

## Room Temperature Controller RAM 710 EIB



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## 1 Operational Characteristics

- ◆ Intelligent 2 point controller with automatic adaption of the switching hysteresis for warm water heating and all types of direct electrical heating.
- ◆ Measuring area 5-30,5° , resolution 0.1°
- ◆ Assembling surface type
- ◆ Controller comprises the EIB-BUS-docking.
- ◆ Output of the regulation signal "heating on/off" (1 bit) cyclic or if needed, when regulating, the BUS
- ◆ Three different operation types (comfort, set-back, antifreezing) with according temperature steps selectable via the Bus.
- ◆ Active operation type is indicated by two LEDs.
- ◆ Temperature steps can be given by the manual setting wheel, by BUS, by parameters corresponding to the chosen application programme.
- ◆ The temperature regulation area via manual setting wheel can be limited by parameters (e.g. max. 20 C, min. 10°C).
- ◆ Actual temperature can be transmitted via Bus.
- ◆ When pressing party keys you can change between the operation types: comfort lengthening and set-back.
- ◆ Party key can be deactivated by parameters.

## 2 Technical Data

**supply from Bus**

voltage: 24 V DC (+6V / -3V)  
household consumption: < 10 mA  
connection: via Bus connection screw

**kind of protection:**

IP 20 (with integrated Bus docking)

**measurement of temperature**

sensor: NTC  
measuring area: +5°C to +30,5°C  
regulation area: +6°C to +30°C  
resolution: 0.1 K

**operation elements:**

- a manual setting wheel to regulate the comfort temperature
- party key to switch the comfort lenghtening/set-back function

**indication elements:**

- a LED to indicate the operation type "set-back"
- a LED to indicate the operation type "comfort"
- both LEDs to indicate the operation type "frost protection"

**colour:**

white

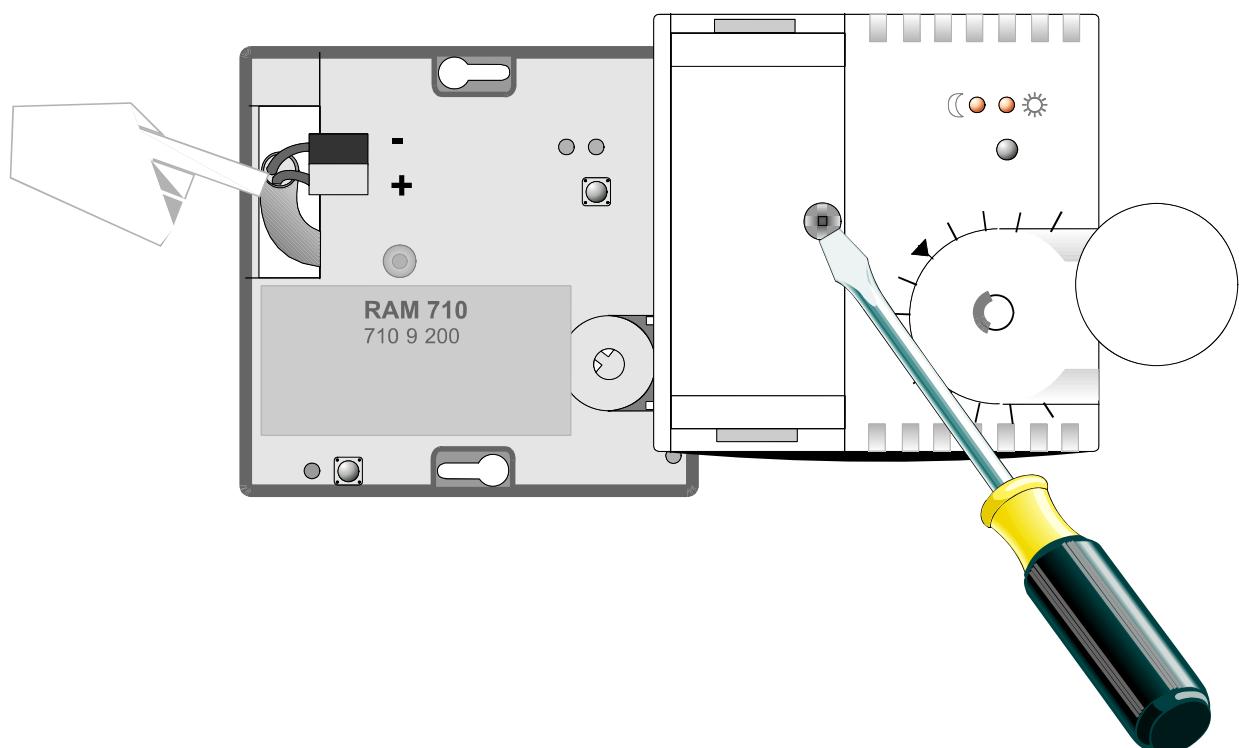
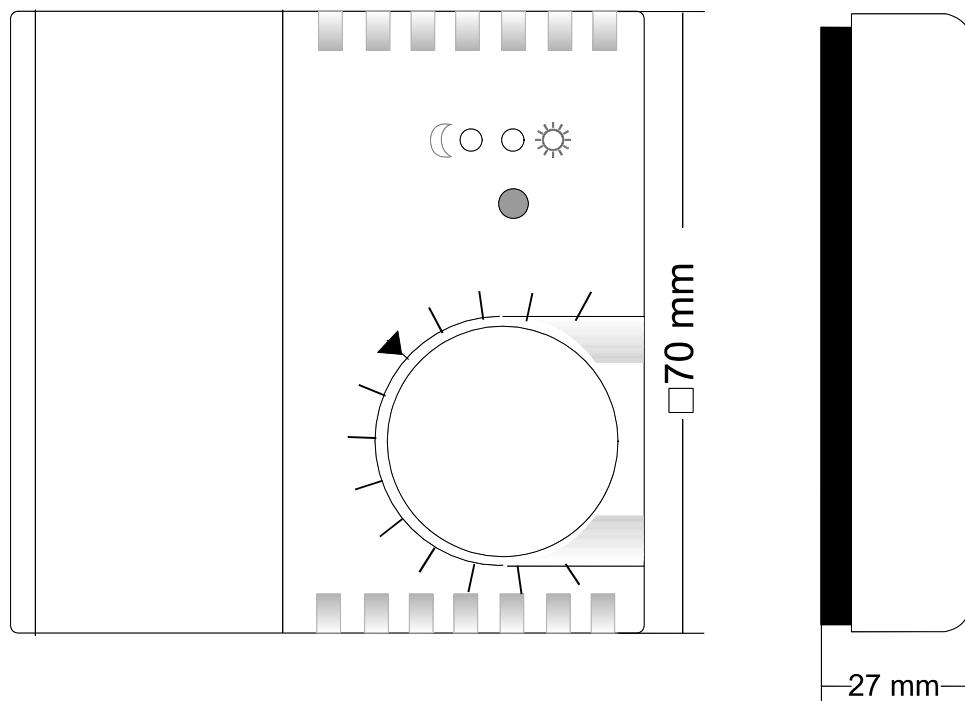
**assembly:**

surface type

**housing measurements:**

71 x 71 x 27,5 mm

## 2.1 Dimensional Drawing / Connection Diagram



### 3 Application Programs

The following application programs for the room temperature controller RAM 710-EIB are available.

application program	short description
<b><i>2 point controller with 3 temperature steps</i></b>	<p>regulation type: 2 point controller with automatic adaption of the switching hysteresis</p> <p>output of the regulation signal on the Bus: switching end (1bit)</p> <p>transmitting reaction of the regulation signal: cyclic or if needed only when regulating</p> <p>possible regulation types: comfort, comfort lengthening, set-back, frost protection</p> <p>selecting the operation types: comfort, set-back, frost protection via 1 bit-messages, comfort lengthening via party key</p> <p>allowed set-temperatures: for set-back and frost protection via parameters; for comfort via manual setting wheel</p>
<b><i>2 point controller with actual value and 3 temperature steps</i></b>	<p>same characteristics as application program „2 point controller with 3 temperature steps“ only with the additional function „transmission of the currently measured temperature“</p> <p>output of the actual temperature: as 2 byte-message via Bus</p> <p>transmitting reaction of the actual temperature: cyclic or if needed only when regulating</p>
<b><i>controller with desired temperature via Bus</i></b>	<p>same characteristics as application program „2 point controller with 3 temperature steps“ with the only difference that the allowed set-temperature can be effected optionally via Bus and by the additional function „transmission of the currently measured temperature“</p> <p>allowed set-temperatures: - for comfort via manual setting wheel - for set-back via Bus as 1 byte-message - for frost protection via parameters</p> <p>output of the actual temperature: as 1 byte-telegram via Bus</p> <p>transmitting reaction of the actual temperature: cyclic or if needed only when regulating</p>

### 3.1 Selection in the Product Data Bank

<b>producer:</b>	THEBEN-WERK ZEITAUTOMATIK
<b>product family:</b>	heating, climate, ventilation
<b>product type:</b>	regulator
<b>product name:</b>	RAM 710 EIB

Download the application from: <http://www.theben.de>

### 3.2 Application Program „Controller with Actual Value and 3 Temperature Steps“

#### Function Characteristics

With this applications you can realize/implement the following functions:

- There are 3 types of regulation (comfort, set-back, frost protection) with corresponding temperature levels selectable.
- The desired value specification for the operating mode " comfort " is made by the hand adjusting wheel at the automatic controller.
- The temperature range of adjustment over the hand adjusting wheel can be limited by parameters. Adjustments which are situated outside this area are reduced to the boundaries adjusted by parameters.
- For the operating modes " set-back " and " frost protection " the desired value specification is made by parameters.
- The ambient temperature actual value is transmitted cyclically or with a modification as 2 byte value on the bus.

The function of the party calipers:

- Over a parameter it can be determined whether the tracer must have a function or not.
- If the function is released and the party calipers pressed during the operating mode " comfort ", a change into the operating mode " sinking " takes place.
- If the party calipers are pressed during the operating mode " sinking ", a change into the operating mode " comfort " (party time) is effected temporally limited. The length of time can be adjusted over a parameter. A premature stop of the party time, by a bus telegram, is not possible. Also no acknowledgement takes place on the bus that a party time runs at the moment.



## Communication Objects

Nr.	Object name	Function	Type	Behaviour
0	automatic controller output	transmitting a telegram heating ON/OFF	1 Bit	to send
1	frost protection	receipt of a telegram frost protection ON/OFF	1 Bit	to receive
2	comfort	receipt of a telegram comfort / set-back	1 Bit	to receive
3	actual value	transmitting of the measured temperature actual value	2 Byte	to send

Max. number of communication objects: 4

Max. number of group addresses: 6

Max. number of allocation: 6

- **Object „0-controller output“**

**The controller transmits over this object in dependency with the 2 point controller behaviour 1 bit adjusting signal.**

1 = heating on  
0 = heating out

- **Object „1-frost protection“**

The operating mode " frost protection " is selected over this object.

1 = frost protection ON (device regulates on the parameterized frost protection temperature)  
0 = frost protection OUT

- **Object „2-comfort“**

The operating modes " comfort " and " set-back " are selected over this object.

1 = comfort operation (device regulates on the temperature set by the hand adjusting wheel )  
0 = set-back operation (device regulates on the parameterized set-back temperature)

- **Object „3-actual value“**

Over this object, the automatic controller transmits the current ambient temperature (actual value) in the EIB slide comma form („Gleitkommaform“) (2 byte / EIS 5). The value is transmitted cyclically (ETS parameters) or due to a modification of the adjusting signal (object 0) on the bus.

## Adjustment of Operating Modes via Communication Objects

operating mode	object „frost protection“	object „comfort“	LED moon	LED sun	specification of the temperature set value
frost protection	1	0 or 1	off	off	via parameter
set-back	0	0	on	off	via parameter
comfort	0	1	out	off	via hand adjusting wheel

## Parameter

Chart 1: parameter on the page "temperatures"

Description	Values	Meaning
When frost protection regulation on:	6 ° : 12 °	Adjustment of the temperature level for the operating mode "frost protection". This adjustment is at the same time the lowest set temperature specification, on which one regulates.  <u>Example:</u> frost protection = 8°C Set temperature on the hand adjusting wheel = 6°C => The device regulates on 8°C
When set-back regulation on:	9 ° : 15 ° : 29 °	Adjustment of the temperature level for the operating mode "set-back". This operating mode is activated, if the status of the objects is 1 (frost protection) and 2 (comfort) 0.
Max. adjustable temperature:	9 ° : 24 ° : 29 °	With this parameter the range of adjustment for the set temperature specification can be limited over the hand adjusting wheel (= comfort temperature)  <u>Example:</u> Adjusted temperature at the hand adjusting wheel = 29°C, max. adjustable temperature = 22°C the → device regulates on 22°C

**Chart 2: Parameter on the page "Party caliper"**

Description	Values	Meaning
Function of the calipers:	<b>Change between comfort and set-back</b> blocked	Definition of the function party calipers. If you change the function by the calipers from comfort on set-back operation, you can regulate so long on the set-back operation till the operating mode is again removed by the calipers or by a telegram. When changing from set-back operation into comfort operation, a time adjustable comfort temperature can be regulated (party circuit). The duration can be adjusted in the following parameter field.
duration of the party circuit	appr. 30 minutes : <b>appr. 2 hours</b> : appr. 4,5 hours	When this time goes by, you can change automatically into the operating mode "set-back". If the party calipers are pressed before the end of this time you can also change into the operating mode "set-back".
pressing the key with frost protection	<b>freece protection unchanged</b> cancels freece protection	Determining of the function of the party calipers in the operation mode „freece protection“

**Char 3: Parameter on the page "transmitting behaviour"**

Description	Values	Meaning
adjusting size and actual value:	<b>transmitting cyclically</b> only when regulation is required	Adjustment of the transmission behaviour of the objects 0 (= automatic controller output) and 3 (actual temperature)
cycle time:	appr. 3 min : <b>appr. 5 min</b> : appr. 60 min	Appears, if the parameter was adjusted "cyclically transmitting". The adjusting size and the measured ambient temperature are transmitted cyclically on the bus.

**Chart 4: Parameter on the page "mesurement and regulation characteristics"**

Description	Values	Meaning
Hysteresis:	+/- 0,3 ° +/- 0,5 °	It can be prevented by adjustment of a hysteresis that the automatic controller switches several times, if the measured ambient temperature value (actual value) is situated in the area of the adjusted desired value.
Feed back time:	appr. 1 min appr. 3 min appr. 5 min appr. 10 min	At the beginning of a heating phase the automatic controller sets the switching point on the desired value + hysteresis. At the same time a feedback time is started. As long as the feedback time runs, the switching point remains unchanged. If, however, the time has already expired, only the pure desired value is set as switching point. The same applies with other signs in a set-back phase. As long as the feedback time runs, the desired value is the switching point less the hysteresis. As soon as the feedback time expires, the switching point is again the pure desired value.  <b>Note!</b> If the automatic controller switches too frequently, the value should be increased.
Adjusted value		In order to adjust enviromental influences, the measured ambient temperature value can be shifted by an an adjusted value.  Enviromental influences can be e.g.: - influences by other heat sources or assembly on cold external wall - temperature difference between room use area and assembly place - measurement deviation of the device.

### **3.3 Application Program „Controller with Desired Value Specification via Bus“**

#### **Function Characteristics**

With this applications you can realize/implement the following functions:

- There are 3 types of regulation (comfort, set-back, frost protection) with corresponding temperature levels selectable.
- The desired value specification for the operating mode " comfort " is made by the hand adjusting wheel at the automatic controller.
- The temperature range of adjustment over the hand adjusting wheel can be limited by parameters. Adjustments which are situated outside this area are reduced to the boundaries adjusted by parameters.
- The desired value specification for the operating mode " sinking " is made by the bus (byte object " ext. desired value ") or over parameters.
- For the operating modes " set-back " and " frost protection " the desired value specification is made by parameters.
- The ambient temperature actual value is transmitted cyclically or with a modification as 2 byte value on the bus.

The function of the party calipers:

- Over a parameter it can be determined whether the tracer must have a function or not.
- If the function is released and the party calipers pressed during the operating mode " comfort ", a change into the operating mode " sinking " takes place.
- If the party calipers are pressed during the operating mode " sinking ", a change into the operating mode " comfort " (party time) is effected temporally limited. The length of time can be adjusted over a parameter. A premature stop of the party time, by a bus telegram, is not possible. Also no acknowledgement takes place on the bus that a party time runs at the moment.

## Communication Objects

Nr.	Object name	Function	Type	Behaviour
0	automatic controller output	transmitting a telegram heating ON/OFF	1 Bit	to send
1	frost protection	receipt of a telegram frost protection ON/OFF	1 Bit	to receive
2	ext. set value in %	receipt of a telegram for the specification of the temperature set value	1 Byte	to receive
3	actual value	transmitting of the measured temperature actual value	1 Byte	to send

Max. number of communication objects: 4

Max. number of group addresses: 5

Max. number of allocation: 4

- **Object „0-controller output“**

**The controller transmits over this object in dependency with the 2 point controller behaviour 1 bit adjusting signal.**

1 = heating on

0 = heating out

- **Object „1-freeze protection“**

The operating mode "frost protection" is selected over this object.

1 = frost protection ON (device regulates on the parameterized frost protection temperature)

0 = frost protection OUT

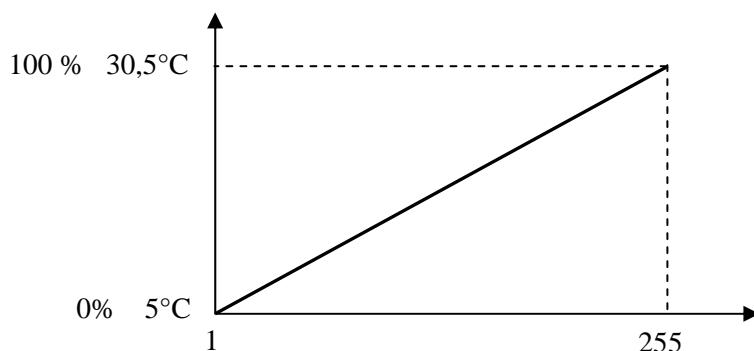
- **Object „2 ext. set value in %“**

The operating mode „comfort“ and „set-back“ are selected by this byte-object.

0 = comfort operation (device regulates on the temperature set by the hand adjusting wheel)

1...255 = set-back operation (device regulates on the temperature resulted by the %-value)

specification of the temperature level via the object „ext. must value in %“



The value which must be transmitted on the object "ext. DESIRED VALUE in % " is calculated as

follows:

$$\text{value} = (\text{temperature} - 5) \times 10$$

Examples:

temp. specification	value which must be transmitted
30,5 °C	255
20 °C	150
15 °C	100
7 °C	20

- **Object „3-actual value“**

Over this object the automatic controller transmits the current ambient temperature (actual value) in % of the measured value in the format 1 byte. The measuring range is situated between 5°C and 30,5°C. From this follows:

$$0\% = 5^{\circ}\text{C} \text{ (transmitted value} = 1)$$

$$100\% = 30,5^{\circ}\text{C} \text{ (übertragener Wert} = 255)$$

The actual temperature can also be calculated with the following formula:

$$\text{actual temperature in } ^{\circ}\text{C} = (\text{transmitted value} + 50) / 10$$

The value is transmitted cyclically (ETS parameters) or due to a modification of the adjusting signal (object 0) on the bus.

### Adjustment of the Operating Modes over the Communication Objects

Operation mode	Object „frost protection“ (1 Bit)	Object „Ext. SET VALUE in %“ (1 Byte)	LED Moon	LED Sun	Specification of the set temperature
frost protection	1	-	OFF	OFF	via parameter
set-back	0	1 ... 255	ON	OFF	via Bus
comfort	0	0	OFF	ON	via hand adjusting wheel

**Parameter****Chart 5: Parameter on the Page "temperatures"**

<b>Description</b>	<b>Value</b>	<b>Meaning</b>
When frost protection regulation on:	<b>6 °</b> : <b>12 °</b>	Adjustment of the temperature level for the operating mode " frost protection ". This adjustment is at the same time the lowest set temperature specification, on which one regulates.  <u>Example:</u> frost protection = 8°C Set temperature on the hand adjusting wheel = 6°C ➔ The device regulates on 8°C
Max. adjustable temperature:	<b>9 °</b> : <b>24 °</b> : <b>29 °</b>	With this parameter the range of adjustment for the set temperature specification can be limited over the hand adjusting wheel (= comfort temperature)  <u>Example:</u> Adjusted temperature at the hand adjusting wheel = 29°C, max. adjustable temperature = 22°C the ➔ device regulates on 22°C

Chart 6: Parameter on the page "reaction on pressing the calipers"

Description	Value	Meaning
Function of the calipers:	<b>Change between comfort and set-back</b> blocked	Definition of the function party calipers.
Pressing the calipers during „comfort“ has following set value as result	15 ° : 29 °	If during the operating mode " comfort " the party calipers are pressed, you can regulate so long on the following parameterized set-back-set-value till a new desired value specification takes place by pressing the calipers again or by a renewed telegram on the object " ext. DESIRED VALUE ".  This parameterized set-back-set-value is written into the object " ext. DESIRED VALUE in % " when pressing the party key.
Pressing the calipers during „set-back“ has following set value as result	<b>Temperature according to potentiometers</b> 15 ° : 29 °	Definition which new temperature-set-value is to apply, if the party calipers are pressed in the operating mode "set-back".  When changing from set-back operation into comfort operation, a time adjustable comfort temperature (specification by the hand adjusting wheel) or other temperature (party circuit) can be regulated. The duration can be adjusted in the following parameter field.
For	appr. 30 minutes : <b>appr. 2 hours</b> : appr. 4,5 hours	When this time goes by, you can change automatically into the operating mode " set-back ". If the party calipers are pressed before the end of this time you can also change into the operating mode " set-back ".  Then you can regulate on that temperature level which is specified in the object "ext. MUST-VALUE in % ".

Chart 7: Parameter on the page "after first use"

Description	Value	Meaning
Regulate on:	<b>temp. accor. to potentio.</b> 15 ° :	Adjusting, on which temperature you have to regulate on after loading the application software.

	29 Grad	
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Tabelle 8: Parameter on the page "transmitting behaviour"

Description	Value	Meaning
adjusting size and actual value:	<b>transmitting cyclically</b> only when regulation is required	Adjustment of the transmission behaviour of the objects 0 (= automatic controller output) and 3 (actual temperature)
factor for cycle time x 33 sec:	4... <b>10</b> ...255	Appears, if the parameter was adjusted "cyclically transmitting".  The adjusting size and the measured ambient temperature are transmitted together with the adjusted cycle time on the bus.

Chart 9: Parameter on the page "measuring and regulation characteristics"

Description	Value	Meaning
Hysteresis:	+/- <b>0,3</b> °  +/- 0,5 °	It can be prevented by adjustment of a hysteresis that the automatic controller switches several times, if the measured ambient temperature value (actual value) is situated in the area of the adjusted set value.
Factor for feed back time:	<b>appr. 1,5 min</b>  appr. 2,5 min  appr. 5 min	At the beginning of a heating phase the automatic controller sets the switching point on the desired value + hysteresis. At the same time a feedback time is started. As long as the feedback time runs, the switching point remains unchanged. If, however, the time has already expired, only the pure desired value is set as switching point. The same applies with other signs in a set-back phase. As long as the feedback time runs, the desired value is the switching point less the hysteresis. As soon as the feedback time expires, the switching point is again the pure desired value. <b>Note!</b> If the automatic controller switches too frequently, the value should be increased.
Adjusted value		In order to adjust environmental influences, the measured ambient temperature value can be shifted by an adjusted value. Environmental influences can be e.g.: - influences by other heat sources or - assembly on cold external wall - temperature difference between room

		use area and assembly place - measurement deviation of the device.
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## 4 Examples of Use

### 4.1 Example of Use "Individual Room Regulation within the Living Area"

#### Topic

Application of the ambient temperature automatic controller RAM 710-EIB with the application program "3 temperatures with actual value transfer".

Task in a house is to be recalled the heat supply for the individual spaces optimally and non-standard. Are to be implemented the following rule, - control and control functions:

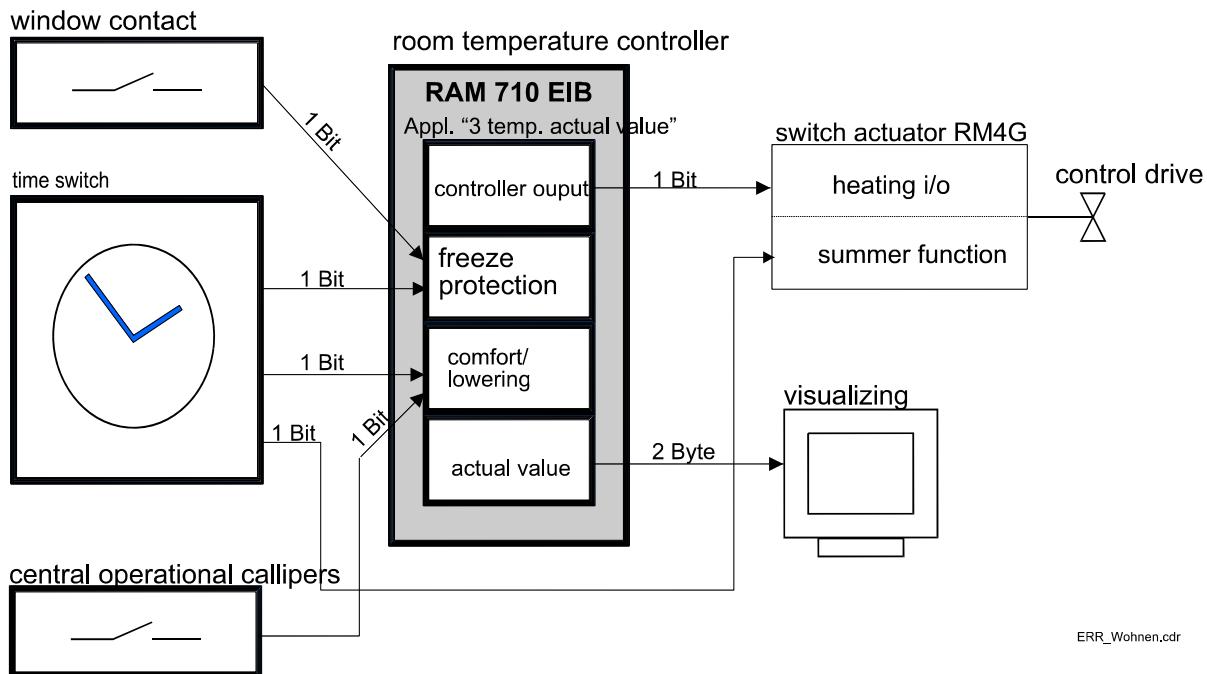
#### Task

The heat supply shall be recalled optimally in a house for individual rooms. The following regulation, control and operation function shall be implemented:

1. The regulation and operation of the ambient temperature are to be made in each room by its own temperature regulator RAM 710 EIB.
2. With presence the room shall be heated on the comfort temperature, which is adjusted at the hand adjusting wheel of the RAM710.
3. With absence and at night the temperature is to be lowered automatically in all spaces.
4. With an additional heat requirement in a room (e.g. living room) beyond the normal comfortable heat time, the comfort phase in this room is to be extended at an adjustable time by operation of the party key at the RAM 710.
5. When premature leaving a room, a temperature reduction is to be implemented only for this room over the party key at the RAM 710.
6. If the windows in a room are opened, this room is to be heated on a frost protection temperature of e.g. 7 °C.
7. During the winter vacation is to be likewise heated in all rooms on the frost protection temperature set in the automatic controllers.
8. For unscheduled presence and absence in the apartment, an operational caliper shall be installed in a central place. The user can remove the actual active temperature reduction by an input command for all rooms. If the apartment is left prematurely, a temperature reduction can be implemented by switching off the instruction for all rooms.
9. During the summer time the heating elements in the living and bed rooms are to be completely switched off. Only the heating element in the bath shall still analyse the rule signals of the tem-

perature regulator RAM 710-EIB . So that the valves do not stick in the living and bed rooms during the long summer time, these are to be opened once a day for 3 minutes.

## Function Scheme (of a channel)



## Realization

In each room an ambient temperature automatic controller RAM 710-EIB detached by the heating elements is installed. Usual 230 V AC control drives are installed at the heating elements, which are headed for over an actuator. The user can set a non-standard temperature set value over the hand adjusting wheel at the ambient temperature automatic controller. As long as the actual room temperature has not achieve the given temperature set value, the automatic controller transmits an ON-instruction to the actuator which thereupon switches the control drives at voltage. With achieving or exceeding the must temperature the automatic controller switches the control drives off over the actuator.

Over window contacts, which are wired on a binary input, the closing status of the windows is monitored. If a window contact announces the status "open", the RAM 710 switches in the operating mode "frost protection", in which e.g. on a must temperature by 7°C is regulated. In this way it is guaranteed that on the one hand no energy is wasted and on the other hand frost damages in the rooms are avoided. As soon as all windows are closed, the automatic controller returns again to its original operating condition.

The demand automatic set-back and heating on comfort temperature is implemented with the help of a yearly time switch. Thereby the time switch is programmed in such a way that it transmits an ON-instruction for the operating mode "comfort" from Monday to Friday e.g. at 6:00 h, at 17:00 h and at the week-end at 08:00 h. In this operating mode you can regulate on the temperature which is adjusted at the hand adjusting wheel of the RAM 710. The time switch transmits an OFF-instruction to the bus over the same channel from Monday to Friday e.g. at 7:00 h and the whole week e.g. at 22:00 h in order to activate the operating mode "set-back". The must temperature in this operating mode is stopped by software parameters at the automatic controller and amounts to e.g. 16 °C.

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The second channel transmits an ON-instruction at the beginning of the winter vacation time for the operating mode "frost protection" on the bus. This operating mode is prior to all other operating modes and is only removed at the end of the vacation by an OFF-instruction. At the central apartment door operational calipers are installed. By pressing these calipers all ambient temperature automatic controllers RAM 710 can be switched mutually in the operating mode "comfort" and "set-back".

The activation of the summer operation is made by the third channel of the season time switch. At the beginning of the summer time this channel transmits an ON-instruction on the object "summer operation" from the switching actuator RMG4. If the switching actuator is in the summer operation, the regulation signals for the living and bed rooms are not analysed any longer.

## **4.2 Example of Use "Individual Room Regulation in Functional Building"**

### **Topic**

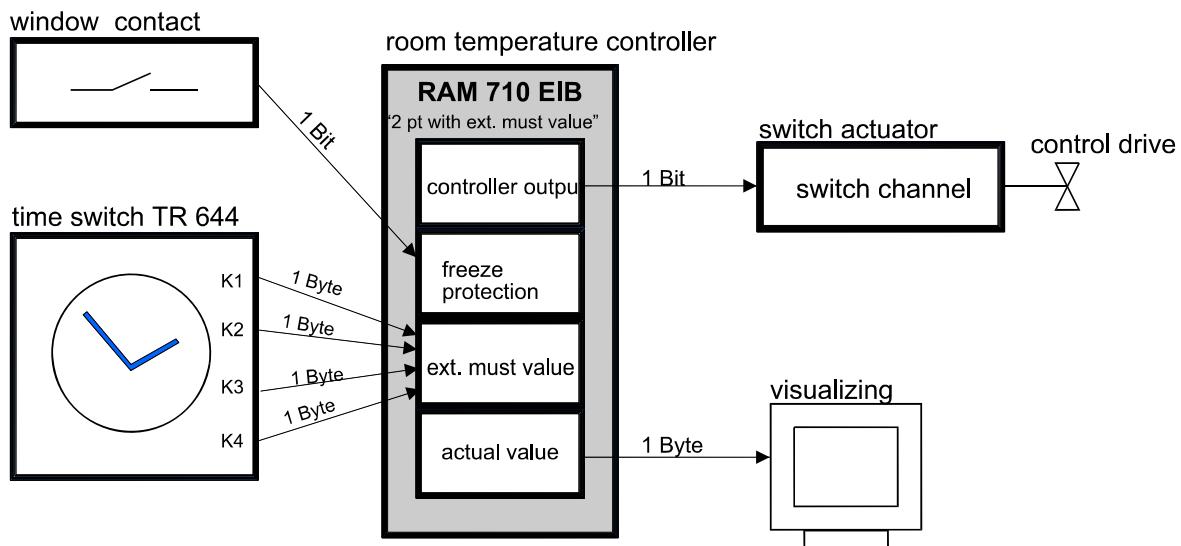
Application of the ambient temperature automatic controller RAM 710-EIB with the application program of "2 point automatic controllers, ext. desired value".

### **Task**

In order to save energy and increase comfort, all rooms shall be equipped with an individual room regulation in buildings such as schools, offices, etc... Following regulation, control and operation functions shall be implemented.

1. Before the work time starts you have to regulate the temperature for 1 hour on a standby temperature-set-value of 19 °C.
2. During work time, the room users can stop the temperature within the range of 7°C to 22 °C individually at the hand adjusting wheel of the RAM710. If at the hand adjusting wheel a temperature desired value is stopped outside this area, a regulation takes place on the corresponding limit value (7°C or 22°C).
3. Outside the work time or at night, the temperature has to be regulated on a set value of 16°C in all rooms during the week. At the weekend and at shorter vacation periods you have to regulate the temperature however on a temperature desired value of 14°C.
4. With an additional heat requirement beyond the normal work time, the comfort phase (specification of the temperature by the hand adjusting wheel) can be extended by 1 hour by operation of the party tracer at the RAM710.
5. When leaving the room earlier, a temperature reduction (set value e.g. 17 °C) is to be implemented only for this room via the party tracer.
6. During the winter vacation time the temparture has to be regulated on set value of 12°C.
7. With opened window the temperature has to be regulated on a frost protection temperature of 7°C.

## Function Scheme



ExtSollw.cdr

## Realization

The demand specification of the temperature-set-value according to the temperature time profiles "heating up before work time, work time, end of work, weekend and vacation" is solved by the application of a 4-channel yearly time switch of the type TR 644-EIB.

One hour before beginning of the work time, the TR 644 transmits a value over the channel 1 on the receiving channel " external set value " from the RAM 710, to which a must temperature of 19°C corresponds.

At the beginning of the work time, the time switch also transmits the value 0 over the channel 1 on the receiving channel " external set value " from the RAM 710. Now the room users can stop their individual must temperature at the hand adjusting wheel, whereby the limits 22°C and 7°C cannot be exceeded or fall below. These limit values can be modified by a simple change of the parametering in the RAM 710. When ending the work over the channel 2 of TR 644, a value is transmitted which corresponds to a must temperature of 16°C.

At the weekend or at shorter vacation periods a value is transmitted over channel 3 of TR644, to which a temperature-set-value of 14°C corresponds. At the beginning of the winter vacation time a value is transmitted over channel 4 of TR 644 to which a temperature-set-value of 12°C corresponds.

If a window in the room is opened, an ON-instruction is transmitted on the receiving channel "frost protection" by RAM 710. During the operating mode "frost protection" a regulation on a temperature-set-value of 7°C (over parameters adjustable) takes place. When closing the window, a switching off instruction on the receiving channel "frost protection" is transmitted, thus this operating mode is left.

If during the normal number of hours worked per week a room is left prematurely, a temperature reduction can be implemented prematurely only for this room by pressing the party callipers.