



# E 2400 AA      VACUUM EVAPORATOR

## DESCRIPTION OF THE PROCESS

The **E 2400 AA** is an evaporator/concentrator which exploits the combined effect of the vacuum technology and heating pump to obtain a distillation at low temperatures.

As can be seen on the flow sheet, the heating pump, by means of a refrigerating circuit, expands and compresses the “freon” gas which supplies both the calories necessary for the evaporation of the waste and the frigories for the condensation of its distillate. The heat transfer to the waste occurs in a tube heat exchanger *E01* outside the flash drum, whereas the steam condenses in the heat exchanger *E03*. The boiling temperature for aqueous solutions is 38-40°C at a residual pressure of about 6 - 7 kPa. In the frigorific circuit an air cooling system *E02* dissipates the exceeding heat resulting from the compression work. The equipment can be provided with an auxiliary water heat exchanger *E05*

operating in case of critical working conditions (i.e. room temperature over 30 °C).

The vacuum is generated by an ejector circuit: the distillate, collected from the tank and pumped through the ejector *S01* by the pump *G01*, generates a depression sufficient to extract both the incondensable gases and the distillate condensed in *E03*.

For a better efficiency of the ejector, the distillate stored in *D02* is cooled (ca. 20°C) by means of a cooling coil *E04*, a deviation on the main circuit of the heating pump provides the necessary frigories.

The waste feeding and drain discharge take place through pneumatic valves. A level control *LT* placed inside the flash drum regulates the feeding valve, whereas the drain valve is controlled by a timer which can be set on the desired concentration level.

## EQUIPMENT'S PARTS

The parts of the equipment are:

Evaporating chamber D01: flash drum. This evaporation chamber is a vertical cylinder, with a 45° conical section bottom and a multicenter-form top supplied with demister for the drops separation. The construction material is austenitic steel AISI 316L (DIN 1.4435).

Approx. dimensions:

- diameter 700 mm, wall height 900 mm, conical section 300 mm.

Heat exchangers E01: tube nest heat exchanger of austenitic steel AISI 316 Ti (DIN 1.4571).

Exchange capacity: 80 kW.

Approx. dimensions:

- diameter 220 mm, length 1300 mm.

Heat exchangers E03: condenser supplied with AISI 316 Ti (DIN 1.4571) austenitic steel U-tubes.

Exchange capacity: 80 kW.

Approx. dimensions:

- diameter 220 mm, length 1150 mm.

Distillate collecting tank D02: cylindrical-vertical tank with cooling coil *E04*, both of austenitic steel AISI 316 (DIN 1.4436).

Exchange capacity: 1.5 kW.

Approx. dimensions:

- diam. 400 mm, height 800 mm, coil length 25m.

Circulation pump G02: centrifugal pump with open impeller, fluxed mechanical seal and engine power about 2 kW, delivery 12 m<sup>3</sup>/h, head 12 mwc.

Material of construction: austenitic steel AISI 316L (DIN 1.4435).

Vacuum pump G01: centrifugal pump with closed impeller, mechanical seal and engine power about 2.2 kW, delivery about 5.5 m<sup>3</sup>/h, head 50 mwc.

Material of construction : austenitic steel AISI 304 (DIN 1.4301).

Ejector S01: Venturi type for vacuum generation.  
Material of construction: polypropylene.

Compressor K01: semihermetic compressor shielded by suitable safety pressure switches as max. and min. pressure switch for freon, differential switch for lubricating oil.

Heat exchangers E02: air cooling system for freon subcooling made of an exchanger with multipass finned pipes and one variable speed fan (0÷1400 rpm).

Exchange capacity: 15 kW.

- Max air flow: 7000 Nm<sup>3</sup>/h.

Min air temperature 5°C, max 30°C.

Heat exchangers E05: auxiliary water tube heat exchangers.

Exchange capacity: 20 kW.

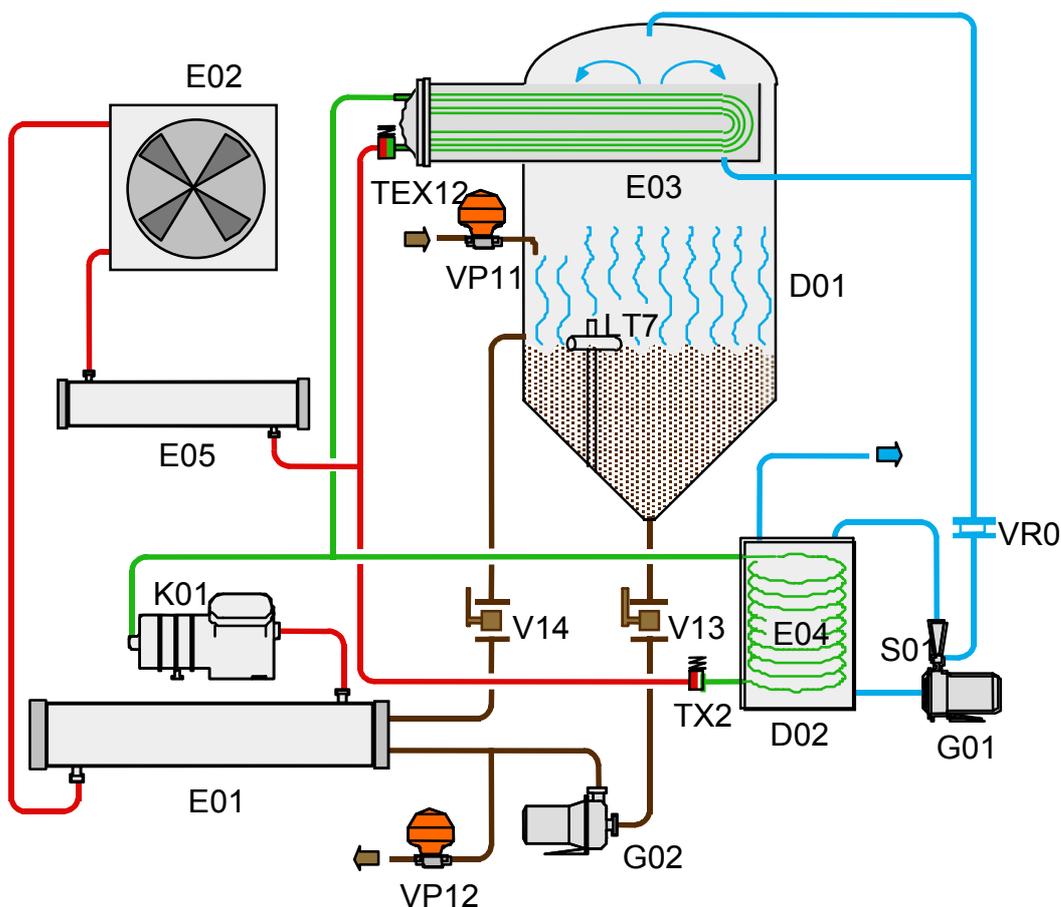
Approx. dimensions :

- diameter 170 mm, length 710 mm.

Frame and piping: the equipment is assembled on an AISI 304 frame (DIN 1.4301). Piping, hoses and accessories are of austenitic steel AISI 316L (DIN 1.4435) and of thermoplastic material (polypropylene).

**NOTE:** Data are referred to a 50 Hz model.

## PROCESS FLOW-SHEET



## INSTRUMENTATION\*

- Evaporating chamber pressure control
- Feeding tank level control (prearrangement )
- Evaporating chamber level control
- Distillate tank level control (prearrangement)
- Concentrate tank level control (prearrangement)
- Drainage timing system
- Distillate conductivity control (prearrangement)
- Density control (prearrangement)
- Distillate pH control (prearrangement)

\* during the executive project the instrumentation may vary according to the process requirements

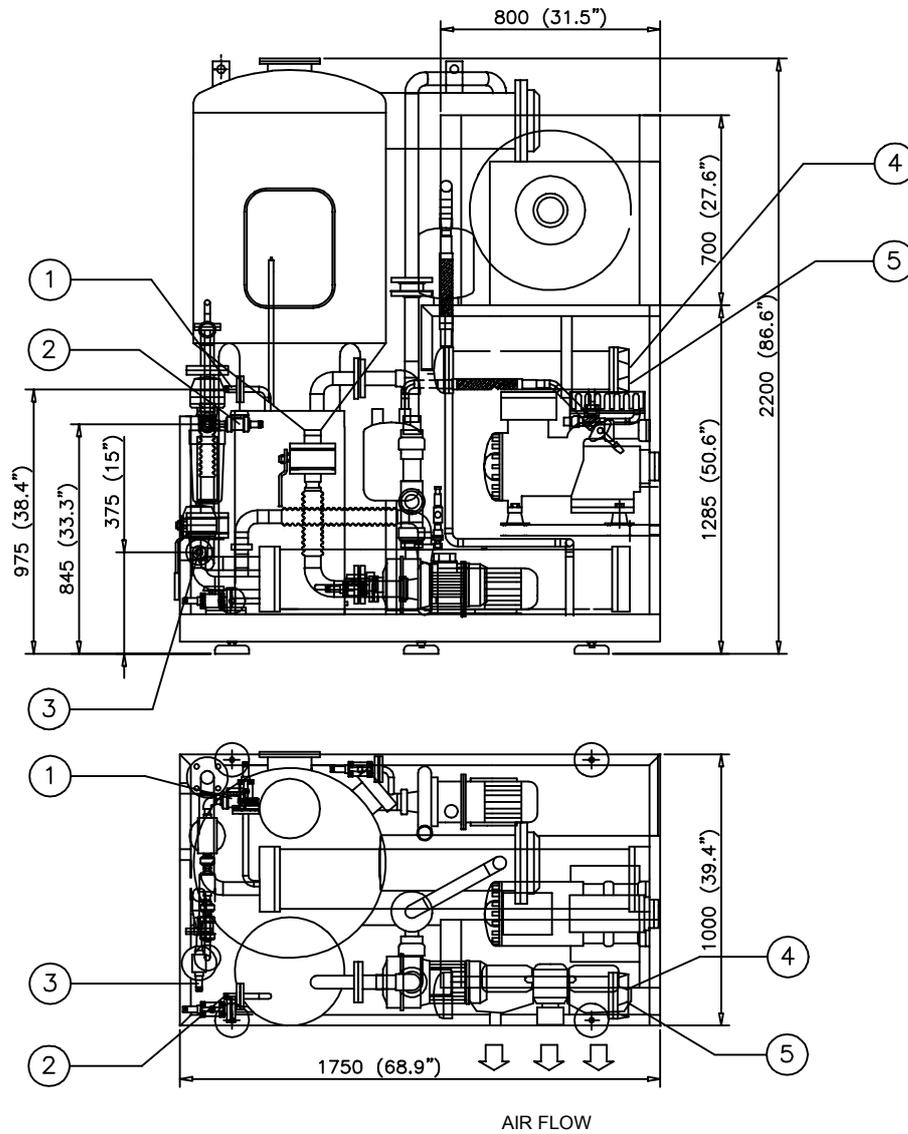
## **ELECTRICAL COMPONENTS**

Centralised IP 54 electrical board supplied with “Siemens” control PLC.  
All automatic features of the equipment are connected to the main board.

“ESA” digital interface supplied with PLC to control alarms, working process and starting/stopping periods. Complied with CEI standard.

## **TECHNICAL CHARACTERISTICS**

<b>TECHNICAL CHARACTERISTICS</b>		<b>E 2400 AA 3</b>	<b>E 2400 AA 4</b>
Frequency	Hz	50	60
Distillate product. max.	l/h ( <i>gal/h</i> )	102.5 (27)	109 (28.9)
with water	l/day ( <i>gal/day</i> )	2450 (648)	2616 (693.6)
Absorbed power	kW	19	23
Voltage	V	400 3F+n	460 3F
Yield (specific consumption)	kWh/l ( <i>kWh/gal</i> )	0,185 (0.7)	0.211 (0.8)
Produced heat	kcal/h ( <i>Btu/h</i> )	10500 (41685)	12600 (50022)
Cooling air	m <sup>3</sup> /h ( <i>gpm</i> )	7000 (30823)	8400 (36988)
Empty weight	kg ( <i>lb.</i> )	800 (1763)	800 (1763)
Width	mm ( <i>in.</i> )	1000 (39.4)	1000 (39.4)
Length	mm ( <i>in.</i> )	1750 (68.9)	1750 (68.9)
Height	mm ( <i>in.</i> )	2200 (88.6)	2200 (88.6)
Noise	dBA	< 80	< 80

**DRAWING**

Ref.	Description	
1	Waste inlet	φ 20 mm
2	Distillate outlet	φ 20 mm
3	Concentrate discharge	φ 20 mm
4*(Option.)	Cooling water inlet	3/4"
5*(Option.)	Cooling water outlet	3/4"

**NOTE:**

All the above mentioned data have to be considered approximate. WATER + LLP reserves the right to change the values during the production without prior notice.