JOUAN

EVAPORATEUR CENTRIFUGE
RC 10-10 & RC 10-22
CENTRIFUGAL EVAPORATOR

MANUEL UTILISATEUR
USER'S MANUAL

89000002-e

LIRE CE MANUEL ATTENTIVEMENT AVANT D'INTERVENIR SUR VOTRE APPAREIL.

L'APPLICATION DE LA GARANTIE EST SUBORDONNEE A L'OBSERVATION DES REGLES ET PRECAUTIONS D'UTILISATION DECRITES DANS CE DOCUMENT

CAREFULLY READ THIS MANUAL BEFORE OPERATING YOUR INSTRUMENT.

THE VALIDITY OF THE GUARANTEE IS SUBJECT TO THE OBSERVATION OF THE INSTRUCTIONS AND PRECAUTIONS DESCRIBED IN THIS DOCUMENT.

MISE A JOUR

REVISION STATUS

INDICE ***INDEX***	**DATE** ***DATE***	**PAGES MODIFIEES** ***AMENDED PAGES***	**NOTES** ***NOTES***
-	11/90		Edition originale *Initial release*
-	03/91	7-1	Huiler les paliers *To lubricate the bearings*
-	10/91	4-3	Surveillance du cycle *Monitoring the evaporation cycle*
-	02/92	7-1	Graisser le palier *To grease the bearing*
-	04/92	3-3, 3-4	Kit de raccordement *Tubing kit*
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b	11/93		Edition révisée *Revised edition*
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d	04/96	7-1	Maintenance *Maintenance*
e	01/97		Edition révisée *Revised edition*

SOMMAIRE

SUMMARY

GUARANTEE TERMS

JOUAN guarantees that this unit is free from defects in materials and workmanship when it leaves the factory, and undertakes to replace or repair the unit if it proves defective in normal use or during servicing for a period of **ONE YEAR** from the delivery.

Our liability under this guarantee is limited to repairing the defective unit or any part of the unit providing it is sent, carriage paid, to an authorised service centre or the SAINT-HERBLAIN office.

This guarantee is invalidated if the unit is incorrectly used, poorly serviced or neglected, mis-used or accidentally damaged.

There is no explicit guarantee other than as stated above.

FOR FURTHER INFORMATION, ASSISTANCE OR SERVICING

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PACKING LIST

QUANTITY	ITEM NAME	CAT. N°
1	Centrifugal evaporator	-
1	User's manual	89000002
1	Mains cable 120 V	26227004
	220 V	64227001
1	Oil for tubing connection	85280509
1	BTR tool	86000579
	RC10-10 fuses / 120 V	
1	50 mA (5 x 20)	26387051
2	1 A (5 x 20)	26387031
2	2 A (5 x 20)	26387048
2	2 A (6.3 x 32)	26387050
	RC10-10 fuses / 220 V	
1	50 mA (5 x 20)	26387051
2	0.5 A (5 x 20)	26387029
2	1 A (5 x 20)	26387031
2	1 A (6.3 x 32)	26387041
	RC10-22 fuses / 120 V	
1	50 mA (5 x 20)	26387051
2	1 A (5 x 20)	26387031
2	2 A (6.3 x 32)	26387050
	RC10-22 fuses / 220 V	
1	50 mA (5 x 20)	26387051
2	0.5 A (5 x 20)	26387029
2	1 A (6.3 x 32)	26387041

CONTENTS

CHAPTER 1

USE AND FUNCTION

1.1 - OPERATING PRINCIPLE

The RC10 is the basic unit of a rapid evaporation system designed for the concentration of biological samples such as DNA, RNA, enzymes, hormones, proteins, etc...

The basic principle consists of using vacuum to evaporate solvents (water, acetonitrile, acetic acid, methanol...). The centrifugal force applied to the samples prevents the bubbling of solvents that would otherwise disperse the molecules of the product to be concentrated and therefore induce cross-contamination hazards.

The samples, either in tubes, plates or vials, are set into a rotor that is mounted onto the spindle of the centrifuge. Vacuum in the bowl is achieved by an external pump. An electro-magnetic clutch drives the rotor to a speed of approximately 1.200 RPM.

The evaporation of solvents induces an important temperature drop in the sample. Heating the bowl compensates for this loss of energy. Evaporation speed is thus increased.

RC10.22 includes a pulsed ventilation system that helps warming up samples during evaporation and thus accelerates the process when sufficient heating is used.

The present manual puts particular emphasis on the evaporator itself (RC10.10/RC10.22) and the operation of the complete configuration. More specific data on individual items, if necessary, are available in separate manuals delivered with each unit.

1.2 - ACCESSORIES - ROTORS

Samples are primarily filled into tubes, vials or plates of various shape, capacity or quality.

To avoid transferring them into other vessels, a wide range of rotors has been designed to fulfill most requirements

Cat. number	Number	Tube capacity (ml)	Size (mm)	Execution
11176718	84	1.5	Eppendorf	dish
11176746	180	2	Eppendorf	sandwich
85220082	54	3.5	13 x 45	disc
11176753	108	4.3	14.7 x 45	sandwich
11176765	120	4	11.5 x 74	sandwich
11176716	202	5	12 x 75	disc
11176715	108	6	13 x 75	sandwich
11176749	92	10	17 x 60	sandwich
85240445	32	10	18 x 105 con.	sandwich
11176748	56	10	20 x 50	sandwich
11176714	32	15	18 x 150	sandwich
85240810	42	20	23 x 75	sandwich
11176747	32	20	28 x 58	sandwich
11176721	10	50	29 x 103	sandwich
85230429	6	140	53 x 90	sandwich
85220689	6	180	56 x 135	sandwich
11176754	4	250	-	sandwich
11176745	2	-	µtitration	swing out

Our rotor range is increasing steadily. Should you not find a rotor that suits your requirement in this list, please do not hesitate to contact us for the specifications of the latest designs.

CHAPTER 2

INSTALLATION PROCEDURE

2.1 - LIFTING AND TRANSPORT

Due to the weight of the machine, all lifting and transporting must be carried out using proper handling equipment (eg : fork lift trolley) that complies with current regulations, and by people having undergone the necessary training.

The machine must be supported from underneath. If it has to be transported without its pallet, for example on a staircase, professional handling assistance is required.

2.2 - UNPACKING

Remove staples to open the cases. Remove packing pads, accessories and documents. Take out the units and set them onto the bench or trolley.

2.3 - ENVIRONMENTAL CONDITIONS

This instrument is designed to operate safely under the following conditions :

- Indoor use.
- Temperature : 5°C to 40°C.
- Maximum relative humidity of 80% for temperatures up to 22°C.
- Maximum altitude : 2000 m.

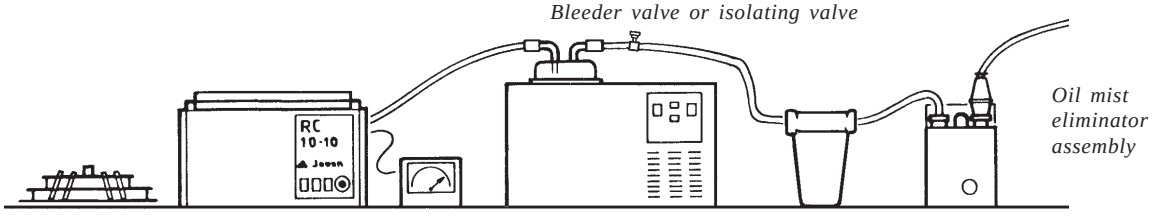
Maximum performance is assured across the following temperature range : 15°C to 25°C.

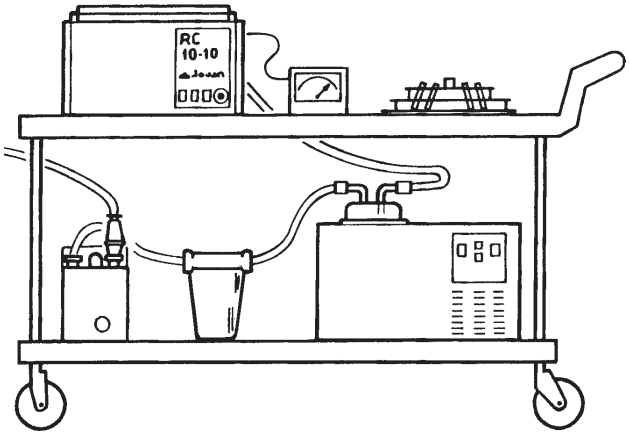
2.4 - LOCATION

All the elements of the RC10.10/22 system are bench-top instruments. They can either be mounted on a bench or on a trolley (Ref : 11176738).

The evaporator is equipped with a sliding lid that requires a free space of 20 cm between the rear panel of the unit and any obstacle. This gap will prove useful to leave easy access to the vapour outlet on the back of the unit.

The following pictures show the possible layouts of the system units either when mounted on a bench or trolley.





2.5 - MAINS SUPPLY

Remember that in order to respect the electrical safety standards related to protection or operators against indirect contact, the supply of power to the instrument must be via a power socket fitted with a protection device ensuring automatic cut-off in the case of an insulation fault. A supply fitted with a cicuit breaker of the correct rating complies with this requirement.

2.6 - OPENING THE LID

Lift the lid slightly slide back and tilt it when you reach end point (it rotates around its middle axis). When vacuum is applied into the bowl, the atmospheric pressure prevents the opening of the lid.

2.7 - SAFETY INTERLOCK SYSTEM

After switching on, open and then close the lid to test the safety device.

While the evaporator is rotating, a pin is lifted at the back of the lid and locks the lid and prevents any attempt at opening it.

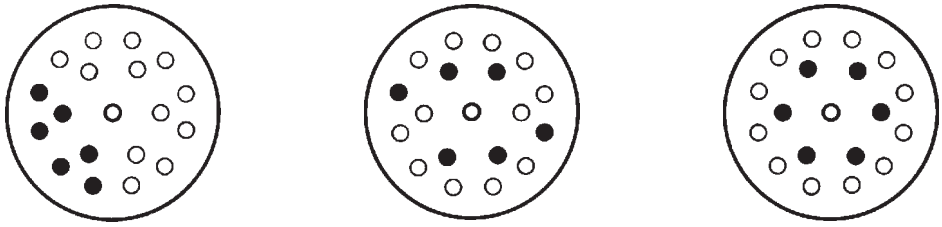
2.8 - INSTALLING A ROTOR

Prior to first use, remove the transport pads set below the drive hub.

Position rotor on the hub and press it down fully. Tighten the rotor milled nut until the rotor is properly secured onto the hub. Should you encounter difficulties in inserting the rotor, please check that the nut is not already tightened.

While putting the tubes into the rotor, make sure that the load is properly balanced around the rotation axis : the tubes must face each other at equal distance across the diameter.

In case of odd sample number, add an extra tube filled with the same volume of the same solvent as that of the sample diametrically opposite.



INCORRECT **GOOD** **BETTER**

2.9 - CONNECTION TO VACUUM

Vapours are exhausted through an 1/2 inch (13 mm) port on the rear panel of the unit. The tube supplied with Jouan's kit fits without clip onto this junction. A Jubilee clip is necessary if you use rigid wall tubing (such as Tygon).

2.10 - INSTALLATION OF THE COMPLETE SYSTEM

The full configuration includes the following elements :

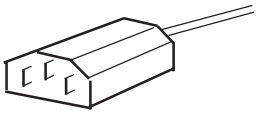
. 1 centrifugal evaporator
. 1 vacuum gauge
. 1 cold trap with glass insert
. 1 chemical trap
. 1 vacuum pump with oil mist eliminator
. 1 system trolley

These units are linked together with a tubing kit.

The following items and tools will prove useful in installing the system :

. cutter (for neat cuts of the tube)
. screw driver
. extension lead with 3 sockets (RC + vacuum gauge + cold trap)

With the trap it is necessary to wire a 3 pin plug onto the pump lead to connect it to the trap. In this way the pump will only work when the temperature of the condensor is below -50°C.



To install a complete configuration proceed in the following way :

1. Assemble the trolley : do not assemble the top shelf at first.

2. Place the cold trap on the bottom shelf of the trolley.

3. Remove packing material around the copper mesh muffle (delivered with the trap). Put muffle (for better thermal conduction) into the bowl of the trap and insert the glass bottle. Fill the remaining space with alcohol.

4. Fill the oil tank of the vacuum pump. Fill up to the middle of the level sight. Caution : use exclusively the oil supplied with the unit or the oil under reference 51601023 in our catalogue. Other lubricants might damage the pump and shorten its lifetime. In this case we could not guarantee the unit.

5. Secure the oil mist eliminator onto the exhaust port

6. Place the vacuum pump on the bottom shelf of the trolley.

7. If a chemical trap is required, unscrew the cap of the trap, secure a filter cartridge onto its holder, screw back the cap tightly and place the trap onto the bottom shelf of the trolley.

8. Assemble the top shelf of the trolley.

9. Place the centrifugal evaporator on one side of the top shelf, front panel on the same side as that of the cold trap.

10. Place the vacuum gauge next to the evaporator.

11. Preparation and assembly of the tubing kit - the tubing kit is composed of:

. 2 long sections of tube equiped with a female coupling valve
. 2 short sections of tube equiped with a male coupling
. 1 Pneurop junction.

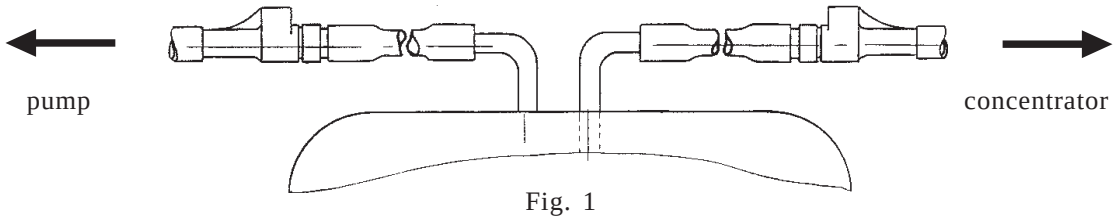


Fig. 1

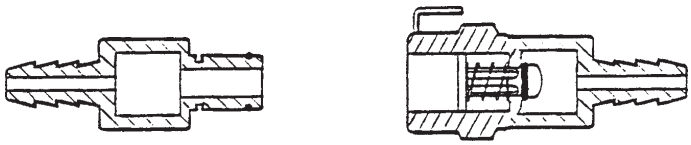


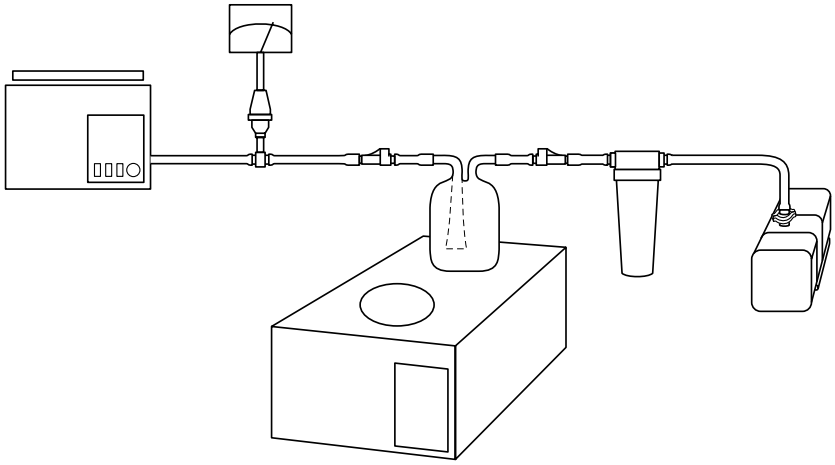
Fig. 2

a. Connection of the glass insert (cf. fig. 1) :
. lightly grease the tubes of the glass insert to ease assembly.
. link the free end of the short tubes to the tubes of the glass insert.
. the quick couplings are made of polypropylene and the female body has a valve which seals the vacuum when couplings are disconnected (fig. 2).

b. Connection of the concentrator :
. link the evaporator to the free end of one long section and connect the other end to the down tube of the bottle.
. to include the vacuum gauge, cut this tube and link the T junction of the gauge (lightly grease the junctions to ease assembly) between the two sections.

c. Connection of the vacuum pump :
. link the Pneurop junction to the free end of the other long section and connect it to the vacuum pump.
. if a chemical trap is used, cut the tubing to the pump and insert the chemical trap paying attention to the direction of the airflow ("PUMP" is marked on the outlet side towards the pump).

d. System installation :
   . Connect the out end of the evaporator to the tubing of the glass insert.
   . Connect the vacuum pump to the other end.
   . The following installation should now be obtained :



12. Connect the whole system to mains : RC + cold trap + vacuum gauge. If a manual bleeder valve (11176709) for volatile solvents or a manual isolating valve (11176708) for very volatile solvents is to be used, fit it after the outlet from the glass bottle/cold trap.

CHAPTER 3

SPECIFICATIONS

3.1 - DIMENSIONS AND WEIGHT

RC 10.10/10.22 :	Height	lid closed	310 mm
		lid open	490 mm
	Width		430 mm
	Depth	lid closed	500 mm
		lid open	520 mm
	Weight		32 kg
Cold trap :	Height	without insert	320 mm
		with insert	380 mm
	Width		485 mm
	Depth		600 mm
	Weight	-55°C	38 kg
		-85°C	46 kg
Trolley/cart :	Height	including handle	93 cm
		work surface	80 cm
		lower level tray	22.5 cm
	Max. space	work surface tray	51 cm
	Length	including handle	105 cm
	Width		65 cm

3.2 - ELECTRICAL REQUIREMENTS

	Cat N°	Power	Voltage	Freq. Hz
RC10.10	11176720	200 W	220/240	50/60
RC10.10	11176719	200 W	120	50/60
RC10.10 Teflon	11176740	200 W	220/240	50/60
RC10.10 Teflon	11176739	200 W	120	50/60
RC10.22	11176713	200 W	220/240	50/60
RC10.22	11176712	200 W	120	50/60
RC10.22 Teflon	11176750	200 W	220/240	50/60
RC10.22 Teflon	11176751	200 W	120	50/60
Cold trap -55°C	11176741	-	220/240	50/60
Cold trap -55°C	11176743	-	120	50/60
Cold trap -55°C	11176763	-	208	60
Cold trap -85°C	11176760	-	220/240	50/60
Cold trap -85°C	11176761	-	120	50/60
Cold trap -85°C	11176762	-	208	60
Vacuum gauge	11176737	7 VA	220/240	50/60
Vacuum gauge	11176744	7 VA	120	50/60
Digital vacuum gauge	11176752	3,5 VA	220	50
Digital vacuum gauge	11176756	3,5 VA	115	60

IMPORTANT : all units in the system must be earthed.

3.3 - PERFORMANCE

ROTATION SPEED : 1.200 RPM

HEATING

RC10.10 : Temperature control through adjustable thermostat (range 30 to 80°C)

RC10.22 : Four temperature levels can be programmed :

level 0 : no heating
level 1 : mean bowl temperature 40°C ± 5
level 2 : mean bowl temperature 55°C ± 5
level 3 : mean bowl temperature 70°C ± 5
level 4 : mean bowl temperature 80°C ± 5

EVAPORATION SPEED

The following data are examples of results of experiments performed in our laboratories under precise and defined protocols.

They cannot reflect the full range of performances of the system since numerous parameters must be taken into account : shape, number and type of tubes, type of solvent, volume per tube, total volume in the bowl, heating level, etc...

They are here to be used as landmarks for further experimentation.

In order to assess the performance of the system and to standardize the measurement results, we have used the coefficient ß that is obtained as follows :

$$ß = \frac{V \times N \times 60}{T \times N} = \frac{V \times 60}{T} = \text{ml/hour/tube}$$

V = solvent volume per tube (ml)
N = number of tubes in the rotor
T = evaporation time (minutes)

Experimentation parameters :

. evaporator :	**RC10.22**	
. rotor :	108 x 6 ml	ref 11176715
. rotor loading :	20 tubes (N)	
. ml per tube :	4 ml (V)	* methanol test with 2 ml/tube
. initial temperature :	25°C	

1. without pulsed ventilation

heating level	0	1	2	3
METHANOL *	1.60	2.00	2.07	2.26
WATER	0.54	0.67	0.79	0.89
ACETONITRILE	2.00	2.40	2.52	3.00
ETHANOL	2.24	2.40	2.40	2.67
ACETIC ACID	4.00	6.00	6.85	6.85

2. with pulsed ventilation

heating level	0	1	2	3
METHANOL *	1.93	2.35	2.40	2.50
WATER	0.65	0.85	1.00	1.14
ACETONITRILE	3.00	3.20	3.20	3.43
ETHANOL	2.40	2.82	3.43	3.70
ACETIC ACID	3.00	4.36	5.33	5.33

Influence of the number of tubes (N) upon coefficient ß :

As a function of N, ß must be multiplied by the following coefficients :

N =	20	40	60	80	100	108
ß x	1	0.87	0.75	0.65	0.52	0.48

CHAPTER 4

OPERATING PRINCIPLES

4.1 - PRINCIPLE

The solutions to be concentrated are put into tubes set into the rotor of the evaporator.

At the beginning of the cycle the rotor starts to rotate. With RC10.10 and RC10.22 vacuum is allowed into the bowl to start evaporation when the rotor reaches 600 rpm. If heating has been selected, it is active from the very beginning of the cycle.

Since the units are equipped with thermostats, it is possible to preheat the chamber prior to starting the cycle in order to reduce processing time.

The duration of the cycle is determined by the operator, since it is not possible to detect precisely the point when all samples are completely dry. However monitoring pressure at the exhaust port of evaporator indicates the end of the cycle quite accurately. The gauge then displays a noticeable pressure drop.

With RC10.22 heating is automatically switched off at the end or before the end of the run as a function of programming (switch off is manual with RC10.10). When the cycle is over, air is automatically allowed into the bowl while the rotor slows down to a complete halt. The cycle is then completed.

Selection of PULSED VENTILATION on the RC10.22 introduces air into the bowl for 5 seconds every 3 minutes. This can reduce evaporation time (especially for low volatility solvents such as water) by as much as 50%.

4.2 - SYSTEM CONFIGURATION

The following units belong to the comprehensive evaporation system :

4.2.1 - CENTRIFUGAL EVAPORATOR

RC10.10 or RC 10.22 including rotors

4.2.2 - VACUUM PUMP

A vacuum pump is used to exhaust solvent vapours from the evaporation chamber. It is characterized by its flow rate. The higher the flow rate, the quicker the vapour exhaustion.

The choice of a vacuum pump is therefore linked to the solvent volume to be evaporated. As soon as the total volume exceeds 100 ml we recommend a pump with a flow rate of 100 l/min or more. For smaller volumes a flow rate of less than 100 l/min is sufficient.

The working pressure is in the 0.2 to 10 mbar range. The time needed to obtain a vacuum and the speed of vapour exhaustion depends on the flow rate.

4.2.3 - VACUUM GAUGE

Knowing the vacuum level in the chamber is essential for monitoring the evaporation cycle and the air-tightness of the system.

Cycle monitoring :

The maximum vacuum level amounts to 0.5 mb when the bowl of the evaporator is empty. As soon as evaporation has started, gasses are present in the circuit and the pressure rises.

During the whole evaporation phase the pressure will remain stable and will drop rapidly towards the end of the process. The vacuum level becomes stable as soon as the samples are dry. The vacuum gauge therefore indicates when the cycle is completed.

With the RC10.22 the pressure curve will be altered by the periodical air injections into the bowl. Pressure rises after each injection.

Airtightness :

A leak in the system, usually located at connection level, does not allow a high vacuum level and will consequently slow down evaporation. The gauge therefore enables checking that the best vacuum level is achieved.

4.2.4 - COLD TRAP

Output improvement :

Low pressure in the system brings on an expansion of solvents which greatly increases the volume to be evacuated by the pump and evaporation takes a very long time.

To reduce evaporating time, a cold trap condensing solvents creates a vapour flow between the concentrator and the trap bottle. The higher the flow rate, the quicker the vapour exhausted.

Protection of users and vacuum pump :

Vaporized solvents are aspirated by the vacuum pump. If they are allowed to reach the heart of the pump, they will saturate the oil and damage the pump since most solvents are very corrosive.

Moreover most solvents are chemically incompatible with pump oil. Only a fraction of the vapours will be trapped by the oil, the rest will be exhausted into the atmosphere.

The trap, installed in between the evaporator and the pump condenses the vapours by cooling. At low pressure the condensation temperature is very low even for water.

Two cold traps are therefore available to comply with most temperature requirements :

. a -55°C trap for the condensation of water and non organic solvent vapours.
. a -85°C trap for the condensation of organic and/or very volatile solvent vapours.

The vapours are condensed into a corrosion resistant glass insert that is placed into the trap.

4.2.5 - CHEMICAL TRAP

Very volatile solvents, with very low condensation temperature at the working pressure, will not be fully condensed in the cold trap. Should they be very corrosive, it is recommended to prevent them from reaching the vacuum pump.

The chemical trap that fits in between the cold trap and the pump is equipped with filtering cartridges. Four cartridge types answer different solvent problems :

. water cartridge (silicon gel)
. acid cartridge (sodasorb)
. organic solvent cartridge (molecular sieve)
. active charcoal cartridge for radio-active products and ammonia based solvents.

Two trap and cartridge sizes are available to match the required flow rate and filtration capacity.

4.2.6 - TUBING KIT

All the elements of the system are linked together by means of tubings and junctions :

. from evaporator to gauge
. from gauge to glass insert
. from glass insert to chemical trap
. from chemical trap to vacuum pump

4.2.7 - VACUUM PUMP ACCESSORIES

Oil mist eliminator :

It fits onto the exhaust port and filters the oil mist generated by the pump.

4.2.8 - SYSTEM TROLLEY

In order to save on bench space and to benefit from a mobile unit, the comprehensive configuration can be mounted on a two shelved trolley.

4.2.9 - VACUUM CONTROL VALVES

For moderately volatile solvents, fit a manual bleeder valve after the cold trap. Two minutes after starting the cycle (when all air is removed from the system) adjust the valve so that no vapour is emitted from the pump. The entry of air by the valve slows down the vapour flow so that it has time inside the cold trap to be condensed.

For very volatile substances, fully open the manual bleeder valve for maximum air entry or operate the isolating valve to block all vapour passage to the pump after 2 minutes running of the cycle. All the solvent will vaporize and move from the evaporator to the cold trap (freeze-drying effect). Since the vapour can go no further, the pump and the operator are fully protected. This extends what is normally a very short run by only 10 to 15% and offers the greatest safety. Set the heater to OFF during such a run.

CHAPTER 5

INSTRUCTIONS FOR USE

5.1 - START PROCEDURE

Connect all the units in the system to mains and switch on :

. centrifugal evaporator
. vacuum gauge
. cold trap

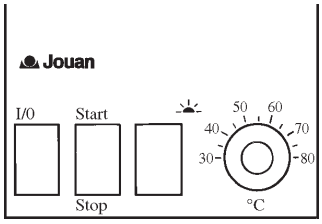
The vacuum pump is switched on automatically by the cold trap when it has reached -50°C. This prevents solvents from reaching the pump when the trap is not cold enough to condense vapours.

The pump may however be switched off manually with the "VAC" switch on the front panel of the cold trap.

. check that the glass insert of the cold trap is empty and that the stainless steel bowl is dry
. if a chemical trap is installed, check its cartridge
. check that the type of cartridge mounted on the trap corresponds to the solvent that will be evaporated.
. if the pump is fitted with an oil mist eliminator, check the condensing filter.

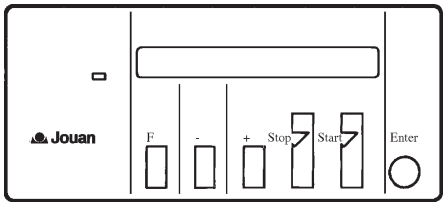
5.2 - PROGRAMMING OF THE EVAPORATION CYCLE

5.2.1 - RC10.10



. switch on mains (left hand switch)
. set the thermostat knob to the required temperature
. if you wish to preheat the bowl, switch on heating with right hand switch
. mount a rotor on the hub
. close the lid
. press [START] (middle switch) to initiate the cycle.

5.2.2 - RC10.22



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PREHEATING

. press [F]
. press [+] or [-] until display shows "PREHEATING ?"
. press [ENTER], "PREHEATING" blinks on the display
. press [STOP] when preheating is completed

ENTER A PROGRAM

. press [F]
. press [+] or [-] until display shows "ENTER PROG"
. press [ENTER]
. select program # with [+] or [-]
. press [ENTER]
. select cycle duration (in minutes) with [+] or [-]
. press [ENTER]
. select heating level (0-1-2-3-4) with [+] or [-]
. press [ENTER]
. select heating duration (in minutes) with [+] or [-]
. press [ENTER]
. select pulsed ventilation (yes/no) with [+] or [-]
. press [ENTER]
. press [START]

RECALL A PROGRAM

. insert a rotor onto the hub
. close the lid
. press [F]
. press [+] or [-] until display shows "RECALL PROG ?"
. press [ENTER]
. press [+] or [-] to display the required programme #
. press [ENTER]
. press [START]

ERASE A PROGRAM

. press [F]
. press [+] or [-] until display shows "ERASE PROG ?"
. press [ENTER]
. press [+] or [-] to display the required programme #
. press [ENTER]

5.3 - MONITORING THE EVAPORATION CYCLE

If a vacuum gauge is included in the system :

. Check that the pressure is below 2 millibars within 5 minutes to make sure that the whole circuit is airtight. To do this check, the system must run without samples in the evaporator and without cartridge in the chemical trap.

. Cycle monitoring : as soon as evaporation starts the pressure rises and stabilizes after a few minutes in the 2 to 10 millibar range. If pulsed ventilation has been selected sudden pressure surges will be displayed every two minutes. By the end of the cycle the pressure will drop progressively towards initial pressure since vapour tension tends towards zero.

. If evaporation time is not known it is possible to interrupt the cycle regularly to monitor the solution level in the tubes. The automatic vacuum shut-off/air injection sequence makes these interruptions an easy task. Moreover, while the system is stopped, the cold trap is still kept under vacuum. The vacuum level will therefore reach its maximum level within a very short time span after resuming the cycle.

5.4 - END OF CYCLE

RC10.10

To terminate the cycle press [START] switch to off. The vacuum port is automatically shut off and ambient air is injected into the chamber while the rotor is progressively brought to a halt. The safety interlock system prevents from opening the lid while the rotor is still rotating.

RC10.22

The end of the cycle is either achieved manually by pressing [STOP] key before the end of the programmed time or automatically when the programmed time has elapsed. Ambient air is immediately and automatically injected into the chamber.

5.5 EMPTYING AND WASHING THE GLASS INSERT

5.5.1 - DISONNECTING THE GLASS INSERT

a. During evaporation :

During evaporation of high quantity of solvents, it is possible to remove the bottle without stopping the cold trap or the pump. Another glass insert equiped with tubes and couplings is required.

Operating procedure :

. Disconnect the quick coupling between the RC 10 and the glass insert, ambient air is injected in to the insert. The concentrator is kept under vacuum because of the coupling valve.

. Disconnect the quick coupling between the glass insert and the pump, the bottle is now at ambient pressure.

. Remove the bottle, avoiding shocks and put it on some absorbent paper.

. Insert the second bottle in to the cold trap; connect it first to the pump and then to the concentrator, evaportation will start again.

b. At the end of cycle :

After stopping of the whole unit, remove the glass insert avoiding shocks and put it on some absorbant paper.

5.5.2 - EMPTYING THE GLASS INSERT

. If solvents are frozen, place bottles in ambient air or under a fresh water flow to defrost.

. We advise you to fill up the bottle with water to dilute solvents which are concentrated.

. Empty the liquid through the exhaust tube (not down tube) into a solvent bin. If solvents are very corrosive, it's recommended to disconnect the section of vacuum tube which could be harmed by organic solvents which are now concentrated (this is not the case during evaporation).

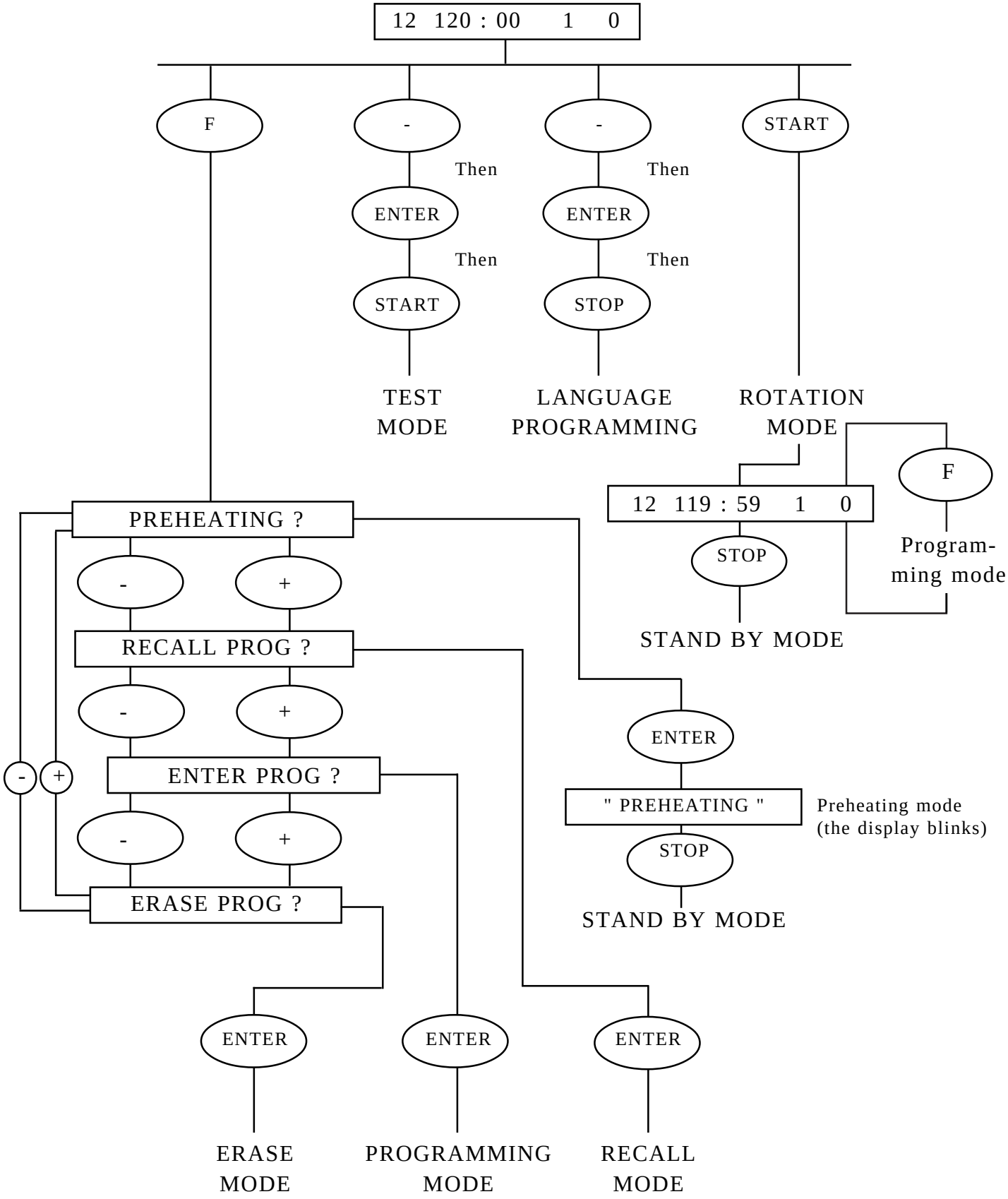
5.5.3 - WASHING THE GLASS INSERT

. The glass insert must be frequently washed with appropriate detergents. This will ensure the efficiency for trapping solvents.

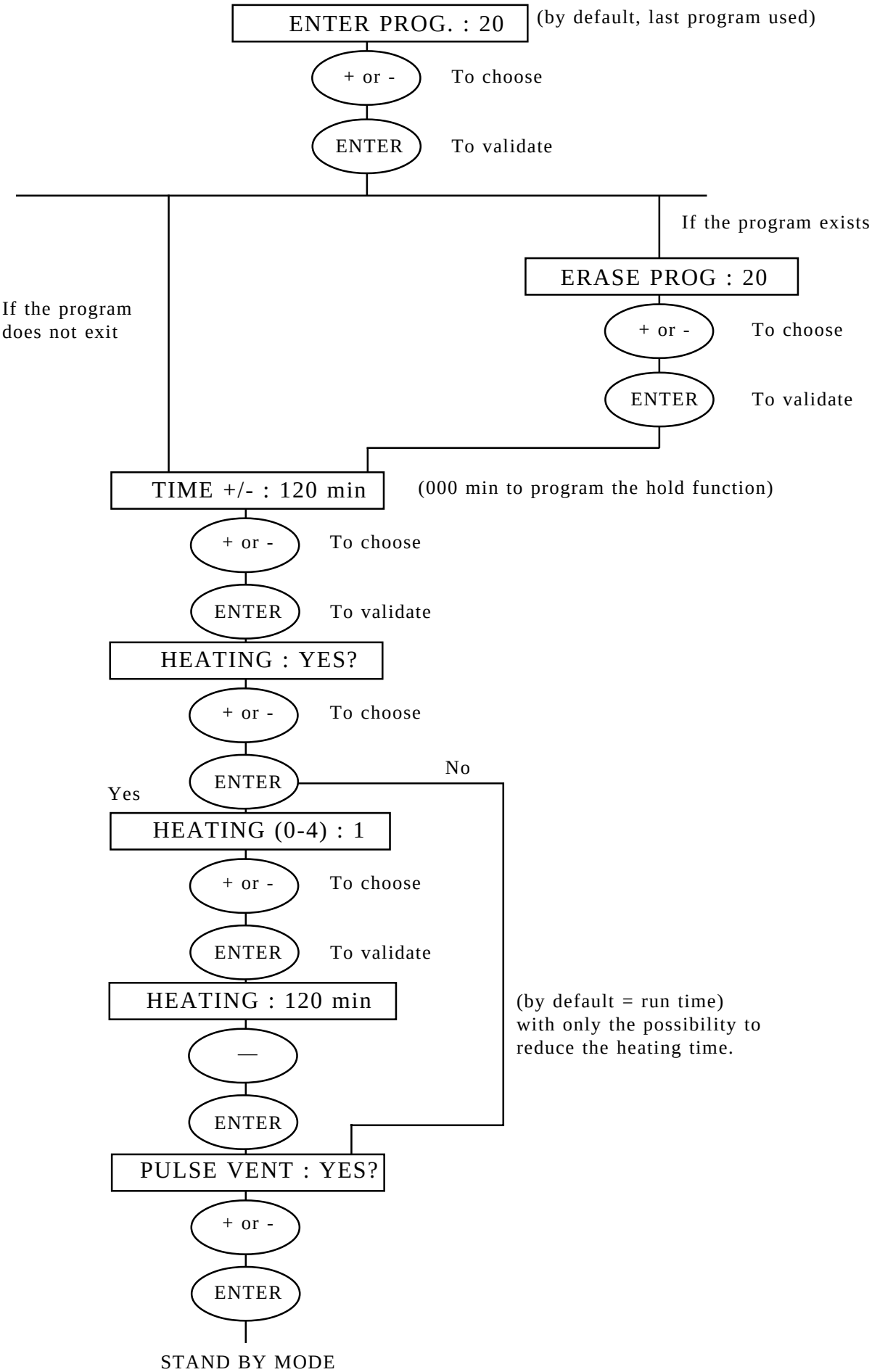
. The bottle is made of glass so most detergents are suitable. Special solvents sometimes need particular detergents.

5.6 - PROGRAMMING CHART OF RC10.22

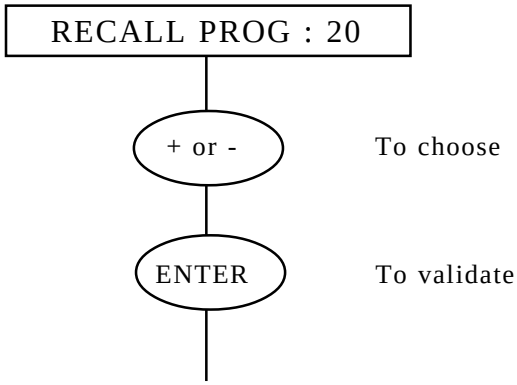
POWER ON
STAND BY MODE



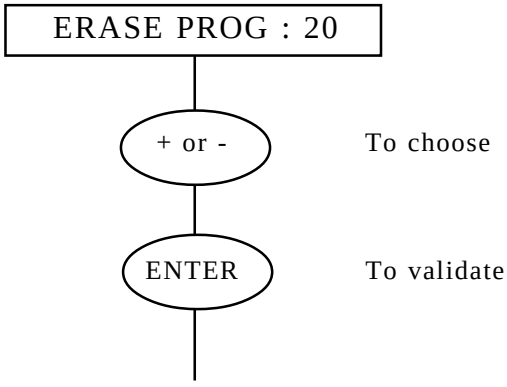
PROGRAMMING MODE



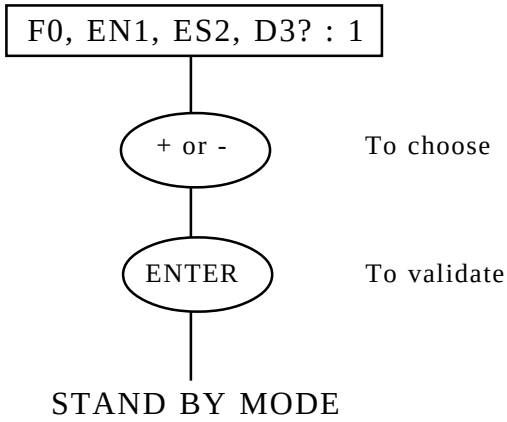
RECALL MODE



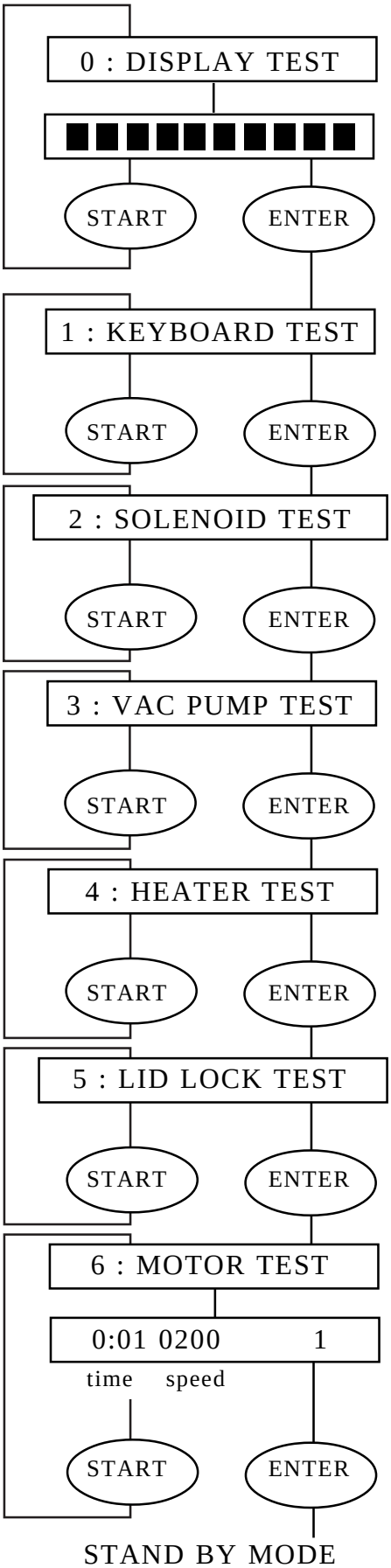
ERASE MODE



LANGUAGE PROGRAMMING



TEST MODE


0 : DISPLAY TEST
START
ENTER
1 : KEYBOARD TEST
START
ENTER
2 : SOLENOID TEST
START
ENTER
3 : VAC PUMP TEST
START
ENTER
4 : HEATER TEST
START
ENTER
5 : LID LOCK TEST
START
ENTER
6 : MOTOR TEST
0:01 0200 1
time speed
START
ENTER
STAND BY MODE

CHAPTER 6

HAZARDS, PRECAUTIONS AND LIMITATIONS OF USE

6.1 - CAUTIONS

. Never try to bypass the lid lock safety while the rotor is spinning.

. Only connect to correctly grounded mains source.

. Use only correct fuses.

. Place the cold trap into a position where the glass insert is well protected against potential shocks.

. Check that the stainless steel bowl of the cold trap is completely dry. Any water would freeze and result in the breaking of the glass bottle.

6.2 - OPERATIONAL LIMITATION

The following points must be checked carefully :

. Installation : proper ventilation of the different units, levelling of the evaporator.

. Accessory care : cleaning the rotors and the bowl of the evaporator is particularly important after evaporating corrosive solvents.

. Set samples carefully into the rotor as described in § 2.7 to avoid imbalance.

. Shape, material and quality of the vessels set into the rotors must be in accordance with the specifications of the evaporator and its accessories.

. Empty the glass insert of the cold trap regularly.

. Check the filters of the chemical trap and of the oil mist eliminator regularly.

. Check vacuum pump oil regularly (level and clarity). Should it appear "cloudy" or "milky", proceed to oil exchange immediately to avoid damaging the pump.

6.3 - HAZARDS

. Never service any unit in the system without disconnecting mains.

. High voltage is present behind the front panel of the evaporator.

6.4 - IMPROPER USE

. Only use rotors and accessories designed for the RC10 range.

. Do not attempt to override the lid interlock assembly.

. Load the rotor as recommended in § 2.7. An improperly loaded rotor could damage the spindle and the bowl in case of breakage.

CHAPTER 7

SERVICING AND PREVENTATIVE MAINTENANCE

7.1 - CLEANING

Daily :

No daily cleaning is required, except in case of tube breakage or if a large volume of sample has been spilled into the bowl. If large volumes of solvent have been evaporated, empty and rinse the glass insert of the cold trap.

Weekly :

Clean the rotor chamber, lid and accessories (do not use abrasive material), rinse them with clear water and dry. Defrost the cold trap, empty and rinse the glass insert.

7.2 - MAINTENANCE

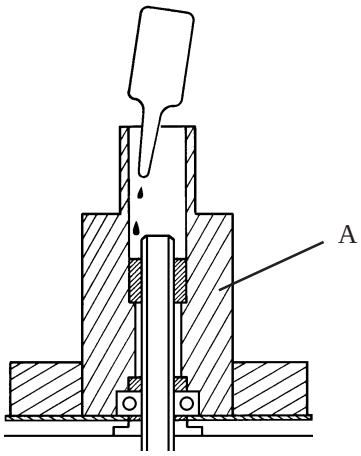
No regular maintenance operations are required on RC10.10 or RC10.22 : force field motor means no brushes to replace.

In the case of abnormal noise or vibrations, it is necessary to lubricate the bearing of the shaft.

Use the small bottle of oil provided with the machine - Catalogue number : 85280509

Put 2 or 3 drops of oil as shown on the diagram. There is no need to remove the hub (A).

Recommended oil : vacuum pump oil.



For oil exchange procedure of the vacuum pump please refer to specific pump manual.

It is recommended to rinse the vacuum pump as often as possible and to degas the oil while operating the unit with an open ballast.

7.3 - FUSE REPLACEMENT

RC10.10 and RC10.22 are protected by fuses. Changing of fuses must not be carried out by the operator but by a qualified engineer who will diagnose the fault before replacing the fuses.