AC/30VA
Rated voltage external on-site supply	24V AC/50/60Hz/+ -15% 30VA (external fuse)
Current consumption	max. 1 A
Power consumption	max. 30 VA
Operating temperature	0 °C to +55 °C
Humidity	max. 80% relative, non-condensing

◆ Housing	
Protection type	IP 20
	Sheet steel
Colour	grey-white, RAL 9002
Dimensions (LxWxH)	(262 x 225 x 90) mm
Weight	approx. 2.8 kg
Device terminals	Screw terminal 1.5 mm ²

◆ Digital outputs	
Number	3 Relays (optional)
Contact type	Switchover contact
Switching voltage	max. 250V AC
Continuous current	max. 3A

◆ Digital inputs (galvanically separated)	
Number	4 optocouplers
Input voltage	max. 24V DC + -15%
Input current	max. 10 mA (per input)

◆ Analog inputs	
Return air actual values of digesters and switchable consumers	
Number	10
Voltage / current	0(2)...10V DC, 1mA
Extension	any, by cascading

◆ Analog outputs	
Setpoint values for volumetric flow controllers room supply air/return air)	
Number	4
Voltage / current	0(2)...10V DC, 5mA

◆ Extension of digital fault message inputs (option)	
Number	10 optocouplers
Input voltage	max. 24V DC + -15%
Input current	max. 10 mA (per input)

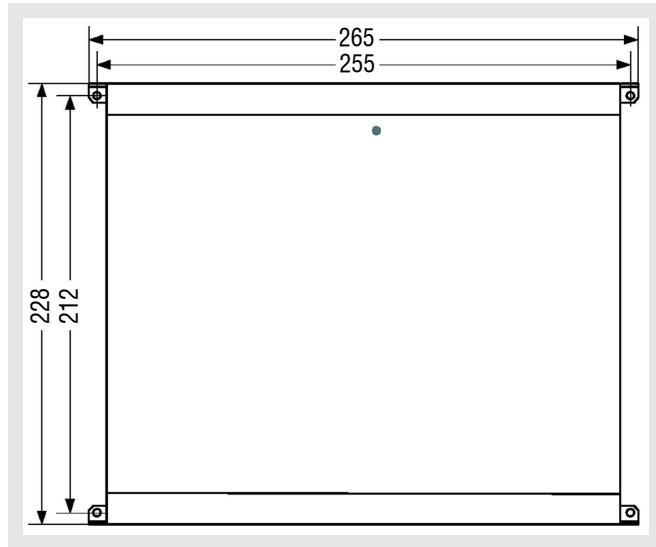
◆ Extension LOM300 -field bus module (option)	
	FT-X1 (FTT-10A), free topology
Network variable	Standard network variable Type (SNVT) to LONMark specification

Room Group Controller GC10

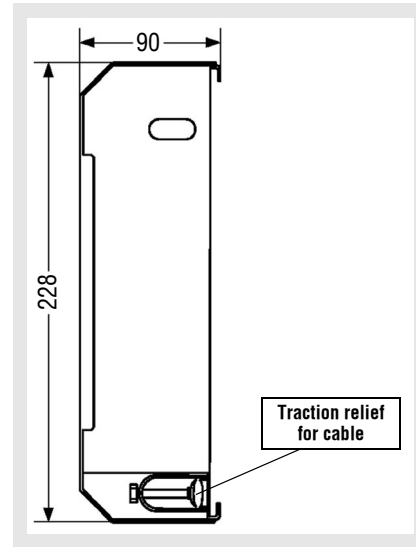
Dimensions

Housing GC10

Top view



Side view



Specification text

Room group controller GC10 for balancing room supply air (added-up) and room return air volumetric flows (difference for maintaining room air exchange rate) in laboratories. Balancing of 10 connected consumers. 4 analog outputs and 4 digital inputs optically decoupled. Extension by cascading 9 digital inputs and 3 analog outputs each für each additional room group controller GC10.

All inputs and outputs are freely parameterizable and can be adapted to existing room volumetric flow controllers and/or frequency converters.

Room group controller with integrated microprocessor and 2 independent watchdog circuits. Saving of all system data in mains failure proof EEPROM. Separate terminal board for clearly visible and quick connection of the cables. Suitable for all types of laboratory fume hoods.

Direct 230V AC mains supply for internal transformer for reserv-

ing the 24V AC/30 VA supply voltage for a maximum of 4 room air volumetric flow controllers. Parameterization via RS 232 interface using laptop or service module or, alternatively, via the LON network.

Optional extensions

Terminal rows can be retrofitted for room functions from/to the DDC.

Redundant room pressure monitoring

Monitors whether a parameterizable maximum room air volumetric flow has been exceeded by means of an optic and/or acoustic warning message (transparent signalling of the simultaneity factor).

LON networking via retrofittable LON module LON 300, including FTT-10A, free topology, Standard Network Variable Type (SNVT) with router functionality.