

IRUMIED®

Apparatus for
Scientific and
Industrial Research

Telefon: 0511/632783
Telefax: 0511/632784

Rubarth Apparate GmbH

OPERATING AND
MAINTENANCE INSTRUCTIONS
FOR
COOLED INCUBATORS
TYPE 3000 - 3500

Version E/30-35/9-90

Table of Contents

	Page
1. General View	3
2. General	4
3. Transportation and Storage	4
4. Installation	4
5. Power Supply	6
6. Operation	6
7. Temperature Control	7
7.1 Mechanic Setpoint Control	7
7.2 Dual Setpoint Control	7
7.3 Electronic Setpoint Control	8
7.4 Electronic Programme Control	12
7.5 Programmable Timer for Alternating Temperatures	15
8. Temperature Protection	17
8.1 Specimen Protection	17
8.2 Unit Protection	18
9. Lighting	19
10. Adjustment of Lighting Intensity	20
11. Humidification	20
11.1 Evaporative Humidification	20
11.2 Ultrasonic Humidification	22
11.3 Steam Humidification	25
11.4 Dehumidification	28
12. Service and Maintenance	28

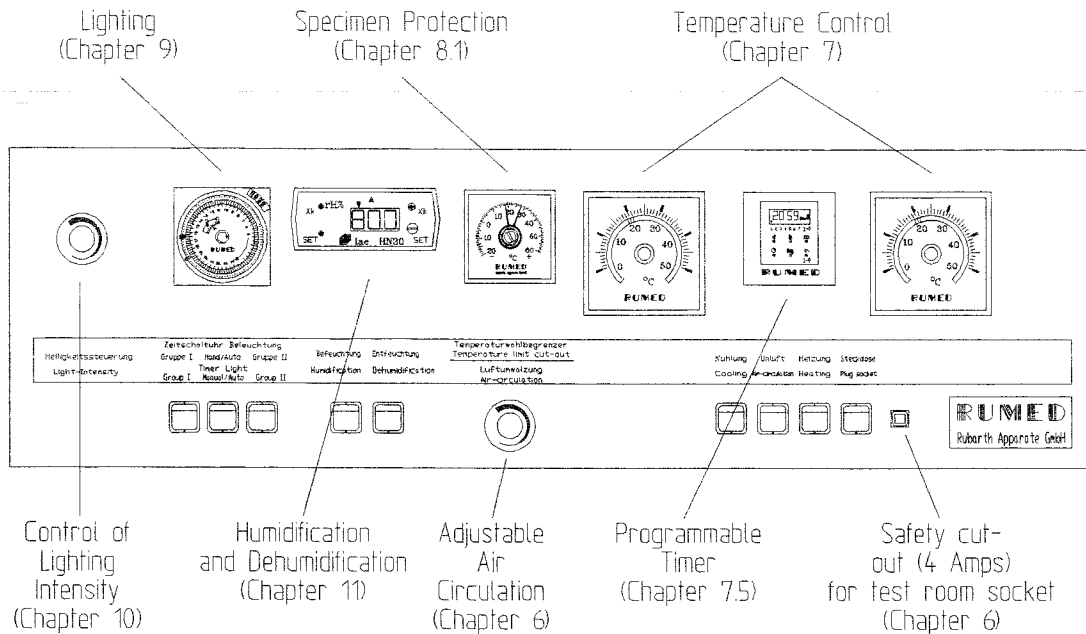
Concerning the basic unit, please refer to the **extra-bold** printed chapters. All further chapters are belonging to options.

Deutsch Diese Bedienungsanleitung ist erhältlich in Deutsch. Version D/30-35/9-90
Français Ce mode d'emploi est disponible en Français. Version F/30-35/9-90

Please unfold!



1. General View



Name-plate

The name-plate is located in the upper left edge of the door frame. In case of failures or for spare-part orders, please indicate the unit type (1) and the serial no. (2).

1 2

RUMED		Rubarth Apparate GmbH Ikarusallee 2, D-3000 Hannover 1	
Typ Type	<input type="text"/>	Nr. No.	<input type="text"/>
		Prüfraum Testroom	<input type="text"/> m ³
	<input type="text"/> kW		<input type="text"/> Volt <input type="text"/> A <input type="text"/> Hz
Vor Reparaturen am Apparat diesen vom Stromnetz trennen Prior to repairs disconnect unit from mains Made in West-Germany			

2. General

Rumed cooled incubators are producing ideal thermal conditions for quality control and research in science and industry. Experiences of more than 40 years stand for a maintenance-free construction and result in longevity.

Cooled incubators are fabricated for two different temperature ranges and three unit sizes each can be chosen from. The options alternating temperature control and programme control, lighting and humidification increase the unit's universal applicability. Depending on equipment, the units are applied in zoology, botany, microbiology, bacteriology, medicine as well as in the artificial aging and testing of electric and electronic components.

3. 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.



4. Installation

-	Model	Volume (l)	Exterior Dimensions (mm)			Maximum load per Insertion Grid (kg)
			Height	Width	Depth	
	3000	180	1420	610	620	40
	3100	250	1840	610	620	40
	3100	390	1725	760	750	50
	3300	170	1000	760	780	25
	3400	260	1920	690	770	25
	3500	500	2160	790	800	25

- 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.

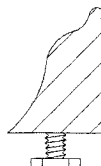
- The distance between the wall and the backside of the unit should be at least 10 cm.
Do not cover the ventilation slots; even a partial covering of the slots may lead to a heat accumulation. Uncovered ventilation slots are very important for a faultless operation of the cooling machine!

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

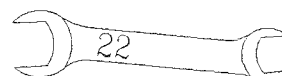
Model	Type of feet	Tool
-------	--------------	------

3000/3100/3200

2 adjustable feet
on the front

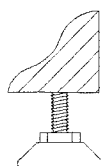


fork wrench SW22
(width: 22mm)

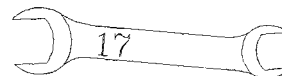


3300/3400

4 adjustable feet

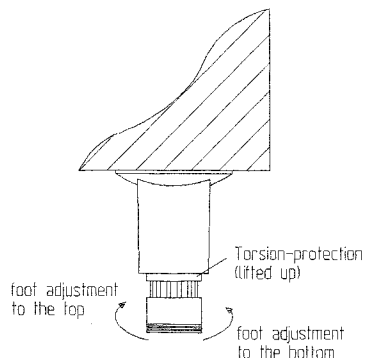


fork wrench SW17
(width: 17mm)



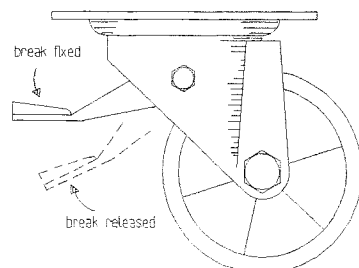
3500

4 adjustable feet



turn by hand by
a multiple of 90°

Option movable design



5. 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).

6. Operation

It is recommended to clean the interior of the unit before starting. Refer to the details described in "Defrosting" and "Cleaning" (chapter 12).

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 explosion-proof. Do not store explosive or easily inflammable substances in the test room!

The white rocker switch "Circulating Air" starts the fan and the unit at the same time. Cooling machine and heating are locked by means of this switch and will be only started when the fan is in operation. On operation of the fan the white pilot lamp is lighting.

In case the fan is fitted with a potentiometer, the air quantity can be reduced by turning the control knob to the left.

The red rocker switch "Heating" and the blue rocker switch "Cooling" are to be switched-on.

The pilot lamps are only lighting-up when the temperature controller demands heating or cooling.

The test room socket is switched-on by means of the yellow rocker switch ("Plug socket") and the pilot lamp is lighting. The test room socket can be charged by max. 4 Amps. In case of an overload or a failure of the connected unit, the safety cut-out being located next to the switch on the right side will be released. Upon repair of the failure, the pin of the safety cut-out shall be pressed down again.

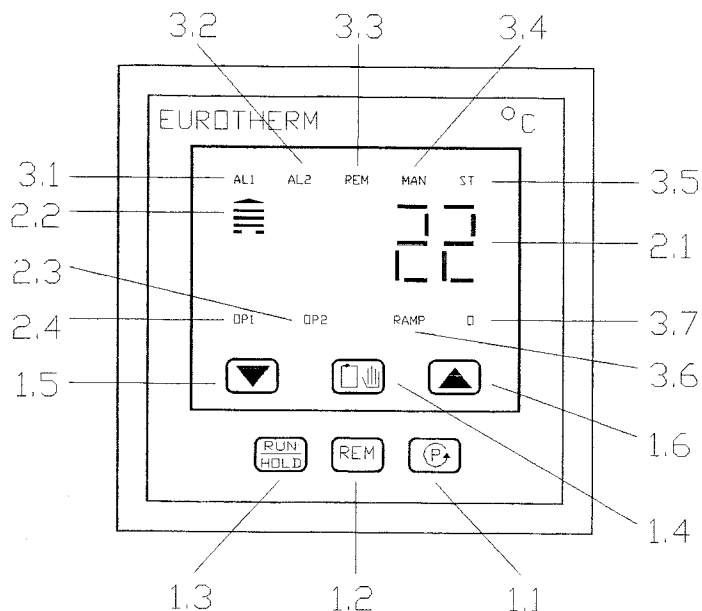
7.3 Electronic Setpoint Control

Functioning

The digital timer keeps a constant temperature according to an adjusted value. The mounted sensor is a resistance thermometer Pt 100, class a.

The following operating instructions with programming examples will facilitate the operation. For further technical details refer to the attached EUROTHERM 815 operating instructions.

General View



Operating Elements + Displays

Function

1.1 Scroll Button	yes
1.2 Local/Remote Button	no
1.3 Run/Hold Button	no
1.4 Auto/Manual Button	no
1.5 Down Button	yes
1.6 Up Button	yes
2.1 Digital Display	yes
2.2 Error Bar Indication	yes
2.3 Heat Output Indication	yes
2.4 Cool Output Indication	yes
3.1 Alarm 1 Active	option
3.2 Alarm 2 Active	option
3.3 Remote Selected	no
3.4 Manual Selected	no
3.5 Self Tune Selected	no
3.6 Programm Active	option
3.7 Digital Communication Active	option

Starting and Failure Indications

When the unit is started the number of the software version is indicated for 2 seconds on the display of the controller. During this time several internal controller tests are effected. After that the controller commutates to standard operation.

In case of a failure "CH..X" or "OR..X" will be displayed (see chapter 2 g of the EURO THERM Operation Instructions).

Digital Display

During standard operation the display (2.1) of the controller indicates the setpoint in °C.

All other unit parameters can be additionally read from the display.

Error Bar

The error bar Indication (2.2) shows the difference between the setpoint and the actual value. If actual value and setpoint are almost identic, only the divided bar is lighting. If the actual value is more (less) than the setpoint, the number of the lighting upper (lower) bars is the measure for the error.

Display Cool Output

If the controller demands cooling, the display OP1 (2.4) is lighting.

Display Heat Output

If the controller demands heating, the display OP1 (2.3) is lighting.

Control Buttons

The controller is equiped with six control buttons.



Down Button



Auto/Manual Button



Up Button

and below the lid:



Run/Hold Button



Local/Remote Button



Scroll Button

Down-/Up Button


By means of these buttons   values can be modified.





Upon a longer pressing of one of these buttons the changing rate is accelerated in six steps.

Auto-/Manual Button, Local-/Remote Button and Run-/Hold Button


These buttons are of no function.



Scroll Button


By means of this button all available parameters can be selected. On a short pressing of the scroll button  the display is commutated from actual value to setpoint (SP). On a further short pressing it is commutated to the correcting variable. The correcting variable is the heating or cooling power in percent of the maximum power (cooling power is indicated with negative signs) being demanded from the controller.

When (SP) is displayed, the respective value can be selected by means of the UP-BUTTON  or the DOWN-BUTTON . A longer pressing of the UP-BUTTON  or the DOWN-BUTTON  changes the value.



Only valid in case of option programme control:



If the SCROLL BUTTON  is pressed for a longer time, the first parameter of the programme PR1 is shown.

For selection of all further parameters, release the SCROLL BUTTON . When the SCROLL BUTTON  is pressed again, the next parameter can be selected.






If the SCROLL BUTTON  is now pressed for a longer time, all the parameters are shown in fast motion.

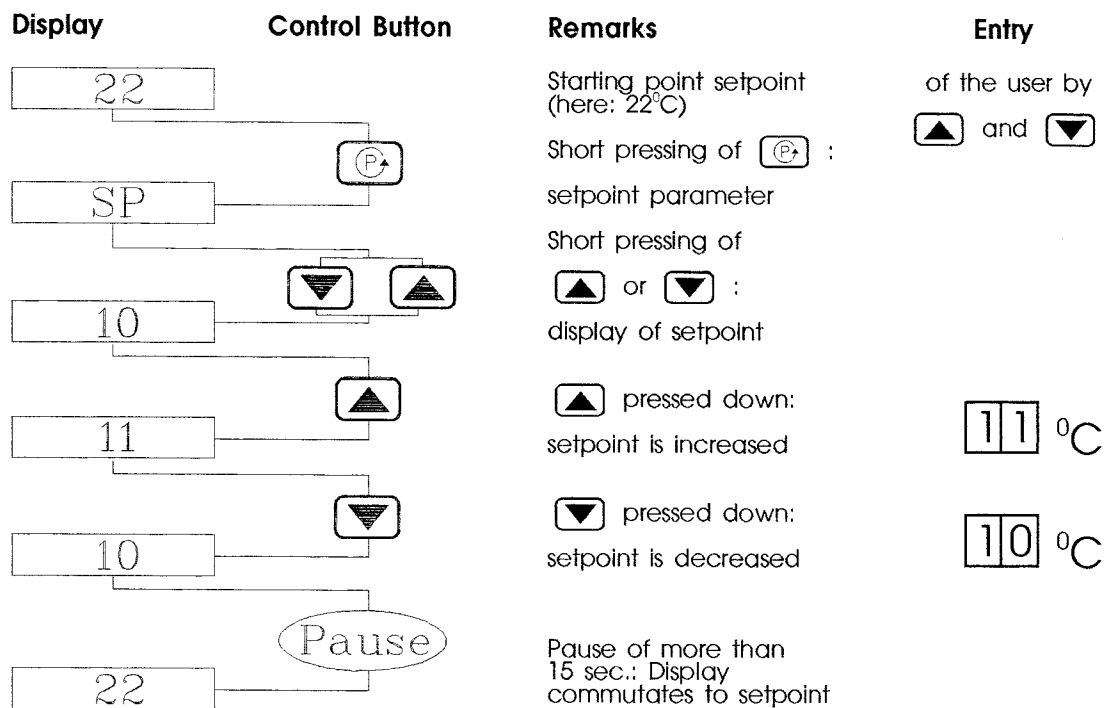
For further details concerning the programme parameter PR1 etc. refer to chapter 7.4 "Electronic Programme Control".

When the desired parameter symbol is shown in the display, the respective value can be selected by means of the UP-BUTTON  or DOWN-BUTTON . When the dot on the left side before the last figure is flashing, the indicated value can be changed.

The modification can be done by means of the UP-BUTTON  or DOWN-BUTTON . In case there will be no data input for 15 seconds, the unit commutates to the display of the actual value.

Setpoint Changes

The digital display is commutated by pressing the SCROLL BUTTON  and the parameter symbol SP is shown. When shortly pressing down one of the buttons  and  the value of the selected parameter is indicated. A further pressing of the button  and  changes the value.



7.4 Electronic Programme Control

By means of the electronic programme controller a temperature alteration between two temperature values with programmable temperature alteration speed values is possible. The programme is able to run either with process time or with real time.

It is possible to operate the programme controller either as set-value controller or as alternating temperature controller (for this purpose, refer to the preceding chapter "Electronic Setpoint Control").

At alternating temperature the programme for a day or a week is programmed at the right side beside the temperature controller.

Differentiation is to be made between set-value control and programme control.

Set-Value Control

Programming of the desired control temperature as described in the chapter 7.3 "Electronic Setpoint Control" (Page 11). Switch the programme timer to "PERMANENT OFF" (see chapter 7.5, paragraph "Permanent Control", Page 16) to avoid a programme start due to probably available alter statements.

Programme Control

For input of the programming parameters refer to the following example:

Input of the turn-on order of the timer for programme start

(in our example: 06.⁰⁰ h (06.⁰⁰ a.m.) every day).

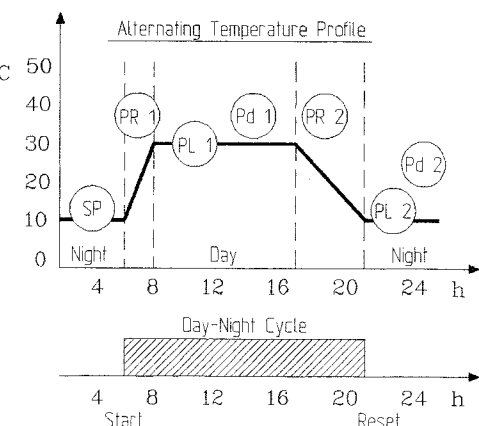
Input of turn-off order of the timer for reset



(in our example: 21.⁰⁰ h (09.⁰⁰ p.m.) every day).

Example for an Alternating Temperature Profile

The following programme parameters belong to the alternating temperature profile in the margin: °C

PR 1	10 °C/h	Heating-up ramp
PL 1	30 °C	Temperature/day
Pd 1	9.0 h	Duration of the day
PR 2	5 °C/h	Cooling-down ramp
PL 2	10 °C	Temperature/night
Pd 2	0.0 h	Duration of the night
PLc	1	Cycle loop
SP 1	10 °C	Temperature setpoint



The above programme parameter values in the temperature controller are factory-adjusted and can be changed by means of the buttons  and . The heating ramp PR1 is calculated from the difference of the day and night temperature divided through the demanded heating-up time.

$$\text{Here: PR 1} = (30^{\circ}\text{C} - 10^{\circ}\text{C})/2\text{h} = 10^{\circ}\text{C/h}$$

The cooling ramp PR 2 is calculated from the difference of the day and night temperature divided through the demanded cooling time.

$$\text{Here: PR 2} = (30^{\circ}\text{C} - 10^{\circ}\text{C})/4\text{h} = 5^{\circ}\text{C/h}$$

For synchronisation of the programme flow with the day time there is a timer beside the temperature controller on the right. The function of this timer is to start the programme at the desired day time, beginning with the heating ramp (here: 06.⁰⁰ a.m. ON). The switching-off time of the timer results from:

Switching-on time + switching-off time + duration of the day + cooling time

(here: 06.⁰⁰ a.m. + 2 h + 9 h + 4 h = 21.⁰⁰ h (09.⁰⁰ p.m.) OFF).

The timer is starting the programme anew every day. By this only one programme cycle each is run (PLc=1). The order OFF of the timer terminates the programme. The controller commutates to set-value control. For this reason the night temperature PL2 and the temperature setpoint SP1 must be identic. The duration of the night results from the remaining time between the order OFF after the programme end and the new programme start on the following day being released by the order ON. For this purpose, the duration of the night PD2 must be set to 0.0 h. If at the initial programme start, the programme will not be started at the desired day-time (here: 06.⁰⁰ a.m.), there will be a displacement of the temperature profile for that day. The programme will be truncated due to the programme end (here 21.⁰⁰ h or 09.⁰⁰ p.m.) and will be restarted with the correct time on the next morning.

As described in chapter "Daily Programme" (page 16) an ON and OFF-command will be programmed to be executed every day.

During the programme flow the programme data can be only read. The status of the programme is indicated in intervals.

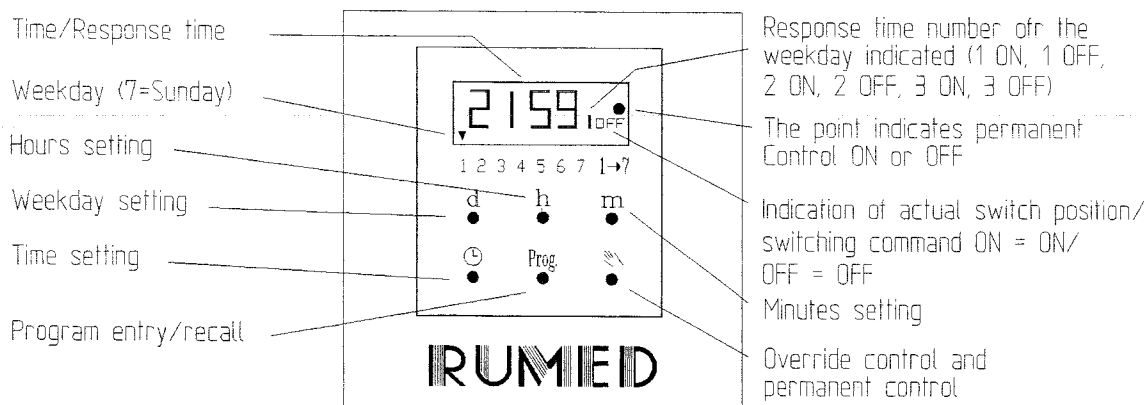
Explanation of abbreviations:

- r1 Heating phase
- d1 Day phase
- r2 Cooling phase
- d2 Night phase
- tr Remaining time in the current segment

Example for a Programme in Day/Night Cycle

Display	Order Button	Remark	Entry
22		Setpoint display (°C) HERE: 22°C)	of the user by ▲ and ▼
Pr 1	Ⓟ	Press Ⓟ until Pr 1 is displayed	
10	▼ ▲	Heating ramp Value of Pr 1 (°C/h)	□□□ °C/h
PL 1	Ⓟ		
30	▼ ▲	Day temperature Value of PL 1 (°C/h)	□□ °C
Pd 1	Ⓟ		
9.0	▼ ▲	Duration of the day Value of Pd 1 (h)	□□□ h
Pr 2	Ⓟ		
5	▼ ▲	Cooling ramp Value of Pr 2 (°C/h)	□□□ °C/h
PL 2	Ⓟ		
10	▼ ▲	Night temperature Value of PL 2 (°C)	□□ °C
Pd 2	Ⓟ		
0.0	▼ ▲	Duration of the night Value of Pd 2 (h)	□□□ h
PLC	Ⓟ		
1	▼ ▲	Programme loop Value of PLC (always=1)	
SP 1	Ⓟ		
10	▼ ▲	Setpoint Value of SP 1 (°C) in the programme mode (always=PL2)	□□ °C
22	Pause	Pause of more than 15 sec.: Display commutates to setpoint	

7.5 Programmable Timer for Alternating Temperatures



Starting up

After connection to power supply, the following 4 keys have to be pressed simultaneously:

d **⌚** **m** **⏏** - Reset (total clearance).

Setting of time and week-day

During setting procedure, keep pressing **⌚**. Set the arrow on the display to the actual week-day by pressing **d**. Set the actual time by pressing **h** or **m**. Now take-off **⌚** - the clock is running.

Weekly programme

Weekly programme with 8 response times (4 ON + 4 OFF) are programmable on one, on several or for all week-days by means of a free block entry option.

Notice If the entry is interrupted or finished, the display shows the actual time after 40 seconds - automatic operation. If necessary, the programme entry has to be started once again.

Starting the programme entry

Press **Prog**.

ON-Switching command

The display shows **:-h**, ON is indicated on the right side of the display representing the ON-command. Now press **d** and the arrow starts flashing above 1=Monday. If this switching command should be carried out on Monday, Monday is entered by pressing **⏏**. Other or further week-days can be selected by pressing **d** and respectively entered by pressing **⏏**. If for example the command should be carried out from Monday to Friday at the same time, 5 arrows must stand above the numbers 1...5.

For daily switching commands, 7 arrows must stand above the week-days. After having entered the week-day(s), the ON response time must be entered by pressing **h** and **m**. The switching command displayed must be entered by pressing **Prog**.

Switching-Off command

OFF is now indicated on the right side of the display. The desired week-days are now selected by pressing **d** and afterwards entered by pressing **h** as already described. The response time can be entered by pressing **h** and **m** and stored by pressing **Prog**. If requested, switching times No. 2, 3 and 4 can be programmed as described above. When the programme entry is finished, please press **⌚**.

Daily programme

After the starting-up (reset) it is also possible to select an every day routine programme with 12 switchings (6ON+6OFF) by means of **time setting without** pressing **d** for the respective week-day. The daily programme is indicated by the arrow standing above 1→7. The programme entry starts as soon as the response time is entered, as no week-day is entered.

Recall

Please recall the ON and OFF switchings by pressing **Prog**. Afterwards press **⌚**.

Change or Clearance of a command

Recall the command by pressing **Prog** and change it by pressing **h**, **m** and if necessary **d** or clear the command indicated by simultaneously pressing **h** + **m**. Afterwards press **⌚**.

Override

Pressing **h**, ON/OFF is switched alternately. The following counter-acting programme sequence annuls the manual control.

Permanent control

By pressing **h** + **m** simultaneously, the following functions are switched: Permanently ON - permanently OFF - Automatic Operation. The point on the display indicates the permanent function ON or OFF.

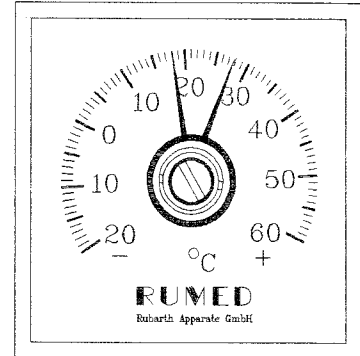
Summer Changeover +1 hour: press **d** + **h** simultaneously

Winter Changeover -1 hour: press **d** + **m** simultaneously

8. Temperature Protection

8.1 Specimen Protection

The unit is equipped with a freely adjustable temperature selector control (TWW) for protection of the specimen to be tested. The temperature controller avoids any deviation from the adjusted temperature range possibly occurring due to malfunction. If the temperature is decreased, the cooling machine is switched-off and if the temperature is increased all the thermal sources (as circulating fan, lighting, humidification and socket) are disconnected. As long as there is an overtemperature in the test room, an acoustic signal warns from superheating. Reconnection is effected automatically when the test room temperature reaches the preadjusted temperature range.



The acoustic alarm can be switched-off by disconnection of the main switch or by increasing the value of the overtemperature limitation.

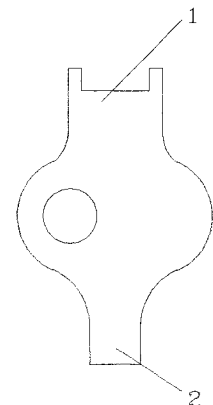
The limit values of the temperature range being adjusted at the temperature selector control should always be 5°C below respectively above the temperatures being adjusted at the temperature controller.

Example: Set-value control +23°C -> blue pointer +18°C
red pointer +28°C

Programme control +10°C/+30°C -> blue pointer +5°C
red pointer +35°C

Adjustment of the Temperature Range:

- Unscrew the cover anticlockwise
- Set the blue pointer with the key side (1) to the desired value of the low temperature disconnection by turning the green ring
- Set the red pointer with the key side (2) to the desired value of the overtemperature disconnection by turning the brass screw
- Screw on the cover after having adjusted

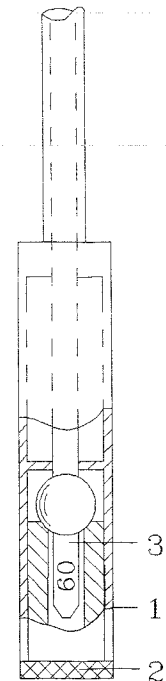


8.2 Unit Protection

The unit is equipped with an overtemperature protection. The measuring sensor is located in the rear test room on the right side below the ceiling. In case of overtemperature the fuse (3) bursts and switches-off the unit permanently.

Replacement of the Fuse:

- Hold fast the shaft (1) and unscrew the knurled screw (2).
- Remove the glass splinters out of the knurled screw (2).
- Insert the spare fuse with a releasing temperature according to the figure in the margin into the knurled screw (2). The releasing temperature is marked on the shaft of the fuse (3).
- Hold fast the shaft (1) and jam in the knurled screw (2) against the spring pressure until the thread gets hold and screw it on.



After response of the unit protection and prior to a new start of the unit, possible failures should be detected.

Any manipulation on this protection device or the mounting of a fuse with a higher releasing temperature than $+60^{\circ}\text{C}$ will destroy the unit and will result in a loss of guarantee claims.

9. Lighting

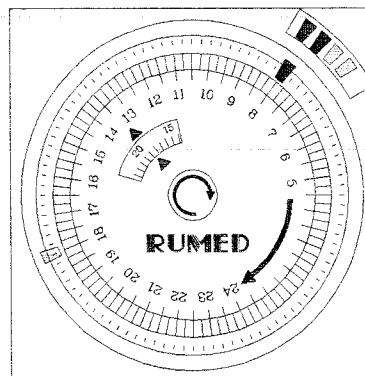
The lighting can be switched in two groups (standard) to reach different luminous intensity values (Exception: If only 1 lamp is mounted, it will be switched over group I and the switch for group II will be of no function). A photoperiod can be run by means of the timer.

Adjustment of the Actual Time

- Detach the plastic cover
- Adjust the actual time (here $13.^{18}\text{ h} = 01.^{18}\text{ p.m.}$) by means of the turning knob in clockwise direction. Hours can be read at the arrow of the outer scale and minutes on the arrow of the inner scale

Programming of the Switching Times

- Light ON - Set the red nose at the desired switching-on time
(here: 08.⁰⁰ h = 08.⁰⁰ a.m.)
- Light OFF - Set the green nose at the desired switching-off time
(here: 18.⁰⁰ h = 06.⁰⁰ p.m.) (spare slid set with 4 pcs. spare slids can be found in timer at the upper edge on the right side)
- Reattach the plastic cover



Zeitschaltuhr Beleuchtung
Gruppe I Hand/Auto Gruppe II

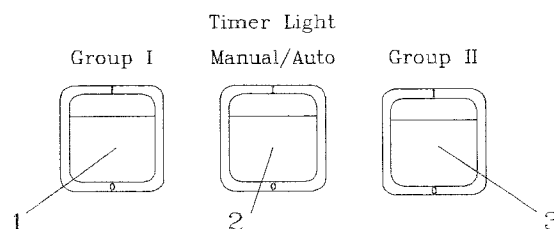
Lighting

Switch-on switch (1) for 50 % luminous intensity (group I)

Switch-on switches (1) and (3) for 100 % luminous intensity (group I+II)

Set switch (2) to automatic for photoperiod (position 0)

Set switch (2) to manual for continuous light (position 1)



Replacement of the Fluorescent Lamps

- Unplug the mains plug of the unit
- Open the unit door widely and remove the insertion grids
- Unscrew the slides of the moisture-proof lampholders
(Caution: Upon a certain operation time the fluorescent lamps are hot!)
- Screw the fluorescent lamp into the lamp holder until the contact pins face the front
- Withdraw the fluorescent lamp
- Insert the new fluorescent lamp (20 or 40 watt, 38 mm diameter, in the desired colour)
Caution: Black-light might affect the test room being made from plastic material due to the high ultraviolet radiation!)
- Turn tube by two notches onto one direction and tighten the slides fastly
- Replace starter in the switch cabinet (not applicable with continuous lighting control)
- For replacement of a fluorescent lamp 18 or 36 watt, 26 mm diameter use other slides to avoid the loss of the moisture-proof characteristics
- Reconnect the unit to mains

10. Adjustment of lighting intensity

The option lighting intensity allows a continuously adjustable intensity in the range of approx. 20 to 100 % of the maximum lighting intensity.

The control unit is located at the left side of the lighting timer. Turn the control knob to the left until the push-to-lock position OFF and to the right in direction of the arrow when an increase of the lighting intensity is desired.

When replacing the fluorescent tubes, observe that the tubes are to be executed with an high resistive component and with vacuum metallized igniters or with a capacitive ignition aid along the lamp surface.

11. Humidification

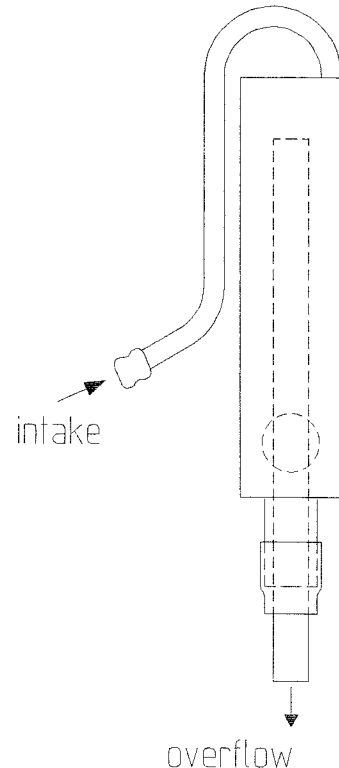
11.1 Evaporative Humidification

General

The air humidifier operates according to the evaporation principle and attains a water temperature of approx. 70°C. The maximum evaporative power amounts to approx. 200g per hour. The relative humidity is controlled by a hygostat. If possible, the water supply should be automatic. If a water intake and outlet is not available, the water supply can also be effected manually.

Commissioning

- Loosen fixing device of the cable clamp on the humidifier bottom.
- Uncoil the desired cable length.
- Reattach the cable by means of the fixing device.
- Place the humidifier onto the test room bottom. (Do not touch the test room walls or deposit objects on the humidifier!)
- Pull the connection hose level regulator/humidifier over the hose nozzles at the test room wall and the humidifier and fix it by means of the hose nozzles.
- Plug-in the shock-proof plug of the humidifier into the socket.

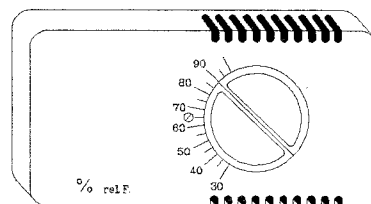


Automatic Filling

- Connect the water intake of the level regulator to the drinking water supply by means of a hose.
- Connect water overflow to outlet.
- Adjust the water quantity at the water cock of the customer until the water penetrates from the overflow in droplets.
- Adjust the water overflow by shifting the overflow pipe in the rubber until the water level in the humidifier vessel is 1 cm below the cover grid.

Manual Filling (if water intake and outlet are not available)

- Pull the water overflow pipe in the rubber entirely upwards
- Fill the humidifier in the test room manually, until the water level is 1 cm below the cover grid.
- **Attention:** In case of a lack of water, the humidifier will be switched off automatically.
- Adjust the hygrostat on the back wall of the test room by means of the control knob onto the desired relative humidity (f. ex. 90% r. h.)
- Switch-on the yellow rocker switch "Steckdose" (socket).
The pilot lamp is lighting, when the relative humidity in the test room falls below the adjusted value.



Maintenance and Cleaning

During the whole operation time, the air humidifier requires least maintenance. This evaporative system dissipates only pure water steam to the room air, and not desired residuals in the air, as lime, mineral salts etc. are retained in the water vessel. For that reason, evacuate the vessel weekly and rinse it with clear water.

Depending on lime content of the water, the air humidifier should be decalcified every second month using our RUMED quick antiliming agent.

For antiliming unplug the plug out of the socket. A detailed description for antiliming will be delivered with our quick antiliming agent. When using other antiliming agents, observe the prescriptions of the respective product.

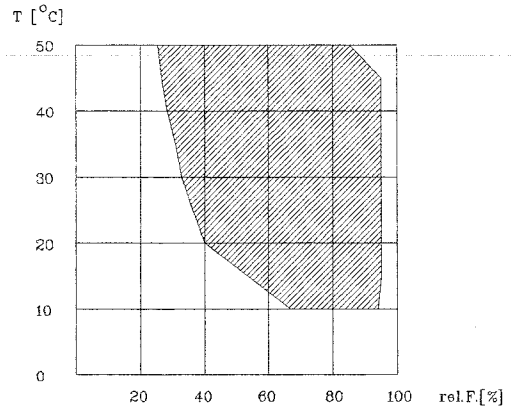
Water softeners or antiliming agents should not be continuously added to the water, but should only be used for antiliming of the unit.

Do not place the unit into water or expose it to running water. However, the water vessel may be rinsed with a shower.

11.2 Ultrasonic humidification

General

The ultrasonic humidification works according to the principle of fine atomization of water. The temperature/humidity diagram in the margin shows the working range in combination with the option dehumidification. Tap water is supplied automatically by means of a level switch and a solenoid valve. After being atomized in the respective chamber the water is led into the test room by means of a blower. The maximum atomizing power is approx. 0,5 liters per hour.



The adjusted relative humidity is kept constant by an electronic controller with digital display. The humidity sensor consists of fine hygroscopic plastic fibres, the change in length of which is converted into an electric resistance alteration.

A humidity controller converts the resistance values into relative humidity values and displays them. This humidity sensor is almost maintenance-free and long-lasting.

Removing of transport fixings

Prior to initial starting of the unit make absolutely sure, that the transport fixings of the humidifier are to be removed as follows:

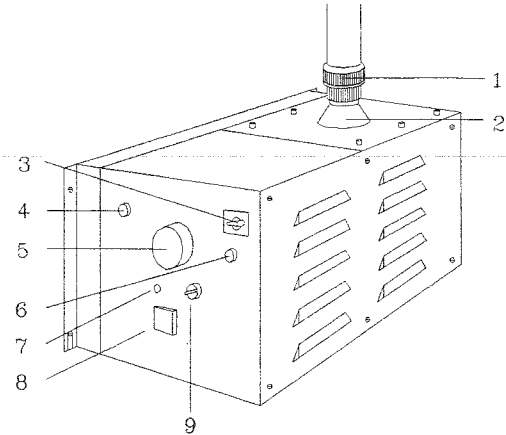
- Disconnect the unit from mains
- Loosen screwing (1)
- Unscrew the cover with the mist outlet nozzle (2)
- Remove transport fixing (paperboard) from the float chamber and the mist outlet nozzle (2)
- Clean float chamber with soft rags
- Screw-on the cover with the mist outlet nozzle (2). Observe that cover screws are screwed down equally.
- Tighten screwing (1)



Do not take the float ring out of the water during operation. An immediate destruction of the ultrasonic transducer would result in. Please take care the unit is always disconnected from mains during cleaning or repair works.

Supply of water

- Connect water intake (4) of the humidifier to a isolating drinking water conduit (1 - 10 bars, "). Commercially available washer hoses are suitable. Demineralized water is unsuitable and leads to failures of the filling level control.
- Connect drain (6) to a depressurized outlet.

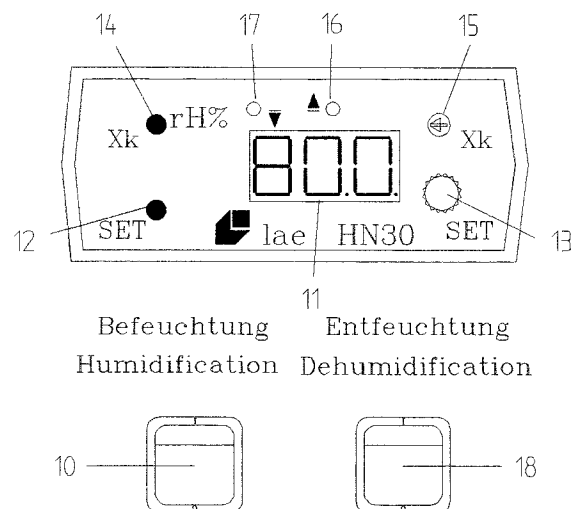


Operation

The humidification is switched-on by the green switch (10). If the humidity controller demands humidity power, the pilot lamp is lighting. During standard operation, the digital display of the humidity controller (1) displays the actual value in % relative humidity. The parameters actual value SET and the switching hysteresis Xk are only displayed on pressing the respective key.

Set-point adjustment SET

- The adjusted set-point in % r. h. is called by pressing the key SET (12).
- Turn the adjusting potentiometer (13) at the same time until the desired set-point is adjusted.
- When key SET (12) is let loose, the adjusting procedure is finished. The display (1) now indicates the actual value. During operation the individual condition of the humidity controller is displayed as follows:



- r. h. too high, dehumidify (16) (refer to chapter 11.4)
- r. h. too low, humidify (17)

Adjustment of the switching hysteresis

By means of the switching hysteresis the range for the admissible deviation of the actual value from the set-point is adjusted. For example: Set-point = 80 % r. h.; switching hysteresis 0,3. When the option dehumidification had been chosen, the inertia of the humidifier respectively of the controller causes an actual value in the range of 79,7 to 80,3 % r. h.

- Press key Xk (14) to call the adjusted value for the switching hysteresis.

- The value for the switching hysteresis can be modified by turning the adjusting potentiometer (15) at the same time by means of a screw driver.
- When key Xk is let loose the adjusting procedure is finished. Display (11) indicates again the actual value.

Adjustment of the Humidification Power

The intensity of the humidification mist can be regulated by means of an adjusting potentiometer (9) at the rear of the humidifier. When turning the potentiometer clockwise, intensity is increased; when turning anticlockwise, intensity is decreased. The intensity should be selected in such a way, that the pregiven set-point is just reached. A too high intensity value would cause a significant exceeding of the set-point.

Cleaning

Clean the humidifier every week or every month, depending on contamination of air or water.

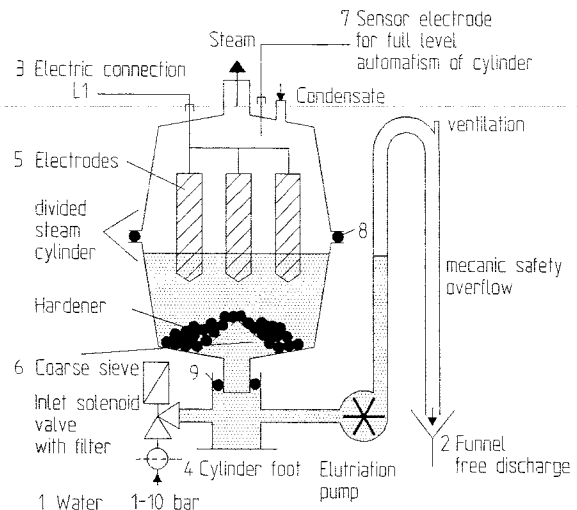
- Switch-on humidification (green switch 10).
- Adjust 99,9 % r. h. at the humidity controller and the humidifier will be put into operation.
- Position operating switch (3) to "pumpen" (pump). The float chamber will be discharged.
- Switch-off humidification (green switch 10).
- Disconnect unit from mains
- Loosen screwing (1)
- Unscrew cover with mist outlet nozzle (2)
- Carefully take out float ring. Clean float chamber, float ring and air intake with soft rags using RUMED's biologic cleansing and antiliming agents. Do not use brushes and aggressive, arenaceous agents.
- Fasten cover with mist outlet nozzle (2) and observe that cover screws are screwed down equally.
- Tighten screwing (1).
- Position operating switch (3) to "humidification".
- Reconnect to mains.
- Adjust setpoint to desired value.

11.3 Steam humidification

General

Each tap water has a certain electric conductivity being used for steam generation. The steam cylinder comprises several surface electrodes being arranged toroidally. Connection is made to alternating voltage. The current flows over the conductivity of the water from one to the other electrode. Due to its resistance, the water is heated-up and the admitted electric energy is directly converted into

heat without any loss. The steam capacity of the humidifier conforms to the consumption of electric energy respectively to the nominal current resulting from. The variation of the immersion surface of the electrodes - and thus of the current value - results in a good continuous control of the system. The steam quantity can be adjusted in the range of 0,3 to 1,25 kg/h. The adjusted relative humidity is kept constant by an electronic controller with digital display. The humidity sensor consists of fine hygroscopic plastic fibres, the change in length of which is converted into an electric resistance alteration. The resistance values are converted into relative humidity values by the humidity controller and displayed. The humidity sensor is almost maintenance-free and long-lasting.



Supply of water

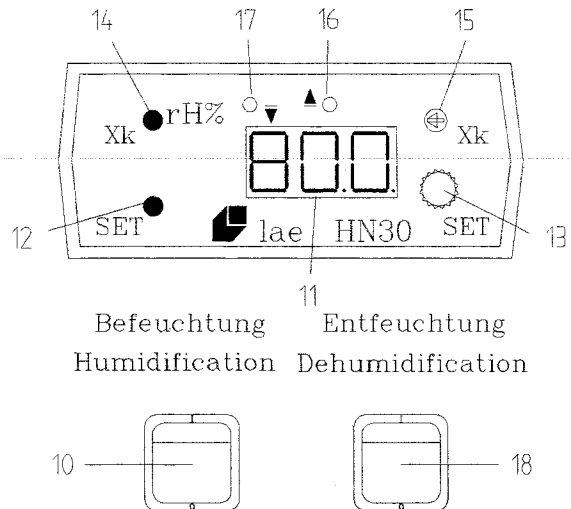
- Connect water intake (4) of the humidifier to a isolating drinking water conduit (1 - 10 bars, 1/2"). Commercially available washer hoses are suitable. Softened water is unsuitable, due to risk of a short circuit caused by salification.
- Connect drain (6) to a depressurized outlet.

Operation

Humidification is switched-on by the green switch at the humidification unit and the green switch (10). If the humidity controller demands humidity power, the pilot lamp is lighting. During standard operation, the digital display of the humidity controller (1) displays the actual value in % relative humidity. The parameters actual value SET and the switching hysteresis Xk are only displayed on pressing the respective key.

Set-point adjustment SET

- The adjusted set-point in % r. h. is called by pressing the key SET (12).
- Turn the adjusting potentiometer (13) at the same time until the desired set-point is adjusted.
- When key SET (12) is let loose, the adjusting procedure is finished. The display (1) now indicates the actual value. During operation the individual condition of the humidity controller is displayed as follows:
- r. h. too high, dehumidify (16) (refer to chapter 11.4)
- r. h. too low, humidify (17)



Adjustment of the switching hysteresis

By means of the switching hysteresis the range for the admissible deviation of the actual value from the set-point is adjusted. For example: Set-point = 80 % r. h.; switching hysteresis 0,3. When the option dehumidification had been chosen, the inertia of the humidifier respectively of the controller causes an actual value in the range of 79,7 to 80,3 % r. h.

- Press key Xk (14) to call the adjusted value for the switching hysteresis.
- The value for the switching hysteresis can be modified by turning the adjusting potentiometer (15) at the same time by means of a screw driver.
- When key Xk is let loose the adjusting procedure is finished. Display (11) indicates again the actual value.

Adjustment of the Humidification Power

The power of the steam cylinder can be adjusted to a value between 10 and 100 % by adjustment of the power potentiometer on the printed card which can be found at the interior side of the humidifier door.

Full level of cylinder

In case of low water conductivity and a cold-start, the cylinder will be filled until the maximum limitation electrode without reaching the nominal current or the nominal power. Such a condition will be signalized by the red luminous diode "full level of cylinder" and the water supply will be interrupted by force simultaneously. Continuous evaporation and the

resulting increased water conductivity switches-off the signal automatically and the nominal power will be automatically reached.

Elutriation

The electronic system decides automatically, if a dilution of the concentration in the steam cylinder is required. Elutriation is always effected with the least possible water quantity. At normal tap water quality, the loss rate is between 7 and 15 % of the humidification power. According to elutriation cycle, there will be a dissipation of approx. 2 liters of hot water.

Maintenance

For an uninterrupted operation it is recommended to effect maintenance works at least once a year. Generally, works are restricted to removal of hardeners occurring during evaporation in the steam cylinder, the water drain hose and the elutriation pump as well as to the verification of the large-surface electrodes which are influenced by normal wear.

Functioning and maintenance intervals of the steam humidifier are depending mainly on the available water quality (water hardness, conductance) and on the steam energy generated in the meantime.

The first maintenance works at standard water quality should be executed upon an operation time of approx. 4 - 8 weeks. A varying water quality may prolongate or shorten maintenance intervals. Future maintenance intervals can be gathered from the residuals which can be found in the steam cylinder. The latest moment for a maintenance of the cylinder upon a certain operation time is indicated by the red pilot lamp "full level cylinder".

Cleaning

- Press the marked pushbutton at the control for manual drainage of the water filling over the elutriation pump.
- Disconnect unit from mains
- Unplug electrode plug (3)
- Lift off the steam cylinder from the foot (4) and the lateral holders
- Remove clamps at the cylinder flange and open cylinder
- Take out all loose hardeners. Remove incrustations. Heating electrodes do not need to look metallic polished. Only remove mechanically the loose layer.
- Check interior side of steam cylinder top for incrustations and for electric bridges (black grooves) between the electrode bushings and remove them completely by washing. If the electric bridges are penetrated very deep into the material, the top part is to be replaced.

- Clean cylinder sieve (6)
- Sensor electrode (7) in the cylinder top is to be cleaned metallic polished.
- Assembly of the steam cylinder and mounting into the unit is to be done in doing above steps in vice-versa sequence.
- Any opening of the cylinder requires **on principal to replace the flange washers (8) and the foot washers (9)** in solvent-free quality.

11.4 Dehumidification

Dehumidification is generated by falling below the dewpoint. If the humidity 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.

The orange switch (18) (refer to page 23) below the humidity controller switches on the dehumidification. If the value being adjusted at the humidity controller is exceeded by more than the switching hysteresis, the dehumidification system is automatically switched-on and the pilot lamps 16 and 18 are lighting.

12. Service and Maintenance

Defrosting

- Models **3000**, **3100** and **3200**: The dew water is collected in the evaporation vessel where it automatically evaporates. Observe, that the dew water can flow off unhindered through the drain at the back wall of the cooling chamber. If required, puncture the drain with a peak object.
- Models **3300**, **3400** and **3500**: Place a condensate collector below the floor drain which is to be emptied if necessary.
- 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°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!

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!

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.

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.