

## INTRODUCTION

The ionic exchange is a “reversible chemical reaction that is produced when an ion from solution is exchanged by other ion with the same sign, which is combined with other immobile solid particle”. This process is usually produced, into the inorganic and organic matter, in nature.

The water has many impurities and pollutants, due to the properties as a solvent and its utilisation in many industrial processes. The mineral salts are dissolved in the water breaking down into ions. Its existence can be no desirable for the normal uses of the water. Also, the increasing interest for the environment has been that many useful treatments are stabilised in order to avoid the deterioration of the water qualities and specially due to the spilling of many pollutants such as industrial products. The exchange ionic is an important option between all possible treatments.

## GENERAL DESCRIPTION

“EII” unit is self-contained unit composed by a panel, where 2 transparent columns are situated in order to put anionic and cationic resins, and also, a spare column, a pump, which supplies the material from the joined pipes. That forms different joined circuits, according to the type of the process that can be slight, taken out the minerals and regeneration. A conductivity meter connected to the exit of the unit allows that the students measure the process and a useful and easy checking of the ionic exchange evolution. Also includes a flow meter.

The unit includes the most usual resins used in the process of softening water (sulphonated styrene, in its sodium form), that have a strong affinity with calcium ionic and magnesium. When these have been eliminated, the solution is also eliminated or can retain the ferrous ion.

The pump with membrane facilitates the circulation of water along the different circuits of the unit: Flow through an anionic column. Flow through a cationic column. Successive flow through anionic and cationic column.



**ISO 9000: Quality Management**  
 (for Design, Manufacturing,  
 Commercialization and After-sales service)



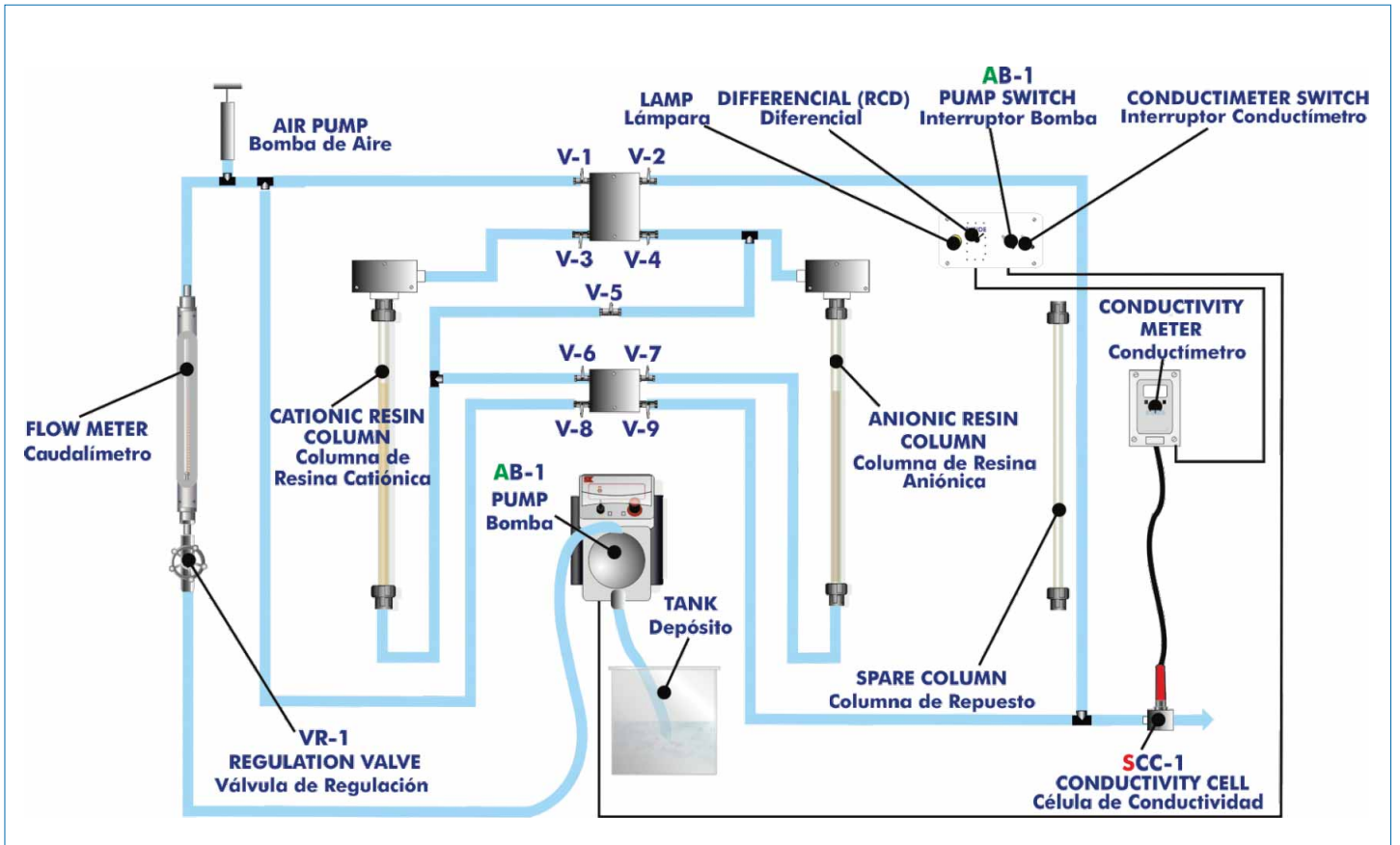
**European Union Certificate**  
 (total safety)



**Certificates ISO 14000 and  
 ECO-Management and Audit Scheme**  
 (environmental management)



**Worlddidac Quality Charter  
 Certificate**  
 (Worlddidac Member)



SPECIFICATIONS

Self-contained unit either single bed water softening or double bed system for demineralisation.

Anodized aluminium structure and panel in painted steel.

Main metallic elements in stainless steel.

Diagram in the front panel with similar distribution to the elements in the real unit.

Exchange capacity of the different materials, as resins and used reagents, as well as the problem water.

Use of simple or double bed for demineralisation.

4 tanks (treated water, demineralized water, hydrochloric acid and sodium hydroxide).

Pump diaphragm type.

Flow meter 0-10 l./h, resistant to hydrochloric acid.

2 transparent vertical columns for the anionic and cationic resins, volume: 0.16 l.

1 spare column.

Valves and pipes circuit.

Conductivity meter (with conductivity cell):

Scale: 0 - 10 mS.

Operating temperature: 0 to 50°C.

Accuracy +/-2%.

Typical commercial anionic and cationic resins.

Switch board.

Cables and accessories, for normal operation.

Manuals:

This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & practices manuals.

## EXERCISES & PRACTICAL POSSIBILITIES

- 1.- Study of general techniques of ion exchange.
- 2.- Familiarization with the operation modes of column ionic exchange.
- 3.- The exchange capabilities of different resins materials.
- 4.- Water softening using a cationic resin.
- 5.- Hard water softening ( $H^+$ ).
- 6.- Hard water softening ( $OH^-$ ).
- 7.- Resin regeneration efficiency ( $H^+$ ).
- 8.- Demineralisation.
- 9.- Demineralisation efficiency.
- 10.-Determination of saline ions concentration.
- 11.-Separation of  $Ni^{2+}$ ,  $Zn^{2+}$ .
- 12.-Hard water softening (sodic resin).
- 13.-Resin regeneration efficiency ( $Na^+$ ).
- 14.-How to operate the conductivity meter.
- 15.-Regeneration efficiency of a softening system.
- 16.-Demineralisation using two-bed exchange.

## REQUIRED SERVICES

- Electrical supply: single-phase, 220V./50Hz or 110V./60Hz.
- Water supply for filling the tanks or deposits.

## DIMENSIONS & WEIGHT

- Dimensions .: 1200 x 500 x 1000 mm. approx.  
(47.24 x 19.68 x 39.37 inches approx.)
- Weight : 50 Kg. approx.  
(110.2 pounds approx.)

## RECOMMENDED ACCESSORIES

- Chemical products: hydrochloric acid, solidum hydroxide, sodium chloride.
- Deionized water.
- Chronometer.

## RECOMMENDED CHEMICAL REAGENTS

- Calcium acetate ( $CaAc_2$ ).
- Chlorhidric acid ( $HCl$ ).
- Methylene ( $CH_4$ ).
- Sodium acetate ( $CH_3COONa$ ).
- Calcium Chlorine ( $CaCl_2$ ).
- Copper sulphate ( $CuO_4S$ ).
- Nickel chloride ( $NiCl_2$ ).
- Barium Chlorine ( $BaCl_2$ ).
- Magnesium sulphate ( $MgSO_4$ ).
- Sodium hydroxide ( $NaOH$ ).
- Ammonia (solution) ( $NH_3$ ).
- Sodium Chlorine ( $NaCl$ ).
- Silver nitrate ( $AgNO_3$ ).
- Trietanolamine ( $C_6H_{15}NO_3$ ).
- Calcium carbonate ( $CaCO_3$ ).
- EDTA patron ( $C_{10}H_{16}N_2O_8$ ).
- Phenolphthalein, indicator ( $C_{20}H_{14}O_4$ ).
- Methyl orange, indicator ( $C_{14}H_{14}N_3NaO_3S$ ).
- Ethanol ( $C_2H_6O$ ).
- Ammonium hydroxide ( $NH_4OH$ ).
- Ammonium chloride ( $NH_4Cl$ ).
- Deionized water.
- Bromopyrogallol red, indicator ( $C_{19}H_{10}Br_2O_8S$ ).
- Eriochrome T, black indicator ( $C_{20}H_{13}N_2NaO_5S$ ).
- Murexide, indicator ( $C_8H_8N_6O_6$ ).

\* Specifications subject to change without previous notice, due to the convenience of improvements of the product.



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