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Rubarth Apparate GmbH

Operating and
Maintenance Instructions
for
Climatic Test Cabinets
Type 4001 bis 4701

Version E/40-47/02-2001

Firmware X.17

$C\:\epsilon$

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5 Temperature Protection

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1 General View

1.1 Control Panel

1.2 Nameplate

The nameplate is located at the right side above the water supply connections. In case of failures or for spare-part orders, please indicate the unit type (1) and the serial no. (2).

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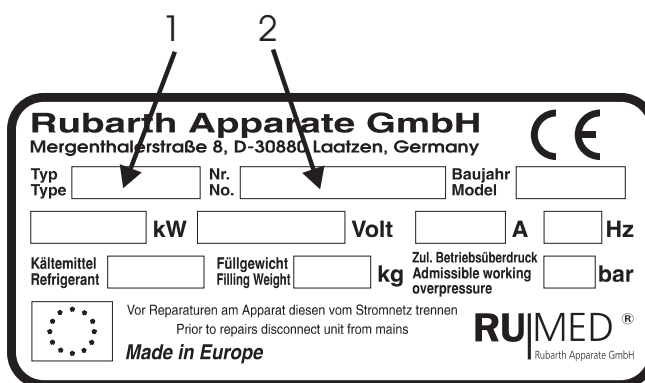
1.3 General

RUMED Climatic Test Cabinets are producing ideal thermal conditions for quality control and research as well as development in science and industry. Experiences of more than 50 years stand for a maintenance-free construction and result in longevity.

Climatic Test Cabinets are produced in two different temperature ranges, and three unit sizes each can be chosen from. Standard test atmospheres according to DIN 50014 and constant test atmospheres according to DIN 50015 can be run in the standard units. The options temperature- and humidity programme control ensure the test method in damp alternating atmospheres according to DIN 50016. Standard atmospheres ensure attaining and maintaining of a defined state of temperature- and humidity-sensitive objects. Constant test atmospheres allow selected stress tests in the range of tempered, damp or dry heat atmospheres for testing of temperature- and humidity-sensitive objects. The method of test in damp alternating atmospheres serves mainly for tests on units, structural components and humidity-proof packing material in view of its applicability at increased humidity of the air and temperature alternations causing condensation water or dew.

All models are equiped with artificial air circulation, if requested with control. Thus, a high temperature accuracy in space and time according to the DIN-regulation 58945 is obtained.

1.4 Exterior Dimensions

Model	Volume (l)	Exterior Dimensions (mm)			Maximum load per Insertion Grid(kg)
		Height	Width	Depth	
4001	210	1120	730	975	25
4101	350	1590	730	975	25
4201	530	2100	730	975	25
4301	1060	2100	1460	975	25
4401	210	1120	730	975	25
4501	350	1590	730	975	25
4601	530	2100	730	975	25
4701	1060	2100	1460	975	25

• changed height with option movable design

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2 Safety, Transportation and Installation

2.1 Safety

It is recommended to clean the interior of the unit before starting. Refer to the details described in "Defrosting" and "Cleaning" (chapter 7).

Open the door widely for removal of the insertion grids. The grids must be charged in such a way that a circulation of the air will not be hindered.

The unit is not explosionproof!
Do not store explosive or easily inflammable substances in the test room!

The refrigerating machine will only start when cooling capacity is requested. On demand of cooling, the temperature controller switches to the cooling circuit by means of a solenoid valve, and when there is no request for cooling, it switches to the bypass-circuit. Should the period where no cooling is requested exceed 3 minutes, the refrigerating machine will be switched-off. The blue pilot lamp will only light-up on request of cooling capacity (cooling circuit is switched-on), the pilot lamp "heating" will only light-up on request of heating capacity.

Option Test room socket:
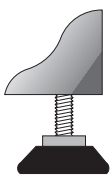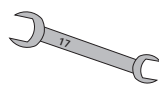The test room socket can be charged by max. 4 Amps.
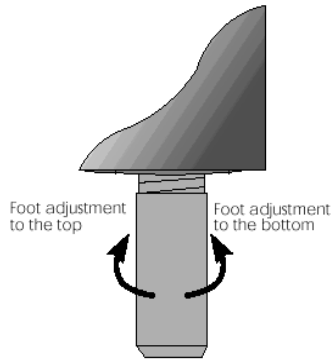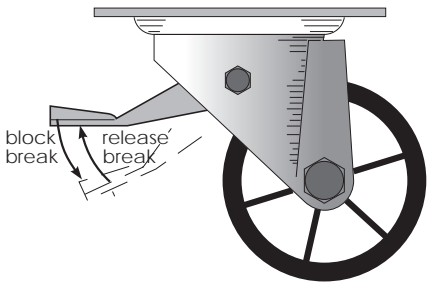
2.2 Transportation and Storage

The standard domestic shipment of the unit will be effected unpacked in a van. The unit should be transported carefully in standing position. In case a short-time tilting of the unit should be unavoidable, for reasons of f. ex. passing doors, it might be possible that oil of the cooling machine will enter into the evaporator. This oil must flow back to the cooling machine. For this reason take care that after transportations the unit should not be started before expiration of 4 hours. The unit is recommended to be stored in dry rooms at temperatures between +10°C and +30°C. The shipment within European countries is mostly effected in stable cartons on a palette. Seaworthy and air-freight cases are generally conserved for 12 months and the units are welded in an aluminium wrapping. Condensation due to passing of different climatic zones is avoided by drying agent bags which are to be removed prior to initial starting of the machine.

2.3 Installation

● Installation places being exposed to direct sunlight, radiators and other thermal sources are to be avoided. Insufficiently ventilated rooms and room temperatures exceeding +25°C are also unsuitable.

● The distance between the wall and the backside of the unit should be at least 10 cm. Do not cover the ventilation slots; even a partial covering of the slots may lead to a heat accumulation. Uncovered ventilation slots are very important for a faultless operation of the cooling machine!

● The floor of the installation place should be even and horizontal. Slight unevennesses can be balanced by the adjustable foots of the unit.

● Units being equiped with the option "Ultrasonic Humidification" must be installed in such a way, that the test room bottom is in level position to ensure a correct drain of water.

Model	Type of feet	Tool
4001 **4401**	4 adjustable feet	fork wrench SW17 (width: 17mm)
4101 **4201** **4301** **4501** **4601** **4701**	4 adjustable feet Foot adjustment to the top Foot adjustment to the bottom	turn foot by hand
option movable design for all models	block break release break	not adjustable

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2.4 Power Supply

● Current (A.C.) and voltage at the installation place must coincide with the indications on the name-plate of the unit. The name-plate can be found at the upper part in the door frame on the left side.

● Connection is to be made to a duly earthed socket (a separately secured socket is recommended). A multitude of units are equiped with combined universal plugs according to the German or French standard.

2.5 Types of Water Supply for Ultrasonic Humidification

2.5.1 Types of Water Supply

Type of Water Supply	Connection	Pressure	Conductivity
Connection to proper supply circuit with demineralized water	$^3/_4$"	0,2 - 5,0 bar	< 5 μS/cm
Connection to tap water supply with ion exchanger connected in series	$^3/_4$"	0,2 - 5,0 bar	
Connection to ventilated supply vessel with demineralized water	$^3/_4$"	min. 1 m water column	< 5 μS/cm

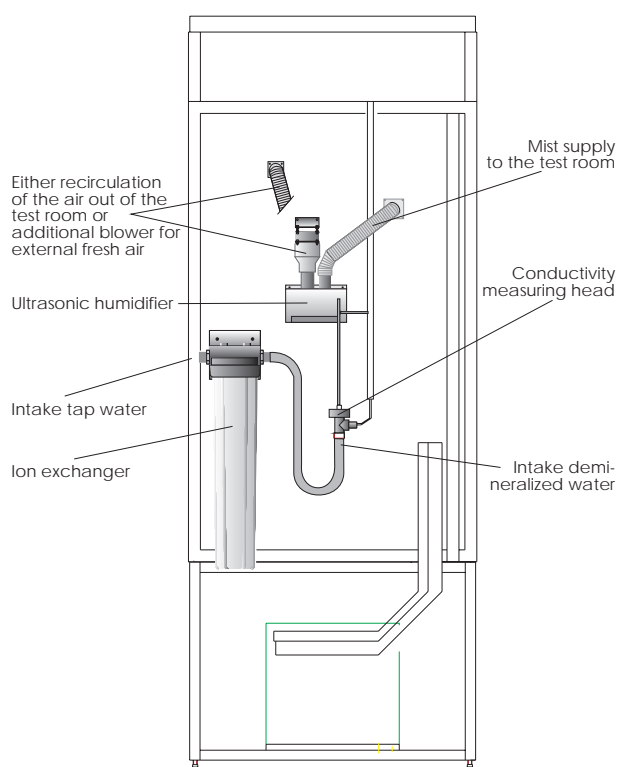### 2.5.2 Operation with Demineralized Tap Water

Connect water intake of the humidifier with the furnished hose to a demineralized water supply according to DVGW (German Supply Company for Gas/Water) which can be shut-off.

2.5.3 Operation with Demineralized Water from a Supply Vessel

Suspend a ventilated supply vessel (recommended volume: 10 liters) minimum 1 m above the level of the humidifier and connect it to the water intake of the humidifier by means of the furnished hose.

2.5.4 Operation with Tap Water

It is not possible to operate the humidifier with directly supplied tap water. If only tap water is available, the water must be supplied through an ion exchanger connected in series. Connect water intake of the ion exchanger with the furnished hose to a tap water supply according to DVGW **(avoiding reflux)** which can be shut-off.

Either recirculation of the air out of the test room or additional blower for external fresh air

Ultrasonic humidifier

Intake tap water

Ion exchanger

Mist supply to the test room

Conductivity measuring head

Intake demineralized water

3 Start-up

3.1 General

... The unit can be switched on and off by means of the softkey ON/OFF [○] .

Since the connection and disconnection is effected by a software switch, the mains plug is always to be withdrawn in case of maintenance tasks to ensure that the unit is completely disconnected from the mains.
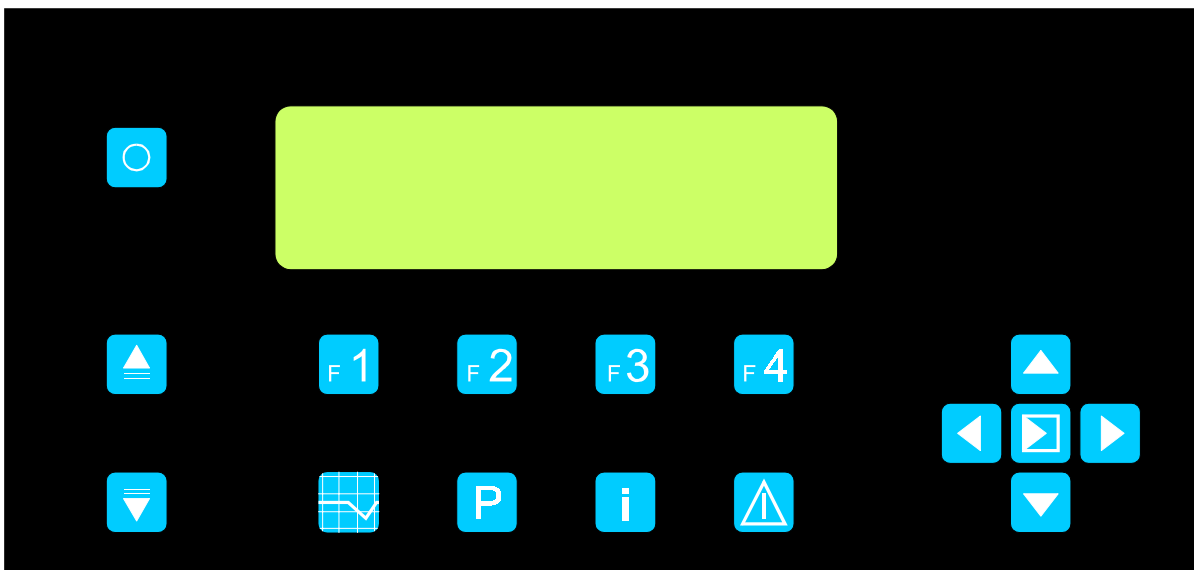
When the unit is reconnected to mains (insertion of the plug into the socket), the display of the controller will be lighting for some seconds, and the controller will be returned to that operating mode which had been active prior to disconnection from mains (withdrawal of the mains plug).
Connection and disconnection can only be effected on entry of the password of operating level 1.

After the first start-up (cold unit), the display might appear to be not uniform and poor in contrast. This effect will, however, disappear, as soon as the working temperature of the display is reached.

If required, the contrast can be adjusted in the actual value screen using the keys [▲] [▼] .

3.2 The Operating Panel

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3.3 The Keys and Their Functions

The General Keys ...	
○	Softkey On/Off Special function: Abortion at password entry
▶	Enter key in the centre of the cursor key set
◀	Cursor to the left
▲	Cursor up
▼	Cursor down
▶	Cursor to the right
▲ ▼	In case of a screen with several pages, these keys are used to scroll (Page up, Page down)
F 1 ... F 4	The functions of the control keys are indicated by the lower screen footer (partly changing meaning)
The Hotkeys ...	
⊞	Upon a keystroke, the "actual" actual value screen will appear. When the actual value screen is displayed, a change between "actual value screen with symbols" and "actual value screen with details" will be effected.
P	Changes to the programme menu (create, edit, invoke programmes etc.)
i	Display of the e nameplate with serial No. etc.
⚠	Changes to the alarm memory. In case of a horn sound, the first keystroke will stop the horn signal; the second keystroke changes to the alarm memory....

3.4 General Operation

Data input is facilitated by means of plain text menus with selection by luminous bars. The function of the control keys F 1 ... F 4 may vary and is indicated in the foot row of the screen. Use the cursor keys to move the luminous bar or the cursor to the desired menu item. Use the key ▶ to acknowledge the selection. The selected menu item will be executed. If a numerical value is selected for modification, the cursor will be flashing in the digit to be changed. The value can be changed by means of the keys ▲ ▼. Holding the key longer will change the value quickly (scrolling by increments with carry over). Repeated pressing will change the value slowly (also with carry over).

Selection of the digit to be changed is effected using the keys ◀ ▶ .

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Editing is to be finished by pressing the key ▶. Use the key F4 to abort the present input. The old value will appear again. Observe that the abort function is only concerning the present field. When having left a field using the key ▶, the values are stored!

Attention: If the programme control is active, the setpoints for single setpoint control cannot be changed during programme flow, since they are part of the programme. The reason is, that all profiles being not occupied are using the setpoint for single setpoint control during programme execution.

3.5 Passwords

3.5.1 General

Any essential entry at the controller is protected by entry of a password. The mere display of data and scrolling through the screen pages can be effected without entry of a password.

3.5.2 Password Entry

All passwords have 4 digits. On delivery of the unit, default values have been assigned to the passwords. The default values of the passwords can be drawn from the following table:

Configuration Level	RUMED	****
Service Level	Service	****
Operating Level 2	Customer / Technician or Experienced User	2000
Operating Level 1	Customer	1000

3.5.3 The "Hidden Ten-key Keyboard"

Entry of the password is effected by a "hidden ten-key keyboard".

▲		F1	F2	F3	F4
0		1	2	3	4
▼		⊞	P	i	⚠
5		6	7	8	9

The numerals are to be entered using that "hidden ten-key keyboard", and they are to be acknowledged using the key ▶ . It is not required to enter zero values behind the decimal point, since they will be added automatically.

This means, the entry of 2000 can be effected by means of the following keystrokes, ꜰ2 ▲ ▲ ▲ ▶ as well as in short-form by the following keystrokes ꜰ2 ▶ .

3.5.4 Abort of the Password Entry

... in case of an erroneous entry is either effected by actuation of the key ○ or after 30 seconds without any entry and flashing cursor.

3.5.5 Validity of The Password

... Once having entered the password, the corresponding access levels are released (i. e. no further request to enter a password) until there has been no keystroke for approx. 2 minutes, or until an entry requires the next higher level.

A higher level releases automatically the lower levels.

3.5.6 How to change a Password

... The passwords can be changed using the menu items **Parameters -> Passwords**. Modification of a password requires knowledge of the old password.

The new password is to be acknowledged using the key ▶ .

Since the password is still released after the modification, press the key ▶ for a second acknowledgement and for a check of the new password and press the key ▶ once more to acknowledge again. Should a password be forgotten, it can be released by the next higher password level. If the next higher password level is unknown, consult the after-sales-service...

3.5.7 How to "Delete" a Password

... Should you desire to gain access to a level without entry of a password (accelerated operation), use the menu items **Parameters -> Passwords** and change the password to "0000". From this moment, all further entries for that level can be effected without any request to enter a password.

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3.6 The Hotkey "INFO" [i]

3.6.1 The e-Nameplate of the Unit

During operation of the unit, the electronic nameplate can be called by pressing the key [i] .

The nameplate gives information about the detailed type of the unit, its denomination, the serial number of the unit and of the control, the software version of the control, the temperature range and, if applicable, the humidity range of the unit..

```
RUMED® Type 3201
Cooled Incubator
SN# : 0815/4711      (6194000/60/99999)
Softwareversion    : 04.17
Temperature-Range  :     0°C  -   60°C
Humidity-Range     :    20%rH -   95%rH
Time        Service    German      Back
```
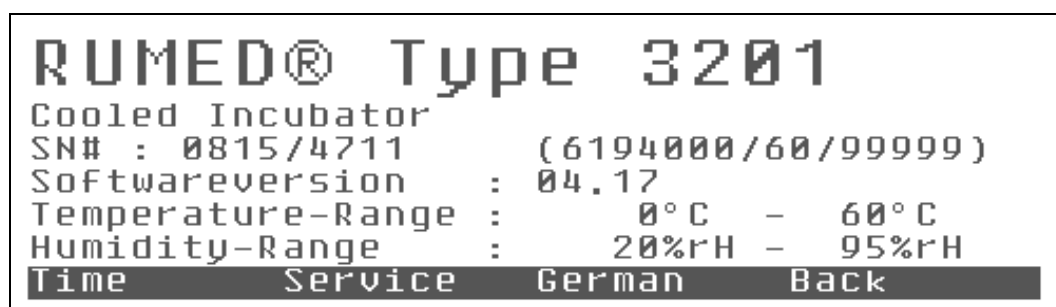
3.6.2 Multilingual Operation of the Unit ...

The key [F3] is used to change between the two languages being loaded. The standard combination is German/English.

(Other operating languages are being prepared. Please contact us....)

```
RUMED® Type 3201
Cooled Incubator
SN# : 0815/4711      (6194000/60/99999)
Softwareversion    : 04.17
Temperature-Range  :     0°C  -   60°C
Humidity-Range     :    20%rH -   95%rH
Time        Service    German      Back
```
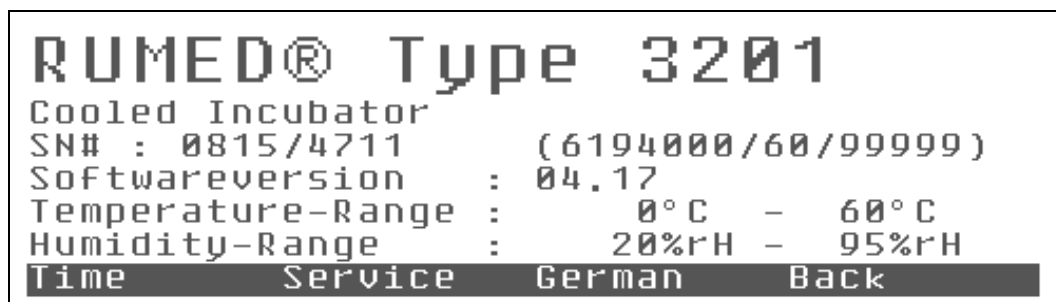
3.6.3 In the Area Service ...

... the working hour meters of the unit can be found

There are up to 4 working hour meters:

Climatic Test Cabinet, Refrigerating Machine, Lighting, Humidification

The feature "maintenance-free" below the respective working hour meter does not mean, that the corresponding unit is really maintenance-free, but only no service interval had been defined. (Please contact your service partner...)

3.6.4 Test in the Area Service ...

```
Elapsed time
Incubator                    0 h
Service Incubator in        16 h
Chiller                      0 h
Maintenance-free
Light                        0 h
Service     Test              Back
```

... is a menu item being meant for the service personnel. It includes functions for specific tests of the individual contactors, valves, relays and other units, if there should really be a problem, once.... Use the key F4 to return.

3.7 Time

3.7.1 General

... The real-time clock is equipped with a power reserve of approx. 5 - 7 days. Usually, the units should arrive at the customer with a clock being adjusted correctly. Should the transport have taken more time than usually or should the unit have been disconnected from mains for an extended period ...

3.7.2 If the Time is to be Set ...

If the clock is to be **set** actually, use the keys ◀ ▶ to move to the values to be corrected and set the correct values using the keys ▼ ▲ . The clock will be stopped as soon as the adjustment procedure is started. The digits of the seconds are stopped ... the minutes and seconds are to be set to the next full or half minute and ....

```
Clock Settings
     08.06.2000 Thu 07:26:26


Set      + 1 h      - 1 h      Back
```

.... the key F1 is to be pressed for **"setting"** right at the correct moment. The seconds will be **"starting to count"** and the synchronization of clock is finished.

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```
Clock Settings
        08.06.2000 Thu 08:35:00

Set                              Back
```

Attent F 4 without having pressed the F 1 key first will result in "No Synchronisation"

.... Return using the key F 4 .

3.7.3 Summertime/Wintertime ...

.... The clock can be easily changed from summertime to wintertime and vice-versa. Use the keys F 2 and F 3 to set the time by +1 h and -1h. While the time is being increased or reduced by 1 hour, the clock continues running.

so in this case you do not have to use the F 1 key for **"setting"** because the clock was not stopped.

```
Clock Settings
        08.06.2000 Thu 08:35:04

Set      + 1 h     - 1 h    Back
```

3.8 Single Setpoint Control

3.8.1 Setpoints

When being in the actual value screen, the setpoints for the single setpoint control will be displayed on pressing the key [F 1] for **"Setpoints".**

A menu with illuminated bars offers the control variables, which can be selected for the corresponding unit.

Use the keys [▲] [▼] to move the illuminated bar to the setpoint to be modified and select it by pressing the key [▶] .

The cursor will be flashing. Use the keys [◀] [▶] to move the cursor to the value to be modified, and use the keys [▲] [▼] to increase or reduce the value.

The new value will be saved by acknowledgement with the key [▶] .

When editing the value, the function ESC is assigned to the key [F 4] , i. e. when pressing the key [F 4] , the old value will appear again. That abort function is only possible during an active entry.

3.8.2 Setpoint ranges

The ranges being admissible for a modification of setpoints are preset by the parameters being specific for each unit.

3.8.3 Take-over of the Values

The values will be taken over by pressing the key [F 4] when leaving the setpoint menu. The new setpoints will then be approached with the ramps being entered in the setpoint menu. If there are parameters to which no ramp can be assigned, they will be taken over with a setpoint jump.

Attention: If the programme control is active, the setpoints for single setpoint control cannot be changed during programme flow, since they are part of the programme. The reason is, that all profiles being not occupied are using the setpoint for single setpoint control during programme execution.

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3.9 Programme

3.9.1 General

Press the hotkey P to call the menu **"Programme"**.

```
Programme
Programme 1        +
Programme 2        +      Active
Programme 3        -
Programme 4        -

            Stop           Back
```
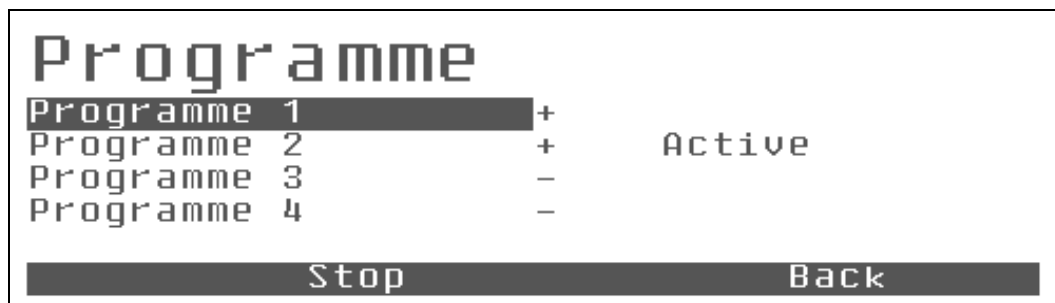
In case of a programme control, 1 to 4 programmes are at choice, depending on the execution. In case of units with single setpoint control with lighting only 1 programme with 1 lighting profile is available. In the overview, programmes being already occupied are marked with **+,** programmes being not occupied are marked with **-**.
Programmes being just active are displayed with the word **"active"** (see above).
Active programmes can neither be deleted nor modified. Modification of an active programme is not possible before the programme is terminated.

3.9.2 How to Select a Programme

```
Programme
Programme 1        +
Programme 2        +      Active
Programme 3        -
Programme 4        -

            Stop           Back
```
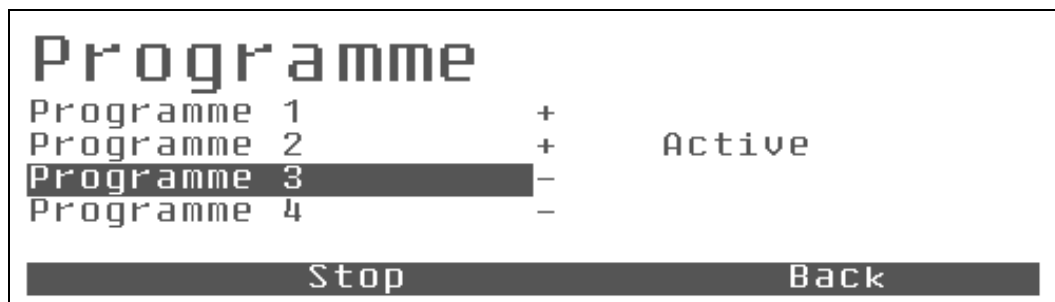
Use the cursor keys ▲   ▼ to move to the desired programme and press the key ▶ to confirm the selection.
The next submenu is used to select the programme type. The programmes, day programme, week programme, real-time programme and process time programme are available.

```
Programme 3
Type               Daily-Cycle



Profile                     Back
```
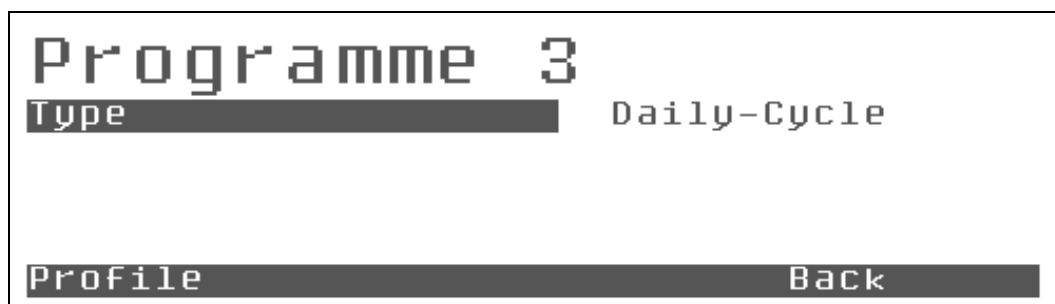
The type of an occupied programme cannot be modified. Any modification results in a deletion of the

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programme (Request for acknowledgement: Delete profiles?)

The key ⬛ F 1 is used to call the menu **Profiles**.

```
Profile    Programme 3
Temp. Profile        -
Humidity Profile     -
Light Profile        -
Fan Profile          -
Contact-Profile      -
Copy      Insert     Preview    Back
```
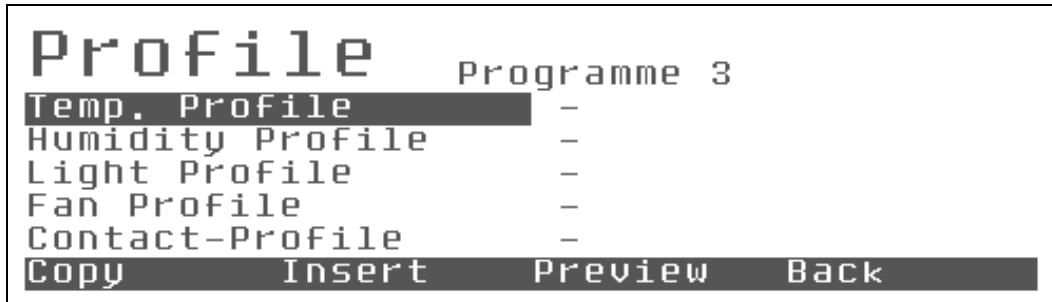
Each programme consists of several profiles (temperature profile, humidity profile etc.)

Occupied profiles are marked with **+,** and empty profiles are marked with **-**.

Use the cursor keys ▲ ▼ to move to the desired profile and press the key ▶ to confirm the selection.

Note: If your cabinet has single setpoint control there is only a "light profile"

Attention: there will be alway a "Light Profile"

```
Programme 3
Temp. Profile
No.  Day  Time   Setpoint
 1        End

Insert     Delete     Shift     Back
```
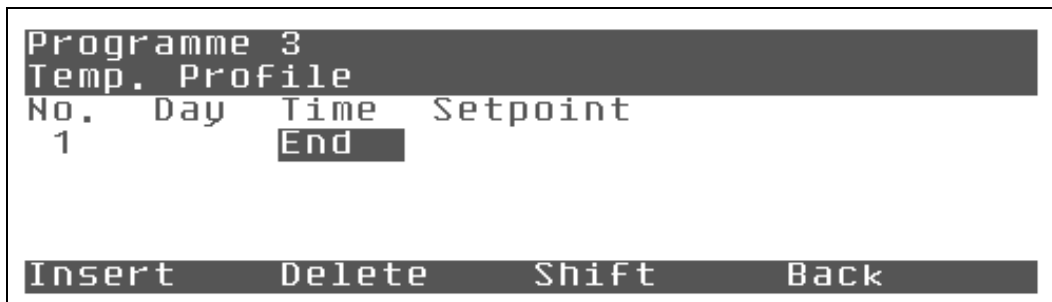
The key ▶ is to be pressed to insert a new programme step.

```
Programme 3
Temp. Profile
No.  Day  Time   Setpoint
 1    1   00:00      0 °C
 2        End

Insert     Delete     Shift     Back
```
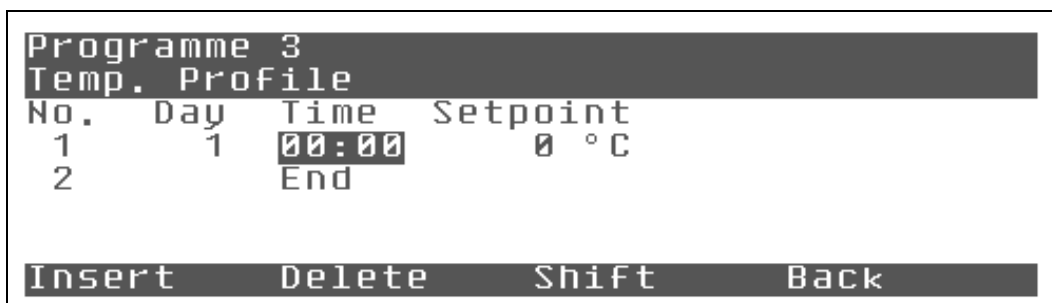
The cursor is flashing at the digits of the hours. Set the desired value using the keys ▲ ▼ . If required, the keys ◀ ▶ can be used to move the cursor to the digits to be modified, and the key ▶ is used to acknowledge the entry. The cursor moves to the next column. If the key ▶ is pressed again, the setpoint input field will be activated and the cursor will be flashing. The desired setpoint can now be adjusted using the

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cursor keys. Acknowledge using the key   .

```
Programme 3
Temp. Profile
No.   Day   Time   Setpoint
  1     1   06:00         0  °C
  2           End


Insert      Delete      Shift      Back
```
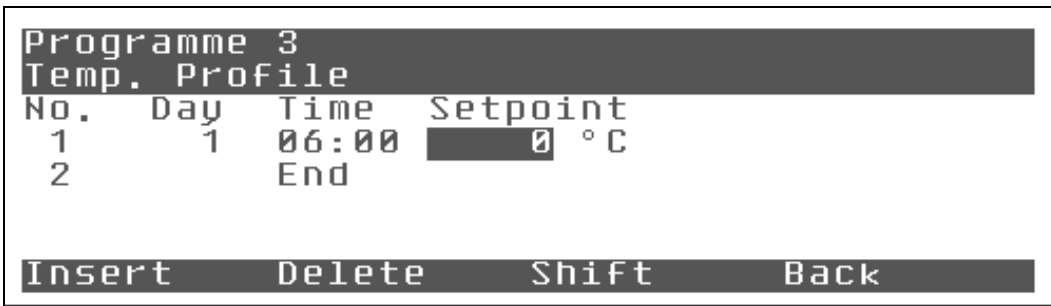
Pressing ▶ a second time will activate the setpoint entry. Use the ▲ ▼ to modify the setpoint and use the ▶ key for acknowledge.

.

.

```
Programme 3
Temp. Profile
No.   Day   Time   Setpoint
  2     1   08:00      30  °C
  3     1   19:00      30  °C
  4     1   21:00      20  °C
  5           End
Insert      Delete      Shift      Back
```
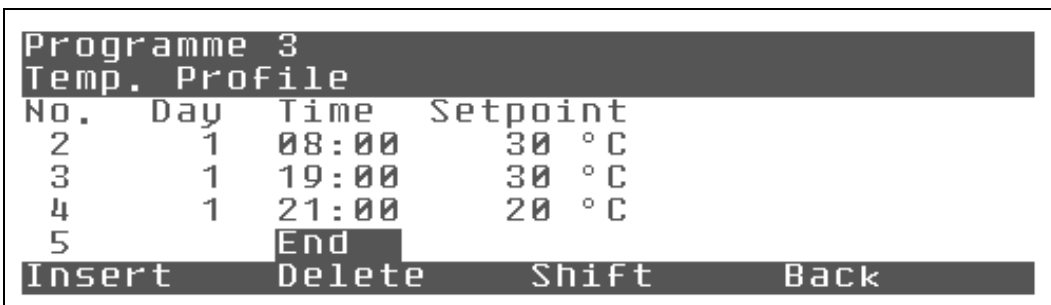
The keys ▲ ▼ are used to scroll through the rows, and the keys ▲ ▼ are used to scroll through the pages of the programme.

```
Programme 3
Temp. Profile
No.   Day   Time   Setpoint
  1     1   06:00      20  °C
  2     1   08:00      30  °C
  3     1   19:00      30  °C
  4     1   21:00      20  °C
Insert      Delete      Shift      Back
```
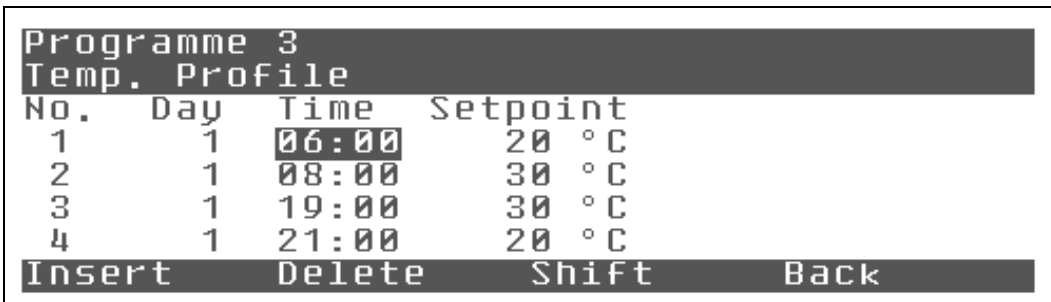
The key F4 **"Back"** is used to leave the edited profile and to call the next higher level **"Profiles"**.

```
Profile      Programme 3
Temp. Profile          +
Humidity Profile       −
Light Profile          −
Fan Profile            −
Contact-Profile        −
Copy      Insert      Preview      Back
```

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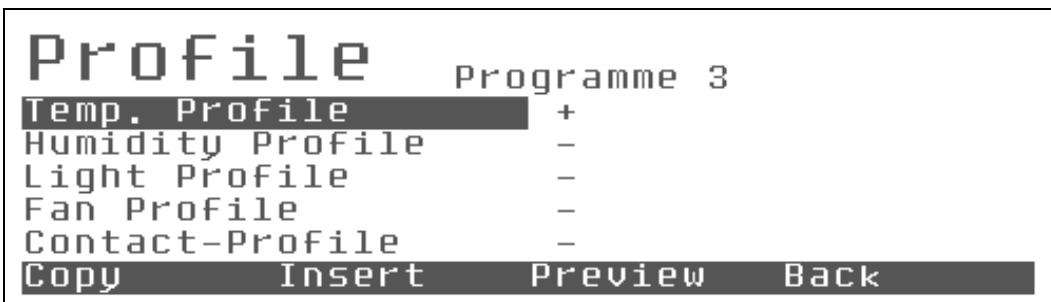
The temperature profile is now marked with **+**.

A visual plausibility check of the edited profile is effected by means of the menu item **"Preview"**.

```
Programme 3          Temp. Profile
max:  30°C   _
                                        Day
                                          1

Preview
min:  20°C
                                       Back
```
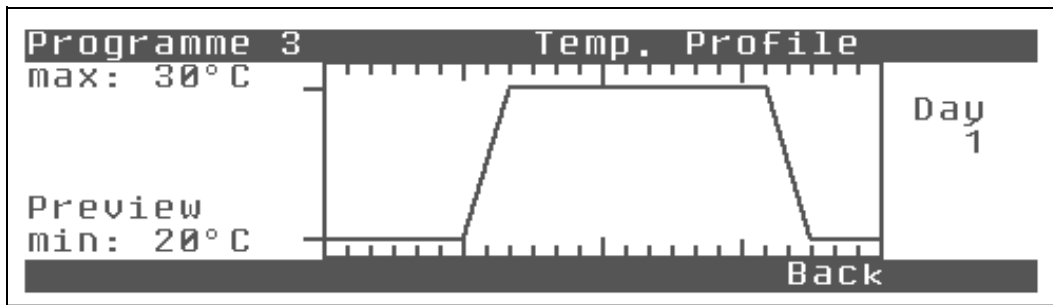
If that day/night profile shall include a constant humidity, the desired humidity setpoint can be entered as setpoint in the setpoint menu, or the humidity profile can be entered in one single step.
This is the preferable method, since the desired single setpoint will be stored with the other profiles.

On principle, the following is valid: If a programme is started, which is containing profiles being not filled-in, the controller will take-over that value as single setpoint for the control parameters which have been set below "Setpoints". After the programme start, neither the setpoints nor the active programme can be modified. Any modification requires the abortion of the active programme.

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3.9.3 How to Start a Programme

```
Programme
Programme 1          +
Programme 2          +
Programme 3          +
Programme 4          −

Start                      Back
```
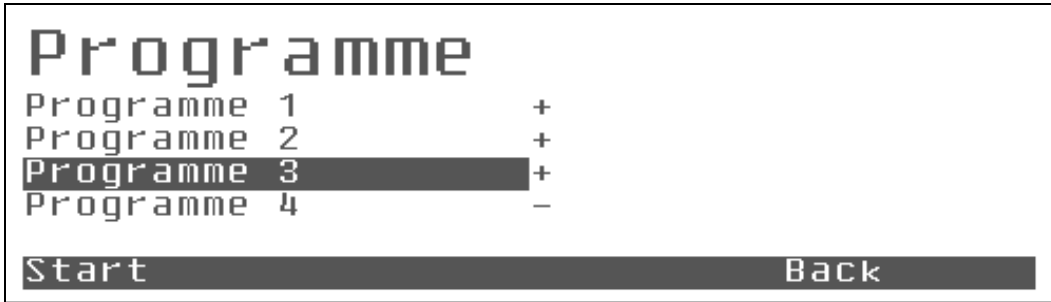
The programme is started from the menu **"Programme"**. Starting of a programme is only possible, when no other programme is active. In that case, the menu point **"Start"** will not be offered.

Press the key [F 1] **"Start"** to call the start menu....

```
Programme 3

Start at    :    Tue  09.01.2001 06:00

Now!        :    Mon  08.01.2001 06:00

Start     Now!              Back
```
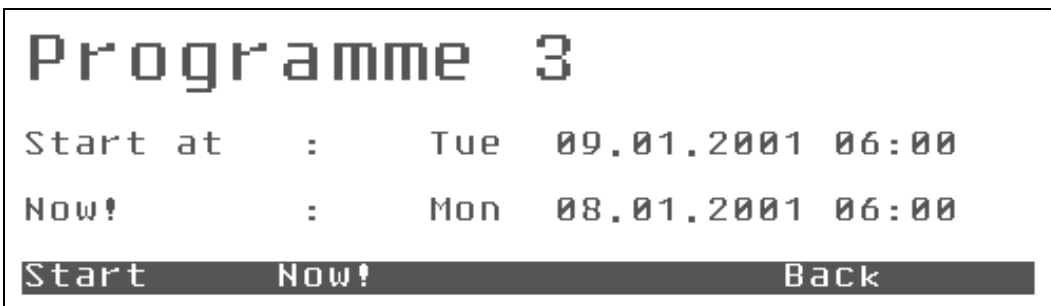
The program to be started will be displayed (here: programme 3).

The starting options **"Now!"** and **"Start"** will be offered.
In case of day, week and real-time programmes the most usual method is **"Now!"**. Immediately means, that the controller will search in the profile for the setpoints and ramps being valid for the actual moment, and that they will be controlled with the maximum admissible ramps. After being synchronized into the programme flow, the controller follows the preset profiles.

The menu item **"Start"** means, that the controller will start a full programme cycle on the next possible date. Until the actual start, it will be controlled to the adjusted single setpoint values, and the message **"Preselection Programme 3"** will be displayed.

For all profiles being not occupied, is the setpoint being valid for the programme execution (i. e. empty profile --> Setpoint for single setpoint control).

Process-time programmes can always be invoked immediately or "in the future", i. e. delayed. Consequently, always complete cycles will be run.

3.9.4 How to stop a Programme

To abort an active programme press **P** to select **"Programme"**.

```
Programme
Programme 1           +
Programme 2           +
Programme 3           +      Active
Programme 4           −

              Stop              Back
```
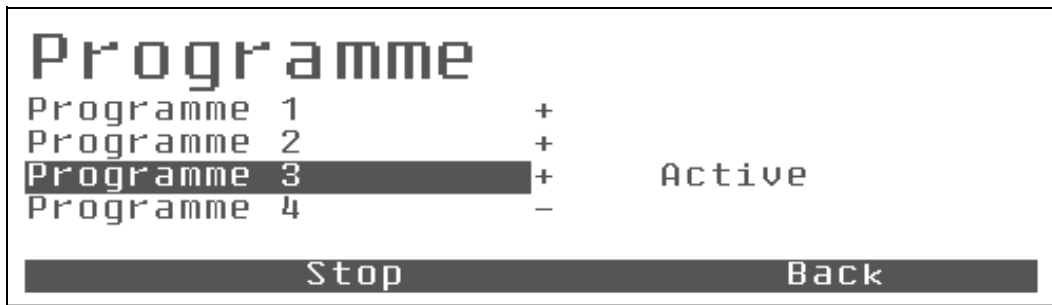
If a programme is active the **F2** key is used for **"Stop"** .

After pressing **F2** once **"Programme terminate ?"** .

```
Programme 3

        Programme Terminate    ?



                    Stop      Back
```

Press **F3** for **"Stop"** , Password level 1 will be needed ...

```
Code input

Level        : User level 1
Input        : ***

0 = Back

```

After aborting the programme the key **F1** „**Starten**" is available again.

```
Programme
Programme 1           +
Programme 2           +
Programme 3           +
Programme 4           −

Start                           Back

```

Use **F4** for **"back"**

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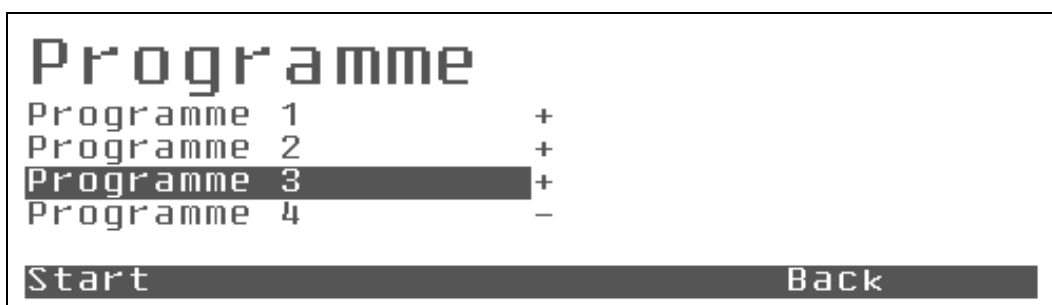
3.9.5 Example: Day/Night Cycle
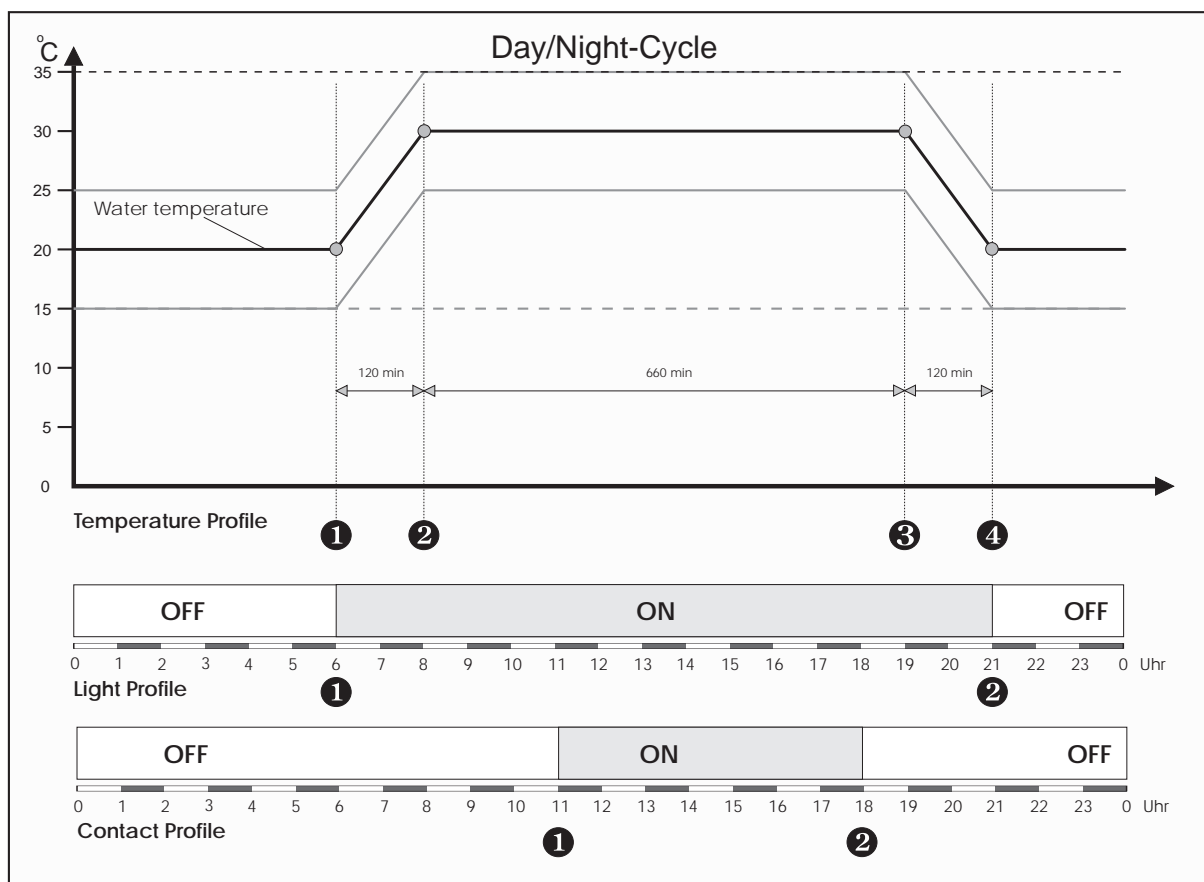
Example: Day/Night Alternation with 11 h and 30 °C, 9 h and 20 °C and two ramps with 2 h, each

Programme 3

Temperature profile

No.	Day	Time	Setpoint
1	1	06:00	20 °C
2	1	08:00	30 °C
3	1	19:00	30 °C
4	1	21:00	20 °C
5		End	

Programme 3

Light profile

No.	Day	Time	Setpoint
1	1	08:00	ON
2	1	21:00	OFF
3		End	

Programme 3 Contact profile			
No.	**Tag**	**Zeit**	**Sollwert**
1	1	11:00	ON
2	1	18:00	OFF
3		End	

3.9.6 Example: Weekly-Cycle

```
Programme 2
Type                Weekly-Cycle



Profile                    Back
```

Programming of a week programme is identical to the programming of the day programme. The essential difference is the column "DAY". While "1" is shown in the day programme, "Mon" (for Monday) is shown in the week programme.

In the time field, the time 23:59 is no more the last possible time for a node point, but it is followed by "00:00", and the day field will make a carry over from "Mon" (for Monday) to "Tue" (for Tuesday).

```
Programme 2
Temp. Profile
No.  Day  Time   Setpoint
 2   Mon  08:00    30 °C
 3   Tue  19:00    30 °C
 4   Tue  21:00    20 °C
          End
Insert    Delete    Shift    Back
```
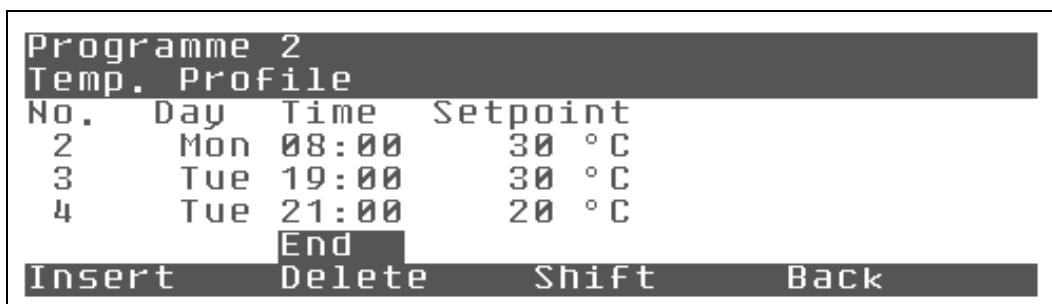
f no entry is to be made for a day, the cursor can be moved to the "day column", and the weekday can be set directly. As for the rest, the entry of the maximum 69 node points is to be effected like the entry of a day programme.

The 69 free node points can be distributed freely to the week.

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3.9.7 Functions for Advanced Programming

When having entered a very complicated week temperature profile, and a light profile shall be entered which is matching to that profile, the functions "Copy" and "Insert" of the menu "Profiles" can be used.

```
Profile       Programme 2
Temp. Profile        +
Humidity Profile     –
Light Profile        –
Fan Profile          –
Contact-Profile      –
Copy      Insert    Preview    Back
```
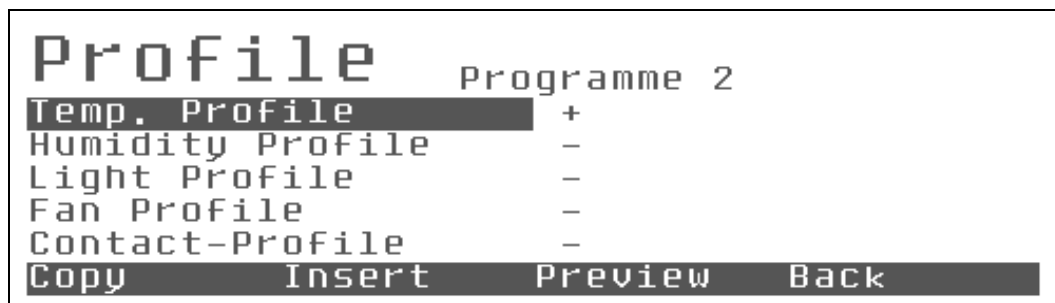
Select the time track (master track) to be copied and press [F 1] to "Copy".

```
Profile       Programme 2
Temp. Profile        +          Copy
Humidity Profile     –
Light Profile        –
Fan Profile          –
Contact-Profile      –
Copy      Insert    Preview    Back
```
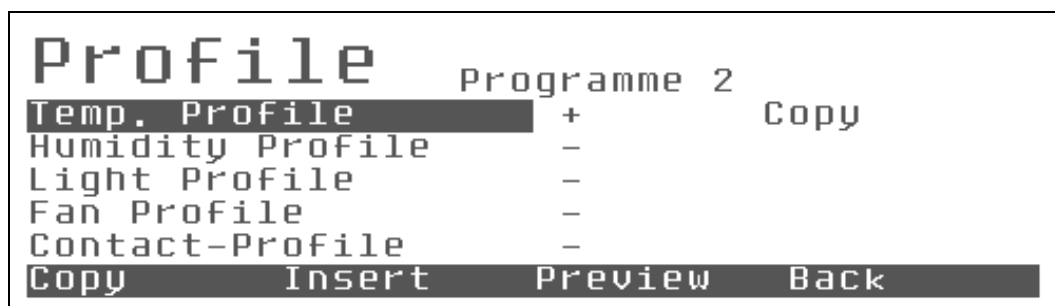
Now select the profile to which the same times shall be copied as support points and press <F2> to "Insert" it.

The track can also be copied to several tracks by one step. In this case e. g. to the light profile and the contact profile.

Attention: If the copied profile is inserted into a profile, which is already occupied, that profile will be overwritten completely!

Hint: This function can also be used to delete an occupied profile by copying an empty profile to an occupied profile.

```
Profile       Programme 2
Temp. Profile        +          Copy
Humidity Profile     –
Light Profile        +          inserted
Fan Profile          –
Contact-Profile      +          inserted
Copy      Insert    Preview    Back
```
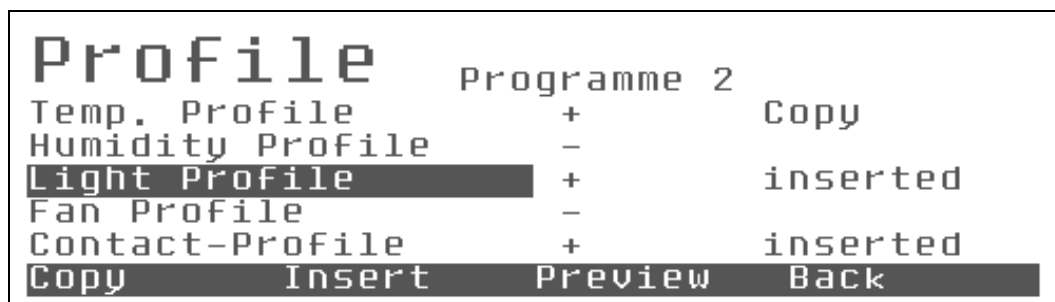
The copied profile can be called by means of the key [▶] . The copied profile includes the same times as

support points. The corresponding setpoint cannot be taken over. A standard value has been assigned to it.

The setpoints can now be adapted without thinking of the time track. If only a few values are to be adapted, it is recommendable to use to cursor keys to move to these values and to change them.
If the key ▶ is used, it lasts a little longer to move through the whole programme.
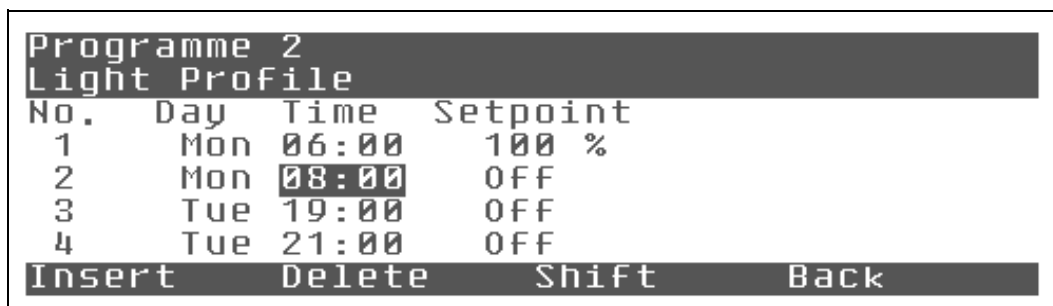
Press the key ▶ , and the actual value can be edited using the keys ▲ ▼ . If the value shall not be modified, press the key ▶ again and the value will be stored without modification. The luminous bar will be positioned on the next value.

The key ▶ can be used to select and edit quickly all values in the columns and rows of the programme. At the end of a row, the cursor will be moved to the first column of the next row.

Remark: The column week-day will be skipped, since it is to be changed very rarely, and thus, the simple input mode is the same for all programme types.

But observe: If the cursor is on the step end and the key ▶ is pressed, a new programme step will be inserted.
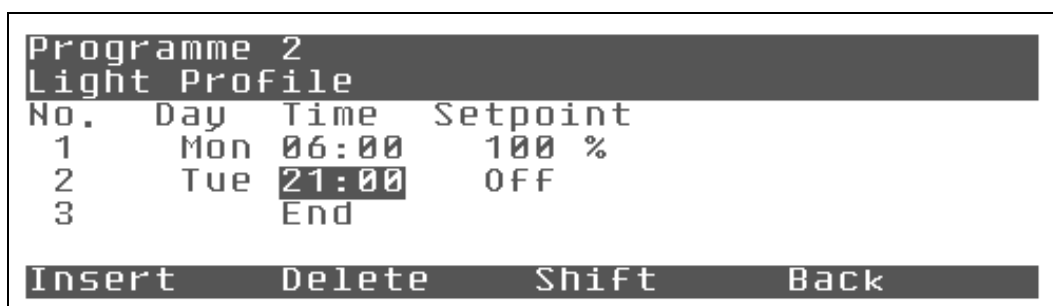
```
Programme  2
Light Profile
No.   Day   Time   Setpoint
  1     Mon  06:00    100 %
  2     Mon  08:00    Off
  3     Tue  19:00    Off
  4     Tue  21:00    Off
Insert      Delete     Shift      Back
```

3.9.8 Delete

It is also possible to "Delete" programme steps during this adaptation procedure by pressing the key F2 .

```
Programme  2
Light Profile
No.   Day   Time   Setpoint
  1     Mon  06:00    100 %
  2     Tue  21:00    Off
  3           End

Insert      Delete     Shift      Back
```

3.9.9 Insert

```
Programme 2
Light Profile
No.   Day   Time   Setpoint
 1    Mon   06:00    100 %
 2    Tue   21:00    Off
 3          End

Insert      Delete      Shift      Back
```

When pressing the key ⟨F1⟩ , a "harmless" programme step will be inserted, i. e. the highlighted step will be copied. There are now two identical programme steps.

```
Programme 2
Light Profile
No.   Day   Time   Setpoint
 1    Mon   06:00    100 %
 2    Mon   06:00    100 %
 3    Tue   21:00    Off
 4          End
Insert      Delete      Shift      Back
```

The inserted programme step can now be edited. Observe the following:

The time of the programme step can only vary within the time limits:

Time programme step n1 <= Time programme step n <= Time programme step n+1.

```
Programme 2
Light Profile
No.   Day   Time   Setpoint
 1    Mon   06:00    100 %
 2    Tue   21:00    100 %
 3    Tue   21:00    Off
 4          End
Insert      Delete      Shift      Back
```

3.9.10 Shift

When pressing the key ⟨F3⟩, the function **"shift"** will be executed. This is an intelligent way to insert a new range into the programme, since it is not required to change all other segments.

If e. g. a ramp shall be a little flattened without changing the stop and ramp periods of the remaining programme, move the cursor to the final point of the ramp to be changed and press ⟨F3⟩ **"Shift"**.

This **"shifting"** is not limited by the time of the next programme step, but the distance from the last programme step to the maximum possible end of the programme.

Note: These limits are required to avoid an unintentional shifting of the programme.

4   Hints, Alarms and Other Messages

4.1   General

Control2000 is equipped with an alarm memory to log up to 20 messages. If at least one message has not been acknowledged, a small "Attention" triangle will be displayed in the actual value screen to indicate an unacknowledged message.

In case of preliminary alarms, a large triangle will be displayed, and a sound can be hard in periodical intervals. A continuous sound indicates alarms and failures. The sound can be switched-off when pressing the hotkey "Alarm Memory" in any screen. When pressing the hotkey again, the alarm memory will be called. Here, you can scroll through the occurred messages, acknowledge the messages with operating level 1 and delete the messages with operating level 2. The alarm memory is organized as FIFO. The oldest messages will be displaced by the newest messages. An integrated priority avoids that a simple message "Door opened" will displace an unacknowledged temperature alarm.

5 Temperature Protection

5.1 Specimen Protection

5.1.1 Integrated Temperature Selector Function "Preliminary Alarm"

The control is equipped with an integrated temperature selector function, which gives a warning if only small deviations between actual value and setpoint are occurring for more than 5 minutes. Very often, this warning indicates that the gradients have been chosen such steep that the unit cannot follow them.

5.1.2 Integrated Temperature Selector Function "Alarm"

The control is equipped with an integrated temperature selector function, which avoids any upper or lower deviation of the admissible temperature range caused by malfunction of the control of the power unit (band alarm). This band alarm refers to the actual setpoint. Consequently, the control is able to early discover malfunctions, such as e. g. melt contacts of relays or stuck relays.

5.1.3 Dependent Specimen Protection - Difference Alarm

The "temperature difference alarm" being factory-adjusted is acting as protection against excess or insufficient temperature, which might be caused by lack of ventilation (fan failure, overload of the unit ...). The temperature difference control is effected by means of two temperature sensors being independent from the control sensor. One of the sensors is located near the heater in the air-conditioning chamber; the other one is installed below the evaporator. If the admissible temperature difference in the air-conditioning chamber is exceeded, the power unit of the unit will be switched-off permanently to avoid formation of an air layer, which would result in "boiling" of the specimen in the upper area, while the specimen in the lower area of the test chamber would be frozen.

Attention:

Any recognized error of one of the three temperature sensors will suppress the temperature difference control and thus will result in permanent disconnection of the unit.

5.1.4 Option: Separate Temperature Selectors for Excess and Insufficient Temperature being Independent of the Controller

Depending on the configuration, the unit can be equipped with optional, freely adjustable temperature selectors according to DIN 12880, class 3.3, acting as additional protection for the specimen. Since the temperature selectors are independent from the controller, they are avoiding any upper or lower deviation from the preset temperature range in case of failure of the controller.

In case of excess temperature, any sources of heat (lighting, humidification and sockets etc.) will be switched-off by the upper temperature selector.
An audible signal is warning additionally of the imminent overheating, as long as there is excess temperature in the test chamber. The disconnected units will be restarted automatically, as soon as the test chamber temperature is falling below the preset temperature value.
The lower temperature selector switches the refrigerating machine off when falling below the preset temperature. An audible signal is warning additionally
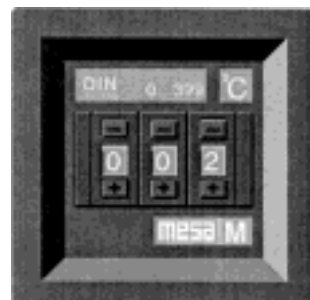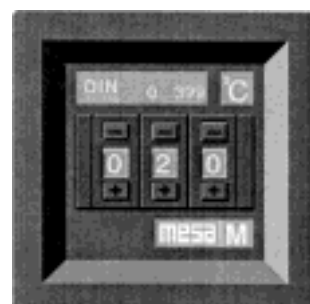
of the imminent undercooling, as long as there is insufficient temperature in the test chamber. The refrigerating machine will be restarted automatically, as soon as the test chamber temperature exceeds the preset temperature value.

The limits of the temperature range being set at the temperature selector should not be chosen closer than necessary. The recommended minimum deviation is 5°C below or above the temperatures being set at the temperature controller.

Example:

Temperature Range	Insufficient Temperature (Lower Controller)	Excess Temperature (Upper Controller)
Single Setpoint Control +23^{0}C	+28^{0}C	
Programme Control +7^{0}C/+15^{0}C	+2^{0}C	+20^{0}C

5.1.5 How to Set the Temperature Range:
- Open the plexiglass cover using a key.
- Use a small screwdriver or ballpoint pen and press the keys - or + above or below the digits to be set until the desired values for the excess temperature or insufficient temperature are set.
- Close the cover after setting.

5.2 Unit Protection

5.2.1 Dependent Unit Protection - Maximum Alarm

Als Schutz gegen Übertemperatur oberhalb der Gerätespezifikationen dient der werksseitig voreingestellte "Regler Maximal Alarm". Bei Prüfraumtemperaturen 5°C oberhalb der Gerätespezifikationen (gemessen am Regelfühler) sorgt der Maximal Alarm für eine bleibende Abschaltung des Leistungsteiles des Gerätes.

5.2.2 Independent Temperature Fuse for Unit Protection

A temperature fuse (TS, according to DIN 12880, class 1) is integrated as independent unit protection if temperatures are exceeding the unit specifications. The temperature fuse is located behind the rear test chamber wall in the air-conditioning chamber near the heater. In case of excess temperature, the fuse (3) will burst. The unit will be switched-off permanently, and an audible alarm is warning additionally.

Attention: Units with divided test chamber are equipped with a temperature fuse for each test chamber half. Since the fuses are connected in series, release of only one fuse will already result in a complete disconnection of the unit for reasons of safety.

5.2.3 How to Replace the Fuse:

- Hold the shaft (1), and unscrew the knurled screw (2).
- Remove the broken glass thoroughly from the knurled screw (2) by tapping.
- Insert the spare fuse with the same releasing temperature into the knurled screw (2) according to the illustration beside (releasing temperature, see imprint on the shaft of the fuse (3)).
- Hold the shaft (1), push-in the knurled screw (2) against the spring pressure until it is caught by the thread and screw it down.
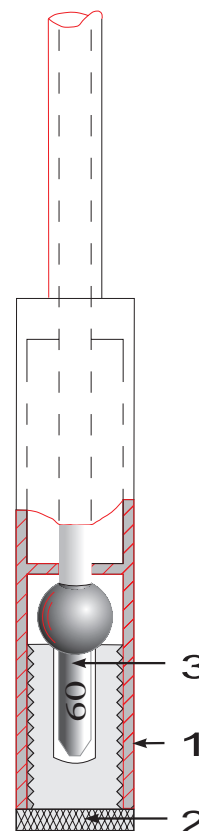
Check the unit for eventual faults whenever the unit protection has been released prior to restarting the unit.

> ***Manipulation of that protection device or use of a fuse with a releasing temperature, which is exceeding the maximum admissible setpoint by more than +10 °C, might result in damage of the unit and results in loss of any guarantee claim!***
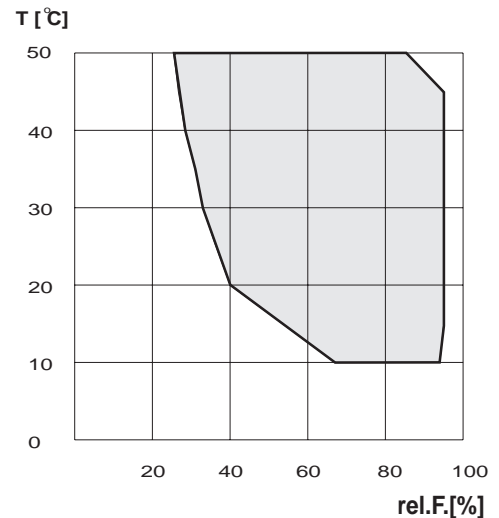
6 Humdification

6.1 Ultrasonic Humdification

6.1.1 General

The ultrasonic humidification is generating mist by means of
ultrasonic waves acting upon demineralized water, and thus the
air is humidified. The temperature/humidity diagram in the
margin shows the working range in combination with the function
dehumidification. Connect the humidifier by means of the
furnished hose to a water supply with a conductivity up to 5 S/cm
and a conduit pressure of 0,2 - 5,0 bar. If connection to a
demineralized water supply is not possible, the demineralized
water can be fed by means of a ventilating valve from a supply
vessel being suspended approx. 1 m above the water level of the
humidifier. The water level in the humidifier is checked by a float switch. In case of a decrease of the water level,
water will be refilled by a solenoid valve. A small part of the circulating air flow is led continuously through the
mist chamber of the humidifier to feed humidity to the test room when demanded by the controller. Units with
temperatures below 0 °C are equiped with an additional blower to supply ambient air to the humidifier, thus
avoiding freezing of the humidifier. When exceeding 53 °C or if the actual temperature is below 3°C
humidification is switched off automatically by the temperature controller. If not, the electronics being cooled by
the water of the humidifier would be superheated. The max. atomization capacity is approx. 0,5 l/hour.

6.1.2 Condcutivity of water

State	Conductivity
Normal state	< 20 μS/cm
Pr-alarm	> 20 and < 50 μS/cm
Alarm, Humidifier is cut-off automatically	> 50 μS/cm

In case of a conductivity of more than 50 S/cm, the humidifier will be cut-off automatically avoiding damage
of the oscillator (transducer) and soiling of the test room by mineral deposits.

6.1.3 Rinsing of the Humidifier and the Hoses before Initial Start or After Erroneous Operation with Tap Water

● Rinse with switched-on unit
● Loosen hose clamp of the right hose ("OUT") on the humidifier and pull off hose
● Suck water out of the water vessel through this opening
● The unit will refill automatically demineralized water
● Repeat procedure until LED is lighting green (only pre-alarm)
● Reattach hose and tighten hose clamp

6.1.4 Replacement of the Tube Filter in the Ion Exchanger

When the tube filter of the ion exchanger is spent it must be replaced.

- Close the stop valve of the water supply of the humidifier and loosen hose from the cock to reduce the overpressure
- Place vessel or bucket as collecting basin below the ion exchanger, as undetermined water might penetrate when replacing the tube filter
- Loosen the lower, blue water vessel of the ion exchanger by turning it clockwise (☛ water may penetrate)
- Evacuate water vessel and withdraw tube filter out of the water vessel
- Insert new tube filter in the same position (☛ the end with the packing ring aims upwards)
- Carefully screw-on (fingertight) blue water vessel (without force), avoiding jamming
- Reconnect water supply hose
- Open stop valve and check tightness of the water vessel screwing (☛ if leaky, replace O-ring in the thread of the blue water vessel)
- Order spare tube filter! Spent tube filters are taken back for regular recycling free of charge, on the condition that they will be sent to the works in D-Laatzen freight prepaid.

6.2 Dehumidification

Dehumidification is generated by falling below the dewpoint. If the controller demands dehumidification power, refrigerant is led to the lower part of the heat exchanger. When falling below the dewpoint, the water vapour in the air condenses. The precipitated water drops off from the heat exchanger lamellae and leaves the test room through the condensate drain.

7 Service and Maintenance

7.1 Defrosting

- Place a condensate collector below the floor drain which is to be emptied if filled with dew water.
- Continuous operation with coldest thermostat adjustments might cause icing or hair-frost on the evaporator. Then a periodical defrosting of the evaporator is necessary. For this purpose, set temperature controller to +20^{0}C and remove the specimen.
  After having defrosted, clean the unit and adjust the temperature controller onto the desired temperature.

> **Do not remove hair-frost or icing with sharp objects, as the evaporator might be damaged!**

7.2 Cleaning

It is recommended to clean the unit regularly.

For supply isolation of the unit, unplug the mains plug from the socket or switch-off (remove) the fuses connected in series!

Clean the **test room and the exterior housing** with tepid water and a scavenger. Rinse with clear water and dry well.

Do not use cleansing agents comprising sand or solvents!

7.3 Cooling Machine

To obtain a high output with a low energy consumption at the same time, it is necessary to clean the heat exchanger from time to time from dust particles. In rooms being less dustladen a cleaning once or twice a year is sufficient.

- **Unplug mains plug from the socket!**
- Clean heat exchanger (black wire grating) at the back-side of the unit with a pencil, hand-brush or a vacuum-cleaner. Care should be taken that no cables are torn off or tubes are bended or cracked.

7.4 Putting out of Operation

If the unit shall be out of operation for a longer period, the mains plug is to be unplugged from the socket or the fuses connected in series are to be switched-off (removed)! Furthermore, the door should remain open during the out of operation period to avoid any odours.

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