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Find the *Kuhner ISF-4-VM* at our website: ***Click HERE***

CLIM - O - SHAKE

ISF - 4 - V

Operating Instructions

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EC-Conformity Statement

We

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declare to take sole responsibility, that the machine

Model	**Clim-O-Shake**
Type	**ISF-4-V**
Serialnumber	**937007**
Year of construction	.....

described in the following operating instructions, corresponds with the EC-Regulation for machines 89/392, changed through EC-Regulation 91/368..

relevant EC-Regulations: EN292-1 EN292-2

Name:	.....
First name:	.....
Position:	.....
Birsfelden, the	.....
Signature:	.....

Represented:

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1. Setting up

The "Clim-O-Shake" has a specially designed base so that it can readily be transported and set up by means of a forklift truck.

It is important to ensure even support of the machine by correctly adjusting the levelling screws.

Warm air from the refrigeration unit is discharged towards the back. In order to ensure free ventilation it is essential to have a distance of at least 12 cm between the back of the unit and wall.

Ventilation, gas supply
Two small vents below the doors and a vent in the centre cover on top of the machine allow for equalisation of pressure and air exchange. Two nozzles are provided at the top of the machine as gas in- outlet:

left nozzle:	suction	inlet
centre nozzle:	pressure out	outlet

1.1 Safety instructions

- Due to the variable tray loading it is not always possible to balance completely the forces due to the moving masses. The Shaker should therefore not be set up close to any vibration sensitive equipment.

- Before making the electrical connections to the machine it is advisable to compare the information on the rating label with the data of your mains supply.

1.2 Technical data of Clim-O-Shake ISF-4-V

Dimensions (W, H, D)	:	1400, 1900, 860 mm
Weight with 4 shaker units	:	760 kg
Ambient temperature	:	+10°C up to +35°C max.
Noise level	:	< 57 dB(A)
Power consumption	:	1600 VA max.
Power consumption with humidifier and door heaters	:	2600 VA max.

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2. Shaker Unit

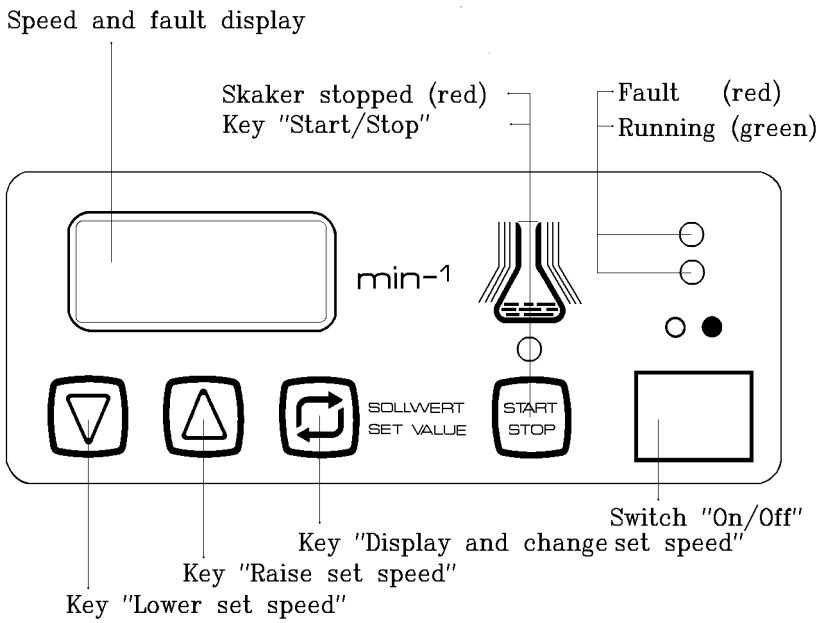
The tray carrier is driven magnetically by two d.c. linear motors. Quartz precise speed regulation is achieved by microprocessor control. Speed is kept constant irrespective of load.

2.1 Installation

The shaker units can readily be set to different levels by moving the support rails. The following points should be noted:

- the shaker units must be secured to the rails with M6 screws, using the self locking nuts.
- any connectors not used should be closed with caps.
- never pull out or insert the control units while the power is on.

2.2 Controls



2.3 Speed setting

The LCD display always shows the actual speed. To change the speed setting it is necessary to simultaneously press the "Set value key" and "Raise set speed" or "Lower set speed key". This effectively prevents unintentional changes in speed setting. It is, of course, possible to change the speed setting while the shaker is stopped.

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2.4 Active brake

The heavy inertia of the moving masses in a shaking machine results in a long slowing-down period after the shaker has been switched off. Where the tray load has to be changed quickly simply press the "Start/Stop" key. This applies an active brake to the drive; pressing "Start/Stop" once more will then drive the shaker back up to its set speed.

When in doubt about the speed setting, the drive should be in the stopped position when the machine is first switched on. The speed setting can then be adjusted at leisure.

2.5 Setting the timer (optional)

With the timer option switched on the shaker run time can be limited:

- This time can be selected when the machine is stopped by using the up/down arrow keys. When pushing the start/stop key again, the shaker will run for the preselected time (in minutes) - then fast, active braking takes place.

- The timer countdown can be interrupted prematurely by pushing the start/stop key; when starting again, the full displayed time is valid.

- The timer function can be turned off by selecting a time of **0'**. Normal start/stop operation is then possible again.

Time range: 1 ... 500 min

Generally the machines are delivered with the timer option switched off.
See section „2.9 Selection of operating parameters“.

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2.6 Safety instructions

- The machine should be completely stopped before the tray and contents are handled. Otherwise there is a serious risk of injury (jamming fingers or broken glass) !
- Please take care that after changing trays, the handle of the tray locking device is as far as possible to the right.
- No other trays than those supplied by the manufacturer of the machine to be used..
- Make sure that there are no loose parts on the tray before starting the machine.
- The trays must only be loaded with the conical flask sizes for which clips are provided. Before shaking round bottom flasks check which flask size can be held securely in the clips. The tension spring on the clips must never be removed.
- Please notice that the sizes of Erlenmeyer flasks can differ depending on the make. When ordering trays and clamps please indicate the manufacturer of the flasks you are using.

2.7 Self-monitoring system

An extensive self-monitoring system switches off the drive when a fault occurs. The red fault lamp lights up and the type of fault is indicated on the speed and fault display as follows:

-F0- drive obstructed or shaker disconnected
-F1- speed sensor 1 faulty
-F2- speed sensor 2 faulty
-F3- maximum speed has been exceeded
-F4- error in check sum of memory
-F5- error in computer monitor
-F6- invalid speed limit selected

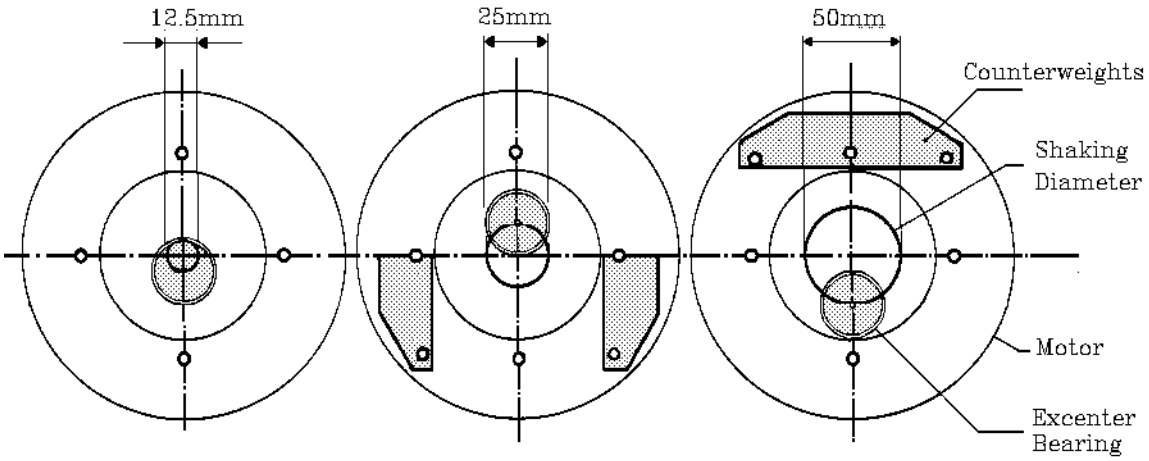
If a safety shut-down is caused by a temporary fault or if the fault clears itself, the fault logic can be reset by simply switching the main supply switch off and then on again.

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2.8 Changing the shaking diameter

The following modifications should be carried out by qualified personnel only:

After removing the tray and the upper cover of the shaker unit, the shaking diameter can be changed by altering the eccentric position of the bearing according to the diagram below. Please make sure, that the counterweights are always mounted opposite to the eccentric bearing. With the shaking diameter set to 12.5 mm, the counterweights must be removed completely. Do not forget to change the speed limit in the speed control unit as explained in section 2.9.



2.9 Selection of operating parameters

The following adjustments should be carried out by qualified personnel only:
The **maximum permissible speed** is determined by the shaking diameter or stroke and is set by the slide switch on the circuit board "EMR-90":

pos.	3	2	1	max. speed	orbital	linear
	-	-	-	-		
	-	-	ON	100 rpm		
	-	ON	-	200 rpm		50 mm
	-	ON	ON	300 rpm	50 mm	25 mm
	ON	-	-	400 rpm	25 mm	12.5 mm
	ON	-	ON	500 rpm	12.5 mm	
	ON	ON	-	-		
	ON	ON	ON	test		

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Switch pos. 4 enables the **timer option**:

pos.	**4**	**Timer**
	-	OFF
	ON	ON

Valid only for program release „EMR-90T“.
Earlier versions requires this switch to be „ON“ always.

2.10 Technical data

Orbital shaker type	**:**	**RSF-V-12**	**RSF-V-25**	**RSF-V-50**
Orbit diameter	:	12.5	25	50
Shaking speed (rpm)	:	30...500	30...400	30...300
Linear shaker type	**:**	**LSF-V-12**	**LSF-V-25**	**LSF-V-50**
Stroke (mm)	:	12.5	25	50
Shaking speed (stroke min.)	:	30...400	30...300	30...200
Loading	:	1 tray size "F"		
Speed accuracy	:	+/- 0.1 rpm		
Speed indication	:	digital, resolution 1 rpm		

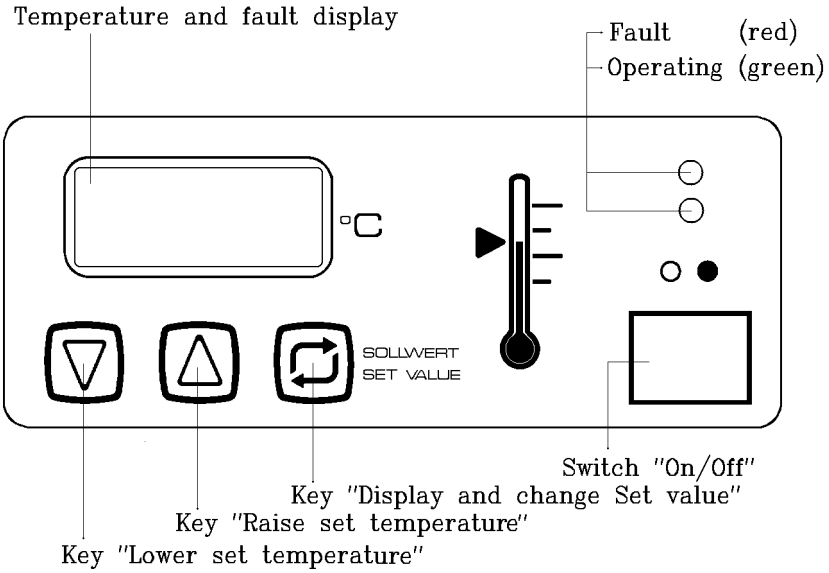
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3. Temperature Control

The temperature control of the Clim-O-Shake operates on the principle of direct air heating and cooling. The air is drawn in at the front top and passed by the powerful fan into the circulation duct at the back wall. There the air flows first past the evaporator of the refrigerator and then past the enclosed electrical finned heaters and returns to the bottom of the chamber.

Electronic, fully digital PID control incorporating a microprocessor ensures exact matching of the heater power and accurately maintains the desired temperature.

3.1 Controls



3.2 Temperature setting

The LCD display always shows the actual temperature. To change the temperature setting it is necessary to press simultaneously the keys "Display and change set temperature" and "Raise set temperature" or "Lower set temperature".

To ensure ready identification the setpoint is displayed with a flashing decimal point.

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3.3 Refrigeration

Below 30 °C the cooling system is permanently switched on. Between 30 °C and 50 °C however, it only operates on demand. Minimum on- and off times are observed automatically. Please note that the processor will turn the cooling system off after reaching the desired setting.

3.4 Test measurements

Before delivery, the temperature distribution in each cabinet is checked carefully. The measurements are done in Erlenmeyer flasks at the front left of centre and at the rear right of centre position on all four shaking units at a speed of 30 rpm. The deviation of the highest and the lowest of all measured values related to the desired value has to be within the following limits:

Temperature	Humidity	Door heaters	max. Difference
15.0 °C	70 %	0 %	+/- 0.25 K
25.0 °C	0 %	0 %	+/- 0.20 K
27.5 °C	85 %	40 %	+/- 0.20 K
45.0 °C	85 %	80 %	+/- 0.40 K
55.0 °C	85 %	100 %	+/- 0.50 K

Ambient temperature : 20....25 °C
Accuracy : +/- 0.05 K

3.5 Self-monitoring system

An extensive self-monitoring system switches off air circulation, heating and refrigeration when a fault occurs. The red fault lamp lights up and the type of fault is indicated as follows:

-F0- cooling system overheated
-F1- actual temperature too low, e.g. through short circuit at probe
-F2- actual temperature too high, e.g. through open circuit at probe
-F3- error in check sum of memory
-F4- error in computer monitor
-F5- invalid slide switch setting

If a safety shut-down is caused by a temporary fault or if the fault clears itself, the fault logic can be reset by simply switching the mains switch off and then on again.

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3.7 Selection of operating parameters

The following adjustments should be carried out by qualified personnel only:

The slide switch settings on the control board "TRK-40" determines the type of machine. This has to be checked whenever the circuit board has been changed:

pos.	4	3	2	1	type of machine
	ON	-	-	-	Lab-Therm
	ON	-	-	ON	Aqua-Shake
	ON	-	ON	-	IRC-1-U
	ON	-	ON	ON	ISF-4-V
	ON	ON	-	-	ISF-4-V with supervision
	ON	ON	-	ON	-
	ON	ON	ON	-	-
	ON	ON	ON	ON	test

3.7 Technical data

Temperature minimum	:	15 °C (at max. 30 °C ambient)
Temperature maximum	:	55 °C with supervision
	:	60 °C without supervision
Temperature accuracy	:	+/- 0.2°C
Temperature indication	:	+/- 0.1°C, digital
Temperature control	:	PID, digital
Temperature probe	:	RTD
Heater rating	:	1000 W
Air circulation	:	700 m^3/h

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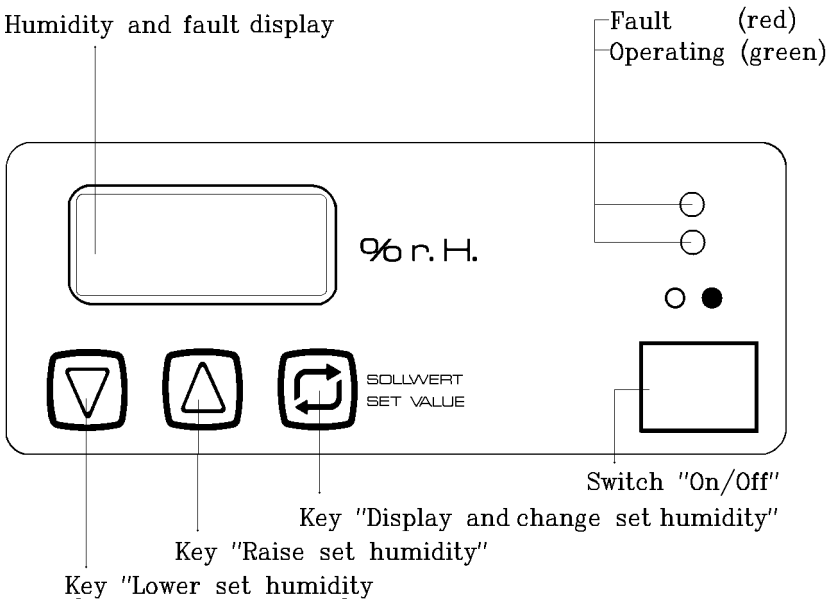
4. Humidifier (Option)

The humidifier uses the principle of an electrically heated evaporation basin including automatic water refill. The water condensing at the refrigerator is piped back to the evaporator. The relative humidity is measured by means of a capacitive sensor. Electronic fully digital PID control ensures exact regulation of humidity.

4.1 Supply

The humidifier should, where possible, be operated with demineralised water. You may use a water tank or a water supply not exceeding 1 bar pressure. For security reasons, if permanently connected to the water supply, the water outlet at the bottom right hand side of the machine must be connected to the building's drainage via a siphon.

4.2 Controls



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4.3 Humidity setting

The LCD display always shows the actual humidity. To change the humidity setting it is necessary to press simultaneously the keys "Set value" and "Raise set humidity" or "Lower set humidity". This effectively prevents unintentional changes in humidity setting.

Please note that with the refrigerator switched off you cannot decrease humidity.

To ensure ready identification the setpoint is displayed with a flashing decimal point.

4.4 Door heaters (option)

Condensation at high humidity and incubation temperature above ambient can be avoided by heating the door frames and windows. With a relative humidity of **85%** the following settings apply:

Temperature	Heating
55 °C	100 %
45 °C	80 %
35 °C	50 %
25 °C	20 %
Ambient	0 %

The heating should be proportionally reduced with lower humidity values. In general, the heating should be regulated so that no condensation is allowed to occur.

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4.5 Test measurements

Assuming a nearly constant water content of the air in the cabinet, deviations in test measurements of relative humidity are mostly due to difference in temperature. The following table gives some numerical examples:

Temperature	Humidity	dew point	Humidity at -1 K	+1 K
55 °C	85 %	51.4 °C	88.9 %	81.3 %
45 °C	85 %	41.7 °C	89.2 %	81.0 %
37 °C	85 %	33.9 °C	89.5 %	80.8 %
25 °C	85 %	22.1 °C	90.0 %	80.4 %
15 °C	85 %	12.3 °C	90.4 %	79.9 %

The thermal inertia of the humidity sensor additionally causes substantially differing readings during stabilisation of temperature. During a heating period, the warm and humid air can condense on a cold humidity sensor, and thus cause a misreading. It is important, therefore, to wait for a steady state condition.

4.6 Checking the sensor

The calibration can be verified without removing the sensor. The probe is checked by producing a known humidity in a small chamber which is mounted onto the sensor element. Unsaturated Lithium-Chloride solutions are used as humidity standards. Different solutions are available to produce different humidities. Additionally a calibration device for 15 mm probes is required.

Calibration procedure:

- Remove top inside cover sheet. The humidity sensor can now be seen at the right hand side.
- Mount the calibration device onto the sensor and tighten the seal. The cover must be positioned downwards.
- Unscrew the cover of the calibration device. Place the fibre disc into the cover and empty the contents of a calibration ampoule on it. Screw the cover back on to the calibration device.
- Wait for about 60 minutes (all parts have to reach ambient temperature). The humidity reading has to remain constant and has to be within 2% of the humidity value of the calibration ampoule.
- If the deviation is above 2%, the transmitter has to be readjusted by means of a 35% and a 80% humidity standard following the Rotronic calibration instructions.
- After calibration carefully clean the cover with water and dry it in order to avoid misalignments next time you use it.

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4.7 Safety instructions / Cleaning

- There might be boiling water in the evaporator basin. Therefore it is advisable to switch off the humidity control and wait for the water and heater to cool down.

- The evaporator basin should be cleaned periodically on units equipped with the humidity option to ensure trouble free operation of the float switch.

4.8 Refill / Self-monitoring system

The **refill cycle** works as follows:
During refill, the float switch opens the water solenoid and at the same time disables the heater in the water bath. This condition is indicated by a temporary "H2-O" display. If, for any reason, a water supply is not present at the cabinet, the "H2-O" display will remain on until the water supply is restored, at which time the display will switch back to the actual value.

An extensive **self-monitoring system** switches off the heater when a fault occurs. The red fault lamp lights up and the type of fault is indicated as follows:

H2-O	Lack of water
-F1-	actual humidity too low, e.g. through defective probe
-F2-	actual humidity too high, e.g. through defective probe
-F3-	error in check sum of memory
-F4-	error in computer monitor
-F5-	invalid slide switch setting

If the safety shut-down was caused by a temporary fault or if the fault has been cleared, the fault logic can be reset by switching the mains supply off and on.

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4.9 Selection of operating parameters

The following adjustments should be carried out by qualified personnel only:

The slide switch settings on the control board "FRK-40" determines the type of machine. This has to be checked whenever the circuit board has been changed:

pos.	4	3	2	1	type of machine
	ON	-	-	-	-
	ON	-	-	ON	-
	ON	-	ON	-	-
	ON	-	ON	ON	ISF-4-V
	ON	ON	-	-	ISF-4-V with supervision
	ON	ON	-	ON	-
	ON	ON	ON	-	-
	ON	ON	ON	ON	test

4.10 Technical data

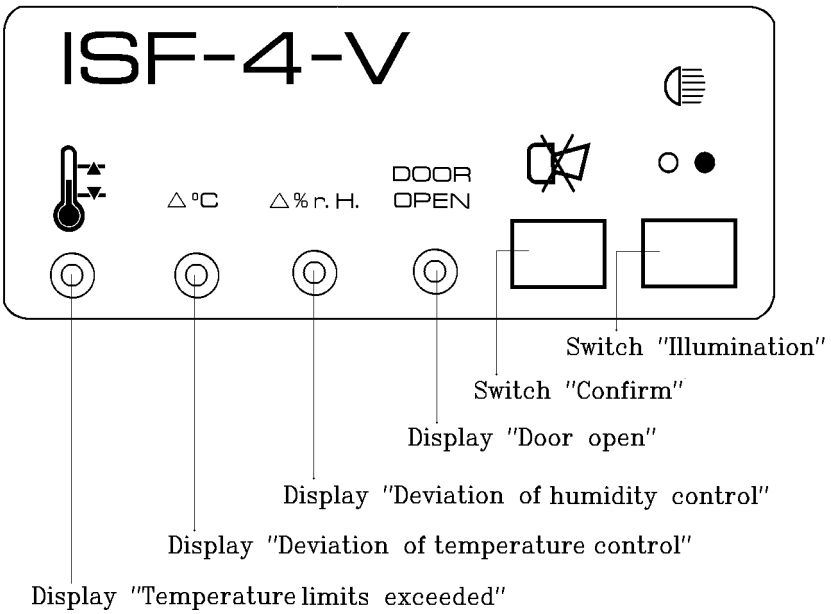
Humidity range	:	max. 85% r.H.
Humidity accuracy	:	+/- 2% r.H.
Humidity display	:	+/- 1% r.H. , digital
Humidity control	:	PID, digital
Humidity sensor	:	capacitive system
Heater rating	:	800 W
Reservoir level sensor	:	Level switch, float type
Reservoir level control	:	Solenoid valve in water supply
Water supply	:	max. 1 bar = 100 kPa

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5. Supervision (Option)

This unit monitors the functions of the entire system. If a problem occurs in any of the following areas the appropriate warning signal will be turned on: open door, deviation of humidity or temperature control, temperature limits exceeded. The messages occur usually with LED lamps and acoustically by means of a beeper. There are dry relay contacts for external monitoring available. The supervision unit is permanently connected and operative.

5.1 Controls



5.2 Function

Reason		Beeper	*contact	switched off
door open		- - -		heater, fans
humidity deviation	> 15 %	- - -	2 - 3	-
temperature deviation	> 2 K	- - -	5 - 6	-
temperature limit	> 57 °C	-------	8 - 9	heater
temperature limit	< 13 °C	-------	8 - 9	cooler

* see section 5.4

Any deviation in temperature is announced only if the temperature control unit switched on. The same applies to any deviation in humidity.

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The audible message can be cancelled by pushing the switch "confirm". If there are several messages, it is sufficient to confirm the first one. The next error that occurs will not be signalled audibly.

After exceeding temperature limits, the switch "confirm" not only cancels the beeper but also the error state and the relay contact 8-9.

5.3 Selection of options

The functions of the supervision unit may be altered to meet your requirements by means of a 4 position slide switch located on the „SRK-40“ p.c. board:

pos.		function
1	ON	acoustic message (beeper)
2	ON	temperature deviation message
3	ON	humidity deviation message
4	ON	30 min delay after door opening

After opening the doors, temperature and humidity deviations are inevitable. If pos. 4 of the above switch is "on", temperature and humidity deviation messages will be suppressed for a period of 30 minutes after opening the doors.
These adjustments should be carried out by qualified personnel only:

5.4 Technical data

Cabinet performance alarms:

Temperature	:	+/- 2 °C variation from setpoint
Humidity	:	+/- 15% r.H. variation from setpoint

Equipment failure alarms:

High temperature limit	:	57 °C
Low temperature limit	:	13 °C

Set of alarm contacts:

Humidity performance	:	1=NC, 2=C, 3=NO
Temperature performance	:	4=NC, 5=C, 6=NO
Temperature failure	:	7=NC, 8=C, 9=NO
Contact ratings	:	250 VAC / 4 A / max. 1 kVA

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6. Maintenance

- Experience has shown that the heat exchanger of the refrigerator has to be cleaned after about 2500 hours operation to remove any dust collected.

- When servicing the heat exchanger, the housing should only be opened by qualified personnel. Remove power supply prior to opening the casing (pull the power plug) !

- Due to the electronically commuted linear motors and self lubricating ball bearings the shaker units are virtually maintenance free.

Machines with humidity control :

- The evaporator basin should be cleaned periodically on units equipped with the humidity option to ensure trouble free operation of the float switch.

- There might be boiling water in the evaporator basin. Therefore it is advisable to switch off the humidity control and wait for the water and heater to cool down.

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6.1 Spare Parts

Pos.	Description	type	pcs
1	**Temperature**		
1.1	Control unit for temperature	ISFT	1
1.2	Controller - p.c. board	TRK-40	1
1.3	Display - p.c. board	LCD-40	1
1.4	Solid state relays	240D10	2
1.5	Fan	4656N	6
1.6	Finned heater	AR25/500W	2
1.7	Refrigerator system	FR7H	1
1.8	RTD probe	GF-7138	1
2	**Humidity**		
2.1	Control unit for humidity	ISFH	1
2.2	Controller - p.c. board	FRK-40	1
2.3	Display - p.c. board	LCD-40	1
2.4	Solid state relays	240D10	1
2.5	Humidifier	complete	1
2.6	Heater for Humidifier	Z009_150	1
2.7	Float switch	FSA-0801-CS3	1
2.8	Solenoid valve Danfoss	24VDC	1
2.9	Rotronic humidity sensor	I28RD31FF001V1	1
3	**Supervision**		
3.1	Control unit for supervision	ISFS	1
3.2	Controller - p.c. board	TRK-40	1
3.3	Supervision- p.c. board	SRK-40	1
3.4	RTD probe	GF-7138	1
4	**Shaker unit (each)**		
4.1	Control unit for shaker	ISFM	1
4.2	Controller - p.c. board	EMR-90	1
4.3	Display - p.c. board	LCD-40	1
4.4	Speed sensor	EM87H	1
4.5	Main bearing	assembly	1
4.6	Excenter bearing	assembly	1
4.7	Fast-action clamp	assembly	1
4.8	Spring for parallelogram	LS/RSF	4
5	**Miscellaneous**		
5.1	Fluorescent tube	18W / F33	2
5.2	Electronic ballast for tubes	HF 416-2	1
5.3	Silicon sealing for doors	3.9.136	1

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