SAIA-Burgess Electronics

SWITCHES • MOTORS • CONTROLLERS

SAIA® PCD

Process Control Devices

Manual
DDC-PLUS-RAG
Single-room control

Edition 26/763 E1

DDC-PLUS-RAG

Single-room control

Edition 26/763 E1 - 09.98

SAIA® Process Control Devices

Subject to technical changes

Contents

Page

1. Description and characteristics

1.1 General

Energy saving by timetable

Comfortable room temperatures, good air quality and lighting promote human health, well-being, concentration and performance and are a basic prerequisite for user-friendliness in buildings. Moreover, only efficient, targeted energy use will minimise overheads without sacrificing comfort, convenience, safety or quality. Today the comfort and economic efficiency of buildings can be guaranteed and even improved with intelligent building automation and building management systems.

The concept of a "single-room controller" is one of the components with which these objectives are achieved. This solution is particularly useful in buildings and premises with widely differing room occupation times and user requirements, such as schools, universities, hotels, health centres, nursing homes, clinics, etc.

Single-room control for individual comfort

The DDC-PLUS-RAG single-room controller enables the user to adjust room climate to individual requirements. It is operated from a room control unit (RAG) which has integral temperature measurement, a setpoint adjuster and a presence key with LED display. A dew-point sensor is controlled directly from the DDC-PLUS-RAG central station.

The SAIA®-RAG bus couples the room control unit directly to the DDC substation for climate control. With its built-in software modules, this manages the regulation and control tasks. Up to 60 room control units can be connected to one DDC substation. If the DDC substation is inactive or the bus connection is broken, the room control units will independently regulate room temperature to 21°C by directly triggering the electrothermal or motor actuating drive.

The DDC substations are in turn connected to the master building control station via a SAIA®S-Bus, PROFIBUS «FMS» or «BA» profile. Presence checking can therefore take place at any time, possibly affecting the temperature in individual rooms. This not only allows for individual comfort, but also reduces costs by economic energy.

1.2 System structure

In addition to the use of a SAIA® PCD, single-room control presupposes the installation of room control units (RAGs) in every room.

These room control units are connected with the PCD via a communications bus and serve as remote I/O units. Temperature regulation takes place in the PCD.

The communications bus is operated with RS 485 level. Selection of the appropriate PCD interface occurs with the parameter settings. If necessary, the interface must be equipped with the relevant interface module.

A maximum of 60 room control units can run on one PCD.

1.3 Modes of service or operation

The single-room controller has several operating modes. Switching between modes is usually time or event controlled.

Out of service

The room is not being used. The room controller maintains temperature within a specific temperature band (usually 15°C .. 30°C) and only channels heating or cooling energy to the room when the temperature lies outside this tolerance. For room control without cooling (PCD7.L710 and ..L711) the upper temperature limit is not monitored.

In service

The room has been occupied for a particular length of time. The room controller keeps the room at the desired temperature, which can be defined by the operator of the installation (usually 20°C .. 22°C). The user of the room is also able to adjust room temperature individually via a setpoint adjuster (±3°C).

Standby

The room is ready for use. Any actual occupation is recognized individually within each single room by the presence key (PCD7.L711/L712) or an optional presence detector. For as long as the presence function considers the room to be unoccupied, the room controller maintains room temperature within the derivative temperature band (usually 17°C .. 28°C). As soon as presence is activated, the room controller regulates to a configurable standby temperature which may differ from the comfort temperature when the room is in service.

As a rule, switching between the different service modes is time-controlled via switch clocks. In an office, for example, it is possible to activate fixed service mode from 9.00 to 15.00 hrs, standby mode during the flexitime periods of 7.00 to 9.00 hrs and 15.00 to 18.00 hrs, and out-of-service mode for other periods and at weekends. The HEAVAC library function blocks are recommended for generating these time-dependent control signals.

2. Devices for single-room control

2.1 Summary

PCD7.L710

PCD7.L711

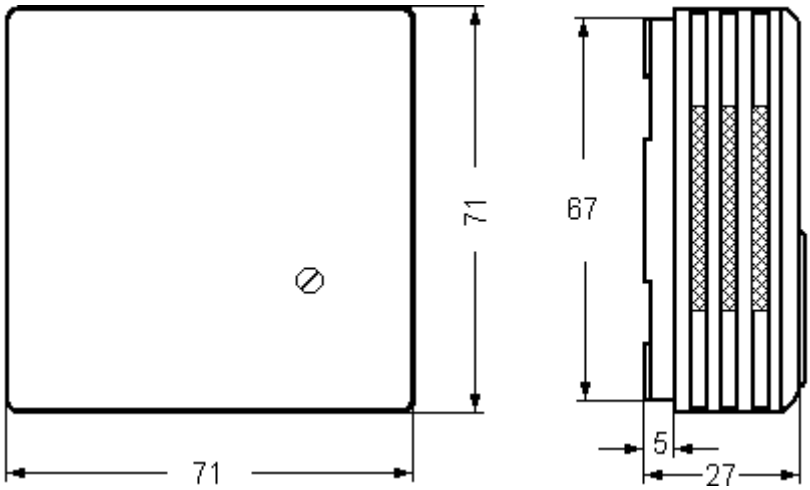
PCD7.L712

PCD7.L710: Room controller for heating without user-prompting

PCD7.L711: Room controller for heating with user-prompting

PCD7.L712: Room controller for heating and cooling with user-prompting

2.2 RAG single-room controller RAGEZR PCD7.L710



Technical data:

Power supply	24 VAC +/- 10%
Power consumption	typically 0.3 VA (**excl. actuating drives**)
Internal temperature sensing	NTC sensor
External temperature sensing	NTC 10 kΩ at 25°C 1%
or external presence detector	potential-free contact
or external window contact	potential-free contact
Heating output	1 (24V for electrothermal actuating drives) for max. 2 actuating drives (model list: see 'Approved actuating drives' on next page)
Control behaviour	quasi-constant, similar to PID
Interface to higher-ranking DDC	RS 485 (2400 Bit/s)
Housing (surface wiring)	plastic, white RAL9010 protection type IP30

In case of DDC substation breakdown or interrupted communication, PCD7.L710 modules will regulate independently to a room temperature of 21°C (**prerequisite: closed, currentless valves**).

Approved actuating drives:

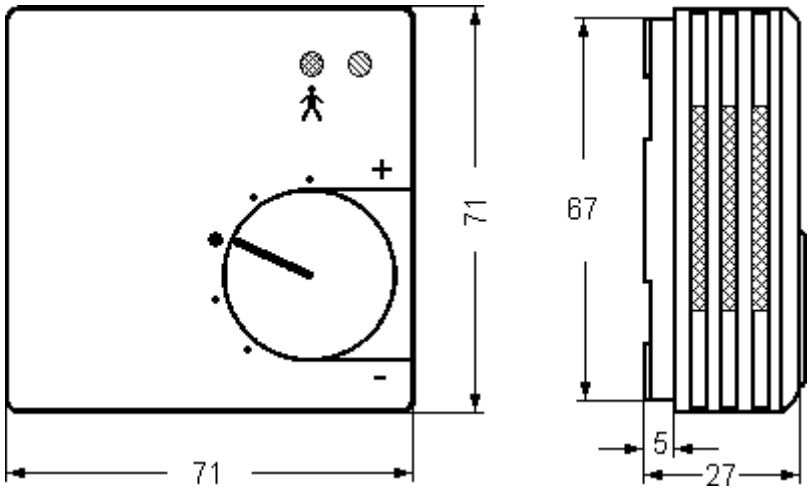
OSTACO AG, CH-8902 Urdorf,
Switzerland Series: taconova 257.16xx.000

Möhlenhoff Wärmetechnik GmbH,
D-38205 Salzgitter, Germany
Series: TS41.xx and TS40.xx

The PCD7.L710 room-temperature controller should only be installed or connected by a competent professional as shown by the wiring diagram and in compliance with prevailing safety regulations.

This temperature controller only serves to regulate temperatures in dry, closed rooms. The maximum permissible relative humidity is 90 %, non-condensing.

2.3 RAG single-room controller RAGEZR PCD7.L711



Technical data:

Power supply	24 VAC +/- 10%
Power consumption	typically 0.3 VA (**excl. actuating drives**)
Internal temperature sensing	NTC sensor
External temperature sensing	NTC 10 kΩ at 25°C 1%
or external presence detector	potential-free contact
or external window contact	potential-free contact
Presence key	yes
Presence display	optical display (LED)
Temperature setpoint adjustment	yes (adjustment range software configurable EZR COM)
Heating output	1 (24V for electrothermal actuating drives) for max. 2 actuating drives (model list: see 'Approved actuating drives' on next page)
Control behaviour	quasi-constant, similar to PID
Interface to higher-ranking DDC	RS 485 (2400 Bit/s)
Housing (surface wiring)	plastic, white RAL9010 protection type IP30

In case of DDC substation breakdown or interrupted communication, PCD7.L711 modules will regulate independently to a room temperature of 21°C (**prerequisite: closed, currentless valves**).

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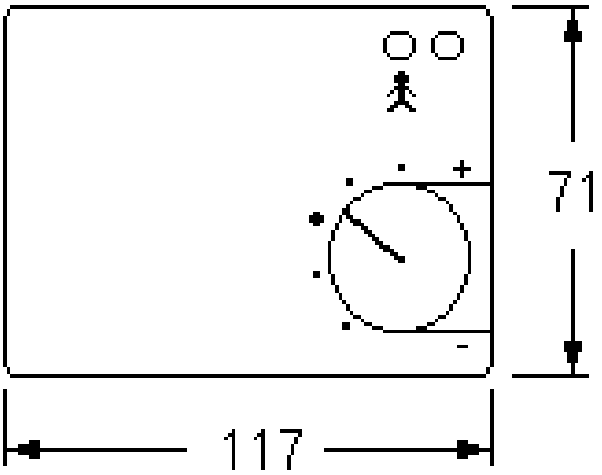
The PCD7.L711 room-temperature controller should only be installed or connected by a competent professional as shown by the wiring diagram and in compliance with prevailing safety regulations.

This temperature controller only serves to regulate temperatures in dry, closed rooms. The maximum permissible relative humidity is 90 %, non-condensing.

2.4 RAG single-room controller RAGEZR PCD7.L712



Technical data:

Power supply	4 VAC +/- 10%
Power consumption	typically 1.7 VA (**excl. actuating drives**)
Internal temperature sensing	NTC sensor
External temperature sensing	NTC 10 kΩ at 25°C 1%
External presence detector	potential-free contact
External window contact	potential-free contact
Heating output	1 continuous adjusting output for motor actuating drive (model list: see 'Approved actuating drives' on next page)
Cooling output	1 continuous adjusting output for motor actuating drive (model list: see 'Approved actuating drives' on next page)
Drive: Triggering:	24 VAC 500mA 0-10 VDC 4mA
Control behaviour	quasi-constant, similar to PID
Interface to higher-ranking DDC	RS 485 (2400 Bit/s)
Housing (surface wiring)	plastic, white RAL9010 protection type IP30

In case of DDC substation breakdown or interrupted communication, PCD7.L712 modules will heat independently to a room temperature of 21°C.

Output 1:		Heating output
Temp. > 21°C	outputs 1 and 2 off	= 0V
Temp. < 21°C	output 1 on	= 10V
	output 2 off	= 0V)

Approved actuating drives:

Möhlenhoff Wärmetechnik GmbH,
D-38205 Salzgitter, Germany

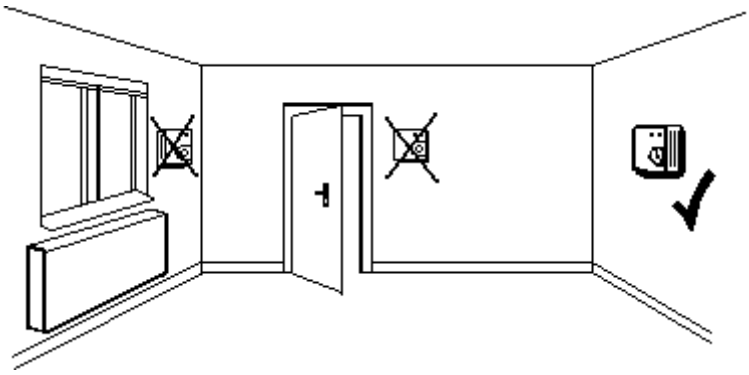
Series: TS41.xx und TS40.xx
(max. 4 pcs per output)

or any actuating drive with 24 VAC motor and 0-10 V control voltage which does not exceed the connection data of the PCD7.L712 module (see technical data).

The PCD7.L712 room-temperature controller should only be installed or connected by a competent professional as shown by the wiring diagram and in compliance with prevailing safety regulations.

This temperature controller only serves to regulate temperatures in dry, closed rooms. The maximum permissible relative humidity is 90 %, non-condensing.

2.5 Positioning the room controller

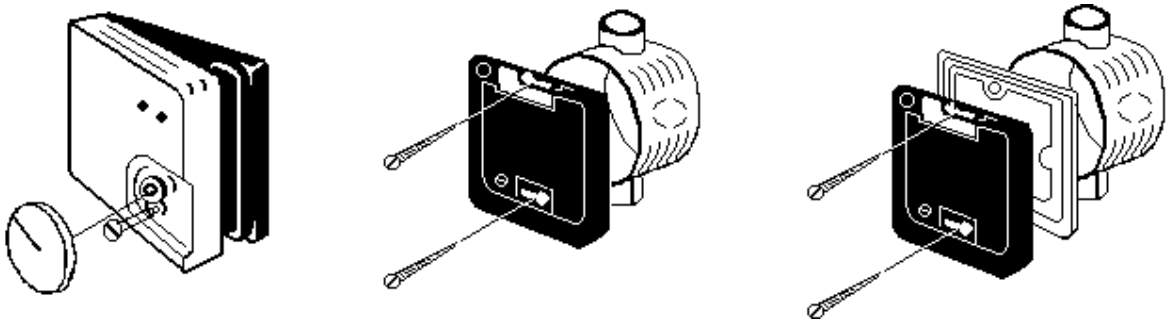


Accurate temperature measurement makes some demands of the mounting location of temperature sensors. This applies equally to the positioning of the room control unit (RAG) and external temperature sensors.

The following points are particularly important:

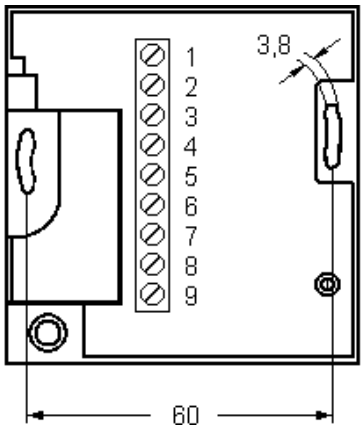
- The RAG must not be mounted in the path of direct sunlight or within the radiant range of strong lamps.
- The RAG must not be mounted in the vicinity of heat sources such as radiators, coffee machines, refrigerators, etc.
- The RAG must not be mounted behind curtains.
- The RAG should not be mounted directly next to windows or doors, since drafts can significantly distort temperature measurements.

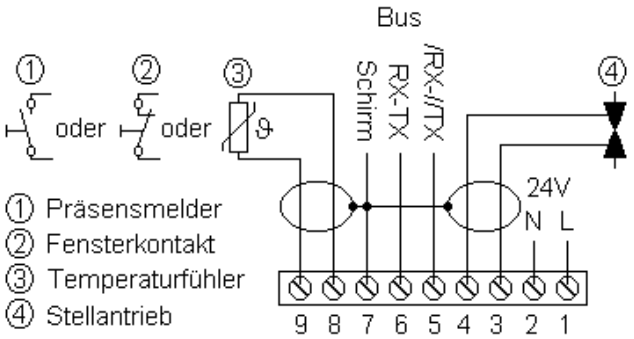
2.6 Mounting instructions for room control units PCD7.L710 and PCD7.L711



Care should be taken during mounting to ensure that the temperature sensor connection wires do not touch each other!

2.7 Terminal connecting plan for PCD7.L710 and PCD7.L711



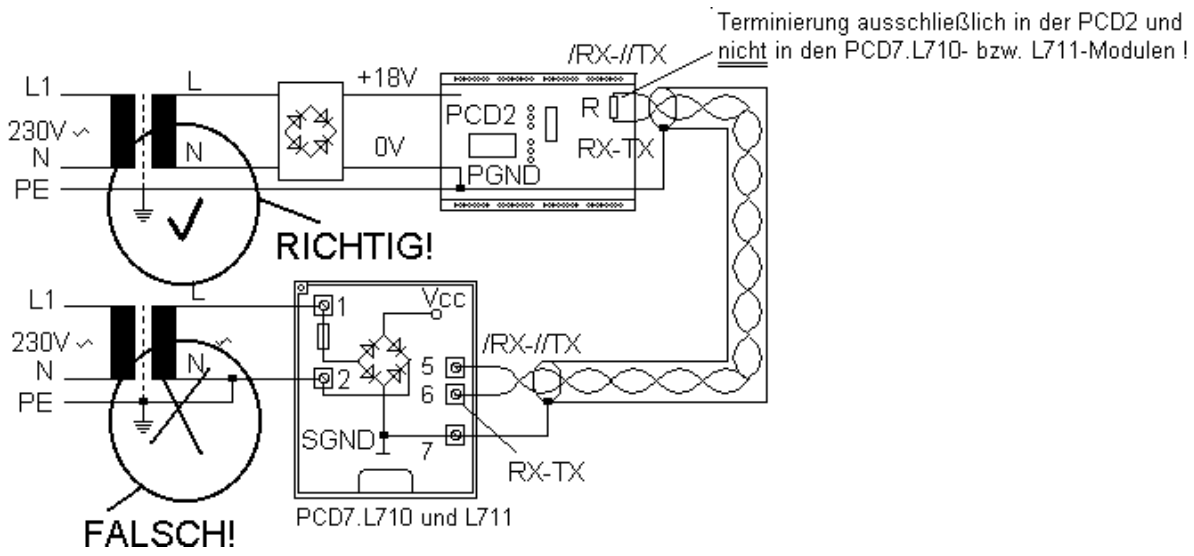


1) Presence detector
2) Window contact
3) Temperature sensor
4) Actuating drive
7 Sheath

Pin configuration

1	24V-L
2	24V-N
3	24V-N for actuating drive
4	24V-L for actuating drive (switch output)
5	Communication /RX - /TX (RS485)
6	Communication RX - TX (RS485)
7	Sheath
8	Option 1 (choice between external sensor or switch)
9	Option 2 (choice between external sensor or switch)

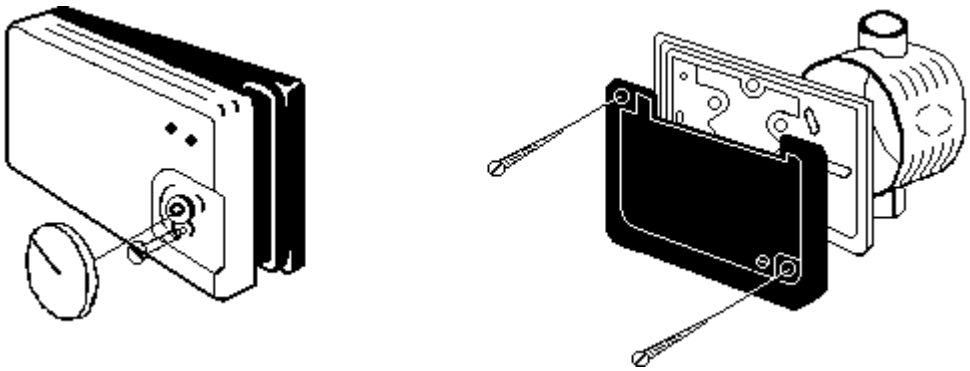
2.8 Ground plan for PCD7.L710 and PCD7.L711



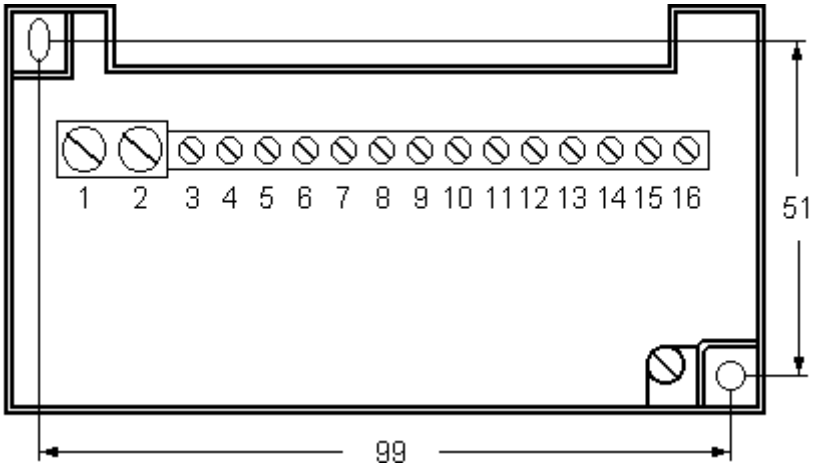
Termination only in the PCD2: <u>not</u> in the PCD7.L710 or L711 modules.
RIGHT
WRONG

<u>Important:</u> **Neither the 24V L, nor the 24V N lines should be connected with the protective conductor, earth wire or sheath!**

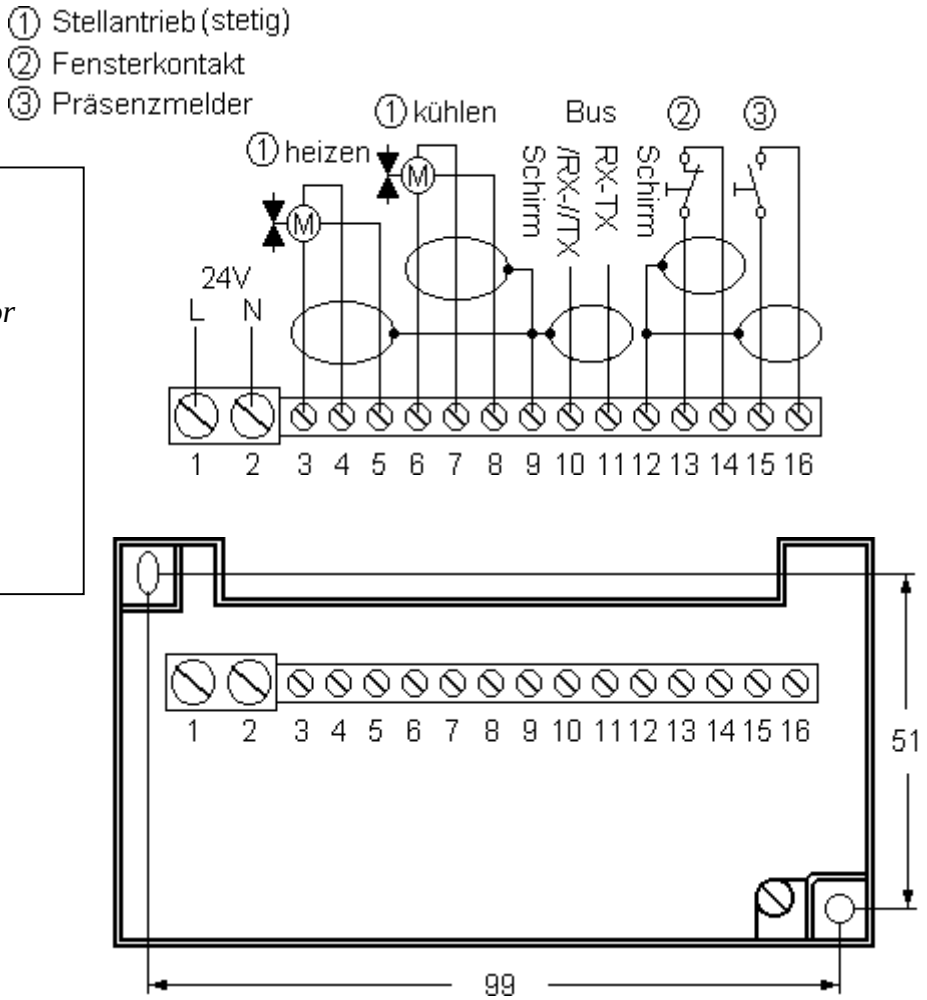
2.9 Mounting instructions for room control units PCD7.L712



Care should be taken during mounting to ensure that the temperature sensor connection wires do not touch each other!



2.10 Terminal connecting plan for PCD7.L712

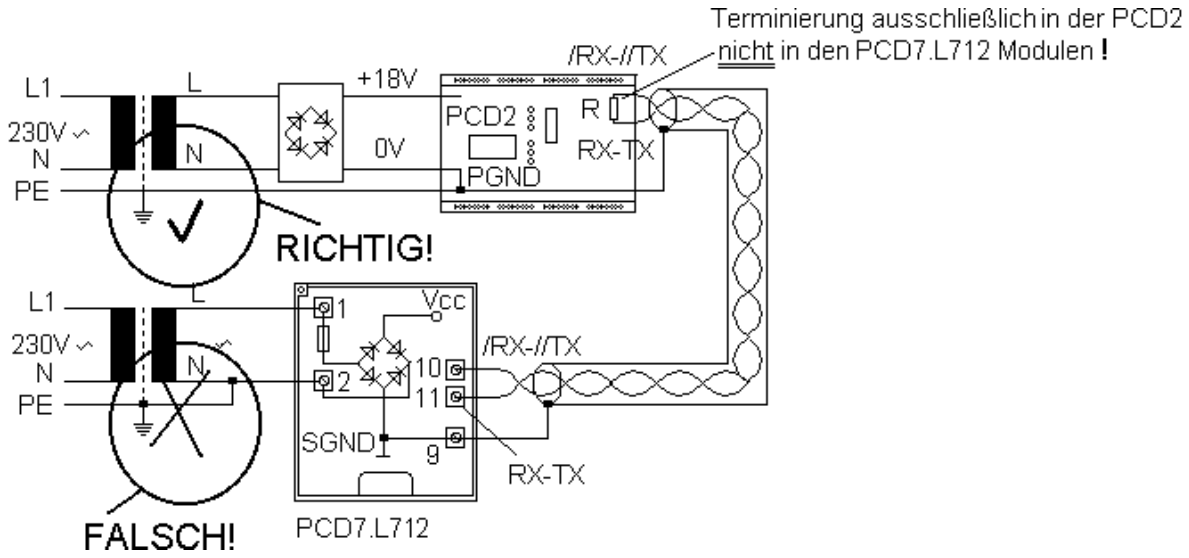


1) Actuating drive (constant)
2) Window contact
3) Presence detector
1) Heat
1) Cool
9 Sheath
12 Sheath

Pin configuration

1	24V L
2	24V N
3	24V L for the heating output (1)
4	0V for the heating output (1)
5	(0-10V DC) for the heating output (1)
6	24V-L for the cooling output (2)
7	0V for the cooling output (2)
8	(0-10V DC) for the cooling output (2)
9	Sheath
10	Communication /RX - /TX (RS485)
11	Communication RX - TX (RS485)
12	Sheath
13	Window contact A
14	Window contact B
15	Presence detector A
16	Presence detector B

2.11 Ground plan for PCD7.L712



Termination only in the PCD2: <u>not</u> in the PCD7.L712 modules.
RIGHT
WRONG

<u>Important:</u> **Neither the 24V L, nor the 24V N lines should be connected with the protective conductor, earth wire or sheath!**

3. Programming

3.1 Resources required

The function blocks of RAG single-room control take up a relatively large amount of memory resources because of their complex function. To estimate memory requirements, the following approximate figures can serve as a guide.
The **EZRCOM** block requires

approx. 280 registers
approx. 500 flags
approx. 50 bytes text
2 timers
approx. 1200 lines of program code (4800 bytes)

The **RAGEZR** block requires
approx. 20 registers
approx. 10 flags
approx. 125 lines of program code (500 bytes)

The **RAG12** block requires
approx. 5 registers
approx. 5 flags
approx. 120 lines of program code (480 bytes)

An average single-room control system with 30 rooms (RAGEZR) therefore takes up

approx. 880 registers
approx. 800 flags
approx. 50 bytes text
2 timers
approx. 5000 lines of program code (20000 bytes)

It should be noted that, with this calculation, additional function blocks (e.g. switch clocks) are still required to trigger the inputs of the RAGEZR blocks.

3.2 CPU time

To execute properly the communications and control functions of single-room control, the EZRCOM function block must be provided with sufficient CPU computing time.

CPU load can be estimated by referring to "cycle time" as displayed, for example, in the adjust windows of HEAVAC blocks "Initialize HEAVAC3" and "Initialize HEAVAC4"

Perfect function can only be guaranteed for a cycle time of

at least 20 cycles / second.

The RAG single-room controller itself only requires (in relation to the functions realized and the amount of program code) relatively little CPU time. However, remember that as a rule and depending on the number of rooms, all FBoxes positioned in association with RAGEZR blocks are present in large numbers and demand significantly more CPU time than single-room control itself.

The following values have been measured for CPU load from single-room control (depending on the number of RAGEZRs):

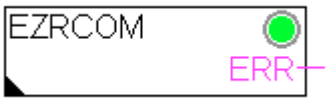
EZRCOM and 10 RAGEZRs approx. 160 cycles / second
EZRCOM and 30 RAGEZRs approx. 80 cycles / second
EZRCOM and 60 RAGEZRs approx. 45 cycles / second

For these measurements, no further FBoxes were positioned apart from the single-room control blocks specified.

3.3 Initialization and communication EZR-COM

FBox 'EZR-COM' establishes communication with the room control units. In addition, this FBox carries out various initializations.

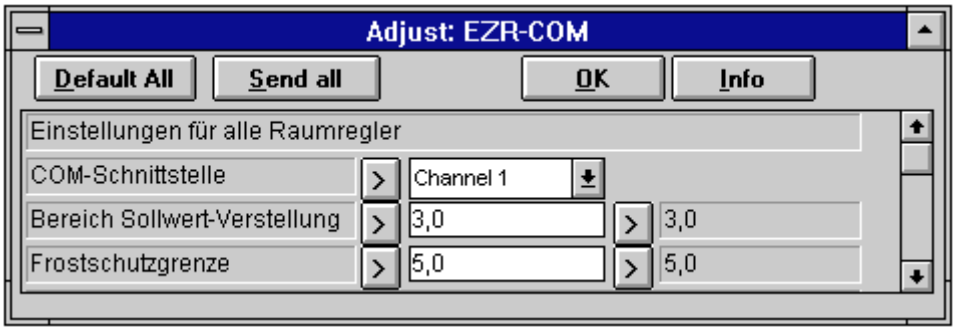
FBox 'EZR-COM' should be positioned on the first page of the function plan. This FBox must always precede the first RAGEZR FBox. It is only positioned once per PCD. This FBox is obligatory for the operation of single-room control.



Inputs: none

Outputs: **ERR** Error message
This output is high when there is a communications fault on the RAG bus. It is signalled simultaneously by the LED.

Adjust parameters:



COM interface designates the interface at which the communications bus for room control units is connected.
Base setting: "Channel 1"
This parameter can only be adjusted offline; the PCD program must then be retranslated and transferred to the PCD.

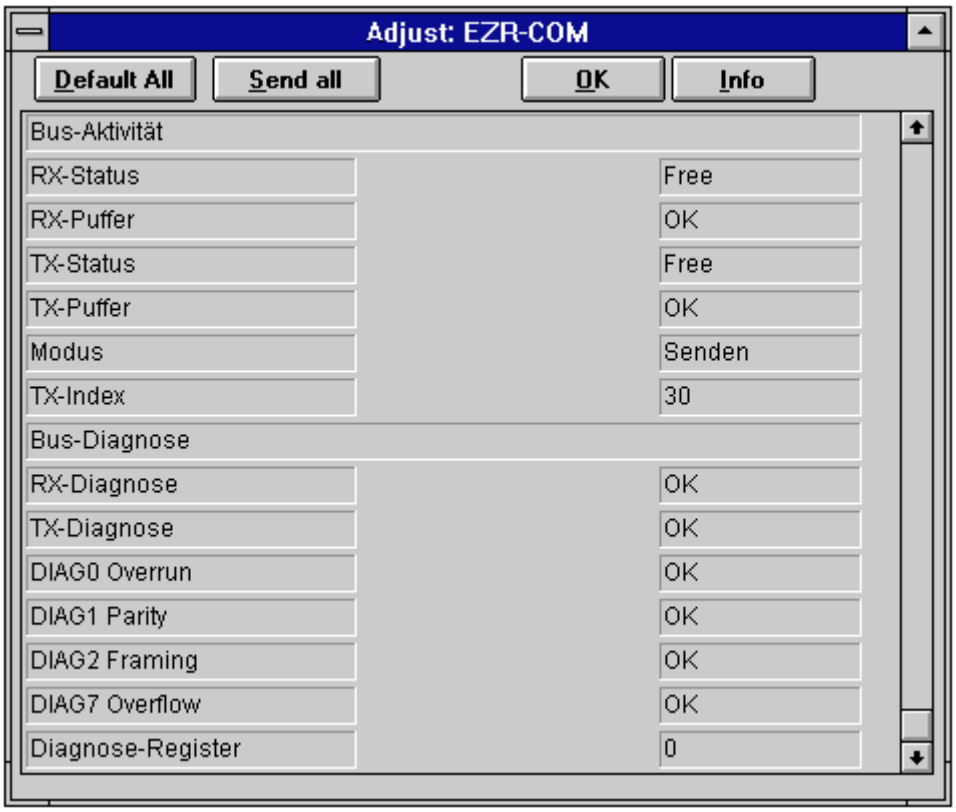
Setpoint adjustment range

indicates how great the influence of the setpoint adjuster is on room control units. The base setting is a shift of ±3 K.

Frost protection limit

defines the temperature below which the room controllers run maximum heating, regardless of any operating state.
Base setting: 5 °C

Data points



The data-point display is divided into two areas:

In the **"Bus activity"** section, internal states are displayed which signal data communications on the single-room control bus line. If data communication is taking place properly, the values displayed here must change more or less regularly.

In the **"Bus diagnosis"** section, data points are displayed which are only needed for intensive diagnosis in case of particular errors. If the system is working properly, "OK" or "0" is displayed here.

Internal data points

Detailed information on the internal data points of the EZRCOM block can be found in the data-point list, chapter 4.

3.4 RAGEZR: Compact room controller for PCD7.L710 and PCD7.L711

3.4.1 System description

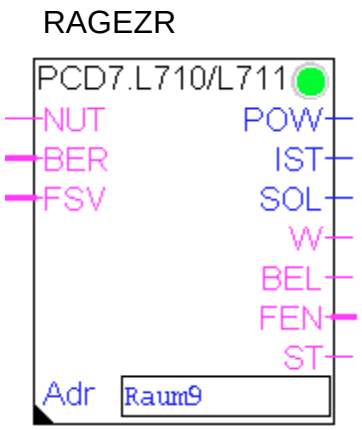
The compact room control FBox RAGEZR includes service-dependent room control and the coupling to a PCD7.L710 or PCD7.L711 room control unit using the central communications function: 'EZR-COM'. This room controller is characterized by its particularly simple configuration.

The control algorithm of this room controller is in the form of a two-position controller with delayed yielding feedback. Control characteristics are therefore similar to a PID controller, although the algorithm gets by with a non-constant actuator.

The operating mode of RAGEZR is controlled through three binary inputs. These signals are generated as a rule by switch clocks.

The outputs of this function block are especially used for connecting optimization strategies and secondary connections. For the basic functions of single-room control they do not have to be switched further.

A maximum of 60 RAG devices can be connected to one PCD. The number of RAGEZR function blocks which can be positioned is also, therefore, limited to 60.



3.4.2 Terminals

Inputs:

NUT Service (Nutzung)
When this input is 1, the controller functions in "service" operating mode.

BER Standby (Bereitschaft)
When this input is 1 and the NUT input is 0, the controller functions in "standby"operating mode.

Controller operating mode is regulated by the two inputs 'NUT' and 'BER'. The 'NUT' input has higher priority:

NUT	BER	Operating mode
0	0	Out of service
0	1	Standby
1	0	In service
1	1	In service

FSV Release setpoint adjustment
(Freigabe Sollwertverstellung)
Release setpoint adjustment at room control unit (1 = release)

Outputs:

POW Power requirement
Reports how much energy the room requires (unit = power factor heat exchanger)

IST Actual temperature (Istwert) in steps of 0.1°C
Shows current real temperature

SOL Temperature setpoint (Sollwert) in steps of 0.1°C
This setpoint display indicates the current setpoint of the room. It will already have taken into acount controller operating mode and any setpoint adjustment carried out at the room control unit.

W Variable signal
Signals whether the room is heated (1)

BEL Occupation (Belegung)
Signals whether the room is at present being regulated towards a comfort temperature (1), or whether a derivative temperature is simply being maintained (0)

FEN Window contact (Fensterkontakt)
Signals whether the window in the room is closed (1) or open (0). In the absence of a window contact, "Window closed" is reported.

ST Fault (Störung)
Reports whether there is a fault in the room. The control station can query which type of fault. Causes may be: communications errors with the RAG, sensor faults, activation of frost protection.

Parameter: **Adr** The address of the assigned room control unit (RAG) is entered here. This address is marked on the RAG.
The address is used for allocation between controller and room and must be set clearly and correctly.
The address can be entered as a numerical value or symbolic constant. Definition as a symbolic constant (e.g.: "OG_R101") is particularly recommended, as it greatly simplifies the administration of RAG addresses in the resource list.

3.4.3 Adjust parameters

Setpoint specification:

Comfort temperature (Komfort-Temperatur)

The room controller regulates towards this setpoint when it is in "service" operating mode.

Offset on standby with occupation (Offset bei Bereitschaft mit Belegung)

This adjustable parameter allows the room to be regulated towards a setpoint other than the comfort temperature when the room controller is in "standby" mode and the room has been reported as "occupied" by the presence key on the RAG or by a presence detector connected to it.
The offset is added to the comfort temperature. Positive values enable the temperature to be raised above the comfort temperature, negative values allow a reduction.
The default value is 0.0°C.

Lower limit for standby (Untergrenze bei Bereitschaft)

The room controller regulates towards this minimum temperature when it is in "standby" mode and if the room has not been reported as "occupied" by the presence functions.

Lower limit for out of service (Untergrenze bei Nichtnutzung)

The room controller regulates towards this minimum temperature when it is in "out of service" mode.

Commissioning:

Sensor calibration (Fühlerabgleich)

This adjustable parameter equalizes any measuring discrepancies between the room control unit and the temperature reached by a reference measurement in the room. Such discrepancies arise mainly from unsatisfactory positioning of the RAG in the room.
The correction value entered here is added to the temperature measured. If a reference measurement indicates that the room's temperature display is too high compared with the reference measurement, a corresponding negative value must be entered here. If the temperature is measured too low, a positive value must be entered.
Default setting is 0.0°C (no correction)

Sensor selection (Fühlerauswahl)

The optional connection of an external temperature sensor is possible with room control units. This adjustable parameter indicates whether the internal, external or both sensors are to be used.
If both sensors are activated, the arithmetical average of both measurements is calculated as the actual value.
Adjustment of this parameter also determines which sensors are reported as faulty, if necessary.
Default setting: internal sensor

External input mode (Modus externer Eingang)

The optional input can be occupied by various functions:

"Not in use":	no external contact connected. This setting should also be used when an external temperature sensor is connected.
"Window open":	Window contact (break contact)
"Window shut":	Window contact (make contact)
"Presence":	Presence detector (make contact)

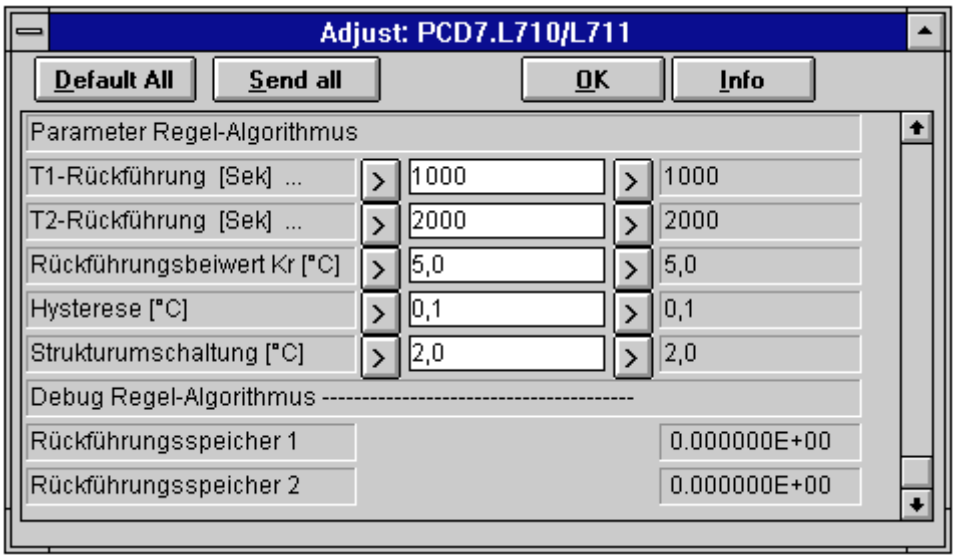
Valve function (Ventil-Funktion)

Determines whether a connected actuating drive activates the valve as "currentless, open" or "currentless, closed".

Power factor heat exchanger (Leistungsfaktor-Wärmetauscher)

This parameter defines how high the energy requirement of the room is when it is being heated. It enables assessment of the energy requirement to be adjusted for various conditions of room size and heating unit.

Control algorithm:



T1 feedback (T1-Rückführung)

Feedback time constant T1 (see below)
Default setting: 1000 seconds

T2 feedback (T2-Rückführung)

Feedback time constant T2 (see below)
Default setting: 2000 seconds, normal value: 2 * T1

Feedback correction value (Rückführungsbeiwert)

Amplification setting of feedback
Default setting: 5.0 °C

Hysteresis

Switching hysteresis of the two-position controller
The default setting of 0.1°C basically suits all radiator heating. Changes to this value should only be made if the switching frequency of the connected actuator must be restricted.

Switching limit structural commutation (Schaltgrenze Strukturumschaltung)

The temperature controller deactivates feedback when the control deviation exceeds a certain size. This switching limit can be adjusted here. This prevents the controller from overshooting when regulating after setpoint jumps.
Default setting: 2.0 °C

In general, the preset values produce good control results. However, some instruction should be given here on the adjustment of control parameters.

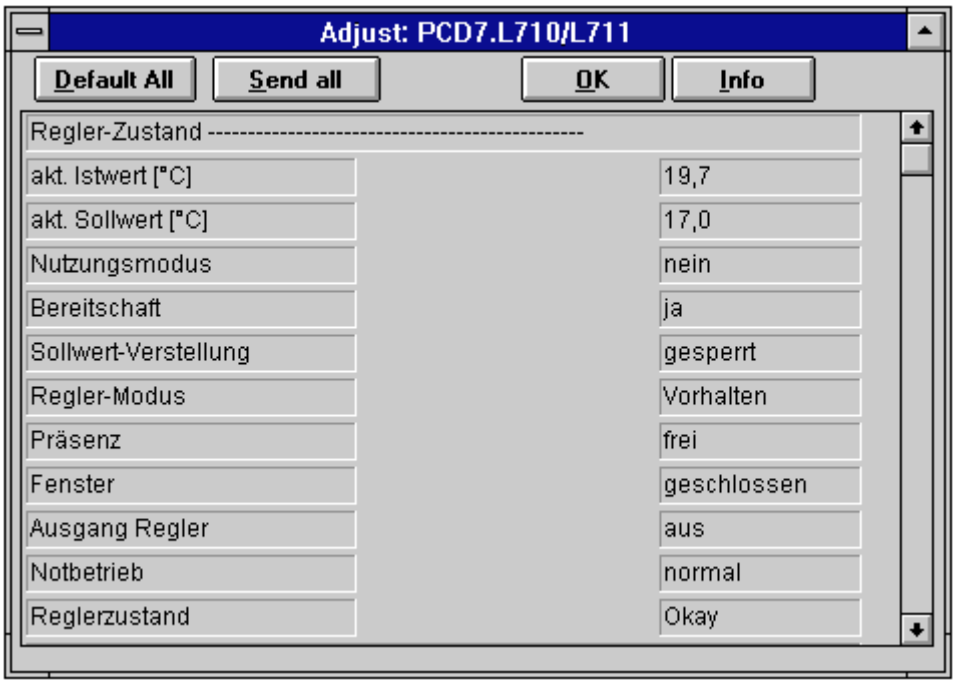
Optimum adjustment of temperature control is only possible with data recording of actual temperature values, such as a process visual display system can supply. Otherwise it is necessary to ensure that, during recording, setpoint adjustment is not modified at the RAG, so that changes to the setpoint do not unnecessary hamper the interpretation of data.

The **feedback time constants** T1 and T2 are dependent on the delay of the controlled system; the longer the controlled system delay time, the longer must T1 and T2 be also. Normal values for T1 are in the range 300..1500 seconds. As a rule, T2 is set to 2 * T1.

Feedback correction value K (amplification of feedback) depends on the heating speed of the room; the greater the heating speed, the higher must this value be set. Normal values are in the range 2.0...8°C. If amplification is set at 0, the controller operates without feedback. This setting can be useful to test the two-position behaviour of the controlled system. From this two-position behaviour, delay times and any necessary system damping can be estimated.

The **switching limit for structural commutation** can vary in the range 1.0..5°C. It is important that the above settings only apply within the defined band for control deviation. If the control deviation is greater than the value set here, the controller works as a straight two-position controller without feedback. The smaller the switching limit set, the more sensitively the controller reacts to transient effects on poorly adjusted control parameters (T1, T2, Kr).

3.4.4 Data points



Current actual value (aktueller Istwert)
Indicates current actual value (as output IST)

Current setpoint (aktueller Sollwert)
Indicates current setpoint (as output SOL)

Service mode (Nutzungsmodus)
Indicates whether the room is in service

Standby (Bereitschaft)
Indicates whether the room is in standby mode

Setpoint adjustment (Sollwertverstellung)
Indicates whether setpoint adjustment has been released (input FSV)

Controller mode (Reglermodus)
Indicates whether the controller is regulating to comfort temperature or maintaining the minimum temperature according to the operating mode ("derivative")

Presence (Präsenz)
Indicates the state of the presence function (presence key or detector)

Window (Fenster)
Indicates window state (as output FEN)

Controller output (Ausgang Regler)
Indicates whether the regulator is heating (as output W)

Emergency service (Notbetrieb)
Indicates whether frost protection has been activated (fallen below the frost protection limit)

Controller state (Regler-Zustand)
Indicates error states in the room (communications error, sensor error, frost protection activation...)

Internal data points

Detailed information on the internal data points of the RAGEZR block can be found in the data-point list, chapter 4.

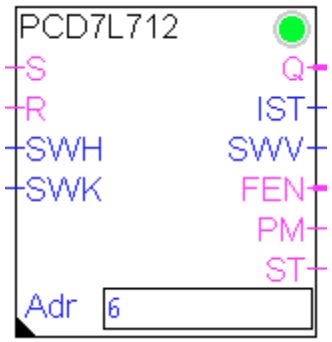
3.5 RAG12: Coupling to PCD7.L712

3.5.1 System description

The RAG12 FBox contains the coupling to a PCD7.L712 room control unit across the central communications function EZR-COM. The PCD7.L712 room control unit has been designed for the control of rooms with heating and cooling groups using constant actuators.

The RAG12 FBox maps the inputs and outputs of the PCD7.L712 room control unit in the PCD. The FBox itself includes no control, as the layout of the regulating algorithm and the control of the heating/cooling sequence are heavily dependent on the regulation plans and groups used.

A maximum of 60 RAG devices can be connected to one PCD. The number of RAG12 function blocks which can be positioned is also, therefore, limited to 60.



3.5.2 Terminals

Inputs:

S Set presence flip-flop
This input controls the presence function (jointly with input R and the presence key in PCD7.L712).
When input S is 1, the presence indicator in the PCD7.L712 room control unit is permanently switched on.
When input S is 0, the state of the presence indicator in the PCD7.L712 room control unit depends on input R and key operation.

R Reset presence flip-flop
This input controls the presence function (jointly with input S and the presence key in PCD7.L712).
When input R is 1, the presence indicator in the PCD7.L712 room control unit is permanently switched off.
When input R is 0, the state of the presence indicator in the PCD7.L712 room control unit depends on input S and key operation.
Only when both inputs (S and R) are 0 can the presence indicator be modified by operating the key on the PCD7.L712 room control unit.

SWH Heating control value (Stellwert Heizen)
This input specifies the control value of the heating output (output 1) for the PCD7.L712 room control unit. The range of values is 0..100 (%); this represents an output of 0..10 V at the PCD7.L712 room control unit.

SWK Cooling control value (Stellwert Kühlen)
This input specifies the control value of the cooling output (output 2) for the PCD7.L712 room control unit. The range of values is 0..100 (%); this represents an output of 0..10 V at the PCD7.L712 room control unit.

Outputs:

Q Acknowledge presence flip-flop (Rückmeldung Präsenz-FlipFlop)

Indicates the state of the presence flip-flop. Presence can be modified by depressing the presence key on the PCD7.L712 room control unit and by fixed specification through the S and R inputs.

IST Actual temperature (Temperatur-Istwert) in steps of 0.1°C
Indicates current actual temperature

SWV Setpoint shift (Sollwertverstellung) in steps of 0.1°C
Indicates the setpoint shift by adjusting the wheel on the PCD7.L712 room control unit.

FEN Window contact (Fensterkontakt)
Signals whether the window contact input on the PCD7.L712 room control unit is closed.

PM Presence detector contact (Präsenzmelder-Kontakt)
Signals whether the "presence detector" input on the PCD7.L712 room control unit is closed. Motion detectors and similar can be connected across this input.
The state of devices connected here has no influence on the presence flip-flop or output Q. Any linking between the PM and Q outputs must, if needed, take place in the PCD program.

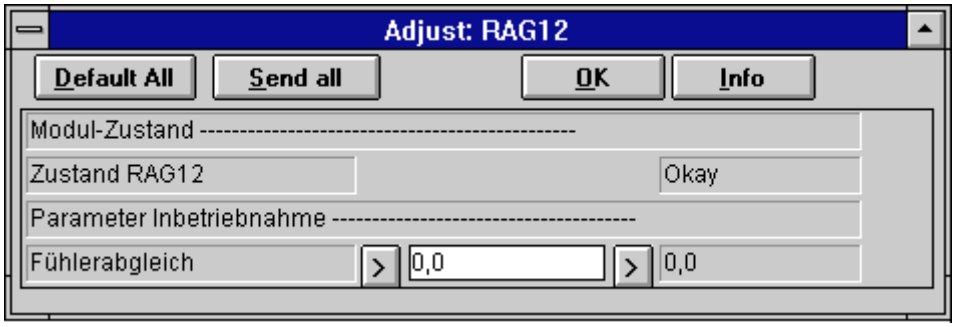
ST Fault (Störung)

Indicates whether there is a fault in the room. The control station can query which type of fault. Causes may be: communications errors with the RAG, sensor faults.

Parameters:

Adr The address of the assigned room control unit (RAG) is entered here. This address is marked on the RAG.
The address is used for allocation between controller and room and must be set clearly and correctly.
The address can be entered as a numerical value or symbolic constant. Definition as a symbolic constant (e.g.: "OG_R101") is particularly recommended, as it greatly simplifies the administration of RAG addresses in the resource list.

3.5.3 Adjust parameters



Commissioning:

Sensor calibration (Fühlerabgleich)

This adjustable parameter equalizes any measuring discrepancies between the room control unit and the temperature reached by a reference measurement in the room. Such discrepancies arise mainly from unsatisfactory positioning of the RAG in the room. The correction value entered here is added to the temperature measured. If a reference measurement indicates that the room's temperature display is too high compared with the reference measurement, a corresponding negative value must be entered here. If the temperature is measured too low, a positive value must be entered.
Default setting is 0.0 °C (no correction)

3.5.4 Data points

Controller state Indicates error states in the room (communications error, sensor error, activation of frost protection...)

Internal data points

Detailed information on the internal data points of the RAGEZR block can be found in the data-point list, chapter 4.

4. Internal data points

4.1 EZRCOM: internal data points

The internal data points of FBox 'EZRCOM' are listed below.

Warning: Access to internal variables must be programmed with the greatest care. The overwriting of internal states can lead to unrecoverable function errors.

4.1.1 Internal register variable rSD

Offset	Variable
0..59	Internal temperature sensor measurement [0.1°C] for RAG 1..60
60..119	External temperature sensor measurement [0.1°C] for RAG 1..60
120..179	Setpoint adjustment [0.1°C] for RAG 1..60
180..239	Physical address for RAG 1..60

Variables written in *italics* contain values which can be set in the adjust window under appropriately titled options. These variables may be written.

Access to all other variables must be read-only. Write access to these variables can lead to serious functional errors!

4.1.2 Internal register variable rS

Offset	Variable
2	Parameter: *Scaling setpoint adjustment* [0.1 °C]
3	Parameter: *Frost protection limit* [0.1 °C]

Variables written in *italics* contain values which can be set in the adjust window under appropriately titled options. These variables may be written.

The remaining offsets, which are not described here, must not be accessed!

4.1.3 Internal flag variable fSD

Offset	Variable
0..59	Set presence LED for RAG 1..60
60..119	Reset presence LED for RAG 1..60
120..179	State of presence LED for RAG 1..60
180..239	Control value output (1 = current-bearing) for RAG 1..60

Access to these variables must be read-only. Write access to these variables can lead to serious functional errors!

4.1.4 Internal flag variable fS1

Offset	Variable
0..59	Acknowledge control value for RAG 1..60
60..119	Status of window/presence contact for RAG 1..60
120..179	Communications error flag for RAG 1..60

Access to these variables must be read-only. Write access to these variables can lead to serious functional errors!

4.2 RAGEZR: internal data points

The internal data points of FBox 'RAGEZR' are listed below.

Warning: Access to internal variables must be programmed with the greatest care. The overwriting of internal states can lead to unrecoverable function errors.

4.2.1 Internal register variable rSD

Offset	Variable
0	Resulting actual value [0.1°C] (same value as at output IST of FBox)
1	Resulting setpoint [0.1°C] (same value as at output SOL of FBox)
2	Internal variable: *Feedback memory 1*
3	Internal variable: *Feedback memory 2*
4	Controller parameter: *Feedback time constant T1* [sec.]
5	Controller parameter: *Feedback time constant T2* [sec.]
6	Controller parameter: *Feedback correction value* [0.1°C]
7	Controller parameter: *Hysteresis* [0,1°C]
8	Controller parameter: *Switching limit structural commutation* [0.1°C]
9	Setpoint parameter: *Comfort temperature* [0.1°C]
10	Setpoint parameter: *Standby temperature* [0.1°C*]*
11	Setpoint parameter: *Lower limit for out-of-service* [0.1°C]
12	Setpoint parameter: *Lower limit for standby* [0.1°C]
13	Parameter: *Sensor calibration* [0.1°C]
14	Parameter: *Power factor heat exchanger* (integer)
15	Parameter: *Sensor selection* (integer: 0..3) 0 = no temperature sensor 1 = internal temperature sensor 2 = external temperature sensor 3 = both temperature sensors
16	Parameter: *ext. input mode* (integer) 0 = not in use 1 = window open 2 = window closed 3 = presence detector

17 Internal variable: error state (integer)
0 = no error
1 = communications fault
2 = frost protection
3 = sensor error

Variables written in *italics* contain values which can be set in the adjust window under appropriately titled options. These variables may be written.

Access to all other variables must be <u>read-only.</u> Write access to these variables can lead to serious functional errors!

4.2.2 Internal flag variable fSD

Offset	Variable
0	Service mode active? (same value as at input NUT of FBox)
1	Standby active? (same value as at input BER of FBox)
2	Release setpoint adjustment (same value as at input FSV of FBox)
3	Comfort control mode (1 = comfort controller activated)
4	Presence (1 = room occupied)
5	Window contact (1 = closed)
6	Current status controller output (1 = heating)
7	Emergency service (1 = drop below frost protection limit)
8	Adjust parameter: *Valve* type (1 = currentless, open, 0 = currentless, closed)

Variables written in *italics* contain values which can be set in the adjust window under appropriately titled options. These variables may be written.

Access to all other variables must be read-only. Write access to these variables can lead to serious functional errors!

4.3 RAG 12 - internal data points

The internal data points of FBox RAG12 are listed below.

Warning: Access to internal variables must be programmed with the greatest care. The overwriting of internal states can lead to unrecoverable function errors.

Internal register variable rSD

Offset	Variable
0	Internal variable: error state (integer) 0 = no error 1 = communications error 2 = frost protection 3 = sensor error
1	Parameter: *Sensor calibration* [0.1°C]

Variables written in *italics* contain values which can be set in the adjust window under appropriately titled options. These variables may be written.

Access to all other variables must be read-only. Write access to these variables can lead to serious functional errors!

5. RAG monitor

The RAG monitor is a debug tool for investigating data communications on the bus line of the RAG single-room controller.

5.1 Connection

The RAG bus line must be connected via an RS485/RS232 interface converter with one of the PC's serial ports (COM1 or COM2).

The interface converter translates the bus line's RS485 signals to the RS232 of the PC's serial port. Please connect the interface converter according to the converter description.

Direct connection between the RAG bus and the PC can destroy the PC or RAG!

5.2 Operation and display

5.2.1 Program start

The RAG monitor is a DOS program.
The program is called from the DOS prompt with

`RAGMON {comnr}`

For the *"comnr"* parameter, specify the serial port number (1 or 2) which is connected to the RAG bus via an interface converter.

5.2.2 Key functions

The program is operated exclusively via function keys. On the bottom line of the screen, the relevant function key assignment is displayed.

F1: START or STOP	Starts or stops the display of data.
F2: DATA or DEBUG	Toggles between debug display (HEX data) and data display (plain text).
F8: EXIT	Terminates the program

5.2.3 Screen representation

Data communication is displayed in the "data" or "debug" window (depending on which mode has been activated with F2). Display in debug mode not relevant to the user, therefore data display only is described here:

Each screen line represents a telegram. A difference is drawn between master and slave telegrams. Master telegrams are those which the PCD sends to the room control units (RAGs); slave telegrams are the replies from RAGs to the PCD.

Master telegrams:

Master telegrams are identified at the start of the line with "->RAG1X", indicating the direction of transmission from PCD to RAG.

Example:

```
->RAG1X    ( ###)         standby  OFF
```

The number in brackets (###) indicates the RAG address.
The third column identifies current RAG operating mode as "standby", "In service" or "Out of service".
The fourth column indicates the RAG control value signal ("OFF" or "heating")

Slave telegrams:

Slave telegrams are identified at the start of the line with "RAG1X->", indicating the direction of transmission from RAG to PCD

Example:

```
 RAG1X-> ( ###)  occupied OFF   22.0°C   ---   0%
```

The number in brackets (###) indicates the RAG address.
The third column shows with "occupied" or "free" whether the LED on the RAG is switched on.
The fourth column returns the control value signal of the RAG ("OFF" or "heating")
The fifth column represents the value measured by the internal temperature sensor and the sixth column the external sensor value (if present, otherwise: "---").
The seventh column indicates the setting of the setpoint adjuster on the RAG (PCD7.L711/712 only). The display is in percent, with +100% signifying maximum temperature increase.

5.3 Error assessment

5.3.1 RAG does not respond

Normally each master telegram must be followed by a slave telegram from the appropriate RAG. If not (two consecutive master telegrams) the causes may be the following:

- No RAG present in system with corresponding address
- The RAG has no supply voltage.
- The bus line has been cut or its poles reversed.

5.3.2 Display LenError / BCCError

If there is a transmission fault between the PCD and RAG, as a rule `"LenError"` or `"BCCError"` are displayed. The following points should be noted here:

- Depending on the environment and any sources of interference present, this message can be displayed occasionally even when the bus is operating conventionally.
- If the fault always occurs with the same RAG, it is highly likely that this RAG, or the bus line near it, is damaged.
- If the fault occurs with all RAGs, either the interface adapter has been wrongly connected or the bus line has been wired incorrectly (transposition?)
- If the error messages occur only with master or only with slave telegrams, the communications lines on the PCD may have been transposed.

Main menu

SAIA®PCD for building automation

SAIA®PCD perfor-mance overview

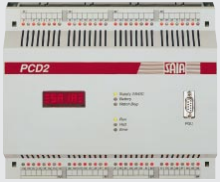
Overview manuals

SAIA®PCD for factory automation

Programming tools

General informations

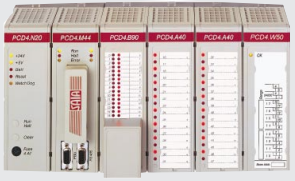
Series PCD1



Series PCD2

PLC + PC: PCD2.M220

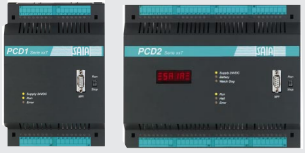
Remote I/Os:
PCD0 and PCD1.RIO



Series PCD4

Series PCD6

Terminals



Serie xx7:
the SIMATIC® S7
compatible PLC