

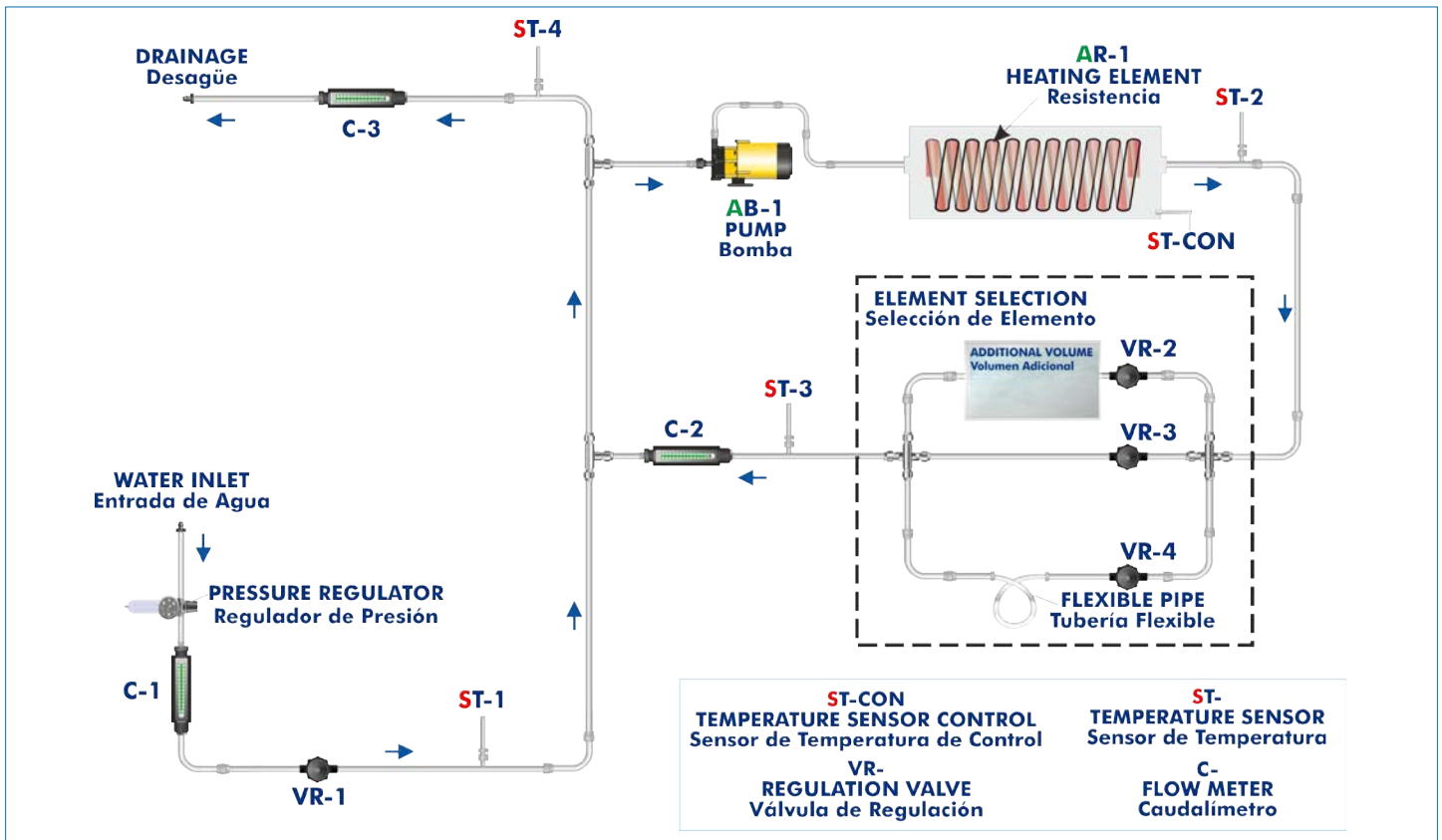
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Products  
 Products range  
 Units  
 9.-Thermodynamics & Thermotechnics



Electronic console

PROCESS DIAGRAM AND UNIT ELEMENTS ALLOCATION



**ST-CON**  
 TEMPERATURE SENSOR CONTROL  
 Sensor de Temperatura de Control

**ST-**  
 TEMPERATURE SENSOR  
 Sensor de Temperatura

**VR-**  
 REGULATION VALVE  
 Válvula de Regulación

**C-**  
 FLOW METER  
 Caudalímetro

## INTRODUCTION

The kinetic chemistry treats the chemical reactors calculation and study, based on experimental kinetic models and on the energy and mass balance equations. Basically, it consists in determining the operation size and time to get the final product desired quantities. So, one of the parameters to take into account will be the residence time, which is the requirement for a fluid to complete its input cycle, permanence and output from a system.

The Recycle Loops Unit "TRLB" is developed by the EDIBON technical team to demonstrate the principles of the recycle loops basic operation. In addition, several practices are developed for the thermodynamic analysis of the parameters that affect the system.

In the "TRLB" unit an input water flow rate is thermally conditioned by a recycle loop to get an output water flow rate in the desired terms. The hot water recycle loop is a type of application used in several chemical and industrial installations with the purpose of controlling the outlet temperature with changes inside the loop.

The recycle loop consists of a heating element mounted in a pipe to carry out the heating of the water that goes through it.

## GENERAL DESCRIPTION

The Recycle Loops Unit "TRLB" has been designed to demonstrate, both visually and experimentally, what a recycle loop is and how it works. It has many teaching applications, among them the performance of mass and energy balances under stable and unstable state conditions.

In this unit an inlet water flow is thermally conditioned in a recycle loop to obtain an outlet water flow that fits the desired conditions.

The unit consists of a tube that carries water from the cold water supply to a drain and a loop connected between the supply and the drain connections. This recycle loop includes a pump and a heating element to increase the water temperature inside the loop.

Different volumes of the recycle loop can be selected by just opening the corresponding valve.

The residence time of each configuration can be studied. The loop flow variation has important didactic properties. The recycle loop is regulated through that variation.

The water temperature at the inlet, outlet and inside the loop are measured with temperature sensors. The water flows in the corresponding points are measured with flow sensors.

## SPECIFICATIONS

Bench-top unit.

Anodized aluminum structure and panel of painted steel.

Main metallic elements of stainless steel.

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

Water inlet tube, including:

A "J" type temperature sensor.

A flow meter.

A valve to regulate the water inlet flow to the circuit (0-3 bars) to avoid overpressures along the circuit.

A regulation valve.

Recycle loop, where the water that flows through the periphery of the test tube is heated. It consists of:

Hot water impulsion pump.

Heating element of 2000 W. It includes a protection thermostat.

Three water regulation valves to select the recycle loop and regulate the water flow.

Three different volumes of recycle loop: additional volume, rigid pipe and flexible pipe.

Two "J" type temperature sensors.

One flow meter.

Water outlet pipe, including:

A "J" type temperature sensor.

A flow meter.

Electronic console:

Metallic box.

Temperature sensors connectors.

Digital display for the temperature sensors.

Selector for the temperature sensors.

Pump regulator.

Electrical heating element controller.

Cables and Accessories, for normal operation.

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

## EXERCISES AND PRACTICAL POSSIBILITIES

1.- Understanding the meaning of Water Recycle Loop.

Mass balances of steady state:

2.- Mass balance in the recycle loop in stationary regime with different water proportion in recirculation and different loops.

Heat balances of unsteady state:

3.- Determination of the recycle loop system response faced, when the heating element is switched on, at different flow rates and different loops.

4.- Determination of the recycle loop system response faced, when the heating element is switched off, at different flow rates and different loops.

Heat balances of steady state:

5.- Thermal balance in the recycle loop in stationary regime with different water proportions in recirculation and different loops.

Additional practical possibilities:

Mass balances of steady state:

6.- Demonstrating that whatever the recycle rate, the inlet flow rate equals the outlet flow rate.

Heat balances of unsteady state:

7.- Study of the effect of change the inlet flow.

8.- Study of the effect of recycle with no through flow.

Heat balances of steady state:

9.- Checking the variation of the outlet temperature, with the heating element switched on and a fixed water flow at the inlet, caused by different recycled flow.

10.- Determination of the heat quantity absorbed in the recycle loop.

11.- Use of the steady flow energy equation for the overall system.

12.- Use of the steady flow energy equation for different points of the system.

13.- Study of the system response when the recycle flow is changed.

14.- Study of the system response when the inlet-outlet flow is changed.

15.- Study of the system response when the recycle volume is changed.

16.- Study of the system response when the heating element power is changed.

## REQUIRED SERVICES

Electrical supply: single-phase, 220V./50Hz or 110V./60Hz.

Water supply and drainage.

## DIMENSIONS & WEIGHTS

TRLB:

Unit: -Dimensions: 1110 x 630 x 300 mm. approx.  
(43.70 x 24.80 x 11.81 inches approx.).

-Weight: 40 Kg. approx.  
(88 pounds approx.).

Electronic console: -Dimensions: 490 x 330 x 310 mm. approx.  
(19.29 x 12.99 x 12.20 inches approx.).

-Weight: 12 Kg. approx.  
(26.4 pounds approx.).

## AVAILABLE VERSIONS

Offered in this catalogue:

- TRLB. Recycle Loops Unit.

Offered in other catalogue:

- TRLC. Computer Controlled Recycle Loops Unit.

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



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