

**LED ITALIA**

**R 150**

**CE**

**OPERATING MANUAL**

Code R 150S G 0.0  
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## **TABLE OF CONTENTS**

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	<b>SECTION</b>
INTRODUCTION	1
CONFIGURATION	2
PRE-INSTALLATION	3
INSTALLATION	4
START-UP	5
OPERATING INSTRUCTIONS	6
INTENDED USE	7
TROUBLESHOOTING	8
MAINTENANCE	9
DEMOLITION	10
PARTS LIST	11
ACCESSORIES	12
ENCLOSURES	13

## FOREWORD

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R 150 is a heat pump vacuum evaporator.

It is built in different versions depending on its building materials and its operating functions.

This manual includes information and technical features of all available models of R150.

For further information or technical features, not included in this manual, call the service centers or LED ITALIA Customer Technical Service.

## SAFETY TECHNICAL WARNING

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This document contains the necessary information for the correct use of the unit.

It is intended for qualified technicians, who have a specific knowledge in the field of control, setting and refrigeration technics.

The technical knowledge of and the absolute compliance with the instructions and warnings contained in this document enable, to perform safely and successfully the installation, start-up and maintenance of the unit.

**i** Faulty maintenance on the evaporation plant or non compliance with the warnings reported in this manual or on the unit may cause serious injury to people and damage to things.  
Maintenance operations on the unit may be performed only by personnel having attended vocational schools in the field of refrigeration, mechanics and/or electrical engineering or with any equivalent or higher qualification.

## SAFETY TECHNICAL SIGN

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In this operating manual are used the following signs:



**DANGER** : It shows an impending danger. Not observing these signs, the risk of death or serious injuries are taken.



**DANGER** : It shows an impending electric danger. Not observing these signs, the risk of death or serious injuries are taken.



**WARNING** : It shows the possibility to be in a dangerous predicament. Not observing these signs, injuries and/or damage to equipment are occurred.



: It shows important information and manner that, if not observed, should cause damages to equipment.



: It shows operating advices and further useful information

LED ITALIA Srl shall not be liable for any injury or damage caused by modifications or structural or component alterations to the equipment.

Personal safety and first-aid devices must be chosen by the user/operator of the unit in function of the nature and the chemical-physical properties of the waste to be treated.

Also for future reference, this operating manual and all the technical documentation enclosed to it, must be kept in an accessible and known to all staff authorized to operate the equipment place.

This manual is divided into the following sections

### **Configuration**

The system

Technical data

Units range

Available options

Process chemicals

### **Pre-installation**

Dimensions and weight

Packaging

Storage

Displacement

### **Installation**

Work area

Utilities

Connections

### **Commissioning**

Software

Start-up

### **Operating Instructions**

Setting and checking

### **Intended use**

Application fields

### **Troubleshooting**

Instructions in case of faults and troubles

### **Maintenance**

Preventive periodic maintenance operations

### **Demolition**

### **Spare parts list**

### **Accessories**

Optional accessories

### **Enclosures**

Schemes and flow-charts

**CONFIGURATION****2**

PARAGRAPH	PAGE
2.1 THE SYSTEM .....	9
2.1.1 Process description .....	9
2.1.2 Main parts description .....	10
2.1.3 Electrical part.....	12
2.2 TECHNICAL DATA.....	13
2.3 UNITS RANGE.....	14
2.4 AVAILABLE OPTIONS.....	15
2.5 PROCESS CHEMICALS .....	15



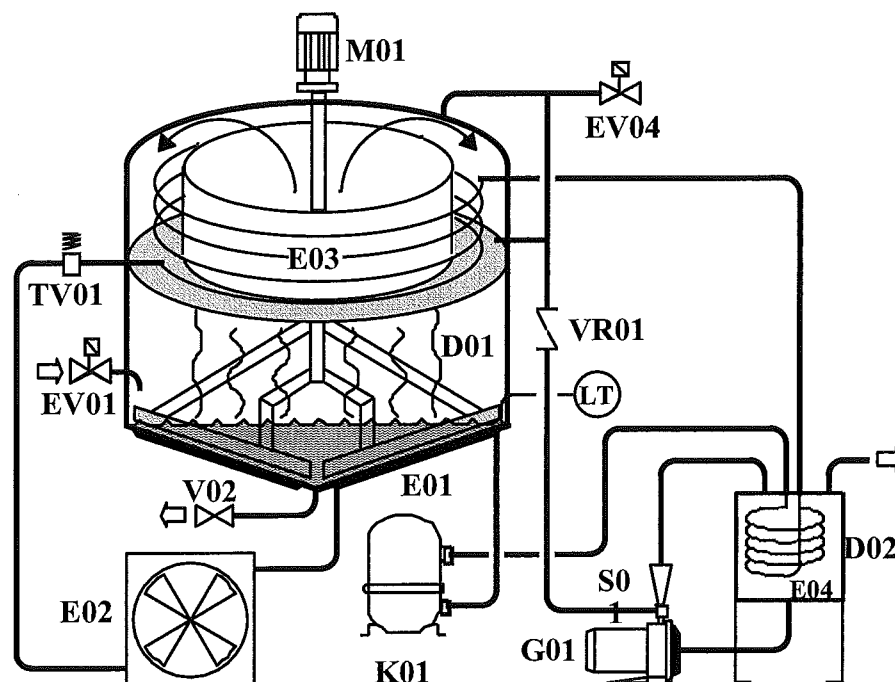


## 2.1 THE SYSTEM

### 2.1.1 Process Description

R 150 is an evaporator/concentrator which obtains the distillation of liquids at low temperature through the combined effect of vacuum technology and the heat pump.

The working scheme is as follows:



Through a frigorific circuit, the heat pump carries out the expansion and compression of the Freon gas and yields both the necessary calories for the evaporation of the liquid and the necessary frigories for its condensation.

The thermal exchange takes place within the heating jacket E01, which is located in the lower part of the boiling chamber D01; vapours condense in the condenser E03.

At boiling, temperature is approximately 35°C (95°F) and the residual pressure is approximately 5.3 kPa (0.77 psi).

The compression work and the exceeding heat are dissipated by means of a set of fans E02.

Vacuum is created by a circuit consisting of the following parts:

- G01 centrifugal pump;
- S01 ejector;
- D02 distillate receiver with cooling coil E04.

The distillate is drawn from the receiver and pumped by the pump G01 through the ejector S01 to create vacuum.

The pressure variation produced is sufficient to extract both the recondensable and the distillate which condenses in E03.

The distillate receiver is equipped with a coil in which R 407C Freon flows.

It has to cool the distillate to approximately 25°C (77°F), thus improving the ejector performance. The waste is let in through the pneumatic valve EV01, the concentrate is let out through the discharge valve V02.

The feeder valve is controlled by the level control LT, placed in the boiling chamber D01. The discharge valve V02 is manually operated at the end of the duty cycle. An optional kit for the automatic actuation of valve EV02 at the end of the duty cycle is available.

### 2.1.2 Main parts description

The standard unit consists of the following parts:

#### Evaporation chamber D01

Flash evaporation chamber. The shape of the chamber is a vertical cylinder with a frustum bottom at 15° and a convex dome with decinormal outline, complete of demister for drop separation

- |                     |     |     |                  |
|---------------------|-----|-----|------------------|
| - diameter          | 600 | mm, | } <i>h 3 gal</i> |
| - height of plating | 400 | mm, |                  |
| - conic bottom      | 80  | mm. |                  |

#### Heat exchanger E01

Heating jacket heat exchanger:

- Exchange surface      0,3 m<sup>2</sup> approximately.

#### Heat exchanger E03

Evaporating coil

- exchange surface      0,3 m<sup>2</sup> approximately

Approximate dimensions:

- coil length              9,3    m
- coil diameter            10    mm.

Distillate receiver D02

Parallelepiped tank with cooling coil E04:

Approximate dimensions:

- Exchange surface      0,3 dm<sup>2</sup> approximately
- coil length              8      m
- coil diameter            12      mm.

Vacuum Circuit Pump G01

Closed impeller centrifugal pump. Mechanical seal

- Motor power              1,7      kW approximately
- Maximum flow rate      4,8      m<sup>3</sup>/h approximately
- Head                        31      m.

2.5

Ejector S01

Ejector for vacuum production

Building material: polypropylene

Frigorific Compressor K1

Gas-sealed compressor equipped with safety systems, such as maximum and minimum pressure switches for freon pressure.

Heat Exchanger E02

Freon condensation and undercooling heater, consisting of a multirank finned tube exchanger and fan.

- Air flow rate              1000 Nm<sup>3</sup>/h.

The unit is assembled on an AISI 304 frame, closed by coated aluminium panels.

Onboard piping, tubes and line components are made either of austenitic steel AISI 316L or of thermoplastic material, such as polypropylene.

**i** The evaporation concentration plant building materials could change on the basis of the particular waste and/or of the technical modifications that LED ITALIA may judge necessary.

## INSTRUMENTATION\*

The instruments measure:

- Absolute pressure in the evaporation chamber
- Level in the feed tank (preset)
- Level in the evaporation chamber
- Level in the distillate tank (preset)
- Evaporation cycle
- Distillate pH (preset).



At project implementation stage, the instrumentation may be changed to further adapt the plant to the process requirements.

### **2.1.3 Electrical Components**

Electromechanical check panel with protection degree IP54.

## 2.2 TECHNICAL DATA

TECHNICAL CHARACTERISTICS		R 150	
Distillate output	l/h	7	<i>2 GPM</i> 8
(with water)	l/24	168	192
Absorbed Power	kW	2,9	3,2
Voltage	V	230 V	230 V
Frequency	Hz	50	60
Yield	kWh/l	0,402	0,426
Heat Produced	kcal/h	2.500	2.900
Requested air flow-rate	m <sup>3</sup> /h	1.000	1.196
Empty weight	kg	160	160
Length	mm	850	850
Width	mm	730	730
Height	mm	1.460	1.460
Acoustic Pressure	dBA	<80	<80

## 2.3 UNITS RANGE

Model R 150 is available in the following versions:

MODEL	230 V/50Hz single phase	230 V/60 Hz single phase
	Code	Code
R 150 AA1M	10.4178.0	
R 150 AA2M		10.4179.0
R 150 FF1M	10.4180.0	
R 150 AA1V	10.4182.0	
R 150 AA2V		10.4183.0
R 150 FF1V	10.4184.0	
R 150 FF2V		10.4185.0

## Construction materials:

	R 150 AA	R 150 FF
BOILER:		
FRUSTUM BOTTOM	AISI 316L DIN 1.4435	UNS S32750 UNS S31254
PLATING	AISI 316L DIN 1.4435	UNS S32750 UNS S31254 DIN 1.4529
DOMES	AISI 316L DIN 1.4435	AISI 316L DIN 1.4435
DEMISTER GRATE	AISI 316L	UNS N08904
VACUUM PUMP G01	AISI 304 DIN 1.4301	AISI 316 DIN 1.4436

## 2.4 AVAILABLE OPTIONS

The equipment is preset for the installation of the following optional parts:

- Corrector of the distillate pH with neutralizer (acid or base) metering pump and alarm.
- Automatically actuated concentrate discharge valve.

## 2.5 PROCESS CHEMICALS

Product	Description	Packaging	Code
Siliconic antifoam	AS 1-D	1x20 l	1900020
	AS 1-C	1x20 l	1900050
	AS 1-C	1x50 l	1900740
	AS 1-C	1x200 l	1900750
Water-based antifoam	WA 1	1x20 l	1900080
Bactericide	LED 1	1x10 l	1900160
Chemical solutions	CLEANER	2x8 l	1900230
	CLEANER	1x60 Kg	1900250
	NEUTRALIZER	1x10 l	1900240
	NEUTRALIZER	1x60 Kg	1900260
	SULPHURIC ACID 15%	1x50 l	1900270
	CAUSTIC SODA 30%	1x50 l	1900280



### **DANGER**

For the correct use of the chemicals, see the instruction and safety data sheets or call the authorized service centers or LED ITALIA Srl Customer Technical Service



**PRE-INSTALLATION**

**3**

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PARAGRAPH	PAGE
3.1 DIMENSIONS AND WEIGHTS.....	19
3.2 PACKAGING.....	19
3.3 STORAGE.....	19
3.4 DISPLACEMENT.....	19



### 3.1 DIMENSIONS AND WEIGHTS

The overall dimensions and the weights of R 150 are indicated in the pre-installation sheet - see enclosure 1 section 13 "Enclosures"

### 3.2 PACKAGING

The unit is delivered in two different kinds of packaging:

- protection with thermoretractable film and pallet for easy handling by means of a fork lift truck
- palletized wood box lined with nylon sheets

The dimensions and weights for transport are:

• packaging without box:	mm1000x800x1450h	175 kg
• packaging with box:	mm1000x800x1550h	210 kg

approximate weight in operation:	175 kg
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### 3.3 STORAGE

Before final installation, the unit must be placed in a sheltered place with room temperature ranging from 5° to 35°C.

Do not place loads nor any object on the unit or on its packaging.

### 3.4 DISPLACEMENT

The unit may be displaced by means of the following:

- lift truck with 800 mm forks and minimum load capacity of 250 Kg
- electrical or manual transpallet with 800 mm forks and minimum load capacity of 250 kg.



**INSTALLATION****4**

PARAGRAPH	PAGE
4.1 WORK AREA .....	23
4.1.1 Room ventilation.....	23
4.1.2 Room temperature.....	23
4.2 UTILITIES.....	24
4.3 CONNECTIONS.....	24
4.3.1 Hydraulic connections .....	24
4.3.2 Electrical, instrument and auxiliary connections .....	24



## 4.1 WORK AREA



The unit must be placed in a clear area - see enclosure 2 section 13 - to allow the work of its users and of the technical staff.

- **Area (a)** opposite the finned battery and the check panel. This area must be free of any obstacle in order to allow the outflow of the cooling air. The check panel and the inspection door of the boiling chamber are on this side. The area must be kept clear to allow maintenance operations and access to the check panel.
- **Area (b)** cooling air inlet. The area must be kept clear to allow the inflow of the air for cooling the condensation battery.
- **Area (c)** connection to the utilities and concentrate outlet. The area must be kept clear to allow connection to the utilities, to the electrical power supply, the waste inflow, the distillate outflow and the concentrate discharge.

### 4.1.1 Room ventilation

The unit is equipped with an air/freon finned-block heat exchanger.

The airflow rate, requested for heat exchange, varies and reaches its maximum value at a room temperature of 35°C.

Under these conditions, the airflow is:

1.000 Nm<sup>3</sup>/h 50Hz version

1.196 Nm<sup>3</sup>/h 60Hz version

The work area must allow an air change equal to the maximum flow rate.

### 4.1.2 Room temperature

The unit has been designed to work at a room temperature ranging from 5°C to 35°C.

This range can be further extended down to a lower minimum temperature of 0°C by taking particular precautions at start-up - see §5.6 "Start-up procedure in critical conditions".

## 4.2 UTILITIES

R 150 connection to the line voltage must be as follows:

POWER SUPPLY		
Frequency	50 Hz	60 Hz
Voltage	230 V	230 V
Power supply	Single phase	Single phase
Absorbed current	14 A	16 A

## 4.3 CONNECTIONS

### 4.3.1 Hydraulic connections

The unit has two hydraulic connections - see enclosure 1 "Pre-installation"

1- waste inlet	ø 20 pipeholder	stainless steel
2- distillate discharge	ø 20 pipeholder	stainless steel
3- concentrate discharge	ø 50 pipeholder	PP

The installation of a suction filter at the waste inlet is advisable; the suction filter must not be installed on the bottom of the storage tank, but a few centimeters higher. Should a storage tank be installed, make sure that its location falls within the limits indicated in enclosure 3 "Unit positioning scheme". If these requirements are impossible to meet, use a transfer pump.

**AVOID DIPPING THE DISTILLATE PIPE INTO THE DISCHARGED DISTILLATE**

The concentrate storage tank must be placed within the limits envisaged in enclosure 3 "Unit positioning scheme". If these requirements are impossible to meet, use a transfer pump.

**AVOID DIPPING THE DISTILLATE PIPE INTO THE DISCHARGED CONCENTRATE**

### 4.3.2 Electric, instrument and auxiliary connections

#### Power connection

The unit is supplied with the following cable:

- dimensions 3 x 4 mm<sup>2</sup>
- length 3 m





If the cable is not long enough, replace it with another cable of the same section.

The electric line before the check-panel must be insulated in compliance with the laws in force.

The current absorption values and the unit power factor are the following ones:

- absorbed current max: 14÷16A
- power factor  $\cos\phi$  max: 0.94

#### Instrument and auxiliary connections

An electric terminal board is located within the check-panel - see enclosure 6 "Wiring diagram" - It allows the following connections:

- LCL4 minimum level of the liquid to be evaporated;  
terminals 1 and 2: level switch inside the waste tank, which stops R 150 when the minimum level has been reached.  
If the level switch is not used, short-circuit the terminals.
- LCH5 maximum distillate level;  
terminals 3 and 4: level switch inside the distillate tank, which stops R 150 when the maximum level has been reached. If the level switch is not used, short-circuit the terminals.
- Remote control switch;  
terminals 5 and 6: remote control on/off switch for R 150. If the remote control is not used, short-circuit the terminals.
- Terminals 7 and 8: warning light indicating that the minimum waste level has been reached
- Terminals U4, V4 and PE: \*pH correction unit (accessory) - see § 12.1 "Distillate pH correction".
- Terminals PE, N, Y1 and Y2: motorized valve (accessory) - see § 12.1 "Automatic concentrate discharge".



\*The terminal board is not pre-set for connection to the electrode.  
Connect the electrode cable directly to the instrument, so as to avoid any signal interference or disturbance.



**COMMISSIONING****5**

PARAGRAPH	PAGE
5.1 FOREWORD .....	29
5.2 PROCESS SCHEME.....	29
5.2.1 Feeder valve .....	29
5.2.2 Evaporation group .....	29
5.2.3 Discharge valve .....	30
5.2.4 Vacuum group and distillate storage .....	30
5.2.5 Antifoam metering group .....	31
5.2.6 pH correction group (optional) .....	31
5.3 FRIGORIFIC SCHEME .....	32
5.4 PRELIMINARY CHECKS .....	33
5.5 START-UP PROCEDURE.....	34
5.6 START-UP PROCEDURE IN CRITICAL CONDITIONS.....	36
5.7 OPERATION IN HIGH ROOM TEMPERATURE CONDITIONS...	37



## 5.1 FOREWORD

This section describes the steps for the unit start-up, the preliminary checks to make before starting up the unit, as well as the logic of the process scheme.

## 5.2 PROCESS SCHEME

The process scheme can be subdivided into the following logic blocks - see enclosure 4 section 13 "enclosures":

- feeder valve
- evaporation group
- discharge valve
- vacuum group and distillate storage
- antifoam metering group
- pH correction group (optional)

### 5.2.1 Feeder valve

The solenoid valve EV01 is the line organ allowing the unit feeding and it is controlled by the level sensor LT1. When the level inside the boiling chamber D01 decreases, the level sensor LT1 sets the solenoid valve open. By the vacuum intake of waste, the working level within D01 is restored.

### 5.2.2 Evaporation group

The evaporation group consists of:

D01	boiling chamber
E01	jacket heat-exchanger
E03	coil tube nest condenser
EV04	air-breathing valve
VR01	check valve

and of the following control instruments:

PI3	vacuum gauge
LCL1	level control in D01
LAH2	max level alarm in D01
V02	discharge valve

The flash chamber D01 has two inlets and two outlets:

Inlets:

Waste inlet - see § 5.2.1 "Feeder valve"

Antifoam inlet - see § 5.2.5 "Antifoam metering group".

Outlets:

Waste outlet upon cycle completion through valve V02;

The condensate and the incondensables outlet through condenser E03.

The waste evaporates in the boiling chamber D01. The heat needed for the change of state is supplied in the jacket-type heat exchanger E01. The vapour phase flows through a demister and condenses in the heat exchanger E03. Both the condensate and the incondensables are sucked by the ejector S01, see § 5.2.4 "Vacuum group and distillate storage".

The line components in the condensate pipe are:

The solenoid valve EV04 is meant to break vacuum upon completion of the duty cycle; the check valve VR01 keeps vacuum in the unit when it is in stand-by. The instrumentation of the "Evaporation group" consists of a vacuum gauge-vacuum meter PI3 and of two level controls LT1 and LT2.

The vacuum gauge-vacuum meter indicates the pressure value in absolute mbar in the boiling chamber D01.

The floating-type level controls have the following functions:

maximum level alarm LAH2: stops the unit and opens valve EV04;

working level LCL1: controls the opening and closing of the feeder valve EV01 - see § 5.2.1 "Feeder valve".

### **5.2.3 Discharge valve**

Valve V02 allows the discharge of the concentrate upon completion of the duty cycle. The device M02 for the automatic opening of valve V02 may be installed on request - see § 12.1 "Automatic concentrate discharge".

### **5.2.4 Vacuum group and distillate storage**

The group consists of:

G01	centrifugal pump
S01	ejector
D02	distillate storage tank
E04	cooling coil
V01	tank drainage valve D02

Vacuum is generated by the ejector E01

The motive fluid is the distillate stored in D02.

The pump G01 pumps the distillate from D02 back to D02 through the ejector S01. The branch of the ejector is under vacuum and is connected to the heat exchanger E03, so that the ejector sucks both the incondensables and the condensate produced in E03. The distillate overflows from D02.

The fluid in D02 is cooled by a coil inside which freon R 407C expands.

The aim of cooling is keeping the distillate at a temperature below 25°C so as to improve the ejector efficiency.

The aim of valve V01 is draining tank D02 during maintenance operations.

### 5.2.5 Antifoam metering group

The antifoam metering group consists of:

EV02      solenoid valve

EV03      solenoid valve

and of a suction filter to be placed inside the antifoam storage tank D03, equipped with a minimum level alarm LAL3, which stops the unit. The antifoam metering is controlled by a cam cycle programmer following the sequence described below:

opening of solenoid valve EV02 with consequent squeezing of tube H01 by vacuum;

pause 1;

opening of solenoid valve EV03 with consequent release of tube H01 and intake of a small quantity of antifoam;

pause until the next cycle.

### 5.2.6 pH correction group (optional)

The pH correction group is usually installed for the distillate, see § 12.2 "Distillate pH correction"; it consists of:

G02    electronic metering pump

XE01   pH-meter

D04    neutralizer tank, equipped with a minimum level alarm LAL6.

The pH electrode is inserted in tank D02 and controls the metering pump G02. The alarm LAL6 is placed in the tank with the aim of stopping the pump G02 when the pH corrector runs out.

### 5.3 FRIGORIFIC SCHEME

The frigorific circuit - see enclosure 4 - shows a heat pump.

The compressor K01 compresses the gas R 407C at a pressure of approximately 20-21 bar and sends it to heat exchanger E01, where it condenses, thus releasing heat to the waste inside boiling chamber D01.

The condensation in E01 is never complete, but it completes itself in the air heat exchanger E02.

The liquid R 407C is filtered in F01 and sent to the lamination valve TV01, which is placed before the exchanger/evaporator E03 with the aim of condensing the water vapour generated in the boiler D01. As it flows out of the evaporator E03, R 407C is almost totally gaseous. The small quantity of liquid R 407C evaporates in heat exchanger E04, which is placed inside the distillate storage tank D02, thus keeping the distillate temperature below 25°C and thus improving the efficiency of the vacuum generating group G01/S01.

R 407C flows out of exchanger E04 at gaseous state and flows back to the compressor.

The instrumentation keeping the frigorific circuit under control consists of:

PS1 - PAH1	high pressure alarm
PS2 - PAL2	low pressure alarm
PS3 - PCH3	working pressure control
PI1	delivery pressure manometer
PI2	intake pressure manometer

The function of pressure gauge PS3 is operating the fan K02 of the unit heater E02 when delivery pressure exceeds 21 bar.

The pressure gauge PS3 is calibrated as follows:

fan started at delivery pressure over 21 bar;

fan stopped at delivery pressure below 20 bar.

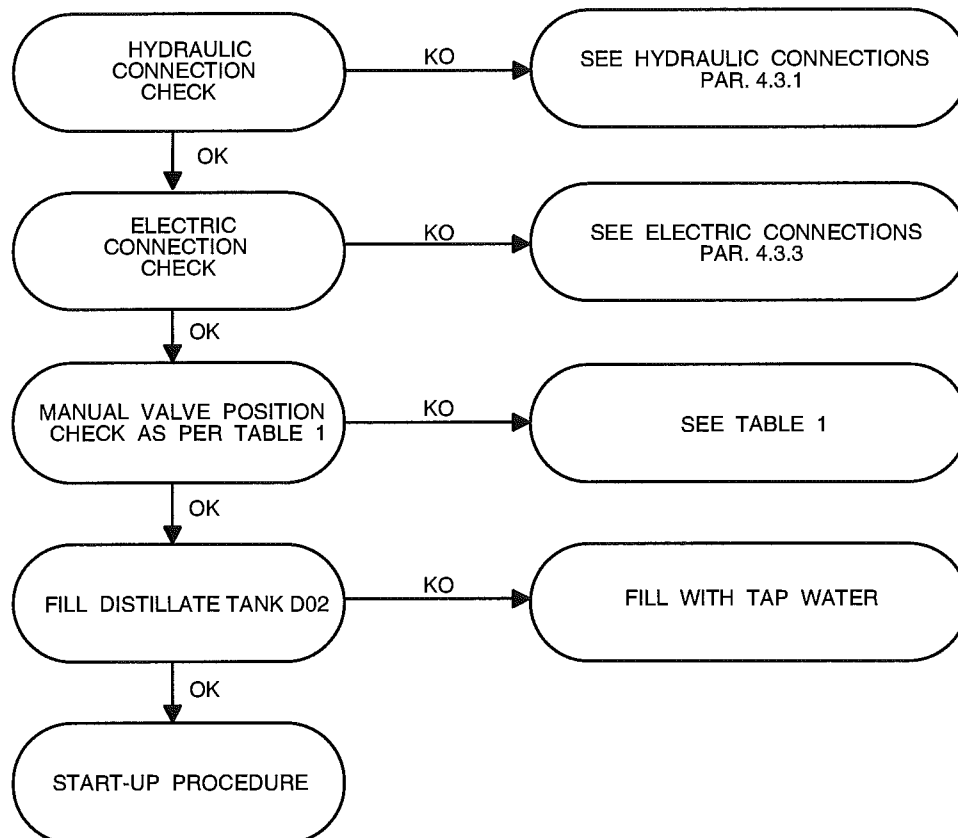
If delivery pressure exceeds 24 bar, the high pressure alarm PAH 1 is actuated and the unit is stopped.

If intake pressure drops below 2 bar, the low pressure alarm PAL2 is actuated and the unit is stopped.



## 5.4 PRELIMINARY CHECKS

**i** The following preliminary checks are necessary when R150 is started-up for the first time and every time it is subject to modifications or special maintenance operations.

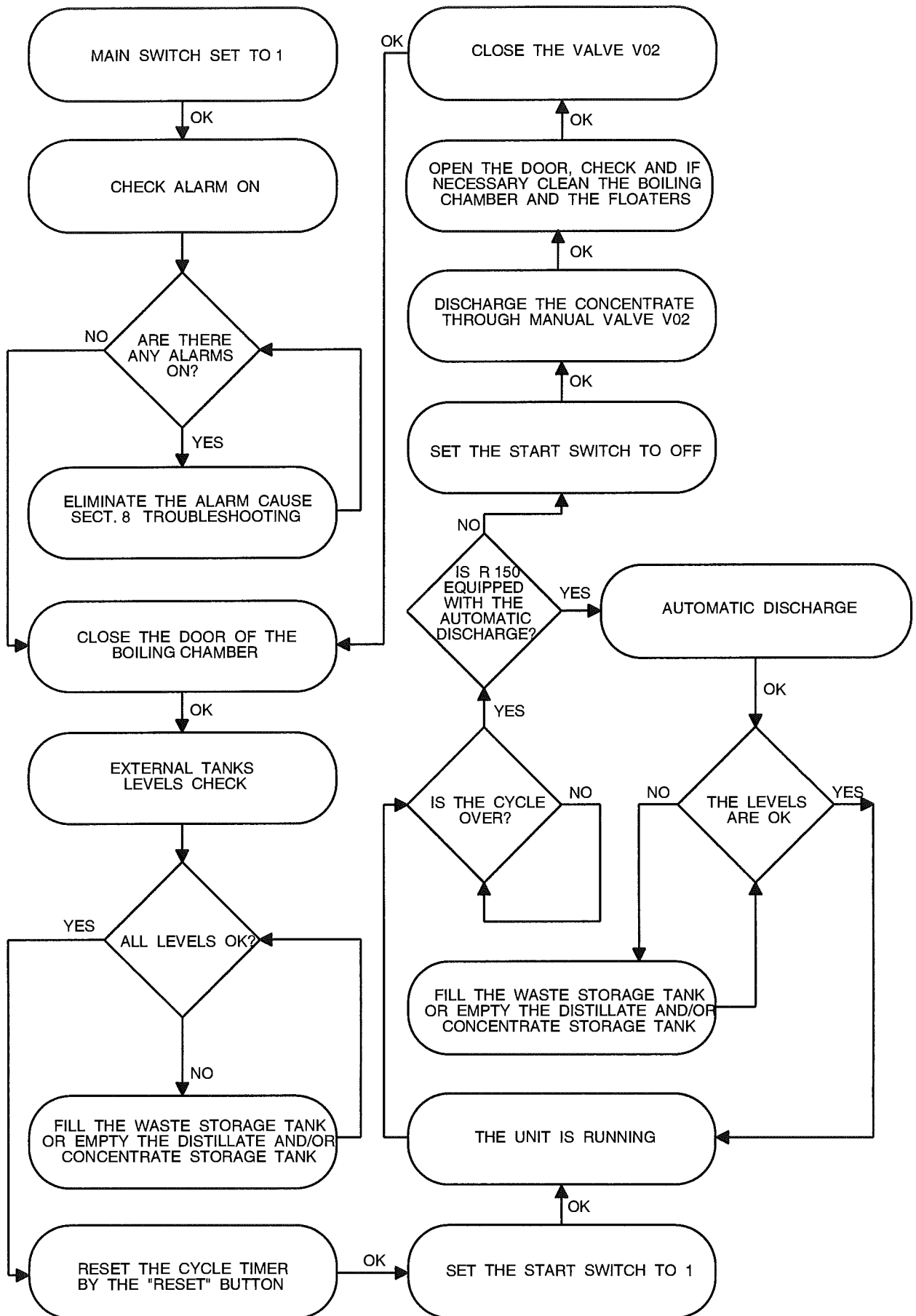


POSITIONING OF MANUAL VALVES DURING R150 RUNNING		
VALVE	OPEN	CLOSED
<i>Hydraulic circuit</i>		
V01 distillate discharge		*
V02 concentrate discharge		*
<i>Frigorific circuit</i>		
V03 compressor K01 inlet	* 1 rotation less	
V04 compressor K02 delivery	* 1 rotation less	
TABLE 1		

## 5.5 START-UP PROCEDURE

All R 150 units are tested with water at the factory of LED ITALIA.

During this test standard values are set for the correct functioning of the unit - see section 6 "Operating Instructions". For the start-up, follow the procedure below:



By pressing the start button, the following components are set to run:

- 1 Vacuum pump G01;
- 2 Compressor K01
- 3 pH correction system with metering pump G02 if supplied;
- 4 Antifoam metering by the opening of the solenoid valves EV02-EV03 with the pre-set standard frequency, which can be changed through the "Antifoam" timer - see § 6.2.1 "Antifoam metering setting".

The ejector S01 sucks the air from inside the boiling chamber D01. The vacuum which has thus been generated causes the waste to be taken in through the solenoid valve EV01 until the working level LCL1 is reached.

Before reaching the right vacuum and temperature conditions for evaporation, R150 is at a temporary start-up stage. This stage is characterized by a low intake pressure in compressor K01 (4÷5 bar), a lower temperature of the distillate in tank D02 and by the flow of liquid R 407C through the observatory FG1, in the presence of small gas bubbles. The steam generated inside the boiling chamber D01 is condensed in contact with the freon evaporator E03.

The condensation heat is transferred to the freon inside the intake circuit of compressor K01, thus causing the intake pressure to raise.

Such raise, which can be seen through the manometer PI2, causes on turn a raise in delivery pressure, which can be seen through the manometer PI1.

When the delivery pressure reaches 21 bar, the fan K02 of the unit heater E02 is set to work. From this point on, through the observatory FG1, the flow of freon in the liquid state only, i.e. with no bubbles, can be seen.

The unit is now in working conditions. Upon completion of the evaporation cycle, the duration of which is pre-set through the "Evaporation" timer, R150 stops and the air-breather solenoid valve EV04 opens to restore atmospheric pressure conditions inside the boiling chamber.

If R150 is equipped with a motorized valve V02/M02, the unit is automatically drained and re-started.

## 5.6 START-UP PROCEDURE IN CRITICAL CONDITIONS

Low room temperature is a critical condition to start-up R150 - see § 4.1.2 "Room temperature". When both the room and the waste temperatures are below 5°C, the start-up procedure is as follows:

- 1 Where possible, fill up the boiler with water at 40°C instead of waste; or heat the waste.

As for the rest, follow the standard start-up procedure.

## 5.7 OPERATION IN HIGH ROOM TEMPERATURE CONDITION

The unit is equipped with an air heat exchanger E02 designed for a maximum room temperature of 35°C.

In case of higher temperature, the unit cannot dispose of the heat produced by compressor K01 and it consequently stops because of the high pressure alarm. If this is the case, the room must be ventilated or air-conditioned to bring temperature below 35°C.



**OPERATING INSTRUCTIONS****6**

PARAGRAPH	PAGE
6.1 FOREWORD .....	41
6.2 USE OF THE CHECK PANEL .....	41
6.3 R 150 SETTING .....	42
6.3.1 Duty cycle.....	42
6.3.2 Antifoam metering setting .....	43
6.3.3 Other settings .....	43





## 6.1 FOREWORD

The unit is fully automated. It stops automatically when there is no waste left to be treated in the storage tank or when the distillate in the distillate storage tank has reached the maximum level.

If any trouble occurs, the check panel sets the unit to stop and the alarm is displayed.

## 6.2 USE OF THE CHECK PANEL

The check panel allows to check all the functions of the unit.

The front panel includes the following components:

- "Main switch": it cuts off the electric power supply to all electric components.
- "Start-Stop" switch: the duty cycle starts if the warning lights "Alarms" and "Duty cycle" are off and the warning lights "Feed" and "External signals" are on.
- "Extra antifoam metering" button: set to ON, in the event of sudden and excessive foam formation inside the boiling chamber, it allows the inlet of a large quantity of antifoam by opening both solenoid valves EV02 and EV03 simultaneously.
- "Cycle time reset" button: set to ON it resets the timer "Duty cycle" to zero, it turns off the relating warning light and enables the next duty cycle. The cycle starts only if the warning lights "Alarms" and "Duty cycle" are off and the warning lights "Feed OK" and "External signals" are on and if the "Start" switch is set to ON.
- White light "Feed": indicates that the main switch is set to ON and that the necessary voltage is in the auxiliary circuits.
- White light "End of cycle": it lights to indicate that the "Evaporation time" timer has finished its counting. It turns off when R150 is either working or in stand-by.
- Green light "External signals levels/remote command": it lights to indicate that the contacts of the following switches are closed:
  - Minimum level float switch of the waste tank.
  - Maximum level float switch of the distillate tank
  - Remote switch.

- Red warning lights: they light to indicate an alarm caused by some trouble: if one or more warning lights are on, R150 stops.
- "Boiler maximum level alarm": indicates that a high level has been reached inside the boiler.
- "Antifoam minimum level alarm": it indicates that the antifoam tank D03 is empty.
- "Frigorific circuit high/low pressure alarm": it indicates the actuation of pressure gauge PS1 or PS2.
- "Motor protections actuation alarm": it indicates the actuation of a motor protection in the check panel.
- "Evaporation time" timer: the set time corresponds to the duration of an evaporation cycle, at the end of which R150 stops.

If R150 is equipped with the motorized valve V02/M02 the following operations are automatically carried out:

- R 150 stop
- restoration of the atmospheric pressure in the boiling chamber by the opening of solenoid valve EV04.
- Opening of the valve V02 and subsequent concentrate discharge.
- Closing of valve V02;
- Resetting of the "Evaporation time" timer;
- R150 start-up.

If the motorized valve V02/M02 is not supplied, R150 stops and the solenoid valve EV04 opens to restore the atmospheric pressure inside the boiling chamber. Concentrate discharge and "Evaporation time" timer resetting must be carried out manually.

- "Antifoam dosage" timer: it establishes the time between intake cycles.
- "Boiler pressure" manometer: absolute pressure inside boiling chamber D01.
- "Delivery pressure of frigorific circuit" manometer: the delivery pressure in compressor K01.

## 6.3 R150 SETTING

### 6.3.1 Duty cycle

The time for the automatic discharge must be set in function of the kind of fluid to be evaporated.

To work out the duration of a duty cycle, follow the instructions below:

Measure the density of the liquid to be evaporated, see § 9.7 "Preventive maintenance"

Measure the distillate output per hour while R150 is in operation - see § 9.3.5 "Check of distillate output".

Input the measured values in the following formula:

$$t = \frac{V_c \times (d_c - d_i)}{V_d \times (d_i - 1)}$$

where:

- t** = time (hours) to set in the "Evaporation time" timer
- d<sub>c</sub>** = required concentrate density in kg/dm<sup>3</sup>
- d<sub>i</sub>** = waste density in kg/dm<sup>3</sup>
- V<sub>c</sub>** = volume in liters of concentrate output at the end of every cycle
- V<sub>d</sub>** = volume in liters of distillate output per hour
- 1** = distillate density in kg/dm<sup>3</sup>

Set value "t" resulting from the calculation in the "Evaporation time" timer.

The value obtained from the formula is approximate, therefore check the distillate density at the end of each cycle and if it is lower than required set a longer time, or, if it is higher than required, a shorter one.

### 6.3.2 Antifoam metering setting

Entrainment of the liquid may occur depending on the type of waste treated, owing to excessive foam formation inside the boiling chamber D01.

Set the pause time to 10 minutes. Check the layer of foam in the boiler frequently and modify the pause time value accordingly: shorter time if there is foam, longer time if there is not.

The optimum setting is obtained when foam starts to form as the pause gets longer and foam disappears as the pause gets shorter.

In the event unexpected foam formation, add an extra dosage by pressing the "Antifoam extra dosage" button.

### 6.3.3 Other settings

At testing stage, the timers in the check panel are set in accordance with standard values. Normally, this values do not need to be modified. However, the standard pre-set values and the functions of the different timers are reported here after - see enclosure 6 "Wiring diagram".

- Timer K3: delayed actuation of the high level alarm in the boiling chamber. Possible sprinkling during boiling may actuate the floating-type level sensor LAH2. In order to avoid the immediate actuation of the high level alarm a 10 second delay time is set on timer K3.
- Timer K4, delayed actuation of the antifoam minimum level alarm LAL3. The alarm may be actuated if the antifoam suction filter is lifted from the empty tank. To avoid the immediate actuation of the minimum level alarm, a 10 second delay time is set on timer K4.
- Timer for the opening of the feeder solenoid valve EV01. To prevent the feeder solenoid valve EV01 from being actuated too often with the intake of a very small quantity of waste, a minimum opening time is set. The set time is normally 1 second.

**INTENDED USE**

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**7**

**PARAGRAPH**

**PAGE**

7.1 APPLICATION FIELD.....	47
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## 7.1 APPLICATION FIELD

The units of the R 150 series are vacuum evaporators designed for the distillation of water based liquids, containing organic and inorganic compounds. The unit can treat mixtures containing corrosive liquids within fixed concentration values.

Instead, the unit cannot treat liquids or mixtures of liquids with the following characteristics:

- flammable
- developing flammable aerosol
- radioactive
- developing poisonous aerosol
- food use\*
- making adhesive films
- with temperature above 70°C
- crystallizing

**i**

\*Neither the distillate, nor the concentrate obtained through evaporation, can be used for food products. However, for the correct use of the unit, call LED ITALIA Srl Technical Department.

The putrescible liquids, containing organic substances, surfactants, mineral oils, and in particular the wastes coming from manufacturing processes of food field, have to be treated in such a way as to prevent bacteria from proliferation and emission in air of foul smell.

These situations may happen in the event of the liquids remain in the storage tanks or in the boiler of the evaporator not in operation, for a time above 24 hours and at a room temperature above 10°C (50°F).

Into the waste and relating distillate, obtained by evaporation, stored in the storage tank, have to be added with a planned frequency suitable quantity of bactericide.

The bactericide must be mixed with all liquid to achieve the best result.

The bactericide can be added automatically through a device which consists of a metering pump and a check panel with timer.





**TROUBLESHOOTING****8**

PARAGRAPH	PAGE
8.1 ALARMS.....	51
8.1.1 Antifoam minimum level alarm.....	51
8.1.2 Boiler maximum level alarm.....	51
8.1.3 High/low pressure alarm of frigorific circuit .....	52
8.1.4 Thermal protections actuation alarm .....	53
8.2 OTHER TROUBLES.....	54
8.2.1 Scarce distillate output .....	54



## 8.1 ALARMS

R 150 is equipped with a monitoring system which stops the equipment when any trouble occurs. The trouble is signalled by one or more red warning lights. The alarms and relating interventions to restart the unit are the following:

### 8.1.1 Antifoam minimum level alarm

This alarm lights to indicate that the antifoam is finished. If the pH correction device is on, it indicates that the pH corrector is finished. If this is the case, just refill the tank of the antifoam or of the pH corrector with their respective liquids. To restart the unit, switch R150 off and on again by the main switch.

### 8.1.2 Boiler maximum level alarm

This alarm lights to indicate that the fluid in the boiler has reached the maximum level. To restart the unit, empty the boiler partially by opening the discharge valve V02, then switch R150 off and on again by the main switch. Possible causes for this alarm are the following:

#### No. 1 Solenoid valve EV01 dirty or with its membrane damaged

The liquid may leak out through the solenoid valve EV01 in the event of scale forming on its membrane - see § 9.7.12 "Cleaning the feeding solenoid valve"

#### No. 2 Incorrect antifoam metering

Foam formation causes a lowering of the liquid level in the boiler. Consequently, the solenoid valve EV01 opens to restore the working level. During antifoam metering, foam drops and the level of liquid increases.

Under these conditions, the maximum level alarm may light.

See § 9.1.2 "Antifoam metering setting" and 9.4.1 "Checking the antifoam suction group"

#### No. 3 Level sensor dirty.

Possible deposits may cause the inefficiency of the level sensor and the consequent opening of the solenoid valve EV01 - see § 9.3.2 "Level sensor cleaning"

### **8.1.3 High/low pressure alarm of frigorific circuit**

This alarm lights to indicate that the pressure gauge PS1/2 has been actuated owing to minimum intake pressure or maximum delivery pressure of compressor K01.

The actuation of pressure gauge PS1 indicates that the delivery pressure of compressor K01 has exceeded the set value, which is normally 24 bar.

To restart the unit, press the key on the upper part of the pressure gauge.

If the problem should occur again, call the Technical Service.

The possible causes for the alarm and relating remedies are:

#### No. 1 Too high room temperature.

Air or air-condition the room until room temperature falls back within the limits of the working specifications, see § 4.1.2 "Room temperature"

#### No. 2 Air condenser dirty

See § 9.7.1 "Cleaning the air-condenser".

The actuation of pressure gauge PS2 indicates that the intake pressure of compressor K01 is lower than the set value, which is normally 2 bar.

To restart the unit, wait until the intake pressure has increased, since the pressure gauge is automatically restored.

If the problem should occur again, call the Technical Service.

The possible causes for the alarm and relating remedies are:

#### No. 1 Freon leakage

This problem is mostly caused by the insufficient quantity of R 407C in the frigorific circuit, possibly due to a leakage - see § 9.6.1 "Checking the freon leakage"

#### No. 2 Too high density of the fluid in the boiler

Drain the liquid in the boiler totally or in part. The fresh liquid, flowing into the boiler to restore the working level, reduces the liquid density.

Check the duration of a duty cycle - see § 9.1.1 "Duty cycle setting"

Check the concentrate density - see § 9.3.4 "Checking density"

#### No. 3 Scaled heating bottom

See § 9.7.8 "Washing the boiling chamber"

No. 4 Too low room temperature

Heat the room until the temperature is back within the limits of the working specifications - see § 4.1.2 "Room temperature"

No. 5 Insufficient vacuum inside the boiler owing to the scarce efficiency of the vacuum group or to leakage in the hydraulic connections to the boiler

Detect possible air infiltration - see § 9.8.1 "Checking the vacuum seal"

If no leakage is found, wash the distillate tank - see § 9.7.2 "Cleaning the distillate tank"

No. 6 Packing elements clogging

It causes an increase in steam load loss, thus reducing the steam flow to the condenser.

See § 9.7.4 "Cleaning packing elements"

**8.1.4 Thermal protection actuation alarm**

This alarm lights to indicate that, during a duty cycle, a motor protection has been actuated.

To gain access to the protections, open the check panel door.

To restart the unit, after detecting the cause for the protection actuation, restore the protection.

If the problem should occur again, call the Technical Service.

Possible causes for the alarm and relating remedies are:

No. 1 Actuation of motor protection F3 of compressor K01

The actuation of F3 means that the compressor has absorbed a higher current value than the maximum nominal value, indicated on the identification plate.

Its cause may be the same which causes the compressor high delivery pressure alarm - see § 8.1.3 "Frigorific circuit high/low pressure"

No. 2 Actuation of motor protection F2 of vacuum pump G01

The actuation of F2 means that the vacuum pump has absorbed a higher current value than the maximum nominal value, indicated on the identification plate. This may occur either if the pump is jammed or in case of short-circuit. In this case call LED ITALIA Technical Service.

### No. 3 Actuation of motor protection F6 of gear motor M01

The actuation of F6 means that the gear motor has absorbed a higher current value than the maximum nominal value, indicated on the identification plate.

Its possible causes are the following:

- jamming or short-circuit. In this case the gear motor needs replacing
- over-absorption caused by excessive concentration of the liquid inside the boiler: in this case, follow the instructions below:

Drain the liquid from the boiler totally or in part. The fresh reflux liquid, flowing into the boiler to restore the working level, reduces the liquid density.

Check the duration of a duty cycle - see § 9.1.1 "Duty cycle setting"

Check the concentrate density - see § 9.3.4 "Checking density".

## **8.2 OTHER TROUBLES**

Other troubles may occur, which jeopardize the unit performance but are not so serious to cause an alarm condition.

### **8.2.1 Scarce distillate output**

Scarce distillate output may be due to the following causes:

#### No. 1 Too high density of the fluid in the boiler

Drain the liquid in the boiler totally or in part. The fresh liquid, flowing into the boiler to restore the working level, reduces the liquid density.

Check the duration of a duty cycle - see § 9.1.1 "Duty cycle setting"

Check the concentrate density - see § 9.3.4 "Checking density"

#### No. 2 Insufficient vacuum inside the boiler.

It is due either to the scarce efficiency of the vacuum group or to air infiltration in the circuit connected to the boiler. Sometimes this trouble is worsened by a temperature increase in the liquid.

Detect possible air infiltration - see § 9.8.1 "Checking the vacuum seal"

If no leakage is found, wash the distillate tank - see § 9.7.2 "Cleaning the distillate tank"

#### No. 3 Packing elements clogging.

It causes an increase in steam load loss, thus reducing the steam flow to the condenser.

See § 9.7.4 "Cleaning packing elements"

No. 4 Excessive foam formation in the boiler with difficult distillation.

See § 9.1.2 "Antifoam metering setting"

If necessary, clean the distillate tank - see § 9.7.2 "Cleaning the distillate tank"

No. 5 R 407C in the frigorific circuit insufficient due to a leakage

See § 9.6.1 "Checking the freon leakage"

No. 6 Scaled heating bottom, due to excessive concentration.

See § 9.1.1 "Duty cycle setting".

See § 9.7.8 "Washing the boiling chamber".





**MAINTENANCE****9**

PARAGRAPH	PAGE
9.1 POST-INSTALLATION SETTINGS .....	59
9.1.1 Duty cycle setting .....	59
9.1.2 Antifoam metering setting.....	59
9.2 DAILY MAINTENANCE .....	60
9.2.1 Checking the antifoam level .....	60
9.2.2 Checking the pH corrector level.....	60
9.3 WEEKLY MAINTENANCE.....	60
9.3.1 Data recording .....	60
9.3.2 Cleaning the level sensors .....	61
9.3.3 Cleaning the suction filter .....	61
9.3.4 Checking density .....	62
9.3.5 Checking the distillate output.....	62
9.3.6 Checking pH.....	63
9.3.7 Checking conductivity.....	63
9.4 MONTHLY MAINTENANCE .....	64
9.4.1 Checking the antifoam intake group. ....	64
9.4.2 Checking the air-breathing valve seal.....	64
9.4.3 Checking the scrapers.....	65
9.5 SEMESTRAL MAINTENANCE .....	65
9.5.1 Checking the electric terminals.....	65
9.6 YEARLY MAINTENANCE .....	66
9.6.1 Checking freon leakage.....	66
9.6.2 Checking the hydraulic interconnection parts .....	66
9.6.2 Cleaning the waste storage tank .....	66
9.7 PREVENTIVE MAINTENANCE .....	66
9.7.1 Cleaning the condensation battery .....	66
9.7.2 Cleaning the distillate tank.....	67
9.7.3 Cleaning the vacuum pump.....	67
9.7.4 Cleaning packing elements .....	68
9.7.5 Replacing packing elements.....	68
9.7.6 Checking the antifoam solenoid valve .....	69
9.7.7 Replacing the air-breathing solenoid valve.....	70
9.7.8 Washing the boiling chamber .....	70

9.7.9	Replacing the freon filter.....	72
9.7.10	Replacing the scrapers.....	73
9.7.11	Replacing the sealing rings .....	74
9.7.12	Cleaning the feeder solenoid valve .....	74
9.8	MAINTENANCE DURING NON-OPERATIVENESS .....	75
9.8.1	Checking the vacuum seal .....	75
9.8.2	Emptying the liquid stored onboard the evaporator	76

## 9.1 POST-INSTALLATION SETTINGS



Before starting R150, some settings must be done, mainly relating to the duration of the duty cycle and the antifoam metering.

These parameters must be checked with a higher frequency at the unit starting stage, i.e. until a steady working condition is reached.

### 9.1.1 Duty cycle setting

To set this value, refer also to § 6.3.1 “Duty cycle”.

The parameters needed to determine the correct density of the liquid when discharged are:

- Distillate output:

It is the function of the concentration ratio: the higher the concentration ratio, the lower the yield in distillate, owing to a worse heat exchange in condenser E01.

High concentration causes the parts in contact with the liquid to get dirtier (boiler, exchanger etc.) thus requiring more maintenance.

- Distillate quality

High concentration in the boiler does not usually cause the entrainment of the liquid to be evaporated into the distillate.

In case of entrainment, the distillate chemical characteristics are altered.

### 9.1.2 Antifoam metering setting

To set the antifoam intake frequency, refer to § 6.3.2 “Antifoam metering setting”.

Antifoam consumption must be as low as possible.

By rule, the dosage should be such as to keep foam under the boiler sight glass.

Higher consumption only implies higher costs, but it does not cause any alteration in R150 running.

## 9.2 DAILY MAINTENANCE

### 9.2.1 Checking the antifoam level

Check the antifoam level. In the event of low level, add more antifoam to prevent the unit from being stopped by the minimum level alarm LAL3.

### 9.2.2 Checking the pH corrector level

If the pH correction device is installed, check the level of the neutralizing agent. In the event of low level, add more neutralizing agent to prevent the pump G02 from being stopped by the low level alarm LAL6.

## 9.3 WEEKLY MAINTENANCE

### 9.3.1 Data recording

Recording data about the unit functioning is definitely useful to prevent any trouble or to change the parameters setting when necessary.

Fill the data in the data sheet - see enclosure 13.

The data to be recorded are :

- Distillate output per day.  
See "Checking the distillate output" in this paragraph.
- Distillate temperature  
See "Checking the distillate temperature" in this paragraph.
- Duty cycle.  
This value is reported on the "Duty cycle" timer placed on the control panel.
- Pause between antifoam metering  
This value is reported on the "Antifoam" timer placed on the control panel.
- Pressure in the boiler.
- Delivery pressure.  
These values are reported on the control panel.
- Distillate conductivity.  
See "Checking conductivity" in this paragraph.

- Distillate pH  
See "Checking pH" in this paragraph.
- Density of the discharged concentrate.  
See "Checking density" in this paragraph.
- Waste conductivity  
See "Checking conductivity" in this paragraph
- Waste pH  
See "Checking pH" in this paragraph
- Waste density  
See "Checking density" in this paragraph.

### 9.3.2 Cleaning the level sensors



#### **WARNING**

Before cleaning the level sensors, always switch off R150 by the main switch and wear protective gloves and goggles.

To accede to the level sensors in the boiling chamber, operate as follows :

- Set the "Start-Stop" switch to stop and wait until atmospheric pressure is restored in the boiling chamber;
- Open the door;
- Clean the float level and the axis where they are fit through a brush;
- Close the door and restart R 150.

### 9.3.3 Cleaning the suction filter

A filter is inserted at the end of the waste suction pipe, in order to catch possible solids and prevent obstructions.

The filter needs periodical cleaning to allow correct waste suction.

Operate as follows:

- Set the "Start-Stop" switch to stop;
- Remove the suction filter from the waste storage tank, clean it and place it back into the tank;
- Restart R 150 by setting the "Start-Stop" switch to start.

If the filter is often dirty, clean the waste storage tank - see § 9.6.2 "Cleaning the waste storage tank".

#### 9.3.4 Checking density.

To check that R150 is working properly and to set the duration of the evaporation cycle, check the concentrate density at the end of every duty cycle.



#### **WARNING**

Wear protective gloves.

Operate as follows:

Set the "Start-Stop" switch to stop and wait for the restore of the air-pressure inside the boiling chamber.

- Pour the concentrate into a 2 liter tank through the discharge valve V02;
- Put the densimeter inside it and measure density;
- Restart R 150 by setting the "Start-Stop" switch to start.

Densimeters with measuring range not exceeding 100 kg/m<sup>3</sup> are recommended for more accuracy.

LED ITALIA can supply glass densimeters with the following measuring ranges:

1000 ÷ 1100 kg/m<sup>3</sup>

1100 ÷ 1200 kg/m<sup>3</sup>

1200 ÷ 1300 kg/m<sup>3</sup>

1300 ÷ 1400 kg/m<sup>3</sup>

1400 ÷ 1500 kg/m<sup>3</sup>

If the measured density value is different from the required value, change the time set in the "Evaporation time" timer - see § 9.1.1 "Duty cycle setting"

In addition to the concentrate density, measure also the waste density, by taking the waste directly from the storage tank.

#### 9.3.5 Checking the distillate output

To measure the distillate output per day, sample the distillate flowing out of tank D02 - see enclosure 5 "Vacuum ring scheme" - after disconnecting the discharge pipe.

**WARNING**

Wear protective gloves

Sample the distillate with a graduated tank for a recommended 30 minute time. The daily volume is equal to the measured value multiplied by 48. This measure is more accurate if it is calculated as the average of several measurements.

### 9.3.6 Checking pH

#### Distillate

Checking the distillate pH is only necessary in some processes. In these cases, a pH checking and correcting device is supplied as an accessory.

However, measure the distillate pH by means of a portable instrument, to verify that the device installed has been set correctly.

To measure pH, operate as follows:

**WARNING**

Wear protective gloves and goggles

Pour a small quantity of distillate into a clean, non metallic container, through valve V01, see enclosure 5 "Vacuum ring scheme".

Insert the electrode of the pre-set portable instrument and measure the pH value.

#### Waste:

The pH check on the waste flowing into R150 must be carried out by means of a portable pH meter. Dip the instrument electrode directly into the waste, previously tapped from the storage tank into a small non metallic container.

### 9.3.7 Checking conductivity

#### Distillate:

Take a small quantity of distillate into a clean, non metallic tank, through the intake valve V01 of the distillate tank.

**WARNING**

Wear protective gloves and goggles

Insert the portable instrument electrode and read the conductivity value.

Waste:

Take a small quantity of waste into a clean, non metallic tank. Insert the portable instrument electrode and read the conductivity value.

## 9.4 MONTHLY MAINTENANCE

### 9.4.1 Checking the antifoam intake group

This check has to be carried out while the unit is in operation.

- Put the antifoam suction filter into a small tank, previously filled with water ;
- Set the "Antifoam dosage" timer to zero for a short time, to carry out an antifoam intake cycle.
- Repeat this operation several times and see whether the level of the liquid in the tank drops.

The causes for non-suction of antifoam may be the intake circuit obstruction (suction filter, pipe, solenoid valves etc.) or, if a very small quantity of liquid is taken in, the elasticity loss of hose H01 - see enclosure 4 "Process scheme".

If the connecting pipe linking EV02 to EV03 is damaged, operate as follows:

- Switch off R 150 by the "Start-Stop" switch;
- Loosen the ring nuts of hose H01;
- Remove the pipe and replace it with a new one;
- Restart R150 by the "Start-Stop" switch.

In case of obstruction, operate as follows:

- Switch off R 150 by the "Start-Stop" switch;
- Check the suction filter and clean it;
- Disconnect the pipes connected downstream to solenoid valve EV02 and upstream to solenoid valve EV03;
- Check and remove the obstruction with water;
- Check that the solenoid valves EV02 and EV03 are working correctly, see § 9.4.1 "Checking the antifoam intake group".

### 9.4.2 Checking the air-breathing valve seal

To check the seal of the air-breathing valve EV04 - see enclosure 4 "Process scheme"- just block up the free end of the valve itself with a wet finger while there is vacuum inside the boiler. If the finger is sucked, there is a blowby.

In this case, the valve needs cleaning or replacing - see § 9.7.7 "Replacing the air-breathing solenoid valve".



### 9.4.3 Checking the scrapers

The scrapers may get worn during the duty cycle.

To verify their efficiency:

- Switch off R 150 by the "Start-Stop" switch;
- Discharge the content of the boiling chamber through the solenoid valve V02;
- Take the door off;
- With the gear motor on, make sure that the scraper blade adheres perfectly to the whole of the surface of the heating bottom.

If the adherence is not perfect or if the scraper blade is not in contact with the bottom, without being too much worn, make the scraper support lower as follows:

- Switch off R 150 by the main switch;
- Loosen the bolts locking the collars of the scraper support to the shaft of gear motor M01, see enclosure 9 "Scrapers scheme";
- Make the support lower until the scraper blades adhere to the heating bottom;
- Tighten the collar lock bolts, put the door back to its place and restart the unit by the main switch and the "Start-Stop" switch.

If the scraper blades are worn out, replace them - see § 9.7.10 "Replacing the scrapers".

## 9.5 SEMESTRAL MAINTENANCE

### 9.5.1 Checking the electric terminals

While the unit is in operation, its vibrations may alter the electrical connections of the terminal board, contactors, motorprotectors etc.



#### **DANGER**

Before tightening the connections, cut off the power supply

About six months after R150 installation, check and, if necessary, tighten the terminals of the electric contacts, paying particular attention to the power contacts.

## 9.6 YEARLY MAINTENANCE

### 9.6.1 Checking freon leakage.

In order to avoid substantial leakage of R 407C out of the frigorific circuit, look for any possible trace of oil in the copper pipes and on the compressor, since the leakage of R 407C often causes also a small lubricating oil spill.



If a leakage is detected, call LED ITALIA Customer Technical Service.

### 9.6.2 Checking the hydraulic interconnection parts

Tighten the hose clamps in the external connecting circuits (waste suction pipe, distillate discharge pipe) and in the internal connecting circuits (suction pipe of the vacuum pump G01 and suction pipe of ejector S01).

Check and if necessary tighten the flange nuts and the ring nuts

### 9.6.3 Cleaning the waste tank.



#### **WARNING**

Wear protective gloves and goggles

Check if the tank is sufficiently clean, paying particular attention to deposits.

Clear deposits away to avoid the obstruction of the filter and/or of the suction pipe.

## 9.7 PREVENTIVE MAINTENANCE

### 9.7.1 Cleaning the condensation battery

Dusts in the unit work area may foul the finned surface of the air/freon heat exchanger E02.

Clean the exchanger periodically to keep the heat exchange coefficient unaltered.

- Stop the unit by pressing the "Start-Stop" switch
- Clean the exchanger with compressed air

### 9.7.2 Cleaning the distillate tank

The distillate tank needs cleaning in case the distillate should be so dirty to worsen the efficiency of the vacuum group.

The distillate may get dirty for the following reasons:

Waste entrainment due to foam formation - see § 9.1.2 "Antifoam metering setting".

Distillation of volatiles.

To clean the tank, follow the instructions below:



#### **WARNING**

Stop R150 by pressing the "Start-Stop" switch.

Wear protective gloves and goggles

- Open valve V01 and empty the distillate tank - see enclosure 5 "Vacuum ring scheme". The content can be sent to the waste storage tank;
- Fill the tank with tap water or with the distillate;
- Close valve V01.

### 9.7.3 Cleaning the vacuum pump

The vacuum pump needs cleaning in case the distillate should get so dirty to worsen the efficiency of the vacuum group.

The vacuum pump must be cleaned after or at the same time as the vacuum tank - see previous point.

Disassemble the pump and clean it on a work-table as follows:



#### **DANGER**

Always switch off R150 by the main switch and wear protective gloves and goggles.

- Open valve V01 - see enclosure 5 "Vacuum ring scheme"- and empty the distillate tank; the liquid can be discharged into the waste storage tank;
- Loosen the hose clamps and remove the suction pipe and the outflow pipe of ejector S01;
- Unscrew ejector S01 and pull it out;
- Unscrew the lock bolts of pump G01 and pull them out;
- Loosen the suction hose clamp of pump G01;

- Disconnect the wires after lifting the protection cover;
- Pull out the pump and examine the external impeller; if there are solids on the impeller, just clear them away to put the pump in working order.

If the internal part of the impeller is obstructed too, replace the impeller, since cleaning it would be too difficult:

- Loosen the stop nut with a box wrench and remove the components;
- Reassemble the pump and place it in the unit by connecting the delivery, the intake and the power supply wires;
- Fill the tank with tap water or distillate;
- Close the valve V01;
- Restart R150 by the main switch;

#### 9.7.4 Cleaning packing elements

Packing elements need cleaning if the grate supporting the packing elements is found to be foul at an inspection of the boiling chamber D01.

If only the lower part of the packing elements is foul, wash them following the instructions below; in case of obstruction, replace all the packing elements - see next point.



#### **WARNING**

Always switch off R150 by the main switch. Wear protective gloves and goggles. Before operating, wait a few minutes after opening the boiler and ventilate the room.

- Switch off R150 by the main switch.
- Drain the liquid from the boiler through valve V02;
- Place a tank under valve V02 to collect the washing water;
- Open the door and ventilate the room;
- Remove the deposits from the upper part by means of a bolt of tap water or a hydrocleaner, if necessary use a knife; if the problem is not solved, replace the packing elements - see next point.
- Close valve V02, close the door and restart the unit.

#### 9.7.5 Replacing packing elements

The packing elements need replacing if the trouble persists after cleaning them:

**WARNING**

Always switch off R150 by the main switch. Wear protective gloves and goggles. Before operating, wait a few minutes after opening the boiler and ventilate the room.

Operate as follows:

- remove the scrapers and their supports from the gear motor shaft, inside the boiling chamber;
- Unscrew and remove the bolts of the upper flange;
- Remove the flange and the gear motor;
- Remove the cover placed on the grate which holds the packing elements inside the boiling chamber D01;
- Remove all packing elements, which must be disposed of as waste;
- Wash the boiler with water if necessary;
- Re-place the cover on the grate
- Insert new packing elements at random through the upper flange;



Reassemble the flange and the gear motor, making sure that the gasket is placed correctly.

- Reassemble the scrapers and their supports onto the gear motor shaft;
- Close the discharge valve V02;
- Re insert the door and restart R150 by the main switch.

### 9.7.6 Checking the antifoam solenoid valves

Operate, when the boiling chamber is under vacuum, as follows:

- Remove the protection from the actuators of both solenoid valves, while R150 is in operation;
- Manually push the actuator of solenoid valve EV02; the hose H01 should get squeezed, if it is not, EV02 is clogged up;
- In sequence, manually push the actuator of solenoid valve EV03. The hose H01 should swell, if it does not, EV3 is clogged up;
- Check the electric connections of the solenoid valves and the coil efficiency, if the hose is not clogged up.

If one of the solenoid valves is obstructed, operate as follows:

- Switch off R150 by the “Start-Stop” switch;
- Wait for atmospheric pressure to be restored in the boiling chamber;

**WARNING**

Disconnect R150 from the power supply by the main switch.

- Disconnect the solenoid valve electric connection;
- Disconnect the solenoid valve hydraulic connection;
- Unscrew the two screws and take the solenoid valve out;
- Disassemble the coil after removing the snap ring;
- Loosen the four screws of the valve body;
- Open the valve body, taking care not to lose the shaft thrust spring;
- Clean the valve and its membrane with tap water;
- Reassemble the components carefully in their correct position;
- Restart R150 by the main switch.

### 9.7.7 Replacing the air-breathing solenoid valve

The air-breathing valve needs replacing in case of blow-by and consequent vacuum lost.

In most cases, the trouble is caused by a worn closing membrane.

It is advisable to replace the solenoid valve, as follows:

- Switch off R150 by the “Start-Stop” switch;
- Wait for atmospheric pressure to be restored in the boiling chamber;

**WARNING**

Disconnect R150 from the power supply by the main switch.

- Disconnect the electric and hydraulic connection of the solenoid valve;
- Replace the solenoid valve;
- Reconnect the power supply connector;
- Restart R150 by the main switch.

### 9.7.8 Washing the boiling chamber

This is necessary in case of scale formation inside the boiling chamber, if scale cannot be removed either with water or with any practical intervention; operate as follows:

- Switch off R150 by the "Start-Stop" switch;
- Wait for atmospheric pressure to be restored and drain the boiling chamber through valve V02;
- Take the door off and, by a jet of water, remove any deposits from inside the boiling chamber;
- Disconnect the waste suction pipe and insert a hose of about one meter length;

**DANGER**

Open a CLEANER tank after wearing protective gloves and goggles.

- Insert the previously connected hose into the tank;
- Reinsert the door, close discharge valve V02 and restart R150 by the "Start-Stop" switch;
- Wait until all the content of the CLEANER tank is sucked into the boiling chamber;
- Switch off R150 by the "Start-Stop" switch;
- Reconnect the waste suction pipe to R150 and restart the unit by the "Start-Stop" switch;
- Wait for the liquid inside the boiling chamber to reach the working level;
- Switch off R150 by the "Start-Stop" switch;
- Disconnect R150 waste suction pipe and insert a hose of about one meter length;

**DANGER**

Open the NEUTRALIZER tank after wearing protective gloves and goggles.

- Insert the previously connected hose into the tank;
- Start R150 by the "Start-Stop" switch;
- Press the actuating shaft of the feeder solenoid valve EV01 when the pressure in the boiler has reached 2÷300 mbar, until half the content of the NEUTRALIZER tank has been sucked;
- Switch off R150 by the "Start" switch; leave the unit in this state for at least 10 minutes;

- Drain the boiling chamber through valve V02; the liquid can be sent to the concentrate storage tank;
- Connect the waste suction pipe to R150, close discharge valve V02 and restart the unit by the "Start-Stop" switch.

If washing with a different fluid from the fluid to be treated is required, water for example, disconnect the feeding pipe and insert it into a tank with about 20 liters of liquid.



#### **DANGER**

The CLEANER is an acid product, therefore it cannot be used either in the presence of cyanide or chlorine-based products. In this case, call LED ITALIA Technical Service for an alternative solution.

#### **9.7.9 Replacing the freon filter**

Replace the freon filter when maintenance or repair operations have been carried out on the frigorific circuit.

The following material is necessary:

- a dehydration filter.
- a manometer group complete with connecting pipes.
- a vacuum pump.
- R 407C suction and storage unit.

Operate as follows:

- Switch off R150 by the main switch;
- Make sure that all the valves of the manometer group are closed.
- Remove the closing cap of R 407C intake, located on the casing of compressor K01;
- Connect that intake to the LOW intake of the manometer group;
- Connect the gas intake unit to the REF intake of the manometer group.
- Open the LOW and REF valves of the manometer group.
- Start the R 407C suction and storage unit all R 22 is sucked out the frigorific circuit.
- Switch off the unit by setting the cycle switch to OFF.
- Close the REF valve and open the VAC valve of the manometer group; the VAC intake should be free.

At this point maintenance operations or frigorific components replacement can be carried out, since there is no gas in the frigorific circuit; after completing these operations, replace the filter as follows:



- Loosen the closing hubs and remove the freon filter
- Insert the new filter and close the hubs;



After removing the protective caps, insert the new filter and lock it into the frigorific circuit as quickly as possible, to prevent it from absorbing humidity.

- Connect the HIGH intake of the manometer group to the vacuum pump;
- Open HIGH and LOW intakes and close VAC and REF intakes in the manometer group;
- Start the vacuum pump;
- Close the HIGH intake as soon as vacuum has been created and switch off the pump;
- Disconnect the HIGH intake and connect it to R 407C tank;
- Open the HIGH intake and the interception valve of R 407C tank and introduce 1.8 Kg of gas;
- Remove the manometer group and close the compressor intake by its cap.

#### 9.7.10 Replacing the scrapers

The scraping blades need replacing if they do not work properly; operate as follows:



#### **WARNING**

Before replacing the scraping blades, always switch off R150 by the main switch. Wear protective gloves and goggles. Before starting, wait a few minutes after opening the boiler door and air the room.

- Switch off R150 by the main switch;
- Drain the boiling chamber through valve V02 .
- Take the door off;
- Loosen and remove the bolts locking the scraper support collars to the shaft of gear motor M01, see enclosure 9 "Scrapers scheme";
- Extract the scrapers supports;
- Loosen and remove the bolts of the scraping blade;
- Insert a new scraping blade;

- Tighten the scraper lock bolts, reassemble the supports on the gear motor shaft by pushing them downwards so that the scraping blades are slightly inclined;
- Check that they have been inserted correctly when the gear motor is in operation, considering that the blades must scrape the whole surface of the heating bottom evenly.

#### 9.7.11 Replacing the sealing rings

Sealing rings needs replacing when air infiltration is detected into the boiling chamber; operate as follows:

- Pull out the scrapers supports, see § 9.7.10 "Replacing the scrapers";
- Electrically disconnect the gear motor;
- Loosen and remove the bolts of the larger upper flange and extract the scraper group, the shaft and its support;
- Loosen and remove the bolts of the gear motor and extract it;
- Pull out the shaft from the opposite side;
- Remove the spacer placed on the bearing;
- Remove the bearing by means of an extractor;
- Remove the Seger and extract the three rings from their slots;
- Insert the three new rings taking care that the interstices are filled with lubricating oil;
- Reinsert the Seger, the bearing and the spacer;
- Reinsert the shaft into its original location;
- Replace the flange with the gear motor;

**i** Check that the OR sealing ring of the larger upper flange is inserted correctly.

- Electrically connect the gear motor;
- Reinsert the scrapers supports - see § 9.7.10 "Replacing the scrapers";
- Close discharge valve V02, reinsert the door and start R150.

#### 9.7.12 Cleaning the feeder solenoid valve

The feeder solenoid valve needs cleaning in case of blowby with consequent halt of the unit owing to high level in the boiler.

Its cause may be a worn or dirty closing membrane; in the latter case clean the membrane as follows:

- Switch off R150 by the "Start-Stop" switch;
- Wait for atmospheric pressure to be restored in the boiling chamber;

**WARNING**

Disconnect R150 from the power supply by the main switch.

- Electrically disconnect the solenoid valve;
- Remove the pipe at the solenoid valve inlet;
- Unscrew the solenoid valve and work on a work table;
- Remove the 4 fixing screws and open the solenoid valve;
- Clean the membrane with water; if the membrane is damaged, replace the solenoid valve.
- Reassemble the solenoid valve, insert it back into the inlet pipe to the boiler and reconnect the hose to the inlet of the solenoid valve;
- Reconnect the power supply connector;
- Restart R150 by the main switch.

## 9.8 MAINTENANCE DURING NON-OPERATIVENESS

### 9.8.1 Checking the vacuum seal

This check aims at making sure that there is no air infiltration inside the boiling chamber.

Operate as follows:

- Switch off R150 by the main switch when the residual pressure in the boiler is below 200 mbar;
- Leave the unit in stand-by for about 10 hours.

A remarkable raise in pressure indicates a leakage from some connecting component.

Detect the possible leakage and eliminate it.

Small leakage does not cause any problems to the unit operation.

**9.8.2 Emptying the liquid stored onboard the evaporator.**

If the evaporator is not in operation for period above 24 hours, the liquid in the boiler has to be drained and sent to the storage tank - see "Draining the boiler and hydraulic circuit" sect. 10 "Demolition".

The boiler has then to be washed with tap water.

The distillate storage tank, placed onboard, has to be emptied and the content sent to the relating storage tank or discharged in compliance with the laws in force concerning the waste water.

The distillate tank has to be washed with tap water as well.

These maintenances are needed in case of putrescible liquids, containing organic substances, surfactants, mineral oils and in particular liquid coming from manufacturing processes of food field, to prevent bacteria from proliferation and emission in air of foul smell.

**DEMOLITION****10**

PARAGRAPH	PAGE
10.1 FOREWORD .....	79
10.2 DRAINING THE BOILER.....	79
10.3 DRAINING THE DISTILLATE TANK .....	79
10.4 FRIGORIFIC GAS RECOVERY AND RECYCLING .....	79
10.5 CASING DISPOSAL.....	79



## 10.1 FOREWORD

If the unit is irreparably out of order and is taken away from the work area for demolition, some procedures should be followed to achieve compliance with the laws in force concerning waste disposal.

In fact, the dismantled unit is a waste.

The following operations aim at separating the unit components on the basis of their characteristics.

## 10.2 DRAINING THE BOILER

Operate as follows:

- Place a tank of about 20 liter capacity under the discharge valve V02.
- Open the discharge valve V02 and wait for the concentrate liquid to flow out;
- Check that the boiler has been drained through the inspection door;
- Wash the boiler to eliminate residual product;
- Close valve V02;

Dispose of the gathered concentrate in compliance with the law in force.

## 10.3 DRAINING THE DISTILLATE TANK

Operate as follows:

- drain the distillate tank through the drain valve V01 and collect the liquid in a tank of about 20 liter capacity;
- On completion, close the drain valve V01.

Discharge the distillate into the sewers if it falls within legal limits, or dispose of it in compliance with the law in force.

## 10.4 FRIGORIFIC GAS RECOVERY AND RECYCLING

The gas is drawn from the frigorific circuit by means of special equipment. The extraction pump is connected to the special connection placed on the compressor - see § 9.7.9 "Replacing the freon filter".

The extracted gas, about 2 Kg freon R 407C, can be recycled after purification and dehydration.

## 10.5 CASING DISPOSAL

Without the process liquids, the unit casing can be disposed of through authorized companies.





**SPARE PARTS****11****R 150AA1M (5041780)**

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140121	FAN EBM S4E 300-BA01-01 230V 50HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151027	IMPELLER FOR PUMP CEKM 70/5	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150AA1M (5041780)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

## R 150AA2M (5041790)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140131	FAN EBM S4E 300-BA01-01 230V 60HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151086	IMPELLER/3 FOR PUMP CEA-CE-CEK 70	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150AA2M (5041790)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

## R 150AA1V (5041820)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140121	FAN EBM S4E 300-BA01-01 230V 50HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151027	IMPELLER FOR PUMP CEKM 70/5	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150AA1V (5041820)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

## R 150AA2V (5041830)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140131	FAN EBM S4E 300-BA01-01 230V 60HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151086	IMPELLER/3 FOR PUMPS CEA-CE-CEK 70	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150AA2V (5041830)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2



## R 150FF1M (5041800)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140121	FAN EBM S4E 300-BA01-01 230V 50HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151027	IMPELLER FOR PUMP CEKM 70/5	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150FF1M (5041800)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

## R 150FF1V (5041840)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140121	FAN EBM S4E 300-BA01-01 230V 50HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151027	IMPELLER FOR PUMP CEA-CE-CEK 70/5	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150FF1V (5041840)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

## R 150FF2V (5041850)

Item	Description	MU	Q.ty
<b>HEAT PUMP SPARE PARTS</b>			
2110805	FREON PRESSURE GAUGE WIGAM -1+30 BAR	No.	1
2140131	FAN EBM S4E 300-BA01-01 230V 60HZ	No.	1
2160504	DIFFERENTIAL PRESSURE SWITCH KP5 HP 1,8-6BAR	No.	1
2160505	FREON FILTER 4308/3 3/8 FLARE SAE	No.	1
2160539	DOUBLE PRESSURE SWITCH KP15 LP/HP	No.	1
2160601	THERMOSTATIC VALVE 90° TUB-R 407C ORIFICE N.7	No	1
<b>BOILING CHAMBER SPARE PARTS</b>			
1502021	TEMPERED GLASS DOOR WITH GASKET	No.	1
1622912	BUSH FOR SHAFT	No.	1
1622942	SCRAPING BLADE (TEFLON)	No.	2
2110833	DRY VACUUM GAUGE-1<0 BAR ¼" FREON	No.	1
2151976	SOLENOID VALVE Ø132 V7 Z110A 24V CC	No.	1
2220109	OR 221 FPM	No	1
2220112	OR 4087 FPM	No	1
2220117	OR 4225 FPM	No	2
2220185	OR 6212 FPM	No	2
2220207	OR 4287 FPM	No	1
2220513	OIL SEAL VITON 20X42X7 TYPE A	No.	3
2310105	PROOF BEARING 6004-2RS1	No.	1
2650925	SEEGER FOR HORE Ø42 UNI743 7-75	No	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2840197	LEVEL SWITCH R3/8"-PPU-L110-PP50-1MPVC	No.	1
2930202	SEAL GASKET 399-600 ART.120613	No.	1
<b>VACUUM SYSTEM SPARE PARTS</b>			
1403110	KIT OR FPM FOR PUMPS CEA-CEK 70-80-120	No.	1
2151086	IMPELLER/3 FOR PUMP CEA-CE-CEK 70	No.	1
2220505	GASKET FOR PUMP CEA 70/80/120	No	1
2220904	MECHANICAL SEAL FPM FOR PUMP CEA-CEK	No.	1
2310126	BEARING REF. 0023-140-02 6202 2Z	No.	1
2930152	TRANSPARENT SPIRAL PVC PIPE Ø 10 mm	m	1
2930157	TRANSPARENT SPIRAL PVC PIPE Ø 20 mm	m	1
2930159	TRANSPARENT SPIRAL PVC-PIPE Ø25 mm	m	1
2930161	TRANSPARENT SPIRAL PVC PIPE Ø 40 mm	m	1

## R 150FF1V (5041840)

Item	Description	MU	Q.ty
<b>ELECTRICAL BOARD SPARE PARTS</b>			
1406940	PACKING 10 FUSES 10,3X38 1A	No.	1
1407160	PACKING 10 FUSES 10,3X38 4A	No.	1
1408250	PACKING 10 FUSES 10,3X38 2A	No.	1
1409360	PACKING 10 FUSES 10,3X38 25A	No.	1
1512250	BOARD OF STATIC RELAY 3A 250V	No.	1
2820915	RELAY 3 ARR 3J4 A4	No.	1
2821310	TIMER T45 SCHEME 35 B26 24V 50HZ	No.	1
2821324	CYCLIC PROGRAMMER CDC 6000 3 CAMS 24V	No.	1
2821336	TIMER RTM A2 24V 88895103	No.	1
2840321	WHITE LAMP Ø10 24V	No.	1
2840323	RED LAMP Ø10 24V	No.	1
<b>ANTIFOAM METERING SPARE PARTS</b>			
2151936	SOLENOID VALVE Ø144 V4 Z534A 24V CC	No.	1
2674142	MALE-FITTING DN10/12 G 1/4 PP	No.	1
2674143	FEMALE-FITTING DN10/12 G 1/4 PP	No.	1
2674146	FEMALE-FITTING DN10/14 G 1/4 PP	No.	1
2840125	LEVEL SENSOR COD.0760191 PP+FP	No	1
2930165	SILICONE HOSE Ø10X14 mm	m	0,5
2930308	PE-PIPE 12X9 mm	m	2

**ACCESSORIES****12**

PARAGRAPH	PAGE
12.1 AUTOMATIC CONCENTRATE DISCHARGE .....	91
12.2 DISTILLATE pH CORRECTION .....	91





## 12.1 AUTOMATIC CONCENTRATE DISCHARGE

The check panel is preset for the electric connection of the concentrate automatic discharge device. This device consists of a motorized valve V02/M02 and of a cycle timer K10.

The motorized valve V02/M02 replaces valve V02.

The cycle timer K10 must be fitted in the check panel where there is a terminal board to which the motorized valve can be electrically connected.

The system enables the concentrate discharge on completion of the evaporation cycle and the following automatic start of R150.

## 12.2 DISTILLATE pH CORRECTION

The check board is preset for the electric connection of the distillate pH correction device.

The pH meter and the metering pump, installed on the neutralizer tank, are electrically connected to the terminal board, within the check panel - see enclosure 6 "Wiring diagram". The neutralizer minimum level control is also connected to the same terminal board.

The pH electrode must be installed on top of the distillate tank D02 - see enclosure 5 "Vacuum ring scheme" - by using the supplied connections and connected directly to the pH meter, according to the enclosed schemes.

The neutralizer is introduced on the special connection in the suction pipe of vacuum pump G01.

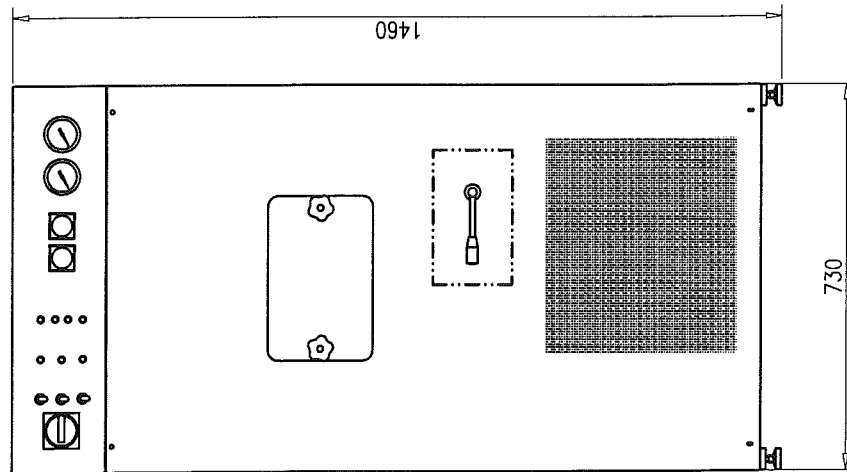
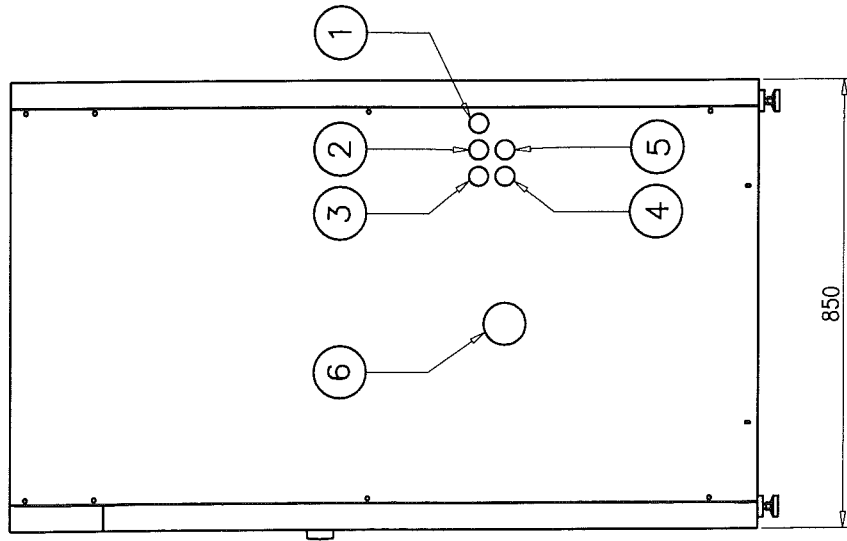
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ENCLOSURE	NO.	CODE
Pre-installation	1	1702035
Clear zones	2	1708140
Unit positioning scheme	3	1708151
Process scheme	4	1708120
Vacuum ring scheme	5	1708160
Wiring diagram	6	1708072
Frigorific circuit lay-out	7	1708172
Data sheet	8	1708190
Scraper scheme	9	1707892

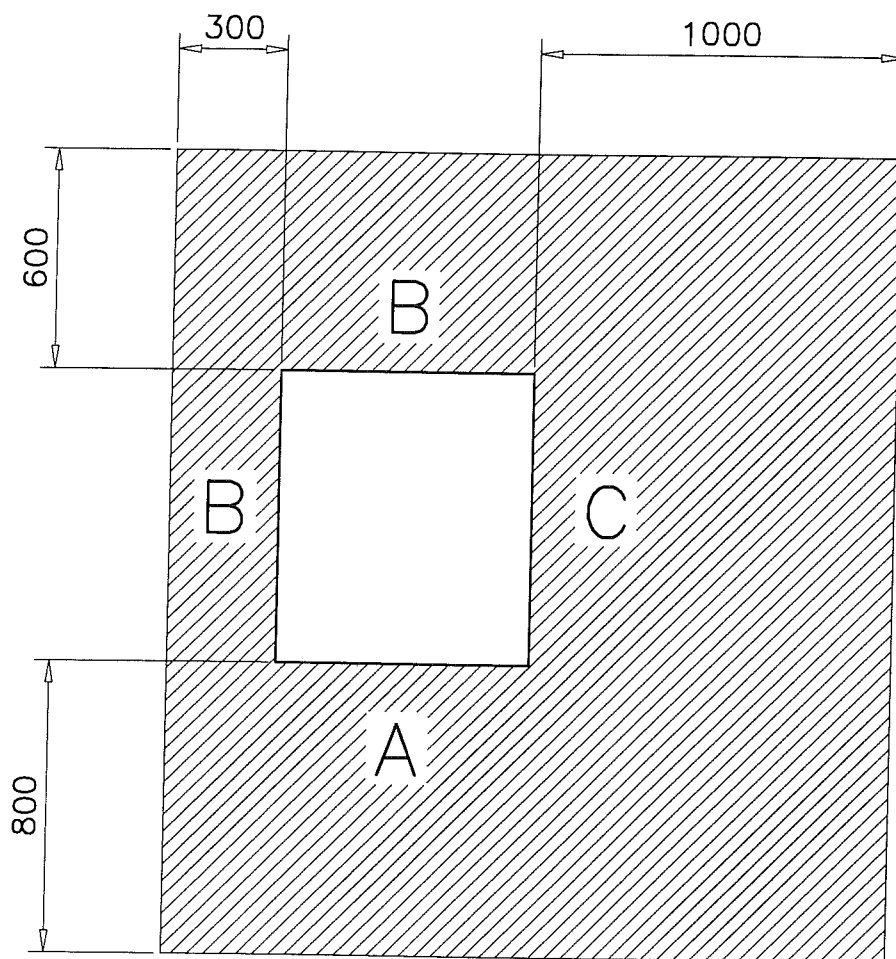


R 150 AA1M  
R 150 AA2M  
R 150 FF1M

POS.	DESCRIPTION	
1	DISTILLATE DISCHARGE	ø20mm
2	ANTIFOAM INLET	===
3	SOLUTION INLET	ø20mm
4	LEVELS OUTSIDE CONTROL INLET	===
5	POWER SUPPLY	===
6	CONCENTRATE DISCHARGE	ø50mm

POWER SUPPLY	230V 1f 50Hz	230V 1f 60Hz
CONSUMPTION	2,9KW 14A	3,4KW 16A
EMPTY WEIGHT	160kg /353lb	
DISTILLATE OUTPUT	7 l/h	8 l/h
	1000Nm <sup>3</sup> /h	1196Nm <sup>3</sup> /h
AIR FLOW	4403gpm	5266gpm
	2500kcal/h	2900kcal/h
HEAT DEVELOPED	9920Btu/h	11508Btu/h

LED ITALIA®	DIS. N.	17-0203-5	DATA	28-05-'99
	DENOMINAZIONE	R 150: PREINSTALLATION	D.S.	S.C.
DESCRIZIONE VARIANTE	DATA	FIRMA	SCALA	1:10
			MAT.	
			ST.FORN.	
			DIMEN.	
			N.COD.	
			TRATT.	
			PESO	



**LED**  
**ITALIA®**

DIS. N. **17-0814-0**

DENOMINAZIONE **R 150: CLEAR ZONE**

DATA **07-02-'97**

DIS. **S.C.**

SCALA **1:20**

MAT.

DESCRIZIONE VARIANTE

DATA

FIRMA

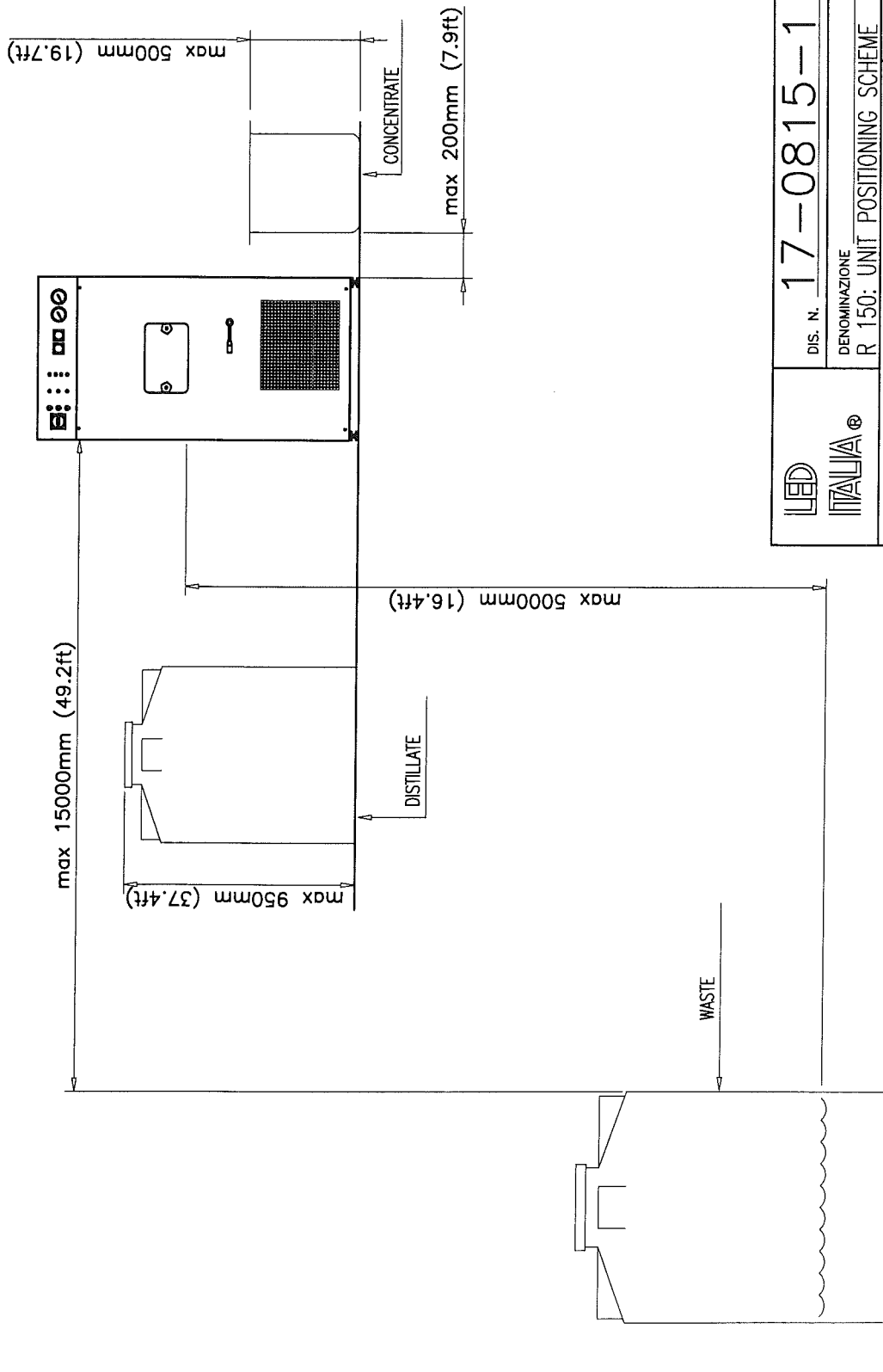
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DIMEN.

N.COD.

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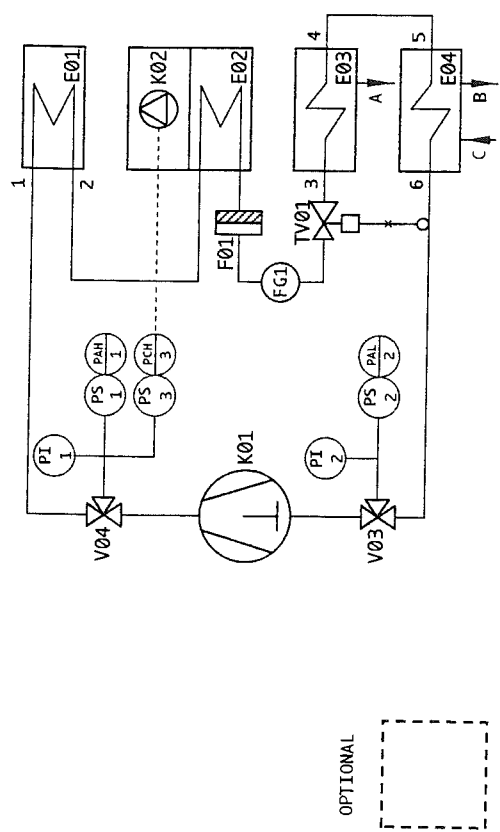
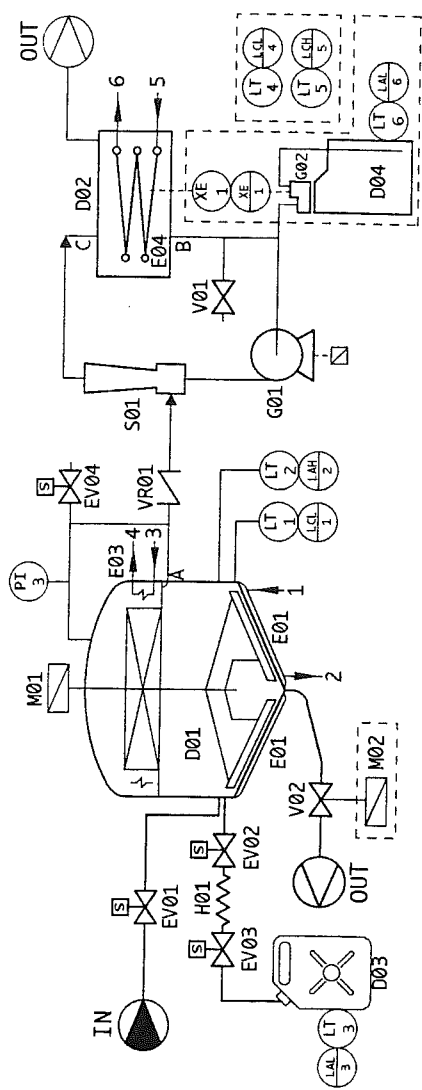
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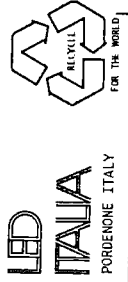
<b>LED</b> <b>ITALIA®</b>	DIS. N.	17-0815-1			DATA	01-03-'99
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	DESCRIZIONE VARIANTE				SCALA	1:20
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			DATA	FIRMA	DIMEN.	
					N.COD.	
					TRATT.	
					PESO	

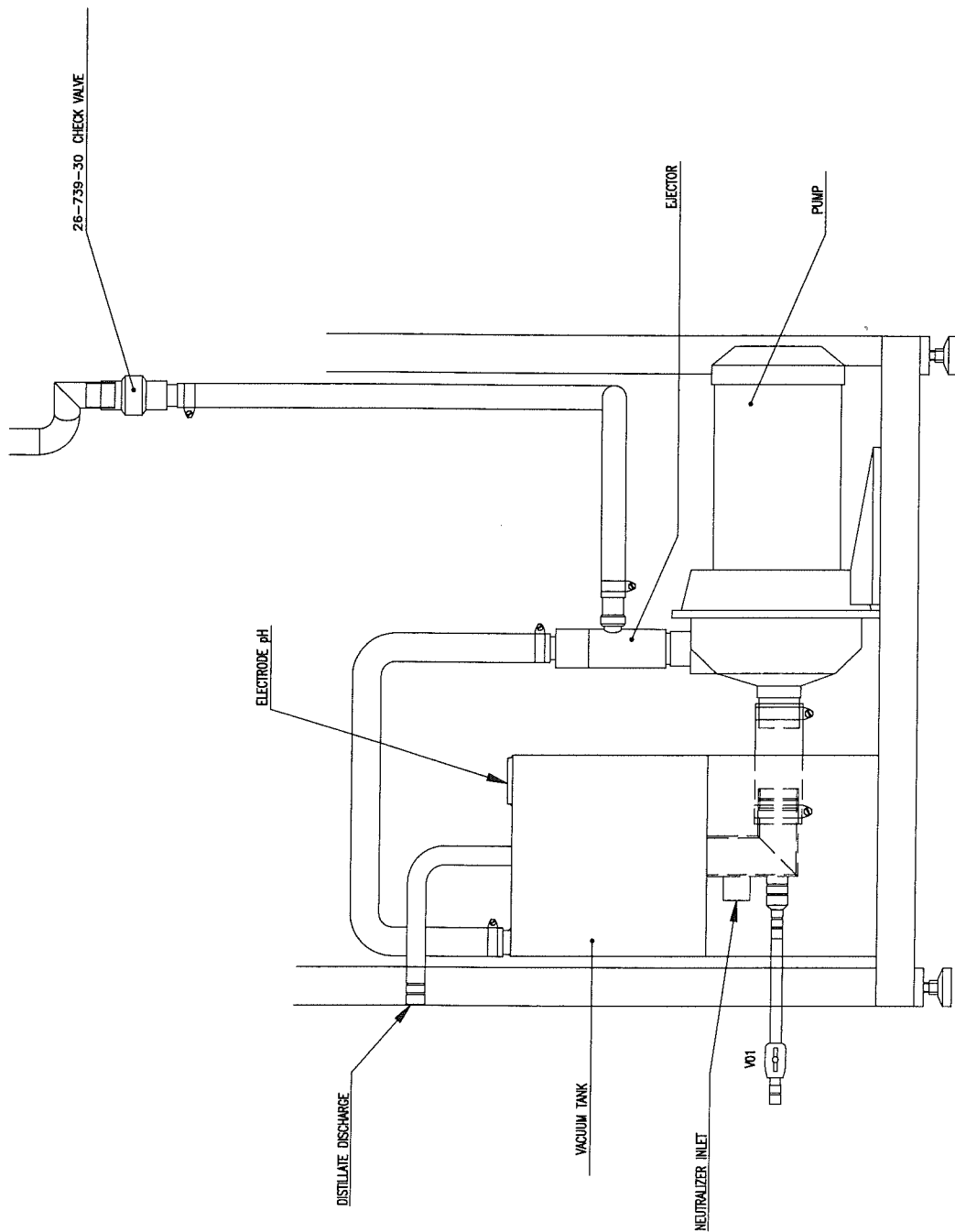
# LEGEND

E01	HEATING JACKET
E02	FINNED HEAT-EXCHANGER
E03	MAIN EVAPORATOR
E04	SECONDARY EVAPORATOR
D01	BOILING CHAMBER
D02	DISTILLATE TANK
D03	ANTIFOAM TANK
D04	NEUTRALIZER TANK
G01	CENTRIFUGAL PUMP
G02	METERING PUMP
H01	HOSE
V01/V02	DRAINING VALVE
V03/V04	COMPRESSOR INTERCEPTION VALVE
VR01	CHECK VALVE
EV01	FEEDER SOLENOID VALVE
EV02/EV03	ANTI-FOAM SOLENOID VALVE
EV04	AIR-BREATHING SOLENOID VALVE
S01	EJECTOR
TV01	EXPANSION VALVE
F01	DEHYDRATOR FILTER
K01	COMPRESSOR
K02	FAN
M01	OPERATING MOTOR OF SCRAPER
M02	OPERATING MOTOR OF VALVE
FG1	SIGHT GLASS
LT	LEVEL TRANSMITTER
LAL	MINIMUM LEVEL ALARM
LCL	WORKING LEVEL CONTROL
LHL	MAXIMUM LEVEL ALARM
PS	PRESSURE SWITCHES
PAL	LOW PRESSURE ALARM
PCH	WORKING PRESSURE CONTROL
PAH	HIGH PRESSURE ALARM
PI	PRESSURE INDICATOR
XE	pH ELECTRODE



VARIATIONS		DATE	REPL. ON	DENOMINATION: R 150 PROCESS SCHEME	
01				CODE No. 17 0812 0	FILE CAD: R 150 Process scheme
02					DATE 15.05.96
03					
04					

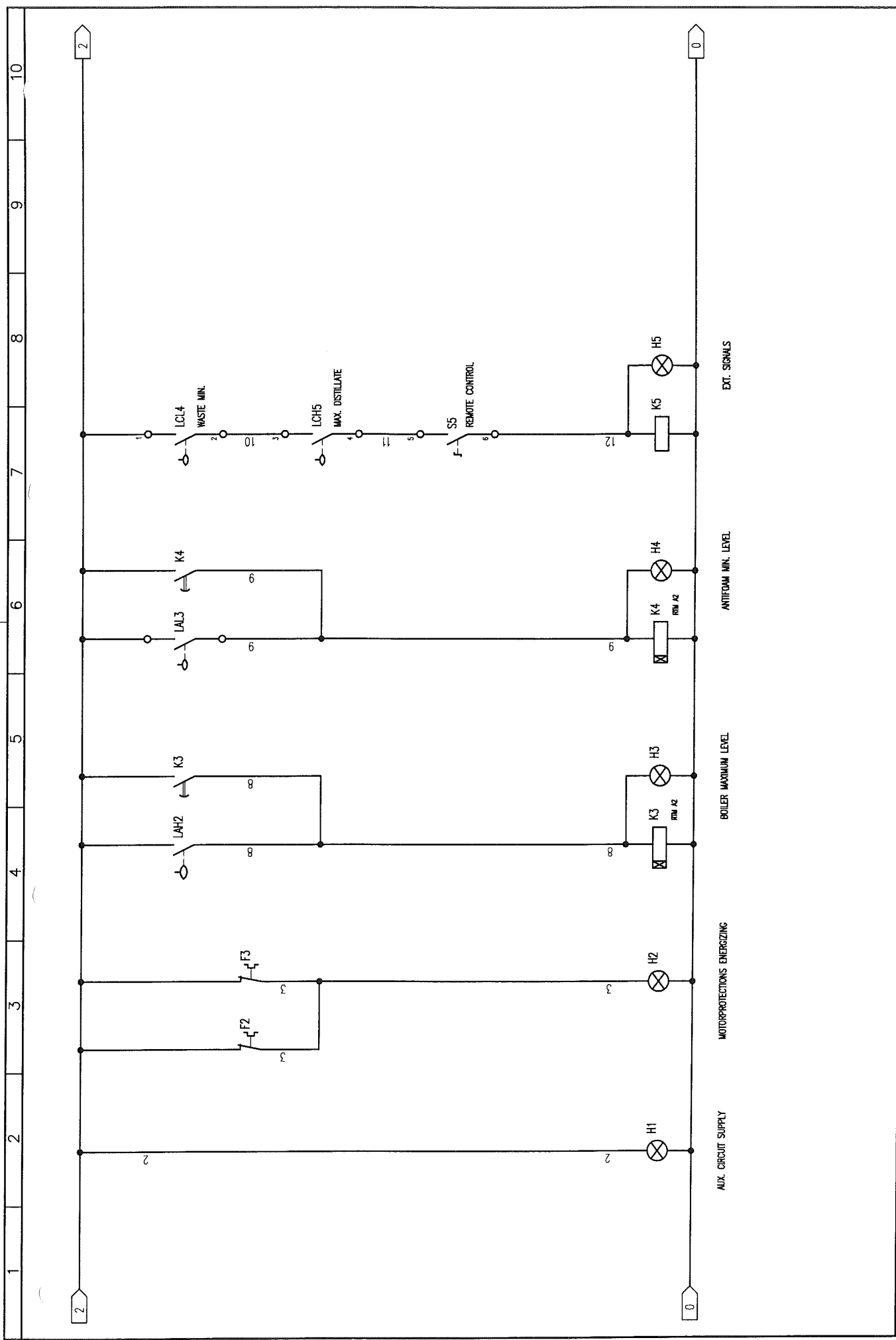






	DIS. N. <b>17-0816-0</b>		DATA 07-02-'97
	DENOMINAZIONE <b>R 150: VACUUM DEVICE</b>		DIS. S.C.
	DESCRIZIONE VARIANTE		SCALA 1:5
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		FIRMA	DIMEN.
			N. COD.
			TRATT.
			PESO

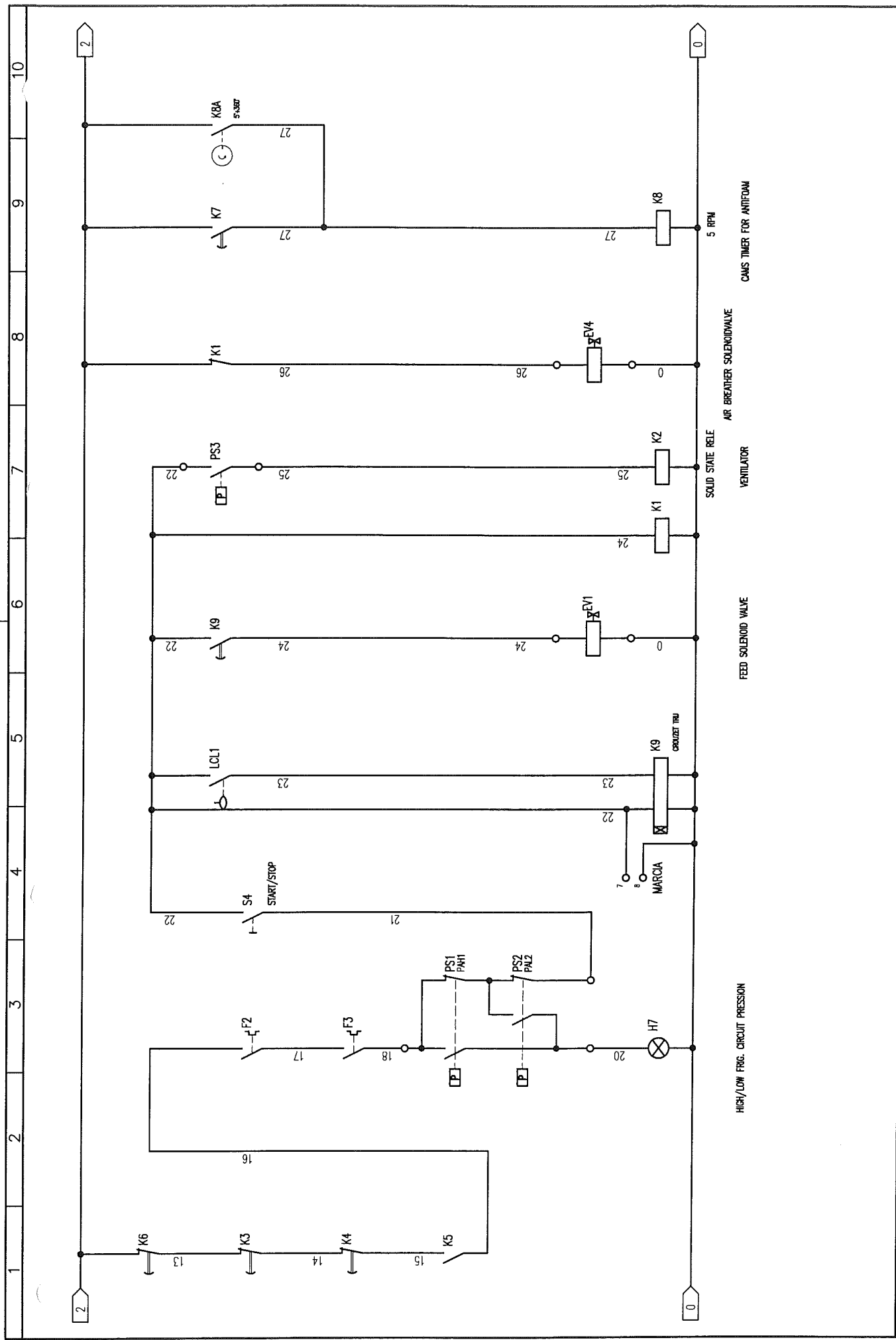






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				PORDENONE ITALY		FOR THE WORLD									
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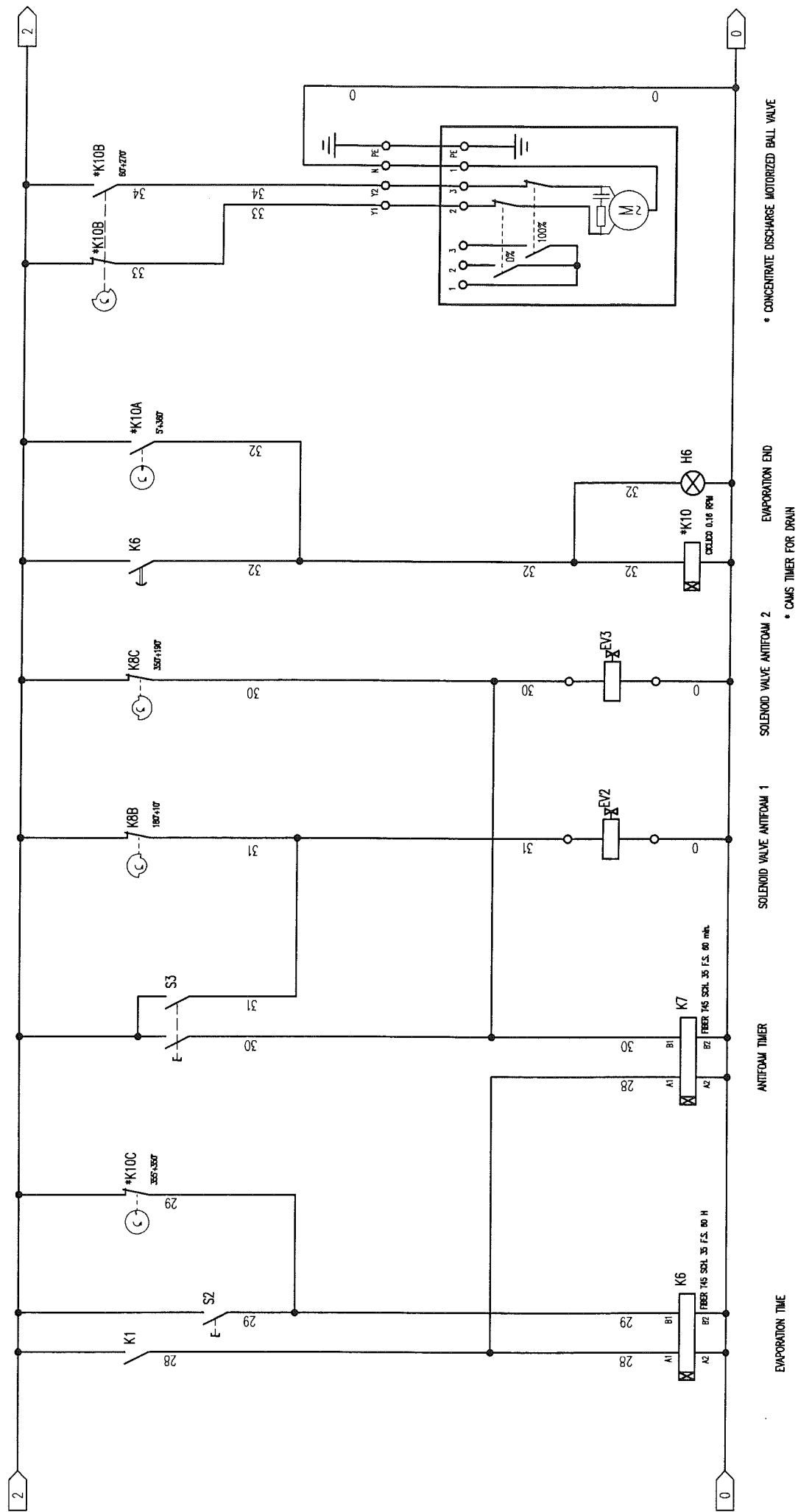
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RECYCLE FOR THE WORLD			

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\* = OPTIONAL

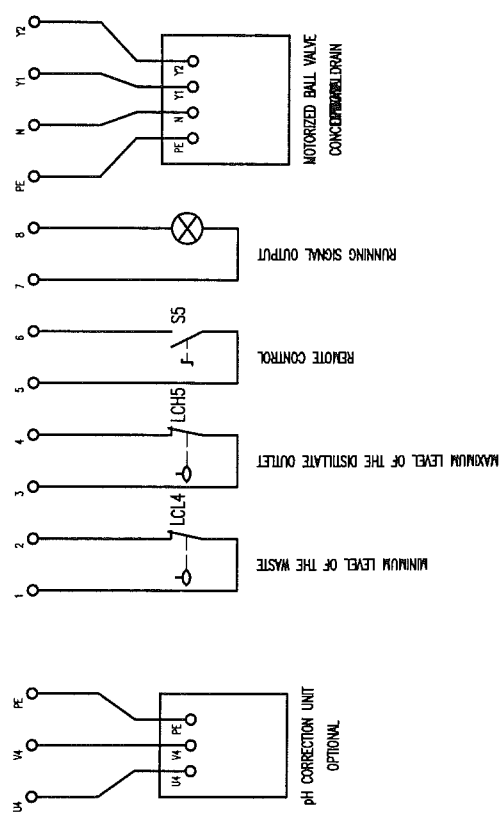
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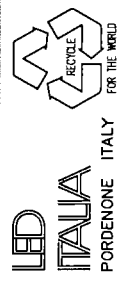
LED  
ITALIA  
PORDENONE ITALY

MODIFICHE		DATA	SOST. IL
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02			SOST. DAL
03			
04			MODULO

# TERMINAL BOARD WIRINGS



MODIFICHE		DATA		DENOMINAZIONE : WIRING DIAGRAM FOR R150			
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02			SOST. DAL				
03			MODULO				
04							
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				DIS.	Z.N.	DATA	14.02.97
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				FOLIO	N	DI N	5
				FOLIO	N	DI N	5



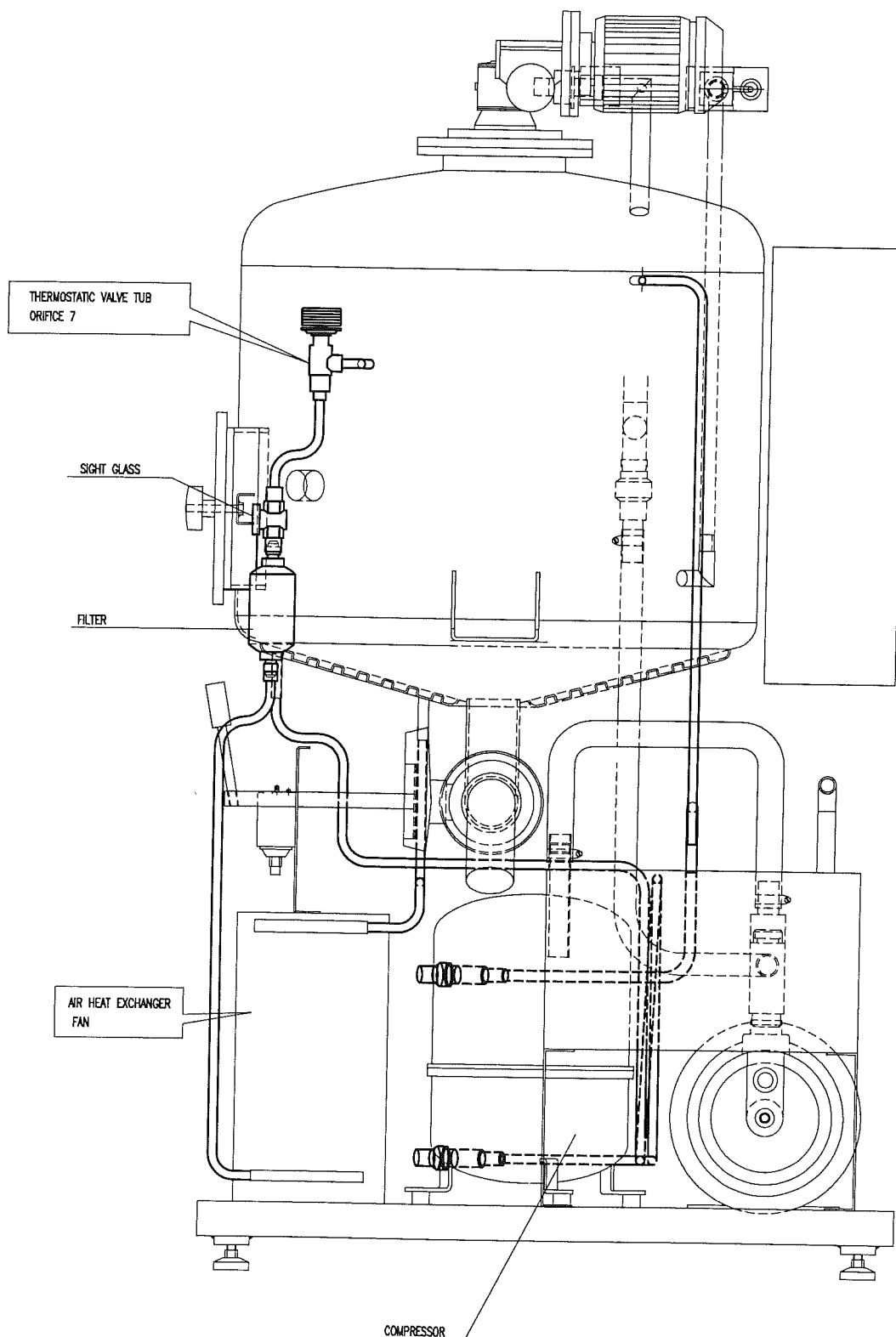
DENOMINAZIONE : WIRING DIAGRAM FOR R150

CODICE N 17.0807.2 FILE CAD : \17\08\07-2 DIS. Z.N. DATA 14.02.97

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LED ITALIA PORDENONE ITALY FOR THE WORLD

FOLIO N DI N 5



<b>LED</b> <b>ITALIA®</b>	DIS. N. <b>17-0817-2</b>			DATA 01-03-'99
	DENOMINAZIONE R 150: FRIGORIFIC CIRCUIT LAY OUT			DIS. S.C.
DESCRIZIONE VARIANTE	DATA	FIRMA	SCALA 1:5	
			MAT.	
			ST.FORN.	
			DIMEN.	
			N.COD.	
			TRATT.	
			PESO	

LED ITALIA SRL  
Via Nuova di Corva 86/D  
33170 PORDENONE

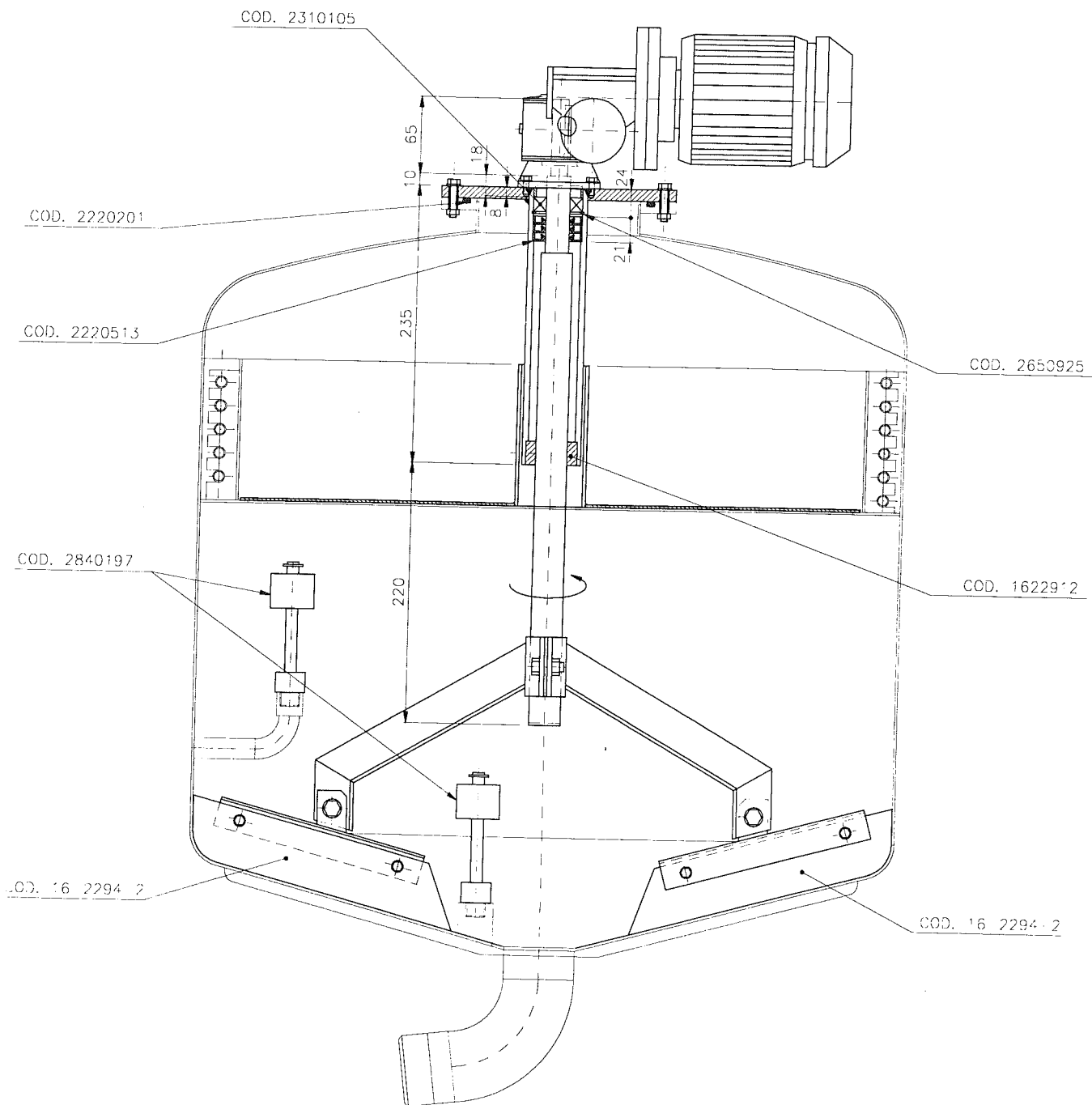
Code 1708190


## DATA SHEET

Type of solution treated \_\_\_\_\_

Evaporator serial number \_\_\_\_\_

DATA						
Distillate output l/24h						
Distillate temperature °C						
Duty cycle sec						
Antifoam pause sec						
Boiler pressure mbar						
Delivery pressure bar						
Distillate conductivity µs/cm						
Distillate pH pH						
Concentrate density kg/dm <sup>3</sup>						
Waste conductivity µs/cm						
Waste pH pH						
Waste density kg/dm <sup>3</sup>						



	DIS. N. <b>17-0789-2</b>		DATA <b>01-03-99</b>
	DENOMINAZIONE <b>SCRAPER ASSEMBLY</b>		DIS. <b>S.C.</b>
DESCRIZIONE VARIANTE	DATA	FRWA	SCALA <b>1:2.5</b>
			MAT. <b>///</b>
			ST. FORN.
			DIVEN.
			N. COD.
			TRATT.
			PT. 50