Product description

The multi-functional and user-programmable room management controller takes over the complete operating mode control and monitoring of a laboratory room.

RMC700 is the HMI (Human Machine Interface) between the laboratory personnel and the building management system (BMS). The plain text messages with custom graphic symbols (icons) and with multi coloured backlight allowing a clear and simple priority-driven allocation of the actual operating conditions.

A high level of ease of use, even in panic or stress situations is ensured by the intuitive and easy operation. Due to the free parameterization, each application will be easily adapted or modified on site. RMC700 is characterized by a very great flexibility, providing a secure investment. Changes in operation and specific interface requirements of building control systems are already implemented and can be easily retrieved.

By consistent utilization of the operation mode changing from working on non-working time (or day / night operation) RMC700 achieve considerable energy savings. The air consumption can be reduced directly and interactively by the laboratory personnel, depending on the operating state. Therefore the requirements of building control systems can be overridden or supported as required.

The internal relay outputs are configurable individually and serve as an interface to the building management system (mode requirement) or for direct control of the laboratory fume hood controller. The flexible network interface LON or Modbus are retrofittable via optional add-on boards and ensure an individual, efficient and cost-effective direct connection to the building management system (BMS).

Operating and fault messages, function assignment in plain text for the user-programmable buttons and display of actual values such as temperature, pressure, air volume flow and humidity are displayed on the graphical LC-display.

Versions

Different versions of up to five buttons with one key switch or max. six buttons without a key switch allows a flexible adaptation to customer-specific room management control.

All button functions, the key switch function, text messages and up to 10 colors for the back-lit graphical LC-display can be parameterized and stored fail-safe in the EEPROM.

Models

RMC700 can be installed easily in cable channels or as an in-wall version and is also in housing available. The supply voltage is 24V AC / DC.

Performance features

- Fast-performance microprocessor
- Suitable for all laboratories with different operating modes such as working or non-working time (day/night) in combination with laboratory fume hood controllers and air volume flow controllers
- Mute alarm of room group alarms and/or fault messages with own mute alarm button
- Built-in adjustable alarm buzzer 85dB
- Full graphic LCD (64x128 pixels) with 10 freely configurable back-lit colors for coloured backlighting of operations and/or error messages
- 6-line free text and/or icon-assignment with customized graphical symbols
- Prioritization of all fault and operating messages
- Three bright free programmable LEDs (green, yellow, red) with a luminous area of 2.25 cm², according to the rules of the BG Chemie BGI / GUV-I 850-0, well visible on the side
- All system and configuration data is stored fail safe in EEPROM
- Direct display of actual value such as temperature, pressure, humidity, air volume flow, etc. with optional analogue input board and appropriate sensors
- Free programming and functional mapping of all buttons, LEDs, relay outputs, digital inputs and graphical LC-display
- Three freely programmable relay outputs with changeover relay contact
- Three freely programmable digital inputs 24V DC, isolated
- Flexible network interface and connection to the building management system, LON, Modbus via optional add-on board, BACnet via Gateway
- Power supply 24V AC / DC

Function Description
Room management controller RMC700

All known room control functions, and operation control systems are already implemented in the multi-functional RMC700 and can be freely parameterized, depending on individual requirements. This allows to implement easily complex room control functions without additional costs.

The clear and straigthforward internal operating system, with the coloured backlight of the alarm, operating mode or fault message is in the foreground. This allows already a visual assignment for the displayed text message.

Graphical LC-display with coloured backlight

The colours for backlighting the entire display area are implemented in RGB mode. In addition to the primary colours red, green and blue also any mixing of all colours is possible such as yellow, white, gray, purple, etc. and is free programmable (RGB = 0 .. 100%).

By the colour mapping to the displayed text or the custom graphics the status and the priority of the alarm, fault or operating signal can already be recognised from a further distance to RMC700.

The RMC700 is a human-machine interface (HMI) between the laboratory personnel and the building management system that is so clearly and simple that it can be operated safely even in a panic situation. International standards IEC/EN 60073 (VDE 0199), IEC/EN 60204-1 (VDE 0113 Part 1) based on indicators on the familiar colours of light installations in road traffic and derive the colours of the controls of push buttons. The colours for the backlighting of the graphical LC-display, should be used as shown in table 1.

Color	Meaning	Comment
Red	dangerous condition	warning of potential danger
Yellow	abnormality condition	pending critical condition
Blue	action mandatory	action by personnel required
Green	safe status	indicates the safe operating condition
White	neutral	neutral display or confirmation

Table 1: Colour mapping of alarm, - fault and operating messages

Room operating mode and control mode
Digital, LON, Modbus

The room operating and control mode of the the multi-functional room management controller RMC700 is completely free programmable and can be configured either via LON or Modbus fieldbus or via the digital inputs/outputs from the building management system. Also, a local room operation without building management system is possible.

Room operating mode is essentially the operation du-ring working hours and the operating during non-working time (day/night mode). The following room operating modes are supported, depending on the configuration level:

■ Without building management system

The room operating mode can be set via contacts or via the internal bus system.

- ► All or specified fume hood controllers (FC500) will be switched in the specific room operating mode.
- ► Accumulative fault and operating messages are enabled and coloured backlight displayed on the graphical LC-display.
- ► Audible alarm with reset function is activated.
- ► LED status indicators are activated.
- ► Buttons and possibly key switches are activated.

The switch-over in the room operating mode can be made through the contact of a timer or completely manually.

All activated groups can be freely configured and functional mapped.

All state and actual values are available on the network (versions RMC700-L, RMC700-M) as the standard variables (SNVT) or objects. The LonMark specifications are compliant with the master list.

■ With building management system

The room operating mode can be provided via contacts, via the internal bus or LON or Modbus.

- ► All or specified fume hood controllers (FC500) will be switched in the specific room operating mode.
- ► Accumulative fault and operating messages are enabled and coloured backlight displayed on the graphical LC-display. Any messages are possible on the BMS.
- ► Audible alarm with reset function is activated.
- ► LED status indicators are activated.
- ► Buttons and possibly key switches are activated.

The switch-over in the room operating mode can be made via the building management system with local intervention.

All activated groups can be freely configured and functional assigned.

All state and actual values are available on the network (versions RMC700-L, RMC700-M) as the standard variables (SNVT) or objects. The LonMark specifications are compliant with the master list.

The multi-functionality of the RMC700 optimizes room conditions for the user in addition to energy saving and added comfort, safety and value.

Buttons and key switches

A key switch prevents effectively switching the room modes and the operation of the RMC700 by unauthorized persons.

The functional assignment to the key switch and the buttons are completely free configurable, allowing the flexible adaptation to customer-specific room management control.

The following versions are available:

- **with key switch**
  and 3 to 5 buttons
- **without Key Switch**
  and 3 to 6 buttons

LED status indicators

The three large bright status LEDs with a luminous area of 2.25 cm², according to the rules of the BG Chemie BGI/GUV-I 850-0 are well visible on the side.

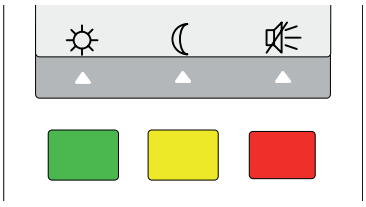


Figure 1: Status LED

The functional assignment and the flashing behavior or the duration of the green, yellow and red LEDs are also freely programmable, as the LED-text assignment on the LC-display.

Alerting and messages

The behavior of the acoustic alarm, with incoming and/or outgoing message or intermittent alarm or permanent alarm with manual confirmation or automatic reset after a predetermined time is also customized.

In addition to the text or graphic symbol (icon), the coloured backlight of the LCD display is freely programmable.

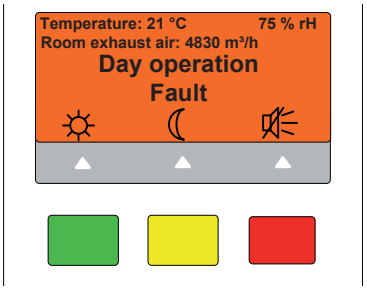


Figure 2: Fault message (example)

Relay outputs

The RMC700-motherboard contains 3 relays, each has a changeover contact 3A/24V AC/DC. The functional assignment of the relays occurs mainly via the buttons or key switch. But via the LON or Modbus network, the digital inputs or the top/bottom limit of the analogue input one or more relays can be assigned.

The relays can be configured with a turn-off delay time or wiper (monostable state).

Digital inputs

The 3 digital inputs are electrically isolated and the functionality as well as the input behavior can be configured completely free.

Beside the switch input (bistable) a push button input or a wiper contact input can be realized.

Analogue input and analogue output

The isolated analogue input is on an optional expansion board and is used for display of any actual value. The following actual value definitions can be realized:

- ▶ temperature in ° C or ° F
- ▶ relative humidity in %
- ▶ pressure in Pa
- ▶ air volume flow in m³/h or l/s

For alerting and reporting via a relay any upper or lower limit and an alarm delay can be defined in case of under- or overrun.

The analogue input signal is designed from 0 (2) ... 10V DC or 0 (4) ... 20mA.

An optional additional analogue extension board provide 2 more analogue inputs and 2 more analogue outputs, each electrically isolated.

Thus a total of up to 3 analogue values on the LC-display of the RMC700 can be displayed.

The 2 analogue outputs 0(2)...10V DC of the analogue extension board can be used as user-programmable digital setpoint setting for example to regulate temperature, humidity or pressure via a laboratory LCO500. Day operation and night operation each can have its own setpoint setting and can be parameterized, so that e.g. during the night operation a lowered temperature can be controlled.

This integrated mode of operation not only reduces the air volume flow but also the room temperature and the humidity as needed and energy efficient.

Serial interface

The serial interface is used to connect the laptop. The parameterization of the RMC700 is done via this interface.

Fieldbus

An additional interface board for connection to the building management system can be retrofitted. It can be a LON interface with FTT10-A transceiver or alternatively a Modbus with RS485.

A connection to BACnet can be implemented easily through a gateway.

General configurations

The general configuration and parameter settings are free and for reasons of clarity shown only briefly.

- display contrast
- serial number device
- Serial Number Software
- behavior of the RMC700 turning OFF and ON and during fault
- time delay for alarms
- status indicators
- operating hours
- display configuration

Operating voltage

The operating voltage is 24V AC/DC on site. The power consumption of RMC700 is max. 7 VA.

Block diagram 1: Connecting of the room management controller RMC700

Block diagram 1 shows an autonomous room control system for 10 fume hoods with room supply air and room exhaust air as well as additional room balancing via LCO500 and the conventional connecting of the Room management controller RMC700.

Connecting of the room management controller

The connecting occurs via an 8-pair standard cable IY (St) Y 8x2x0,8. It will be powered by 24V AC/DC and up to 3 freely programmable digital inputs (Di1...Di3) and 3 freely programmable relay outputs (K1...K3) can be connected to the appropriate terminals.

Common fault alarm

The single fault signals of the fume hood control FC500 (dry relay contact) will be connected to the optional terminal board (In1...In10) in series and are available as common fault alarm signal on the digital input DI1 of the RMC700. Once a fume hood is in failure (e.g. not enough air), it is registerd by the freely configurable digital input Di1 and the appropriate message is shown with coloured backlight on the graphical LC-display.

Day/night switch

The day/night switch (working/non-working time) is done by a dry contact of programmable relay K1...K3 (here K1) of the RMC700. The optional terminal board distributes this contact parallel to the outputs Out1...Out10, which are connected to the day/night inputs of the fume hood controllers FC500.

In- and outputs

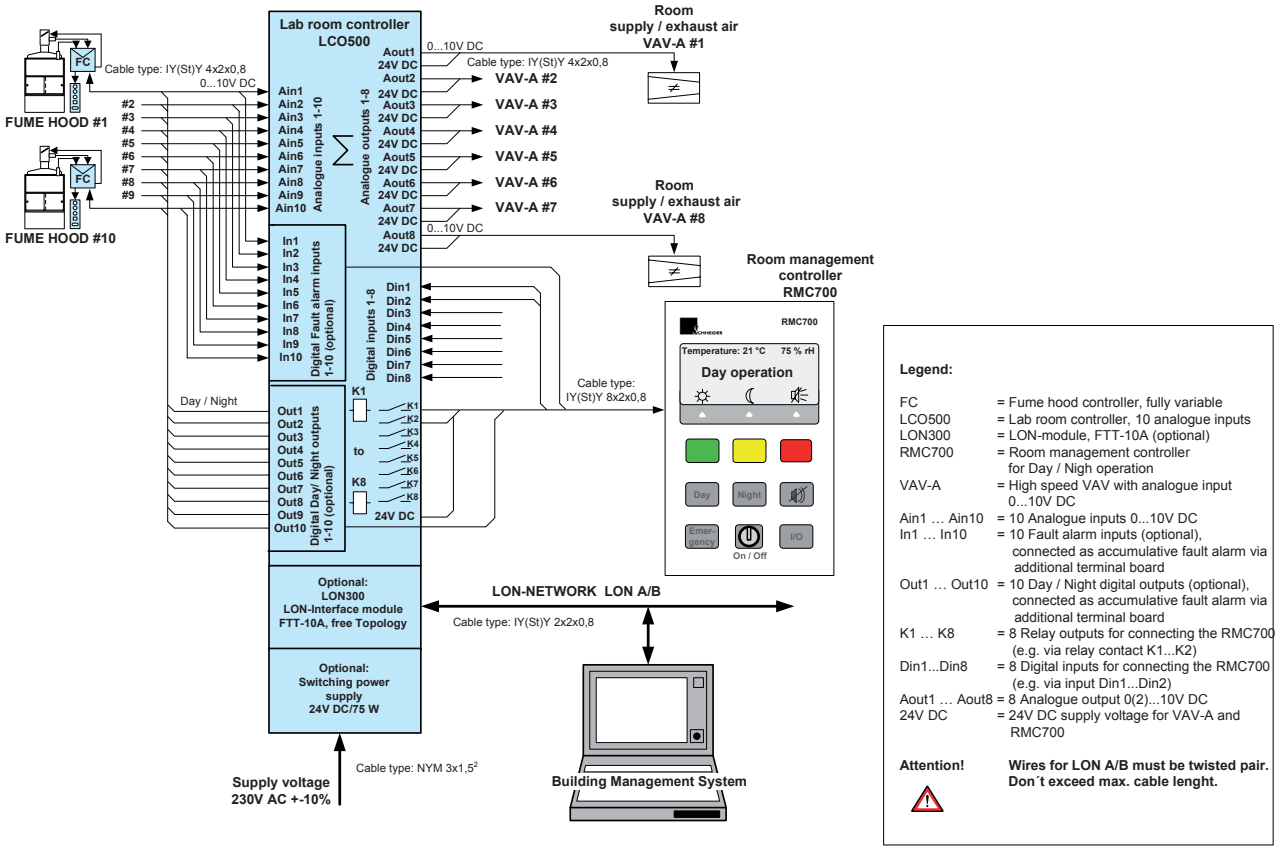
The remaining relay contact outputs (K2...K3) of the RMC700 are connected to the inputs (DIN1...Din2) of the LCO500 and the remaining inputs (Di2...Di3) of the RMC700 are connected to the outputs (K1...K2) of the LCO500. Via the network interface of the LCO500 all signals of the RMC700 are available for the building management system (e.g. request night operation, cancellation day operation, ventilation ON / OFF, etc.).

All inputs and outputs of the RMC700 can be parameterized and can be easily and flexibly adapted to the particular application.

Network functionality (LON, Modbus)

The control of the RMC700 via the LON network interface of the LCO500 is described as an example. The same principle goes for the supported Modbus network, at which differ in this case only the variable types and variable names.

Block diagram 1: Connecting of the RMC700 to the lab room controller LCO500



Legend:

FC	= Fume hood controller, fully variable
LCO500	= Lab room controller, 10 analogue inputs
LON300	= LON-module, FTT-10A (optional)
RMC700	= Room management controller for Day / Nigh operation
VAV-A	= High speed VAV with analogue input 0...10V DC
Ain1 … Ain10	= 10 Analogue inputs 0...10V DC
In1 … In10	= 10 Fault alarm inputs (optional), connected as accumulative fault alarm via additional terminal board
Out1 … Out10	= 10 Day / Night digital outputs (optional), connected as accumulative fault alarm via additional terminal board
K1 … K8	= 8 Relay outputs for connecting the RMC700 (e.g. via relay contact K1...K2)
Din1...Din8	= 8 Digital inputs for connecting the RMC700 (e.g. via input Din1...Din2)
Aout1 … Aout8	= 8 Analogue output 0(2)...10V DC
24V DC	= 24V DC supply voltage for VAV-A and RMC700

Attention! **Wires for LON A/B must be twisted pair. Don´t exceed max. cable lenght.**

Room plan 1: Conventional connection of the RMC700 to the building management system (BMS)

Room plan 1 shows a completely self-sufficient room balancing with the laboratory room controller LCO500. The input Di1 captured the common fault alarm of the optional terminal board and the additional output K1 switches the day/night mode via the optional terminal board. The LCO500 also provides the power for the RMC700.

Fault alarm display during day operation

The RMC700 here shows the red colourd backlit fault alarm during day operation (freely programmable), i.e. at least 1 alarm relay contact of the fume hood controller FC500 (In1...In9) is interrupted and thus generates a common fault alarm on the Di1 of the RMC700.

Connection to the BMS

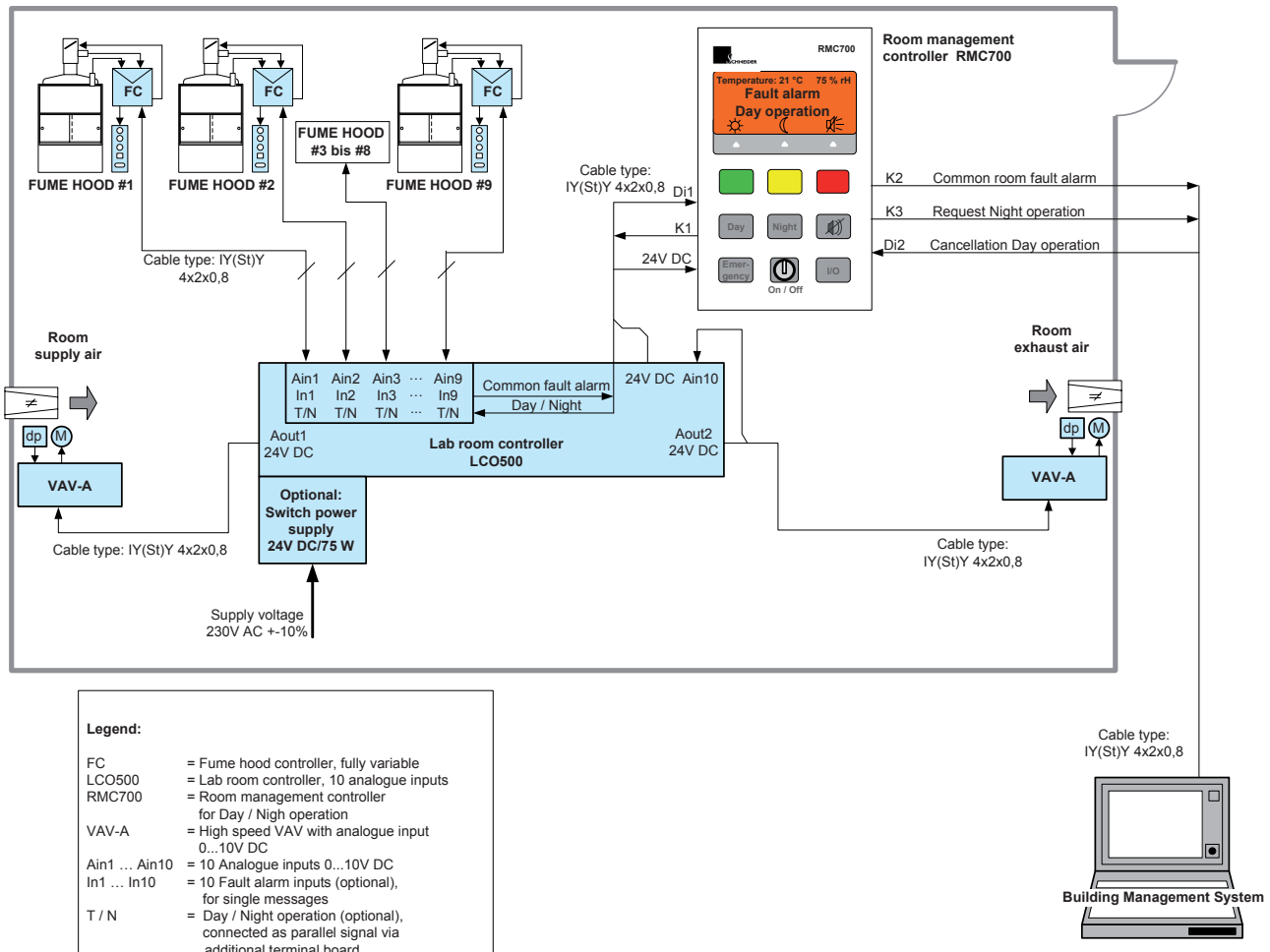
Connection to the building control system (BMS) by means of contacts (K2...K3) and the digital input (DI2). The common room fault alarm is connected via K2 to the BMS .

Requirement night operation to the BMS

The NIGHT-button of the RMC700 controls here the relay K3 and calls on the night operation at the building control system. If the requirement is entitled (e.g. within limited time period boundaries) the cancellation of the day operation is set by the BMS and the switch to the night operation is done by the RMC700. At the same time, the backlight of the graphical display will change to yellow and displays the message NIGHT OPERATION.

All colours and texts as well as customized graphical icons (icon‘s) are freely programmable.

Room plan 1: Conventional connection of the RMC700 to the BMS



Legend:

FC	= Fume hood controller, fully variable
LCO500	= Lab room controller, 10 analogue inputs
RMC700	= Room management controller for Day / Nigh operation
VAV-A	= High speed VAV with analogue input 0...10V DC
Ain1 … Ain10	= 10 Analogue inputs 0...10V DC
In1 … In10	= 10 Fault alarm inputs (optional), for single messages
T / N	= Day / Night operation (optional), connected as parallel signal via additional terminal board
K1 … K3	= 3 Relay outputs for connecting the RMC700
Di1...Di2	= 2 Digital inputs for connecting the RMC700
Aout1 … Aout8	= 8 Analogue output 0(2)...10V DC
24V DC	= 24V DC supply voltage for VAV-A and RMC700

Room plan 2: Conventional connection of the RMC700 to the LCO500 with LON-Interface

Room plan 2 shows a laboratory room on the night operation with the appropriate coloured backlit text message on the RMC700.

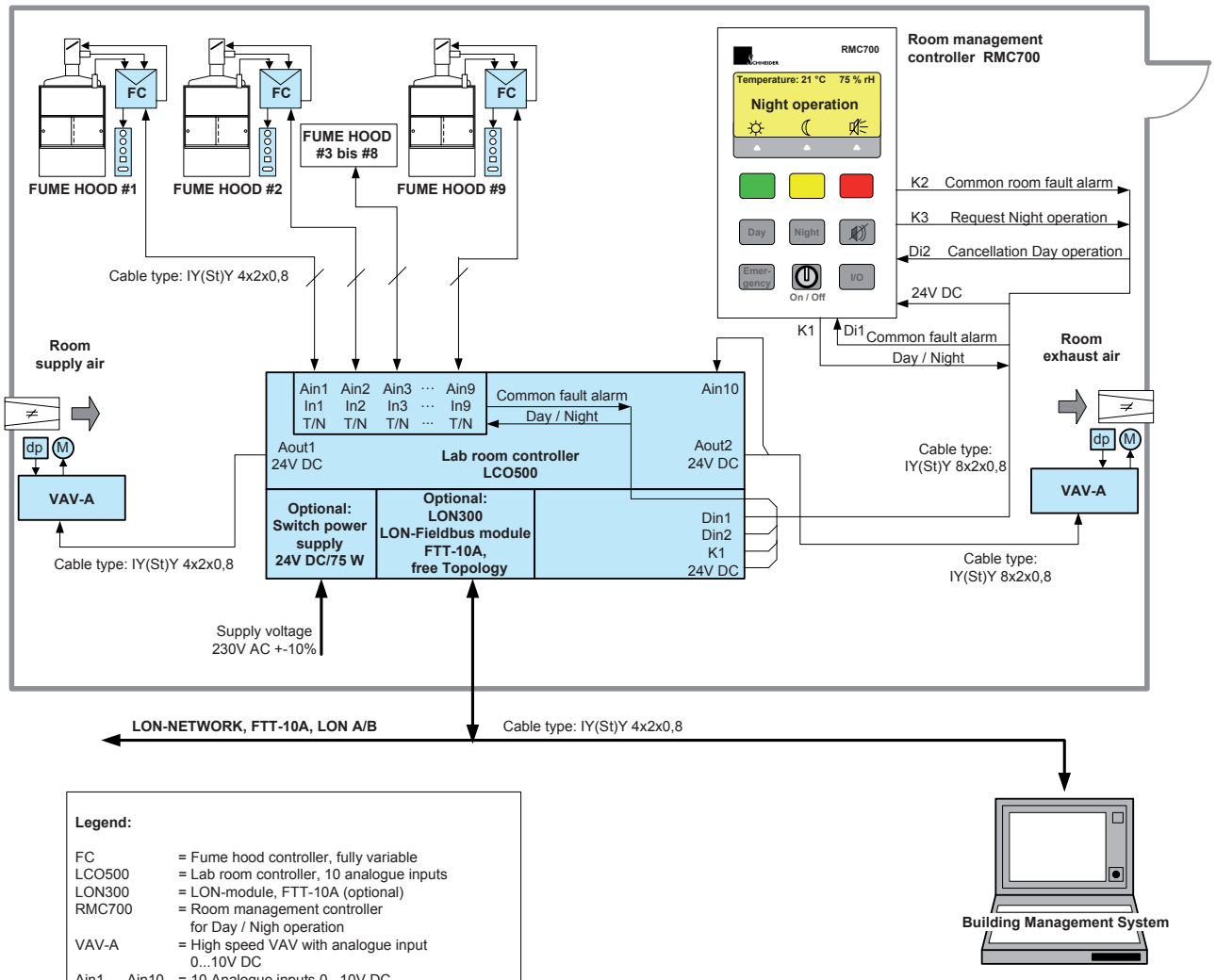
The day/night switching and fault alarm capture comes back to the optional terminal board, installed in the lab room controller LCO500. This provides the same functionality as shown in room plan 1. The appropriate inputs and outputs of the RMC700 are interconnected with the LCO500 and available as standard variable (SNVT) via the LON network.

The control to/from the BMS is handled by the LON interface. All relevant data (e.g. request night operation and fault alarm) go to the BMS to be processed and all digital inputs (Di1...Di3) of the RMC700 can be accessed via the LCO500.

The laboratory room is simple, clear and concise and provides a simple wired service. At the same time, the user has full flexibility at reasonable system cost. With the occupation of only one LON node per laboratory room, the number of routers required is significantly reduced.

Control over the LON network

Room plan 2: Conventional connection of the RMC700 to the LCO500 with LON-interface



Legend:

FC	= Fume hood controller, fully variable
LCO500	= Lab room controller, 10 analogue inputs
LON300	= LON-module, FTT-10A (optional)
RMC700	= Room management controller for Day / Nigh operation
VAV-A	= High speed VAV with analogue input 0...10V DC
Ain1 … Ain10	= 10 Analogue inputs 0...10V DC
In1 … In10	= 10 Fault alarm inputs (optional), connected as accumulative fault alarm via additional terminal board
T / N	= Day / Night digital outputs (optional), connected as parallel control via additional terminal board
K1	= Relay (LCO500) cancellation day operation
K1… K3	= 3 Relays free programmable on the RMC700
Di1...Di3	= 3 Digital inputs free programmable on the RMC700
Aout1 … Aout8	= 8 Analogue output 0(2)...10V DC
24V DC	= 24V DC supply voltage for VAV-A and RMC700

Attention! **Wires for LON A/B must be twisted pair. Don´t exceed max. cable lenght.**

Room plan 3: Direct connection of the RMC700 via the optional LON module

Room plan 3 shows laboratory room during the day operation with the appropriate coloured backlit text message on the RMC700.

The day/night switching and fault alarm capture is switched via an external terminal board. A laboratory room controller LCO500 is not needed in this example. The room balancing is done external (e.g. directly via the BMS).

This provides the same functionality as shown in room plan 1 and 2. All inputs and outputs of the RMC700 are available as a standard variable (SNVT) via the LON network.

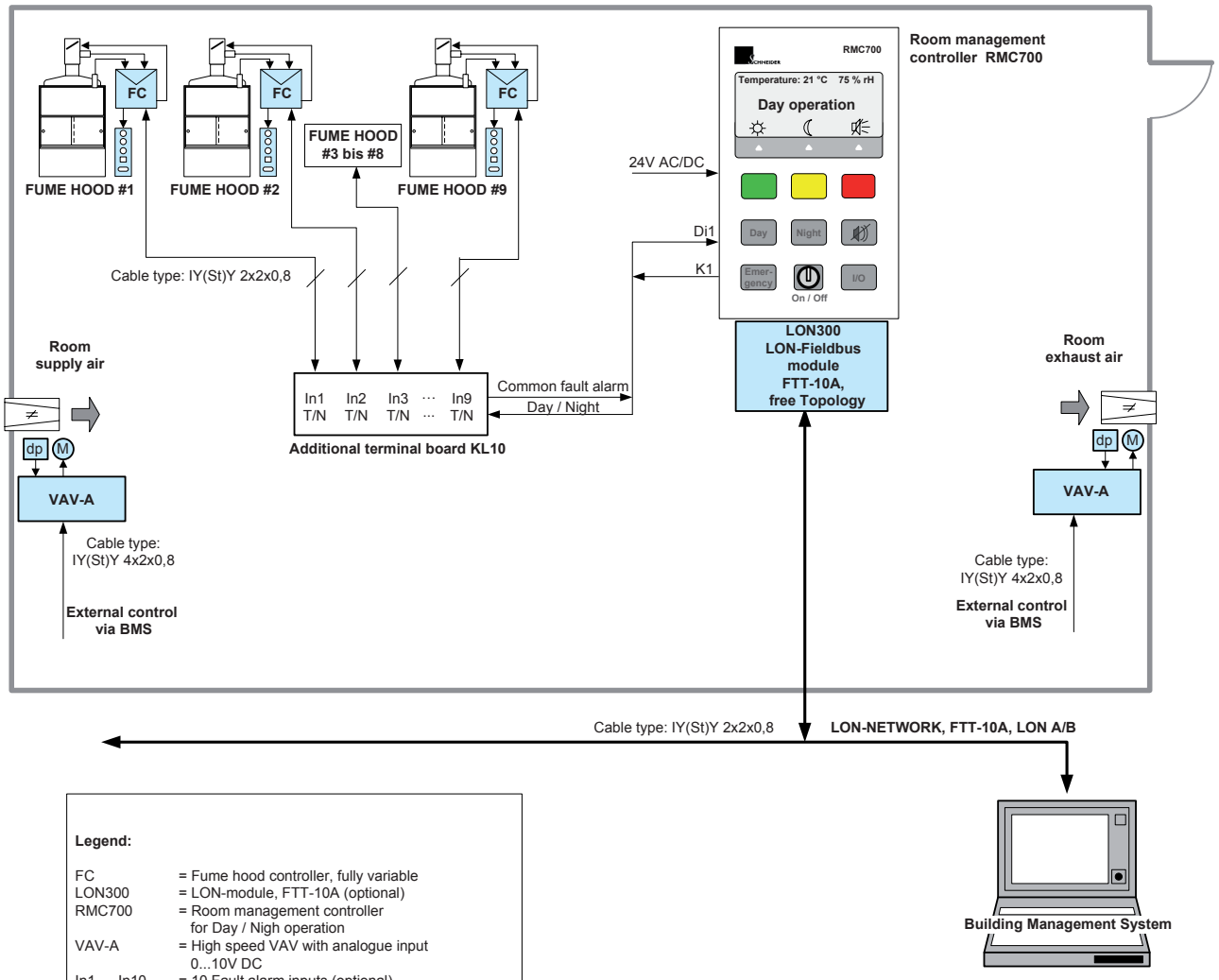
Control over the LON network

The control to/from the BMS is handled by the LON module and can be retrofitted to the RMC700. All relevant data (e.g. request night operation and fault alarm) go to the BMS and are processed there and all digital inputs (Di1...Di3) and all relay outputs (K1...K3) of the RMC700 can be accessed directly over the network.

The laboratory room is also simple, clear and concise and provides a simple wired service. At the same time, the user has full flexibility at reasonable system cost. With the occupation of only one LON node per laboratory room, the number of routers required is significantly reduced.

The same functionality can be achieved via the Modbus network.

Room plan 3: Direct connection of the RMC700-L via the optional LON-Interface



Legend:

FC	= Fume hood controller, fully variable
LON300	= LON-module, FTT-10A (optional)
RMC700	= Room management controller for Day / Nigh operation
VAV-A	= High speed VAV with analogue input 0...10V DC
In1 … In10	= 10 Fault alarm inputs (optional), connected as accumulative fault alarm via additional terminal board
T / N	= Day / Night digital outputs (optional), connected as parallel control via additional terminal board
K1… K3	= 3 Relays free programmable on the RMC700
Di1...Di3	= 3 Digital inputs free programmable on the RMC700

Attention! **Wires for LON A/B must be twisted pair. Don´t exceed max. cable lenght.**

Room plan 4: Complete LON network of all participants in the lab room

Room plan 4 shows a laboratory room on the night operation with the appropriate coloured backlit text message on the RMC700.

This provides the same functionality as shown in room plan 1, 2 and 3. All inputs and outputs of the RMC700 are available as a standard variable (SNVT) via the LON network. The day/night switching, the fault alarm capture and the entire room balancing is done via the SNVTs.

With this example the user achieves maximum flexibility and maximum data transparency. Retrofits and system upgrades are very simple and feasible without major additional wiring.

Control and room control over the LON network

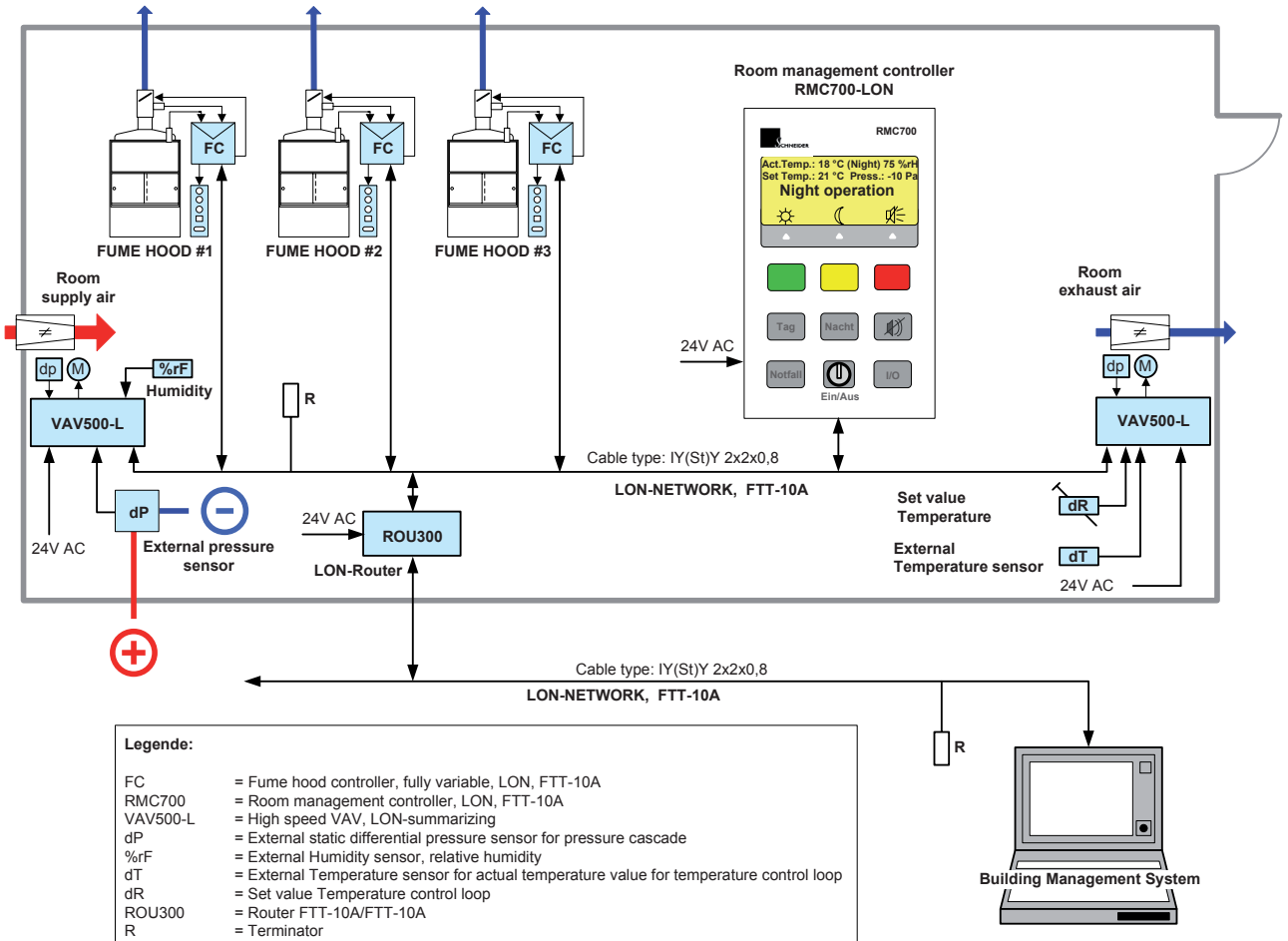
The control to/from the BMS is handled by the LON interface of the functional nodes involved. All relevant data (e.g. request for night operation, and fault requirement day mode) go to the BMS, where they are processed and checked for plausibility. All nodes can be directly accessed via the standard variables SNVTs (e.g. switching to night mode).

Additionally, supplementary room data are captured and displayed via the LON network on the graphical LC-display on the RMC700. Thus allows to display besides the actual temperature and the relative humidity also the set-point temperature, the actual room pressure in Pascal and e.g. the total room air volume rate in m³/h. This increased data transparency improves the information value and ease of use. When the temperature control is done on the VAV500-L (air volume flow shift) the energy-saving night mode (18 ° C fixed or set-point temperature x) also can be selected and displayed.

In this example, a router is located, which is physically connected to only 6 nodes. In practice, one router for about 30 nodes has proved, making the total system costs can be reduced significantly.

The same functionality can be achieved via the Modbus network.

Room plan 4: Complete LON network solution



Legende:

FC	= Fume hood controller, fully variable, LON, FTT-10A
RMC700	= Room management controller, LON, FTT-10A
VAV500-L	= High speed VAV, LON-summarizing
dP	= External static differential pressure sensor for pressure cascade
%rF	= External Humidity sensor, relative humidity
dT	= External Temperature sensor for actual temperature value for temperature control loop
dR	= Set value Temperature control loop
ROU300	= Router FTT-10A/FTT-10A
R	= Terminator
24V AC	= 24V AC supply voltage on site for VAV-L, RMC700 and Router

Attention! **Wires for LON A/B must be twisted pair.**
Don´t exceed max. cable lenght.

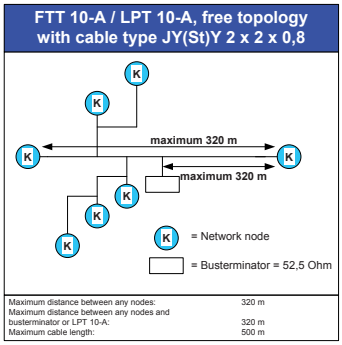
LON-cable specifications (FTT-10A)

To ensure safe transfer in networks with free topology, the following points must be observed:

- A terminator with R1 = 52.5 Ω or an LPT 10-A with integrated terminator must always be connected.
- The distance from each transceiver to all other transceivers may not exceed the maximum distance between two nodes.
- In the case of different signal paths, e.g. with ring topology, the longest transmission path should be used as a basis for observation
- The maximum cable length is the sum total of all network cables connected in the segment.
- Connect shield on one side of RC to ground (R = 470kOhm, ± 5%, 0.25 W, C = film capacitor 0.1 uF, ± 10%, ≥ 100V).
- Specification and connection see LonWorks FTT-10A free Topology Transceiver User's Guide by Echelon.

The mainly used transceiver type in building automation is FTT10-A in free topology. If the wiring is with Belden, the cable length is limited to a maximum of 500 m. With the type of cable JY (St) Y 2 x 2 x 0.8, the maximum cable length is limited to 320 meters. Figure 1 illustrates the cable length.

Figure 3: Cable type JY(St)Y 2 x 2 x 0.8 in free topology



When the recommended cable length is exceeded, a repeater or router has to set that causes a physical separation of the network and limits the traffic on the essential information (router).

FTT10-A / LPT10-A in free topology		
Cable types	**Max. distance from node to node**	**Max. total cable length**
TIA 568A category 5	250 m	450 m
JY(St)Y 2 x 2 x 0.8	320 m	500 m
UL Level IV, 22 AWG	400 m	500 m
Belden 8471	400 m	500 m
Belden 85102	500 m	500 m

Attention on use of cable type JY (St) Y:
Always use the type of cable JY (St) Y 2 x 2 x 0.8
Do not use the type of cable JY (St)Y 2 x 2 x 0.6

WARNING! Connect always the twisted pair on LON-A and LON-B.

BACnet-cable specifications (MS/TP, RS485)

In a BACnet network (MS / TP, RS485) wiring is permitted only in line topology (no free topology, as with LON).

MS/TP (Master-Slave/Token-Passing)

The Master-Slave/Token-Passing protocol was also developed by ASHRAE and is only available for BACnet.

Connection to the field bus is done via the inexpensive EIA RS 485 interface. MS/TP can be operated in pure master/slave mode, with token passing between equal partners (peer to peer token passing method) or with a combination of both methods.

EIA RS 485-Standard

The EIA RS 485 standard defines a bidirectional bus system with up to 32 subscribers. Because several transmitters operate over a shared line, a protocol is required to ensure that a maximum of one data transmitter is active at any time (e.g. MS/TP). All other transmitters must be in a state of high impedance during this time.

In the ISO standard 8482 the cabling topology is standardised to a max. length of 500 metres. The subscribers are connected to this bus cable in line topology via a max. 5 metre long stub line. It is generally necessary to terminate the cable at both ends with terminating resistors (2 x 120 ohm) in order to prevent reflections.

If no data transfer takes place (data transmitter inactive), a defined quiescent level should arise on the bus system. This is achieved by connecting line B via 1k Ohm to earth (pull down) and line A via 1k Ohm to +5V DC (pull up).

Although intended for large distances in industrial environments, where potential shifts cannot be avoided, the EIA RS 485 standard does not prescribe galvanic separation. However, since the receiver components are sensitive to shifts in earth potentials, galvanic separation, as defined by ISO9549, is recommended for reliable installations.

During installation it is essential to install the twisted pair (A and B) individually. It is also essential to ensure correct polarity of the twisted pair, because incorrect polarity can result in inversion of the data signals. Particular in case of problems with the installation of new end devices, troubleshooting should begin by checking the bus polarity.

Always install screened cables in line (daisy chain) topology and install the screen on one side.

Network extension in bus/line structure

The bus line is laid in one strand. Connection of the nodes is done via short stub lines (maximum 5 m). Always install the twisted pair (A and B) individually. It is essential to ensure the correct polarity of the bus wires.

To ensure safe transmission in networks with bus/line topology, the following points must be observed:

- The bus line must be connected to bus terminators at both ends R1 = R2 = 120 Ω.
- Connect shield to ground on one side.
- The second terminator is always required.
- The maximum length of the stub lines must not exceed 5 m.
- The maximum cable length is 500 m.
- A maximum of 32 subscribers may be connected to a bus/line structure.

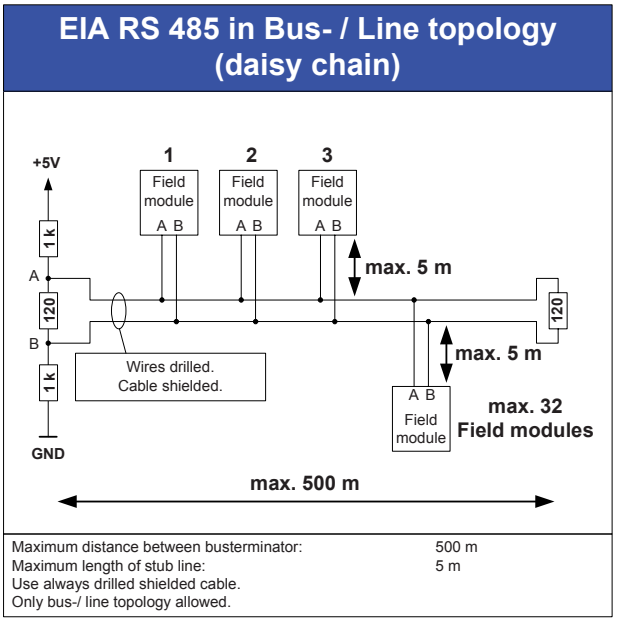


Figure 4: EIA RS 485 in bus/line topology

Figure 4 shows the bus/line topology of the EIA RS 485 standard with the maximum cable lengths.

In table 3 various cables suitable for the EIA RS 485 standard are specified.

EIA RS 485 in bus/line topology						
Cable types	**Manufacturer**	**Conductor diameter [mm]**	**AWG**	**Conductor cross-section [mm²]**	**Rloop Ω/km**	**Max. cable length of the bus line [m]**
Li2YCYPiMF	Lapp	0,80	20,4	0,503	78,4	500
JY(St)Y 2 x 2 x 0,8 geschirmt	various	0,80	20,4	0,503	73	300
9843 paired	Belden		24		78,7	500
FPLTC222-005	Northwire		22		52,8	400
EIB-YSTY	various	1,0		0,80	31,2	500

Table 3: Cable specifications of different cable types

All cables must be shielded and the shield is placed on ground (GND).

Modbus-cable specification (RS485)

Modbus is an application protocol developed in 1979 by Gould-Modicon for exchanging messages between field modules with integrated Modbus controllers.

The Modbus protocol is located on the application layer of the OSI reference model and supports master/slave operation between intelligent devices.

The Modbus protocol defines the message type via which the Modbus controllers communicate with one another. It describes how a Modbus controller establishes access to another controller via a query, how this query is answered, and how errors are recognised and documented.

The Modbus protocol works on a query-response basis and offers various services, which are specified by function codes. During communication, the Modbus protocol determines how each controller learns the device address and recognises messages that are intended for it. In addition, it determines which actions are to be carried out and which information the Modbus controller can extract from the flow of messages. When a response is required, this is assembled in the controller and sent to the corresponding station with the Modbus protocol.

The implementation of Modbus via EIA RS 485 is inexpensive and is therefore suitable for internal laboratory network connections. When laying the cables, it is essential to adhere to the standards described in the EIA RS 485 standard.

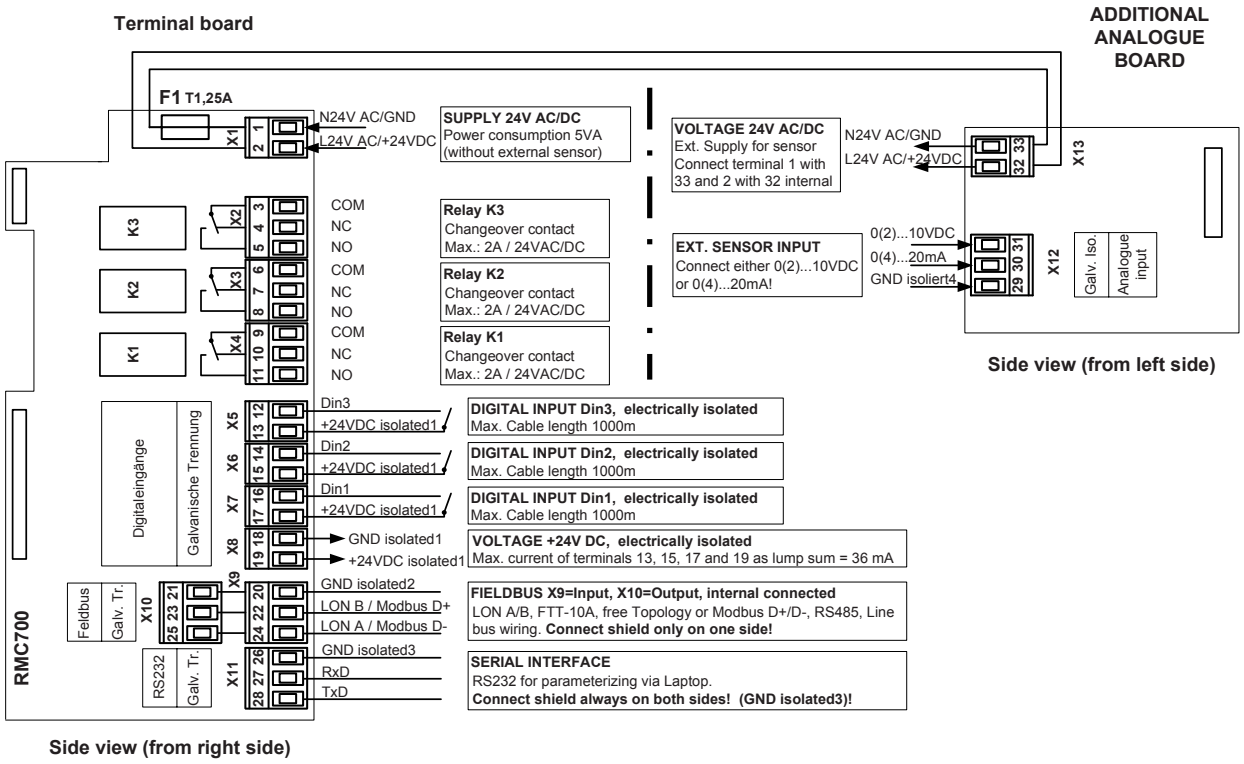
SCHNEIDER products in network systems

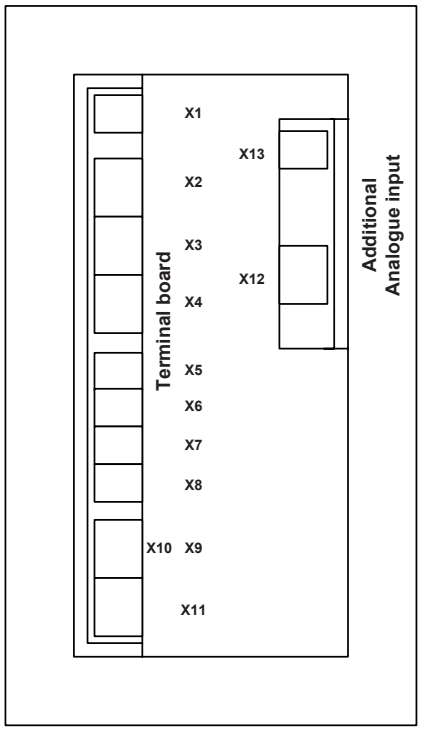
Because field bus modules for LON, BACnet and Modbus can be retrofitted at any time, the entire system is very flexible and can be cost-effectively adapted to various networks.

We offer the entire system from a single source, without compatibility problems.

For detailed cable specification refer to LabSystem handbook from SCHNEIDER, chapter 10.0.

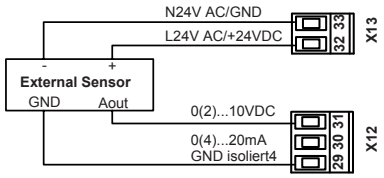
Terminal diagram: Room management controller RMC700





Back view

Connection example:
External sensor to additional analogue board



Legend:

All external sensors must be active (e.g. pressure, humidity, temperature, etc.) with 0 (2) ... 10V DC and / or 0 (4) ... 20 mA output.

Note:
Connect only one analogue input. Either terminal 29 and 30 or terminal 29 and 31.

ROOM MANAGEMENT CONTROLLER RMC700		
Terminal diagram, complete		
SCHNEIDER ELEKTRONIK	Rev.: 1.0	Date: 03. December 2010

Order code: **Multi-functional Room Management Controller**

RMC700 - L - S1 - 3 - 0

Type

Field bus module

without Field bus module. Standard 3 digital inputs and 3 relay outputs, free configurable	**0**
LON, FTT10-A	**L**
Modbus, RS485	**M**

Extension Analogue input board

0	without
A	with additional board, electrically isolated 0(2)...10V DC or 0(4)...20mA

Number of buttons

3	3 buttons
5	5 buttons
6	6 buttons (only without key switch)

Key switch

0	without key switch
S1	with mounted key switch (removable key in **only one** position)
S2	with mounted key switch (removable key in **both** positions)

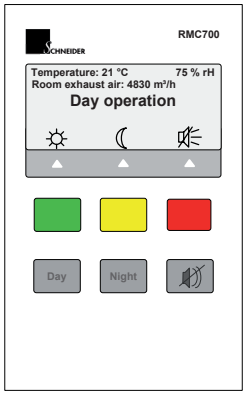
Ordering example: Multi-functional Room Management Controller

Multi-functional Room management controller in the housing, with freely configurable graphical LCD (64x128 pixels), coloured backlight, 3 user-programmable internal relays with changeover contact, 3 user-programmable electrically isolated digital inputs 24V DC, 3 user-programmable bright LED status display with an illuminated area of 2.25 cm², electrically isolated serial interface for programming via laptop, with LON fieldbus, free topology, FTT-10A, with mounted key switch with removable key in one position and 3 additional buttons without additional circuit board for analogue input.

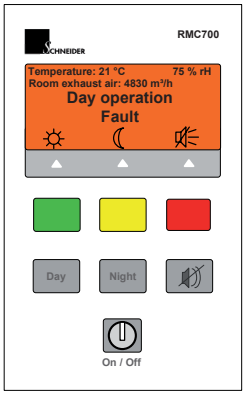
Make: SCHNEIDER **Type: RMC700-L-S1-3-0**

Various versions

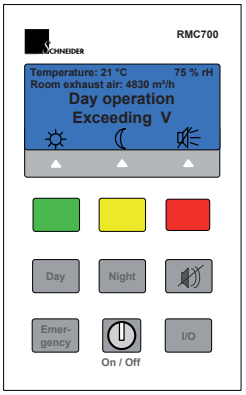
The shown versions are available by default. Other combinations upon request. The text and coloured backlight of the graphic LC- display (64x128 pixels) are freely configurable and adaptable to any application.



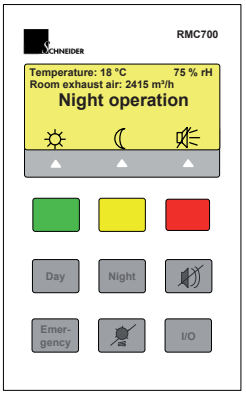
3 buttons



3 buttons with 1 key switch



5 buttons with or without key switch



6 buttons

■ General	
Nominal voltage	24V AC/50/60Hz/+-10%
Max. current	300 mA
Power consumption	7 VA
Reactivation time	600ms
Operating temperature	0 °C bis +55 °C
Humidity	max. 80 % relative, non-condensing

■ Housing	
Protection type	IP 20
Material	steel with front foil
Colour front foil	gray
Dimensions (WxHxD)	(80 x 160 x 70) mm
Weight	approx. 500 g
Terminals	screw terminal 1.5 mm²

■ Relay outputs	
Number	3 relays (K1 to K3)
Contact type	changeover contact
Switching voltage max.	24V AC/DC
Continuos current max.	2A

■ Digital Inputs (electrically isolated)	
Number	3 Optocoupler
Input voltage max.	24V DC, internal
Input current max.	12mA (per input)

■ Analogue input (electrically isolated) with additional board	
1 Input	0(2)...10VDC, 10mA or 0(4)...20mA

■ LC-Display	
Graphic display	64 x 128 pixels
RGB backlighting	R = 0...100 % G = 0...100 % B = 0...100 %
Predefined colours	10
Number of colours	as desired, depending on the RGB-component

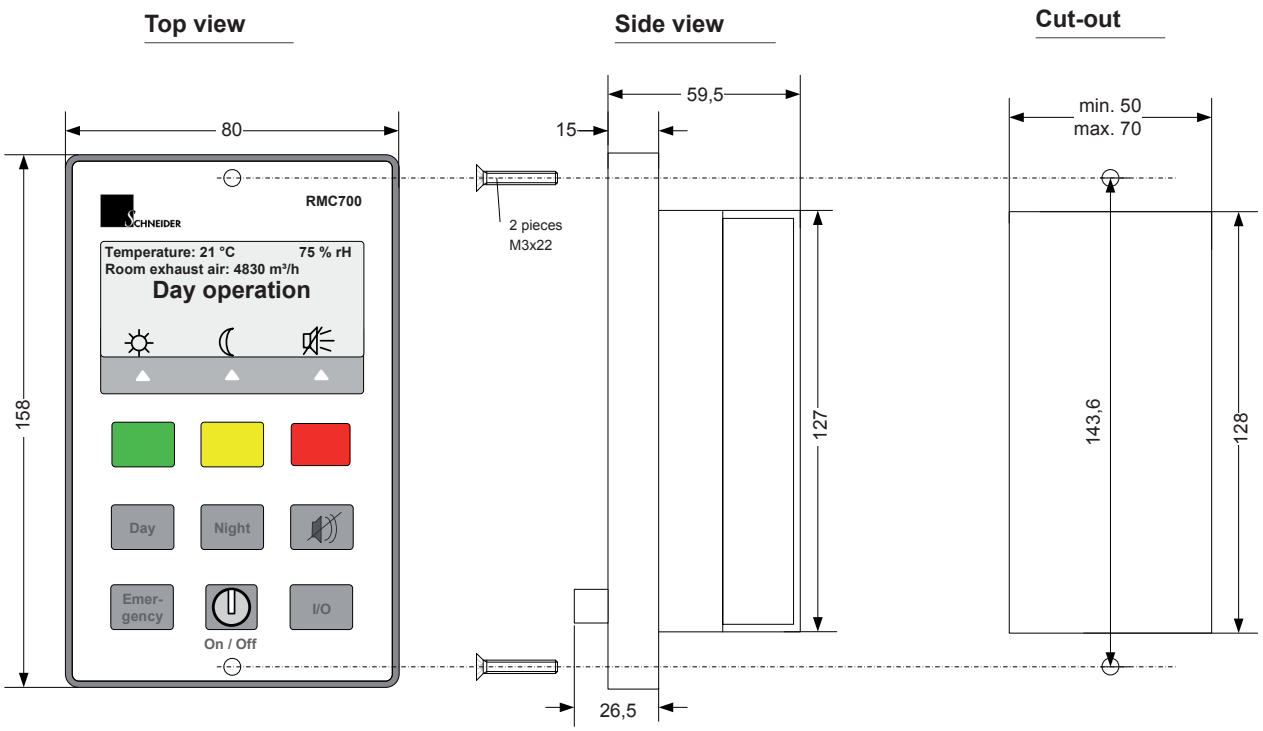
■ Status LEDs	
3 LEDs	green, yellow, red, bright, luminous area 2,25 cm²

■ Key switch (optional)	
Function	On/Off (freely configurable) with removable key

■ Buttons	
3-6 buttons or 3-5 buttons with key switch	Membrane buttons with large area, 2,25 cm²

■ LON-specification (with optional add-on board)	
Transceiver	FTT-10A, free topology
Network variables	Standard Network variables (SNVT) acc. to LonMark

■ Modbus-specification (with optional add-on-board)	
Interface	RS 485 (electrically isolated)



Tender specification (short version, detailed long version available for download):
Multi-functional room management controller in fitted housing for demand-dependent switching from working to non-working time (day/night operation) in conjunction with appropriate laboratory fume hood controllers and air volume flow controllers within a laboratory room. The switch can be done manually from the room management controller RMC700 or as a requirement after authorization check via the building management system (BMS).

The unique user-programmable assignment of different coloured backlit operation, alarm or warning messages (e.g. green, red, yellow) and/or graphical icons on the LC-display improves the safety of laboratory personnel. According to the rules of the BG Chemie BGI / GUV-I 850-0 the operation status can be clearly read from a further distance via the three extra-bright status LED with a luminous area of 2.25 cm², well visible on the side. All text, graphical icons, buttons, digital inputs, relays, status LEDs and the audible alarm of the RMC700 can be parameterized and can easily be adapted to customer-specific room management function.

Graphic LCD (64x128 pixels), freely programmable and coloured backlight, 3 user-programmable internal relays with changeover contact, 3 user-programmable electrically isolated digital inputs 24V DC, 3 user-programmable bright LEDs for status display with a light area of 2.25 cm², serial interface electrically isolated for programming via laptop, with optional LON fieldbus, free topology, FTT-10A, with mounted key switch with removable key in one position and 3 additional buttons.

Make: SCHNEIDER **Type: RMC700-L-S1-3-0**

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