ElettronicaVeneta

CATALOGUE No. 24-B

CHEMICAL ENGINEERING

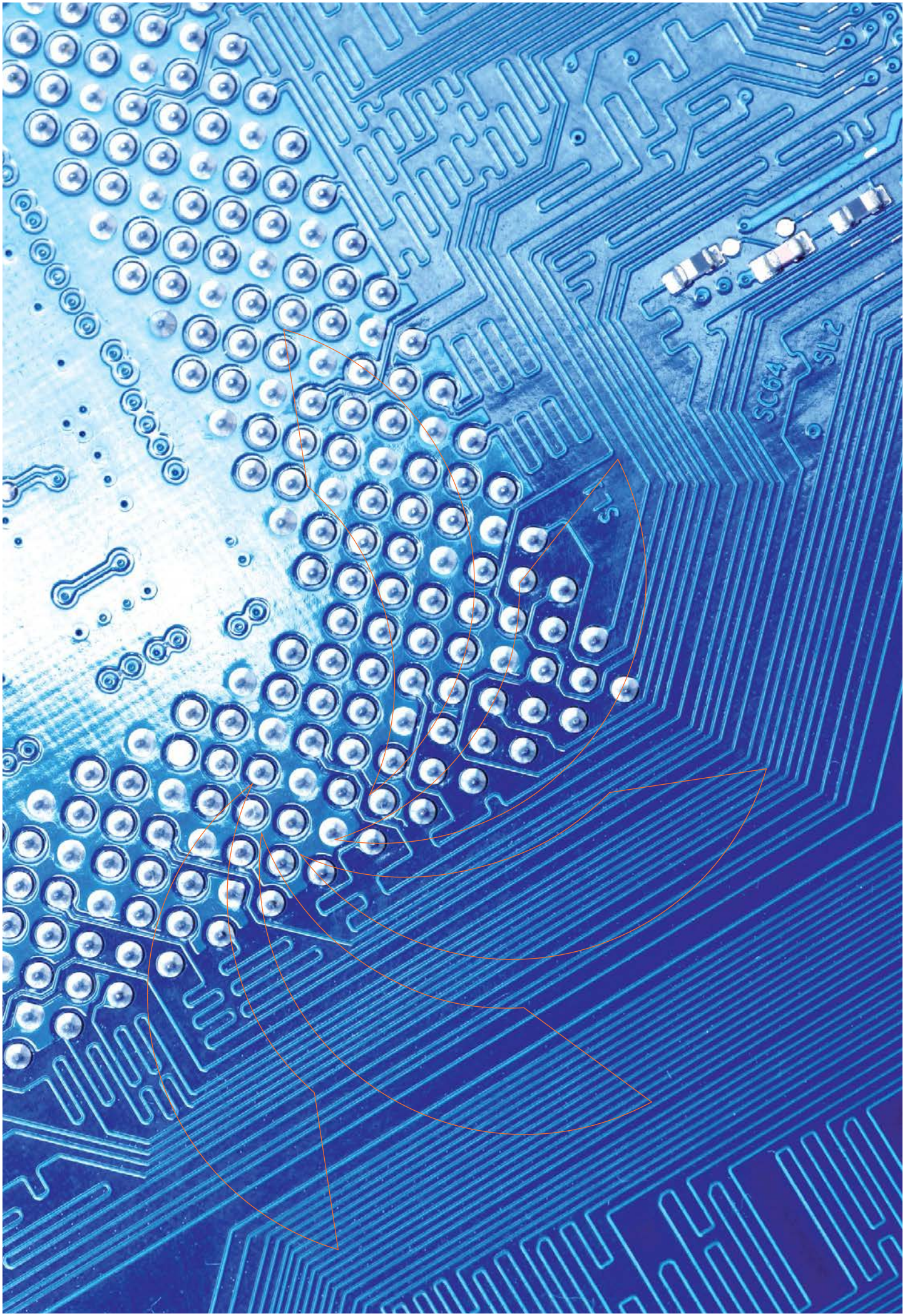
ElettronicaVeneta

CATALOGUE No. 24-B

CHEMICAL ENGINEERING

Chemical Engineering
export@elettronicaveneta.com
www.elettronicaveneta.com

24B-E
Rel. B19

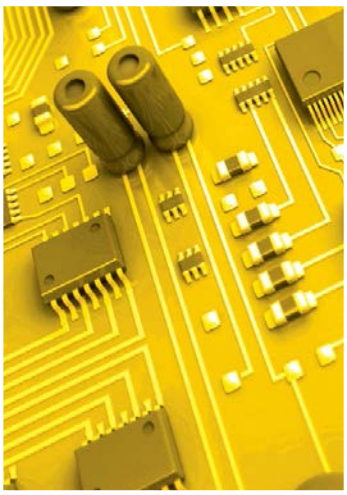

SC64
SL2

CHEMICAL ENGINEERING
CATALOGUE No. 24-B

INDEX

Note: The catalog is constantly updated. Please send any suggestion you have to export@elettronicaveneta.com. We would also like to remind you that, due to the continuous technological upgrades, the described products may be subjected to design and/or technical modifications. Nevertheless, we guarantee that the educational content of our equipment remains unchanged.

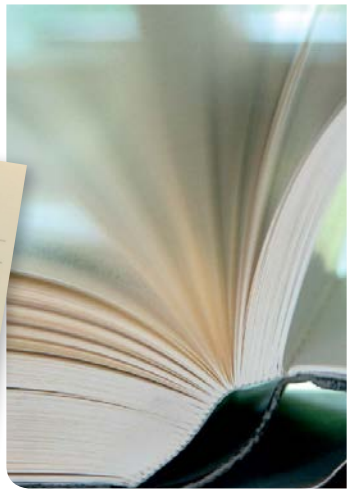
GENERAL INTRODUCTION



ELETTRONICA VENETA S.p.A. has been designing and manufacturing educational equipment since 1963. This equipment, covering the different fields of technology, fulfils two important educational objectives:

- to facilitate the learning process of the student by means of real systems which illustrate practically the important aspects of the theory learned in the classroom.
- to simplify the work of the teacher enabling the demonstration of the real, practical applications of the theory learned.

Increasing the efficiency of the didactic process improves and simplifies the integration of young students into the world of employment and justifies the material and human investments made in schools throughout the world.



ELETTRONICA VENETA S.p.A. operates on an international level and takes into consideration the training programmes and cultures of each specific country. In order to meet different requirements, we offer flexible systems which ensure maximum compliance with the latest technologies, technological advances and the professional profile requirements of local industry.

The proposed laboratories and training equipment are suitable for regular school education as well as ongoing post-diploma training courses and professional re-qualification.

Our training equipment covers most of the technological sectors included in the training programmes of vocational schools, technical institutes and universities, both national and international.

ELETTRONICA VENETA S.p.A. headquarters is located in the green fields of the Veneto region, not far from Venice, and constitute a centre for equipment design and development suited to the training needs of all professional and technical profiles. The modern premises integrates R&D laboratories, a production plant and a fully equipped teacher training centre.

The integration of these efficient training systems into local school structures ensures high-quality, state-of-the-art training programmes which meet the diverse professional expectations of the student and the technological requirements of industry and research within their specific local contexts.

The ISO 9001 (Quality System Certification) obtained in 1998 and updated in application of the latest edition of the International Standard, is further testament to the quality-driven organisation of **ELETTRONICA VENETA S.p.A.** aimed at providing top standard equipment, training and service.

INTRODUCTION

The plan of investments in research and human resources started in 1984 and the intensive collaboration with Italian and foreign universities and with chemical, pharmaceutical and food-farming industries have enabled Elettronica Veneta S.p.A to introduce their renewed line of products for chemical engineering, with a right pride.

Products have been designed for their use in the technical institutes and universities that intend to enrich their equipment with pilot plants and laboratory apparatuses for implementing an up-to-date and complete testing programme.

All the products have been designed and manufactured according to some principles considered essential by our company:

- faithful reproduction of the industrial design, although on a reduced scale;
- use of industrial instruments (sensors, transducers, actuators) of the best trademarks available on the market (ABB, Foxboro, E&H, etc...);
- particular care for the quality of materials for ensuring long lifetime and industrial standard with great use of stainless steel (supporting frameworks, tanks, pipes and valves) and of borosilicate glass (tanks and columns);
- application of the most advanced technologies of plant supervision and control;
- wide choice of sizes and of control types (manual, automated and computerized versions).

Thanks to these important characteristics our plants are also suitable for research and for small productions, consequently they are used in leading companies of chemical, pharmaceutical and food-farming sectors.
All the plants (excepting the desk-type versions) are mounted on a wheeled framework of stainless steel for an easier shiftment and they are equipped with switchboard including automatic differential switch.

Most plants shown in this catalogue are available in three versions:

- manual;
- manual with data logging;
- automated.

The models concerning the version with data logging are identified by the suffix "c", whereas the models concerning the automated version are identified by the suffix "a".
For instance, as regards the distillation unit, the mod. UDC/EV concerns the manual version, the mod. UDCc/EV concerns the computerized version, whereas the mod. UDCa/EV concerns the automated version.

The manual version is not equipped with any automation system and it cannot be connected with any PC; process parameters can be read directly on the instruments included in the plant and on the control board and they can be controlled completely in manual way.

The computerized version too does not show any automated system, but its instruments are equipped with analog-output transmitter; an industrial data acquisition module, available in the switchboard, enables to acquire the process parameters merely with the connection of the serial cable of the equipment with a PC where the supervision software has been installed. Further details on supervision software will be available in the respective section of this catalogue.

The automated version is provided with all the functions of the computerized version, but it is also equipped with one or more microprocessor PID controllers that enable to control some process parameters automatically.

Supervision is carried out by a PC via a SCADA software and it enables the operator to work with the plant without moving from his/her own workstation. Further details on supervision software will be available in the respective section of this catalogue. Besides being recommended for the study of chemical engineering, automated versions are particularly suitable also for the study of process control, as they represent an application to an actual process.

This catalogue classifies the plants according to unit operations and each section subdivides some models furtherly into 2 categories: "Medium" and "Large".
"Large" category includes the plants of bigger size and, consequently, of higher price; whereas "Medium" category includes the plants of smaller size.


www.elettronicaveneta.com

24-B

DISTILLATION

Introduction:

The distillation plants included in this section have been subdivided into two categories:

- **batch distillation plants;**
- **continuous distillation plants.**

These categories include some types of plants with particular construction characteristics.

The plants mod. BDB/EV and BDC/EV are relatively cheap and they are available only in manual version and with essential instruments, but they enable to elaborate on the issues of distillation easily.

The versions available for the line mod. UDB/EV and UDC/EV are manual, manual with data logging and automated; the units of these lines use process instruments of industrial type.

The versions available for the line DIS/EV and DC/EV are manual, manual with data logging and automated; the units of these lines use process instruments of industrial type and, from the dimensional point of view, they include the biggest plants of this section.

Needless to say that all the continuous distillation plants can also be used as batch distillation plants.

This section is also enriched with a simulator mod. DCS/EV: using air and water as process fluids, this simulator enables to study and observe the fluid dynamics of the trays of a distillation column.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

DISTILLATION

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

BATCH DISTILLATION PILOT PLANT

Mod. BDB/EV

INTRODUCTION

This distillation column is completely of glass and it consists of a reboiler, of a sieve-tray column and of a condenser with reflux head and reflux valve.
The distillate is collected into a glass tank after being cooled by a heat exchanger.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) at atmospheric pressure, versus the variation of the following operational parameters:
  - reflux ratio
  - feeding composition
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Distillation column of borosilicate glass, DN50, h = 600 mm, with 7 sieve trays
- Reboiler of borosilicate glass, with capacity of 5 l, provided with electric heater of 1600 W
- Condenser of borosilicate glass with reflux head
- Tank of borosilicate glass for the collection of distillate, with capacity of 1 l
- Tube-in-tube heat exchangers of AISI 304 stainless steel
- 6 digital thermometers with sheath of stainless steel
- Thyristor unit for controlling the power of the reboiler electric heater
- 2 programmable timers for the control of reflux ratio
- Variable-area flow meter of glass and stainless steel, range: 20 to 200 l/h
- Electric switchboard IP55, complying with EC standards
- Emergency button

Power supply:	230 Vac 50 Hz single-phase - 2 kVA (Other voltage and frequency on request)
Dimensions:	1500 × 650 × 2200 mm
Weight:	80 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL ITEMS

- U-tube manometer for measuring the pressure drops in the column
- Distillation column of borosilicate glass, DN 50, with bubble cap trays
- Distillation column of borosilicate glass, DN 50, with Raschig ring packing

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

BATCH DISTILLATION
PILOT PLANT

Mod. UDB/EV manual
Mod. UDBc/EV manual with data logging
Mod. UDBa/EV automated

INTRODUCTION

The distillation column is made completely of glass and it consists of a reboiler, of a bubble cap tray column and of a condenser with reflux head and valve.
The distillate is collected into a glass tank after being cooled by a heat exchanger.
The automated version mod. UDBa/EV is equipped with PID controller: using two pneumatic valves, this controller can automatically control the flow rate of condenser cooling water and the vacuum degree of the plant.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) at atmospheric pressure, versus the variation of the following operational parameters:
  - reflux ratio
  - reboiler heating power
  - bottom composition
  - vacuum degree
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays
- Automatic flow and pressure control by PID controller (for mod. UDBa/EV, only)
- Plant supervision by P.C. (for mod. UDBa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UDB/EV

- Framework of AISI 304 stainless steel with castors
- Distillation column of borosilicate glass with 7 bubble cap trays, DN50, h = 600 mm
- Reboiler of borosilicate glass, with capacity of 5 l, including electric heater of 1600 W
- Condenser of borosilicate glass with reflux head
- Tank of borosilicate glass for the collection of distillate with capacity of 1 l
- Tube-in-tube heat exchangers of AISI 304 stainless steel
- 6 thermoresistances Pt100 with sheath of AISI 316 stainless steel
- 6 board-type electronic temperature indicators
- Thyristor unit for controlling the power of reboiler electric heater
- 2 programmable timers for the control of reflux ratio
- Variable area flowmeter of glass and steel, with range of 25 to 250 l/h (for mod. UDB/EV, only)
- Vacuum gauge of AISI 304 stainless steel with range of 0 to -1 bar
- Vacuum circuit with trap of AISI 304 stainless steel
- Piping and valves of AISI 304 and 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

Mod. UDBc/EV

Besides being provided with all the technical specifications of mod. UDB/EV, this model also includes the following additional items:

- Variable area flowmeter of AISI 304 stainless steel, with range of 25 to 250 l/h and 4-20 mA output signal
- Residual pressure electronic transmitter of stainless steel, range of 0 to 1000 mbar and 4-20 mA output signal
- Interface for the connection with the PC included in the switchboard
- Data acquisition software for Windows

Mod. UDBa/EV

Besides being provided with all the technical specifications of mod. UDB/EV, this model also includes the following additional items:

- Oil vacuum pump with flow rate of 4 m^3/h, provided with trap of AISI 304 stainless steel
- Variable area flowmeter of AISI 304 stainless steel, with range of 25 to 250 l/h and 4-20 mA output signal
- Pneumatic valve of AISI 316 stainless steel for controlling the flow rate of the condenser cooling water, Cv = 0.32
- Residual pressure electronic transmitter of stainless steel, range of 0 to 1000 mbar and 4-20 mA output signal
- Pneumatic valve of AISI 316 stainless steel for controlling the residual pressure, Cv = 0.32
- 2 electropneumatic converters of 4 to 20 mA/ 0.2 to 1 bar
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from the PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 2,5 kVA
(Other voltage and frequency on request)
Dimensions: 1600 × 700 × 2200 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. UDBa/EV, only): 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)
- Personal Computer running Windows (for mod. UDBc/EV and mod. UDBa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL ITEMS

- Electronic differential pressure transmitter for measuring the pressure drops in the column
- Oil vacuum pump (for mod. UDB/EV and mod. UDBc/EV, only)
- Borosilicate glass distillation column with sieve trays, DN 50
- Borosilicate glass distillation column with Raschig rings packing, DN 50

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

BATCH DISTILLATION
PILOT PLANT

Mod. DIS/EV — manual
Mod. DISc/EV — manual with data logging
Mod. DISa/EV — automated

INTRODUCTION

The distillation column is completely made of glass and it consists of a reboiler, of a column with steel mesh packing and of a condenser with reflux valve and head.
The distillate is collected into a glass tank after being cooled by a heat exchanger.
The automated version mod. DISa/EV is equipped with two PID controllers for controlling the feed pre-heating temperature, the flow rate of the condenser cooling water and the level of vacuum in the plant, automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) versus the variation of the following operational parameters:
  - reflux ratio
  - reboiler heating power
  - feeding composition
  - residual pressure
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays
- Automatic flow, pressure and temperature control by PID controller (for mod. DISa/EV, only)
- Plant supervision by P.C. (for mod. DISa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. DIS/EV

- Framework of AISI 304 stainless steel with castors
- Distillation column of borosilicate glass, DN 50, h = 1100 mm, with packing of AISI 316 stainless steel mesh
- Reflux head of borosilicate glass equipped with solenoid valve for the control of reflux ratio
- Over head condenser of borosilicate glass, with exchange surface of 0.4 m^2
- Reboiler of borosilicate glass, with capacity of 5 l, equipped with quartz-sheathed electric resistor of 2.5 kW
- Vacuum gauge of AISI 304 stainless steel, with range of -1 to 0 bar
- 2 programmable timers for the control of reflux ratio
- 8 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 8 electronic temperature indicators
- Electronic differential pressure transmitter (between column top and bottom) of AISI 316 stainless steel , with range of 0 to 200 mm H_2O, 4-20 mA output signal
- Board-type electronic indicator of the measure of differential pressure
- 2 graduated vessels of borosilicate glass for collecting the distillate, with capacity of 1 l
- Tube-in-tube heat exchanger of stainless steel for cooling the distillate
- Liquid-ring vacuum pump (P = 0.7 kW), equipped with air/water separator and check valve
- Thyristor unit for controlling the heating power
- Flowmeter of AISI 304 stainless steel for measuring the flow rate crossing the condenser: range of 0 to 250 l/h (for mod. DIS/EV, only)
- Piping and valves of AISI 304 and 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

Mod. DISc/EV

Besides being provided with all the technical specifications of mod. DIS/EV, this model also includes the following additional items:

- Flowmeter of AISI 304 stainless steel for measuring the flow rate to the condenser, 4-20 mA output, range of 0 to 250 l/h
- Electronic absolute pressure (in column) transmitter of AISI 316 stainless steel, range of 0 to 1000 mbar, 4-20 mA output signal
- Interface for the connection with PC included in the switchboard
- Data acquisition software for Windows

Mod. DISa/EV

Besides being provided with all the Technical specifications of mod. DIS/EV, this model also includes the following additional items:

- Flowmeter of AISI 304 stainless steel for measuring the flow rate to the condenser, 4-20 mA output signal, range of 0 to 250 l/h
- Pneumatic control valve, DN 15 of AISI 316 stainless steel, Cv = 2.5
- Electropneumatic converter 4 to 20 mA/0.2 to 1 bar
- Electronic absolute pressure (in column) transmitter of AISI 316 stainless steel, range of 0 to 1000 mbar, 4-20 mA output signal
- 2 microprocessor multi-loop digital controllers, with 2 PID control loops (flow rate of water to the condenser and residual pressure, input and output signals of 4 to 20 mA
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from the PID controller, real-time trend and historical trend

Dimensions: 1800 × 800 × 3000 mm
Weight: 300 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 4,5 kVA (Other voltage and frequency on request)
- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. DISa/EV, only): 10 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Floor water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)
- Personal Computer running Windows (for mod. DISc/EV and mod. DISa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Borosilicate glass distillation column with sieve trays, DN 50
- Borosilicate glass distillation column with Raschig rings packing, DN 50

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

CONTINUOUS DISTILLATION PILOT PLANT

Mod. BDC/EV

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 1500 × 650 × 2200 mm
Weight: 100 kg

INTRODUCTION

The solution having to be distilled, stored in a tank of plastic material, is sent to the distillation column by a metering pump after crossing a pre-heating exchanger.
The distillation column is completely of glass and it consists of a reboiler, of a sieve-tray column and of a condenser with reflux head and valve.
The bottom product and the distillate are collected into two tanks after being cooled by two heat exchangers.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) at atmospheric pressure, versus the variation of the following operational parameters:
  - reflux ratio
  - feeding flow rate
  - feeding composition
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Distillation column of borosilicate glass with 7 sieve trays, DN50, h = 600 mm
- Reboiler of borosilicate glass, with capacity of 5 l, provided with electric heater of 1600 W
- Condenser of borosilicate glass with reflux head
- Feeding tank of plastic material, with capacity of 5 l
- Tank of borosilicate glass with capacity of 1 l, for the collection of distillate
- Tank of plastic material, with capacity of 5 l, for the collection of bottom product
- 3 tube-in-tube heat exchangers of AISI 304 stainless steel
- Metering pump with flow rate of 0 to 8.5 l/h
- 6 digital thermometers with sheath of stainless steel
- Thyristor unit for controlling the power of the reboiler electric heater
- 2 programmable timers for the control of reflux ratio
- Variable area flowmeter of glass and steel, with range of 20 to 200 l/h
- Switchboard IP55, complying with EC standards
- Emergency button

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- U-tube manometer for measuring the pressure drops in the column
- Distillation column of borosilicate glass, DN 50, with bubble cap trays
- Distillation column of borosilicate glass, DN 50, with Raschig ring packing

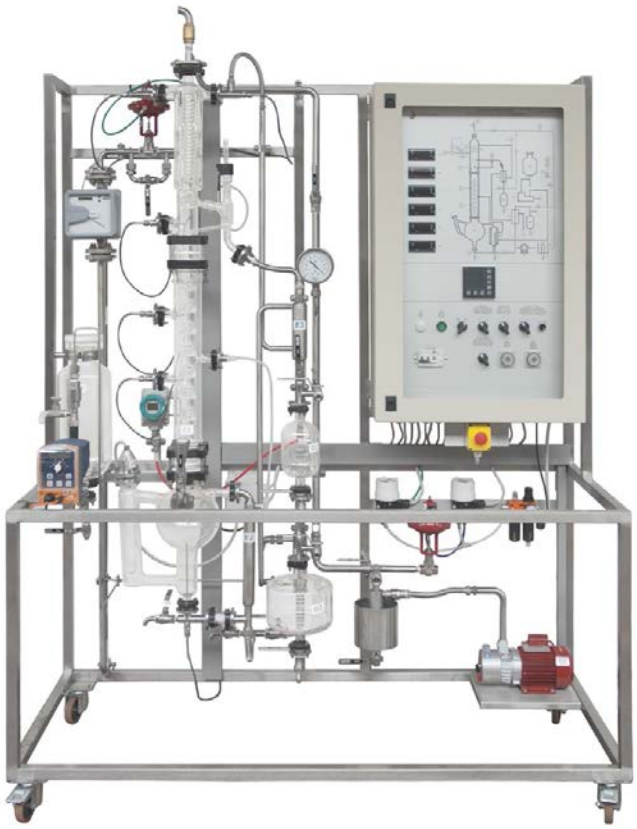
VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CONTINUOUS DISTILLATION PILOT PLANT

Mod. UDC/EV manual
Mod. UDCc/EV manual with data logging
Mod. UDCa/EV automated



INTRODUCTION

The solution having to be distilled, stored in a glass tank, is sent to the distillation column by a metering pump after crossing a pre-heating exchanger.
The distillation column is completely made of glass and it consists of a reboiler, of a bubble-cap-tray column and of a condenser with reflux head and valve.
The bottom product and the distillate are collected into two tanks after being cooled by two heat exchangers.
The automated version mod. UDCa/EV is equipped with PID controller: using two pneumatic valves, this controller can automatically control the flow rate of cooling water crossing the condenser and the vacuum degree of the plant.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) versus the variation of the following operational parameters:
  - reflux ratio
  - feeding flow rate
  - reboiler heating power
  - feeding composition
  - residual pressure
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays
- Automatic flow and pressure control by PID controller (for mod. UDCa/EV, only)
- Plant supervision by P.C. (for mod. UDCa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UDC/EV

- Framework of AISI 304 stainless steel with castors
- Distillation column of borosilicate glass with 7 bubble cap trays, DN50, h = 600 mm
- Reboiler of borosilicate glass, with capacity of 3 l, including electric heater of 1600 W
- Condenser of borosilicate glass with reflux head
- Feeding tank of borosilicate glass with capacity of 5 l
- Tank of borosilicate glass with capacity of 1 l for the collection of distillate
- Tank of borosilicate glass with capacity of 2 l for the collection of bottom product
- 3 tube-in-tube heat exchangers of AISI 304 stainless steel
- Metering pump with head of AISI 316 stainless steel, flow rate of 0 to 8.5 l/h
- 6 thermoresistances Pt100 with sheath of AISI 316 stainless steel
- 6 electronic indicators
- Thyristor unit for controlling the power of reboiler electric heater
- 2 programmable timers for the control of reflux ratio
- Variable area flowmeter of glass and steel, with range of 25 to 250 l/h (for mod. UDC/EV, only)
- Vacuum gauge of AISI 304 stainless steel, with range of 0 to -1 bar
- Vacuum circuit with trap of AISI 304 stainless steel
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UDCc/EV

Besides being provided with all the technical specifications of mod. UDC/EV, this model also includes the following additional items:

- Variable area flowmeter of AISI 304 stainless steel, with range of 25 to 250 l/h and 4-20 mA output signal
- Electronic residual pressure transmitter of stainless steel, range of 0 to 1000 mbar, 4-20 mA output signal
- Interface for the connection with the PC included in the switchboard
- Data acquisition software for Windows

Mod. UDCa/EV

Besides being provided with all the Technical specifications of mod. UDC/EV, this model also includes the following additional items:

- Oil vacuum pump with flow rate of 4 m^3/h
- Variable area flowmeter of AISI 304 stainless steel, with range of 25 to 250 l/h and 4-20 mA output signal
- Pneumatic valve of AISI 316 stainless steel for controlling the flow rate of the condenser cooling water, Cv = 0.32
- Pneumatic valve of AISI 316 stainless steel for controlling the residual pressure, Cv = 0.32
- 2 electropneumatic converters of 4 to 20 mA/ 0.2 to 1 bar
- Electronic residual pressure transmitter of stainless steel, range of 0 to 1000 mbar, 4-20 mA output signal
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from the PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 2,5 kVA (Other voltage and frequency on request)
Dimensions: 1600 × 700 × 2300 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. UDCa/EV, only): 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water floor drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)
- Personal Computer running Windows (for mod. UDCc/EV and mod. UDCa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Electronic pressure transmitter for measurement of load loss in the column
- Oil vacuum pump (mod. UDC/EV and UDCc/EV only)
- Borosilicate glass distillation column with sieve trays, DN 50
- Borosilicate glass distillation column with Raschig rings packing, DN 50

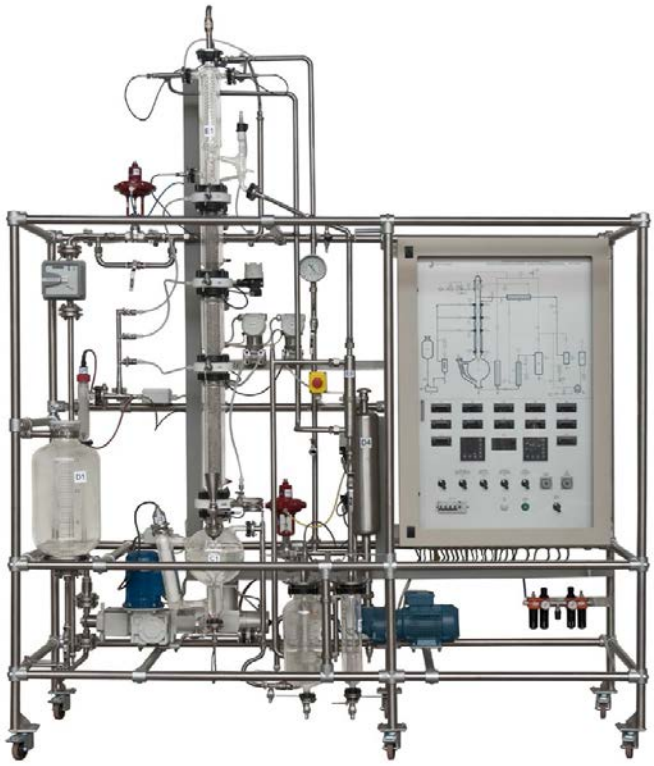
VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CONTINUOUS DISTILLATION PILOT PLANT

Mod. DC/EV manual
Mod. DCc/EV manual with data logging
Mod. DCa/EV automated



INTRODUCTION

The solution having to be distilled, stored in a glass tank, is sent to the distillation column by a metering pump after crossing a pre-heating exchanger. The column can be fed through 3 points at different height.

The distillation column is completely made of glass and it consists of a reboiler, of a column with packing of steel mesh and of a condenser with reflux valve and head.

The bottom product and the distillate are collected into two glass tanks after being cooled by two heat exchangers.

The automated version mod. DCa/EV is equipped with two PID controllers being able to control the flow rate of cooling water crossing the condenser, the vacuum degree of the plant and the feeding pre-heating temperature, automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) versus the variation of the following operational parameters:
  - feed pre-heating temperature
  - reflux ratio
  - feeding flow rate
  - reboiler heating power
  - feeding composition
  - residual pressure
- Mass balance
- Energy balance
- Flooding
- Calculation of the number of theoretical trays
- Automatic flow, pressure and temperature control by PID controller (for mod. DCa/EV, only)
- Plant supervision by P.C. (for mod. DCa/EV, only)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. DC/EV

- Framework of AISI 304 stainless steel with castors
- 15 l feeding tank of borosilicate glass
- Distillation column of borosilicate glass, DN 50, h = 1100 mm, packed with mesh of AISI 316 stainless steel
- Reflux head of borosilicate glass equipped with solenoid valve for the control of reflux ratio
- Reboiler of borosilicate glass, with capacity of 5 l, equipped with quartz-sheathed electric heater of 2.5 kW
- Over head condenser of borosilicate glass, with exchange surface of 0.4 m^2
- 2 graduated vessels of borosilicate glass for collecting the bottom product (4 l) and the distillate (1 l)
- Tube-in-tube heat exchanger of stainless steel for the bottom product
- Liquid-ring vacuum pump, equipped with air/water separator and check valve
- Feeding metering pump of AISI 316 stainless steel, with max. flow rate of 12 l/h
- Flowmeter of AISI 304 stainless steel for measuring the flow rate to the condenser, range of 0 to 250 l/h (for mod. DC/EV, only)
- 2 Thyristor units
- Vacuum gauge of AISI 304 stainless steel with range of -1 to 0 bar
- 2 programmable timers for the control of reflux ratio
- 12 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 12 electronic temperature indicators
- Electronic differential pressure transmitter (between column top and bottom) of AISI 316 stainless steel, with range of 0 to 200 mm H_2O, 4-20 mA output signal
- Electronic indicator of the measure of differential pressure
- Quartz-sheathed electric heater for preheating the feeding mixture, P = 0.3 kW
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Dimensions: 2200 × 800 × 3000 mm
Weight: 390 kg

Mod. DCc/EV

Besides being provided with all the technical specifications of mod. DC/EV, this model also includes the following additional items:

- Flow meter of AISI 304 stainless steel for the flow rate to the condenser, 4-20 mA output signal, range of 0 to 250 l/h
- Electronic absolute pressure transmitter (in column) of AISI 316 stainless steel, range of 0 to 1000 mbar, 4-20 mA output signal
- Interface for the connection with PC included in the switchboard
- Data acquisition software for Windows

Mod. DCa/EV

Besides being provided with all the technical specifications of mod. DC/EV, this model also includes the following additional items:

- 2 pneumatic control valves of AISI 316 stainless steel, DN 15, Cv = 2.5
- 2 electropneumatic converters 4 to 20 mA/0.2 to 1 bar
- Flow meter of AISI 304 stainless steel for the flow rate to the condenser: 4-20 mA output signal, range of 0 to 250 l/h
- Electronic absolute pressure transmitter (in column) of AISI 316 stainless steel , range of 0 to 1000 mbar, 4-20 mA output signal
- 2 microprocessor multi-loop digital controllers, with 3 PID control loops (flow rate of water to the condenser, residual pressure and pre-heating temperature)
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from the PID controller, real-time trend and historical trend

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 4,5 kVA (Other voltage and frequency on request)
- Tap water: 350 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. DCa/EV, only): 10 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Floor water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the distilled mixture (e.g.: a refractometer)
- Personal Computer running Windows (for mod. DCc/EV and mod. DCa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Borosilicate glass distillation column with Raschig rings packing, DN 50, h = 1100 mm
- Borosilicate glass distillation column with sieve trays, DN 50, h = 1100 mm

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

DISTILLATION COLUMN SIMULATOR

Mod. DCS/EV

INTRODUCTION

This unit consists of a column of transparent plastic material equipped with two sieve trays and of a bubble cap tray.
The upper sieve tray will distribute gas and liquid onto the bubble cap tray installed below.
Three pressure taps along the column supply the pressure drops to the bubble cap tray and to the lower sieve tray.
The unit also includes a tank for the water, a pump that recycles the water to the column top, and a blower connected with the column bottom.
The water flow rate is measured by a variable area flowmeter, whereas the air flow rate is measured by an electronic anemometer.
The big diameter of the column (600 mm) enables to observe the operation of the different types of tray easily in the various testing conditions.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Design of trays of distillation columns
- Operation of trays of distillation columns
- Hydraulics of bubble cap trays and of sieve trays

TECHNICAL SPECIFICATIONS:

- Framework of stainless AISI 304 with castors
- Column of transparent plastic, diameter = 600 mm, with two sieve trays, a bubble cap tray and three pressure taps
- 2 differential manometers
- Feeding tank of AISI 304 stainless steel with capacity of 100 l
- Centrifugal pump of AISI 304 stainless steel
- Variable area flow meter
- Centrifugal fan
- Switchboard IP55

Power supply: 230 Vac 50 Hz single-phase - 3 kVA
(Other voltage and frequency on request)
Dimensions: 1600 × 800 × 2400 mm
Weight: 130 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Water drain

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

24-B

EXTRACTION

Introduction:

The extraction units included in this section have been classified into three categories:

- **liquid-liquid extraction plants;**
- **solid-liquid extraction plants;**
- **multifunction extraction plants.**

The "liquid/liquid" category includes the unit mod. ULL/EV that is a relatively cheap system available only in manual version, with essential instruments, but it enables to elaborate on the issues concerning liquid/liquid extraction, easily.

The only difference between the lines mod. LL/EV and mod. LL1/EV concerns the type of used column (with rotating discs and with packing, respectively); they are available in manual version, manual version with data logging and in automated version, and they use process instruments of industrial type.

This section has also been enriched with an equipment, mod. LEA/EV, that enables to study the equilibrium of ternary liquid mixtures and to determine experimental data that can be used in the tests with the extraction plants.

As regards the "solid/liquid" category, the line SL/EV is available in manual and automated versions and the plants of this line use process instruments of industrial type.

At last, the "multifunction" category includes polyfunctional units:

- the unit mod. UESL/EV enables to carry out both liquid/liquid and solid/liquid batch extraction and to recover the solvent by distillation;
- the line mod. LLD/EV, available in manual version, manual version with data logging and in automated version, is the result of the combination of a liquid/liquid extraction unit and of a distillation plant.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

24-B

EXTRACTION

	LIQUID - LIQUID		
EXTRACTION PILOT PLANT	**"MEDIUM" LINE**	MOD. ULL/EV	**EX** 4
		MOD. ULL-1/EV	**EX** 4
	"LARGE" LINE	MOD. LL/EV	
		MOD. LLa/EV	
		MOD. LL1/EV	
		MOD. LL1a/EV	**EX** 5
MIXER - SETTLER UNIT		MOD. MXS/EV	**EX** 7
APPARATUS FOR THE STUDY OF TERNARY SYSTEMS		MOD. LEA/EV	**EX** 8
	SOLID - LIQUID		
EXTRACTION PILOT PLANT		MOD. SL/EV	
		MOD. SLa/EV	**EX** 9
	MULTIFUNCTION		
EXTRACTION PILOT PLANT		MOD. UESL/EV	**EX** 11
EXTRACTION AND DISTILLATION PILOT PLANT		MOD. LLD/EV	
		MOD. LLDc/EV	
		MOD. LLDa/EV	**EX** 12

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

LIQUID-LIQUID EXTRACTION PILOT PLANT

Mod. ULL/EV with rotating disc column
Mod. ULL-1/EV with packed column

INTRODUCTION

This unit includes two separate tanks for the solvent and for the phase having to be refined, that are sent to the extraction column by two metering pumps; the column is provided with top and bottom phase separators and with two other tanks for collecting the refined and extracted products.
This unit is available in two versions:

- **mod. ULL/EV**, with "rotating-disc" extraction column
- **mod. ULL-1/EV**, with "packed" extraction column

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of the number of transfer units
- Height of a transfer unit
- Extraction efficiency
- Mass balance
- Calculation of mass transfer coefficient
- Calculation of the number of theoretical stages
- Exercises on 3-component systems (e.g.: acetic acid – toluene – water)

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Extraction column of borosilicate glass, DN50, h = 600 mm, including disc agitator and motor with tachogenerator (for mod. ULL/EV, only)
- Electronic indicator of agitator speed (for mod. ULL/EV, only)
- Extraction column of borosilicate glass, DN50, h = 600 mm, with Raschig rings (for mod. ULL1/EV, only)
- Top separator of borosilicate glass
- Bottom separator of borosilicate glass
- 2 metering pumps with body of AISI 316 stainless steel, flow rate of 0 to 40 l/h
- Feeding tank of plastic material for the light phase, with capacity of 30 l
- Feeding tank of plastic material for the heavy phase, with capacity of 30 l
- Tank of plastic material, with capacity of 30 l, for collecting the extracted product
- Tank of plastic material, with capacity of 30 l, for collecting the refined product
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Power supply:	230 Vac 50 Hz single-phase - 1 kVA (Other voltage and frequency on request)
Dimensions:	1600 × 800 × 2400 mm (Mod. ULL/EV) 1600 × 900 × 1800 mm (Mod. ULL-1/EV)
Weight:	130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the extracted mixture (e.g.: a refractometer or titration glassware)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

LIQUID-LIQUID EXTRACTION PILOT PLANT

Mod. LL/EV manual
Mod. LLa/EV automated
Mod. LL1/EV manual
Mod. LL1a/EV automated

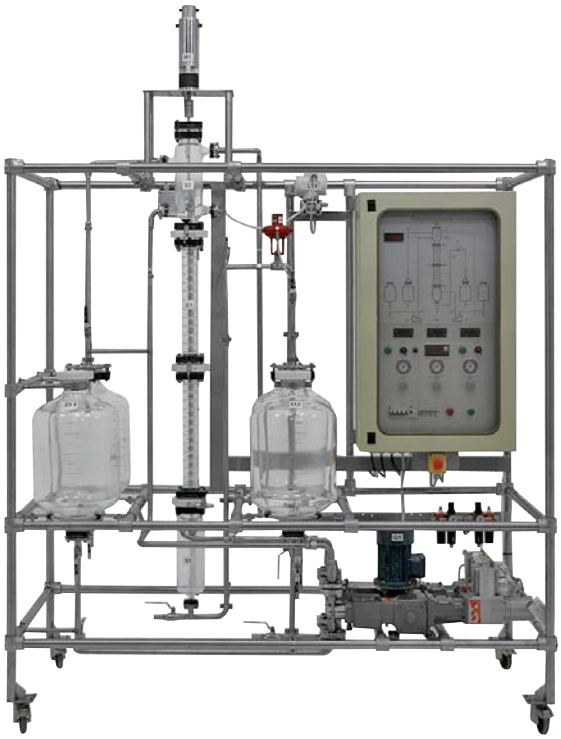
INTRODUCTION

This unit includes two separate tanks for the solvent and for the phase having to be refined, that are sent to the extraction column by two metering pumps; the column is provided with top and bottom phase separators and with two other tanks for collecting the refined and extracted products.

This unit is available in two versions: with rotating disc column or with Raschig rings packed column; each version may be manual or automated:

- **mod. LL/EV:** manual version with rotating-disc column
- **mod. LLa/EV:** automated version with rotating-disc column
- **mod. LL1/EV:** manual version with Raschig rings packed column
- **mod. LL1a/EV:** automated version with Raschig rings packed column.

The automated versions mod. LLa/EV and LL1a/EV are equipped with PID controller to control automatically the level in the column and, in the case of mod. LLa/EV, also the r.p.m. of the stirrer motor.



TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of the number of transfer units
- Height of a transfer unit
- Extraction efficiency
- Mass balance
- Calculation of mass transfer coefficient
- Calculation of the number of theoretical stages
- Trend of concentrations along the column
- Exercises on systems of 3 partially mixable components:
  - acetic acid – toluene – water
  - acetic acid – isopropyl ether – water
  - acetic acid – ethyl acetate – water
- Automatic control with PID controller (for mod. LLa/EV and LL1a/EV, only)
- Plant supervision by P.C. (for mod. LLa/EV and LL1a/EV, only)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. LL/EV and LL1/EV

- Framework of AISI 304 stainless steel with castors
- Extraction column of borosilicate glass, DN50, consisting of 26 stages, h = 1500 mm, and including stirrer with discs of AISI 316 stainless steel , top and bottom separators of borosilicate glass and variable speed motor (0 to 1000 rpm) with tachogenerator (for mod. LL/EV, only)
- Extraction column of borosilicate glass, DN 50, h = 1500 mm, with Raschig rings packing, including top and bottom separators of borosilicate glass (for mod. LL1/EV, only)
- 4 graduated tanks of borosilicate glass, with capacity of 25 l
- Metering double-body pump of AISI 316 stainless steel, with flow rate of 0 to 30 l/h, including pneumatic actuator adjustable with signal of 0.2 to1 bar
- Pneumatic control valve of AISI 316 stainless steel, DN 15, Cv = 0.13
- Thermoresistance Pt 100 with sheath of AISI 316 stainless steel
- Electronic temperature indicator
- 3 manual pneumatic control devices
- Piping and valves of AISI 304 and 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. LLa/EV and LL1a/EV

Besides being provided with all the technical specifications of mod. LL/EV and of mod. LL1/EV, this model also includes the following additional items:

- Electronic level transmitter of AISI 316 stainless steel, differential pressure type, with range of 0 to 200 mm H_2O, 4-20 mA output signal
- 3 electropneumatic converters 4 to 20 mA/0.2 to 1 bar
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from the PID controller, real-time trend and historical trend

Dimensions: 2000 x 900 x 2800 mm (Mod. LL/EV)
2000 x 900 x 2500 mm (Mod. LL1/EV)
Weight: 250 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 1,5 kVA (Other voltage and frequency on request)
- Compressed air: 15 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the extracted mixture (e.g.: a refractometer or titration glassware)
- Personal Computer running Windows (for mod. LLa/EV and mod. LL1a/EV, only)
- Fume suction system

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

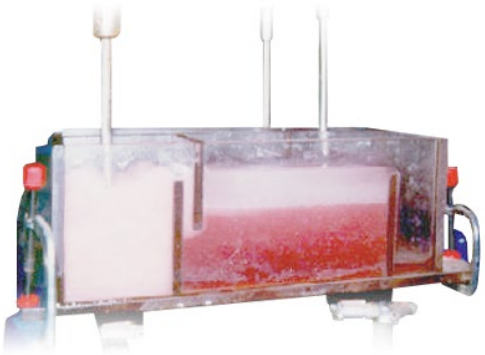
The equipment can be modified on request of the Customer.

MIXER - SETTLER UNIT

Mod. MXS/EV

INTRODUCTION

The unit studies the liquid-liquid extraction in a mixer - settler.
The light and heavy phases are pumped in the mixer where the solute is poured from one phase to the other.
Then the mixture enters in the settler where it is separated into two phases, that are collected in two tanks.
The unit allows to study how mixing speed and feeding flow rate affect the extraction efficiency.



TRAINING PROGRAM

This unit enables to deepen the following issues:

- Demonstrating the functioning of a mixer - settler
- Establishing the extraction efficiency
- Effect of the total flow rate on the extraction efficiency
- Effect of the ratio between light and heavy phase on the extraction efficiency
- Effect of the mixing speed on the extraction efficiency

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel structure
- Glass and steel mixer
- Glass and steel settler
- 2 feeding pumps
- 2 feeding tanks
- 2 collecting tanks
- Switchboard

Power supply: 230 Vac 50 Hz single-phase
(Other voltage and frequency on request)

REQUIRED ACCESSORIES (NOT INCLUDED)

- Refractometer

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

APPARATUS FOR THE STUDY OF TERNARY SYSTEMS

Mod. LEA/EV

INTRODUCTION

This equipment enables to study the balances of ternary liquid mixtures and it consists of three cells equipped with stirrer and thermostating jacket connected with a circulator waterbath.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of partition coefficient
- Determination of "T line"

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel
- 3 cells of borosilicate glass with jacket and variable speed stirrer
- Thermostat bath with circulation pump

Power supply:	230 Vac 50 Hz single-phase - 2,1 kVA (Other voltage and frequency on request)
Dimensions:	760 × 400 × 1200 mm
Weight:	50 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of the composition (e.g.: a refractometer)

SUPPLIED WITH

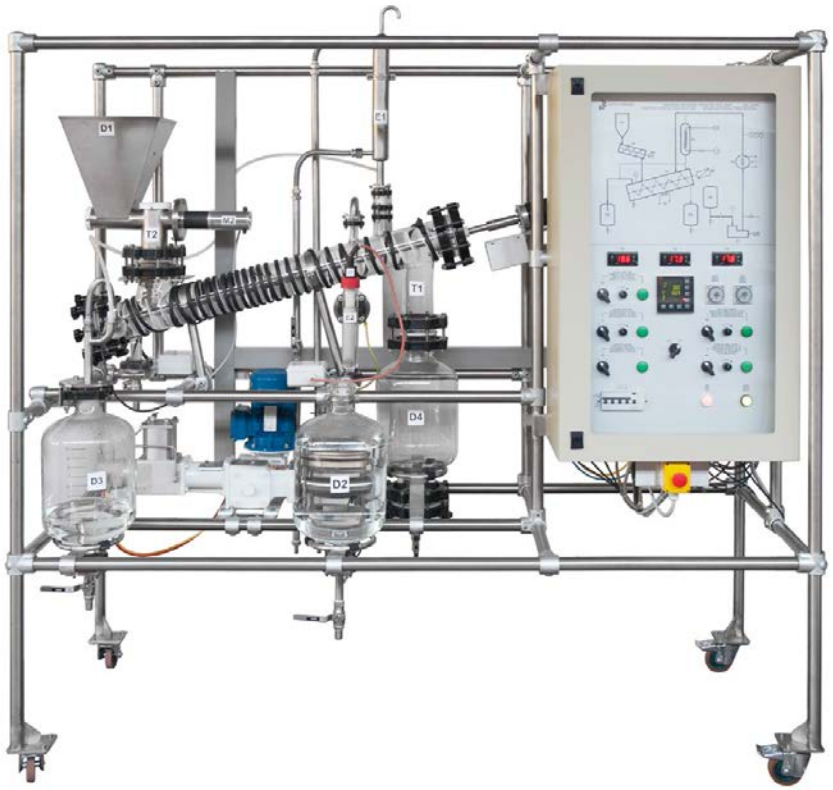
THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

SOLID-LIQUID EXTRACTION PILOT PLANT

Mod. SL/EV manual
Mod. SLa/EV automated



INTRODUCTION

This unit enables to study countercurrent solid-liquid extractions in a continuous extractor with Archimedean screw. The solid, stored in a hopper, is fed to the extractor via an Archimedean screw. The solvent, stored in a tank, is sent to the top of the extractor by a metering pump.

The solid phase is conveyed in the extractor by an Archimedean screw of PTFE, whereas the solvent will fall in countercurrent by gravity. Solvent and extracted product, as well as the exhausted solid, are stored in proper tanks.

The automated version mod. SLa/EV also includes a PID controller that enables to control the solvent pre-heating temperature automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Calculation of the number of theoretical stages
- Study of the extraction performance versus the nature and flow rate of the solid, and the type, flow rate and temperature of the solvent
- Extraction of oil from soybean laminate with hexane
- Extraction of chorophyl from spinach with ethanol
- Extraction of oil from olive husk with hexane
- Extraction of starch from potatoes with water
- Automatic temperature control with PID controller (for mod. SLa/EV, only)
- Plant supervision by PC (for mod. SLa/EV, only)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. SL/EV

- Framework of AISI 304 stainless steel with castors
- Extractor of borosilicate glass, DN 100, l = 1000 mm, with Archimedean screw of PTFE
- Hopper of AISI 304 stainless steel with capacity of 2 l, for storing the solid
- Geared motor for solid feeding Archimedean screw, with speed of 0 to 20 r.p.m.
- Geared motor for the Archimedean screw of the extractor, with speed of 0 to 10 r.p.m.
- 2 programmable timers for controlling the starting and stopping times of the feeding Archimedean screw
- Tank of borosilicate glass for storing the solvent, with capacity of 10 l
- Tank of borosilicate glass for storing the extracted phase, with capacity of 10 l
- Tank of borosilicate glass for storing the exhausted solid, with capacity of 10 l
- Condenser of AISI 304 stainless steel, with exchange surface of 0.1 m^2
- 3 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 3 electronic temperature indicators
- Thyristor unit for controlling the heating power
- Electric heater of quartz for solvent pre-heating, P = 0.3 kW
- Metering pump of AISI 316 stainless steel for the solvent, with flow rate of 0 to 12 l/h; it can be adjusted with signal of 0.2 to 1 bar by a pneumatic actuator
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. SLa/EV

Besides being provided with all the characteristics of mod. SL/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2300 × 800 × 2100 mm
Weight: 290 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 2,5 kVA (Other voltage and frequency on request)
- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 10 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for the analysis of the composition (e.g.: a refractometer)
- Personal Computer running Windows (for mod. SLa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

MULTIFUNCTIONAL EXTRACTION PILOT PLANT

Mod. UESL/EV

INTRODUCTION

This unit enables to study three different types of extraction:

- liquid/liquid extraction
- solid/liquid extraction with heavy extracting phase
- solid/liquid extraction with light extracting phase.

These three types of extraction are carried out through 3 interchangeable extraction vessels.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Liquid/liquid extraction
- Solid/liquid extraction
- Extraction efficiency
- Mass balance
- Exercises on 3-component systems (e.g.: extraction of oil from soybean laminate with hexane)

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Reboiler of borosilicate glass, capacity 20 litres
- Over head condenser of borosilicate glass
- Solid/liquid extractor of borosilicate glass, with capacity of approximately 3 l
- 2 liquid/liquid extractors of borosilicate glass, with capacity of approximately 3 l
- Quartz-sheathed electric heater of 2500 W
- Thyristor for driving the electric resistor
- 3 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 3 digital electronic temperature indicators
- Flow meter of stainless steel and glass for the water to the top condenser, with range of 25 to 250 l/h
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Dimensions: 1500 × 800 × 2800 mm
Weight: 180 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 7,5 kVA (Other voltage and frequency on request)
- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for the analysis of the composition (e.g.: a refractometer)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

MULTIFUNCTION EXTRACTION AND DISTILLATION PILOT PLANT

Mod. LLD/EV — manual
Mod. LLDc/EV — manual with data logging
Mod. LLDa/EV — automated

INTRODUCTION

This plant consists of a liquid-liquid extraction column of glass with rotating discs installed aside a distillation column.
This last column can be used to recover the solvent used for the extraction, or separately for the study of distillation process.

The automated version mod. LLDa/EV is equipped with 2 PID controllers enabling to control the level in the extraction column and the flow rate of the water cooling the condenser of the distillation column.

TRAINING PROGRAM

This unit enables to deepen the following issues:

Extraction

- Determination of the number of transfer units
- Height of a transfer unit
- Extraction efficiency
- Mass balance
- Calculation of mass transfer coefficient
- Calculation of the number of theoretical stages
- Trend of concentrations along the column
- Exercises on systems of 3 partially mixable components:
  - acetic acid – toluene – water
  - acetic acid – isopropyl ether – water
  - acetic acid – ethyl acetate – water
- Automatic control with PID controller (for mod. LLDa, only)
- Plant supervision by P.C. (for mod. LLDa/EV, only)

Distillation

- Recovery of the solvent used in the extraction
- Distillation of different mixtures (water / ethanol, water / methanol, methanol / propanol, etc...) versus the variation of the following operational parameters:
  - reflux ratio
  - feeding flow rate
  - reboiler heating power
  - feeding composition
- Flooding
- Automatic flow control by PID controller (for mod. LLDa/EV, only)
- Plant supervision by P.C.(for mod. LLDa/EV, only)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. LLD/EV

- Framework of AISI 304 stainless steel with castors
- 5 tanks of AISI 304 stainless steel , with capacity of 20 l
- Extraction column of borosilicate glass, DN50, consisting of 26 stages, h = 1500 mm, and including a disc stirrer of stainless steel, 2 separators of borosilicate glass and variable speed motor (0 to 1000 rpm)
- 2 metering pumps of AISI 316 stainless steel , with flow rate of 0-40 l/h
- Distillation column of borosilicate glass, DN 50, with vacuum jacket
- Reflux head of borosilicate glass
- Solenoid valve for controlling the reflux ratio
- Reboiler of AISI 316 stainless steel, with capacity of 7 l, for the distillation column
- Electric heater of AISI 316 stainless steel, P = 3000 W
- Thyristor unit for controlling the electric heater
- 2 timers for controlling the reflux ratio
- Over head condenser of borosilicate glass with exchange surface of 0.3 m^2
- Flowmeter for the water feeding the head condenser, with range of 25 to 250 l/h
- 3 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 3 board-type electronic digital temperature indicators
- Tube-in-tube heat exchanger of AISI 316 stainless steel (cooling of column outlet product)
- Tube-in-tube heat exchanger of AISI 316 stainless steel (cooling of distillate)
- Tank of borosilicate glass, with capacity of 3 l, for collecting the column outlet product
- Graduated tank of borosilicate glass, with capacity of 1 l, for the collection fo distillate
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. LLDc/EV

Besides being provided with all the characteristics of mod. LLD/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. LLDa/EV

Besides being provided with all the characteristics of mod. LLD/EV, this model also includes the following additional items:

- Variable area flowmeter of AISI 304 stainless steel, with range of 25 to 250 l/h and 4-20 mA output signal
- Pneumatic valve of AISI 316 stainless steel, Cv = 0.32, for level control
- 2 pneumatic valves of AISI 316 stainless steel (level and flow control of condenser cooling water), Cv = 0.32
- 2 electropneumatic converters of 4 to 20 mA/ 0.2 to 1 bar
- 2 microprocessor digital PID controllers with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2400 × 800 × 2900 mm
Weight: 250 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 11 kVA (Other voltage and frequency on request)
- Tap water: 250 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for the analysis of the composition (e.g.: a refractometer)
- Personal Computer running Windows (for mod. LLDc/EV and mod. LLDa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

24-B

24-B

REACTION

RE

www.elettronicaveneta.com

Introduction:
This section illustrates a line of plants for the study of the rifest types of chemical reactors.
The relatively cheap bench-top version mod. CRBS/EV enables to study batch reactors, Continuous Stirred-Tank Reactors (CSTR), Plug Flow Reactors (PFR) and CSTRs in series, and the different reactors can be mounted onto the same service unit.

Two lines, mod. REC/EV and mod. RE/EV, have been conceived for the study of batch reactors; these plants are available in different sizes and in manual version, manual version with data logging and in automated version.

The line REC1/EV enables an in-depth examination of continuous stirred-tank reactors (CSTR) and it is available in manual version, manual version with data logging and in automated version.
The line REC2/EV enables the study of plug flow reactors (PFR) and it is available in manual version, manual version with data logging and in automated version.

The line REC3/EV enables a deeper investigation of the issues concerning CSTRs in series and it is available in manual version, manual version with data logging and in automated version.
The mod. TFR/EV is a compact units enabling the study of slurry catalytic reactors.

At last, the mod. UPB/EV and the line FER/EV, available in manual version, manual version with data logging and in automated version, are very good examples of production di biofuels derived from plant materials.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

REACTION

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CHEMICAL REACTORS APPARATUS

Mod. CRBS/EV

INTRODUCTION

The full apparatus mod. CRBS/EV includes 6 chemical reactors (a continuous stirred-tank reactor CSTR, two plug flow reactors PFR, a batch reactor BR, 3 reactors in series and a laminator flow reactor LFR), interchangeable on the same service unit mod. CRB/EV) and a supervision software with interface.

The minimum purchasable configuration is represented by the service unit (mod. CRB/EV) and by one of these reactors.
The service unit (mod. CRB/EV) includes feeding tanks, feeding pumps, temperature control system and various instruments for the CSTR (mod. CR1/EV), for the plug flow reactor (mod. CR2/EV), for the batch reactor (mod. CR3/EV), for the CSTRs in series (mod. CR4/EV), for the plug flow reactor (CR5/EV) and for the laminator flow reactor (mod. CR6/EV).

The reaction proposed is the classical saponification of ethyl acetate with sodium hydroxide, checked in real time with a conductivity meter.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Comparing CSTR, PFR, LFR and BR
- Variation of the conversion with the residence time
- Kinetic equation from experimental data
- Effect of temperature on reaction rate
- Effect of mixing degree on the reaction

TECHNICAL SPECIFICATIONS:

Service unit Mod. CRB/EV

- Bench-top framework of AISI 304 stainless steel
- 2 tanks of AISI 304 stainless steel with capacity of 5 litres/each, for feeding reagents
- 2 peristaltic feeding pumps, with flow rate of 0 - 118 ml/min
- Circulation pump of AISI 304 stainless steel for hot water, with electronic temperature control and safety thermostat
- Digital conductivity meter with sensor
- Electric switchboard of painted carbon steel with ELCB
- 2 displays for r.p.m. of pumps, a display for stirring rate and electronic thermostat

Power supply: 230 Vac 50 Hz single-phase - 1 kVA
(Other voltage and frequency on request)
Dimensions: 850 × 700 × 770 mm
Weight: 70 kg

Continuous Stirred-Tank Reactor (CSTR) Mod. CR1/EV

- Capacity: 0.4 - 1.5 litres
- Made of borosilicate glass, stainless steel and PTFE
- Stirrer of variable speed
- Inner coil of AISI 304 stainless steel
- Removable baffles
- Connections for temperature and conductivity sensors

Plug Flow Reactor (PFR) Mod. CR2/EV

- Capacity: 0.4 litres
- Length of reactor: 20 m
- Tank of Plexiglas for immersing the reactor
- Connections for temperature and conductivity sensors

Batch Reactor (BR) Mod. CR3/EV

- Capacity: 1 l
- Made of AISI 304 stainless steel
- Vacuum insulation
- Inner coil of AISI 304 stainless steel
- Variable speed stirrer
- Connections for temperature and conductivity sensors

CSTRs in series Mod. CR4/EV

- 3 continuous stirred-tank reactors (CSTR) of borosilicate glass and PTFE connected in series; each reactor is equipped with stirrer of variable speed and connection for conductivity sensor
- 2 conductivity sensors

Plug flow reactor (PFR) Mod. CR5/EV

- Framework of AISI 304 stainless steel
- Plug flow reactor:
  - Made of borosilicate glass
  - Working volume = 1 litre
  - Length = 1100 mm
  - Packing = 3 mm diameter glass beads
  - Static premixer

Laminator flow reactor (LFR) Mod. CR6/EV

- Framework in AISI 304 stainless steel
- Laminar flow reactor:
  - Made of borosilicate glass
  - Length = 1100 mm
  - Jacketed
  - Static premixer

Data acquisition software with interface Mod. SI-CR/EV

- For Windows
- Synoptic with values of measured variables
- Real-time trend
- Historical trend

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

BATCH REACTION PILOT PLANT

Mod. REC/EV — manual
Mod. RECc/EV — manual with data logging
Mod. RECa/EV — automated

INTRODUCTION

This pilot plant concerns the batch reaction; the study of kinetics is carried out versus the variation of conductivity in the reactor.
This reactor includes an electric heater and a distillation column with condenser.
The automated version mod. RECa/EV is equipped with PID controller for the automatic control of reaction temperature.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of reaction kinetics
- Reaction thermodynamics
- Mass and energy balance
- Sizing of an homogeneous reactor
- Automatic temperature control with PID controller (for mod. RECa/EV, only)
- Plant supervision by P.C. (for mod. RECa/EV, only)
- Exercises than can be carried out:
  - kinetics of hydrolysis of ethyl acetate
  - preparation of p-Toluensulfonic acid
  - preparation of diethyl adipate
  - preparation of cyclohexanonoxime from hydroxylamine sulfate and cyclohexanone
  - transformation of acetic anhydride into acetic acid and display of reaction kinetics by measurement of conductivity
  - preparation of amide

TECHNICAL SPECIFICATIONS:

Mod. REC/EV

- Framework of AISI 304 stainless steel with castors
- Reactor of borosilicate glass, with capacity of 3 l and electric heater of 1.0 kW
- Stirrer for reactor provided with mechanical seal lubricated with silicone oil, 0 to 400 rpm
- Electronic rpm indicator of the stirrer
- Distillation column of borosilicate glass, DN25, packed with mesh of AISI 316 stainless steel
- Over head condenser of AISI 316 stainless steel
- Tanks of borosilicate glass, with capacity of 1 l, for adding reagents
- 2 tanks of borosilicate glass, with capacity of 2 l, for collecting distillate
- 2 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 2 electronic temperature indicators
- Electronic conductivity meter with automatic temperature compensation
- Circuit for the connection with vacuum pump (not included), equipped with check valve
- Vacuum gauge of AISI 304 stainless steel, with range of 0 to -1 bar
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. RECc/EV

Besides being provided with all the characteristics of mod. REC/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. RECa/EV

Besides being provided with all the characteristics of mod. REC/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 1,5 kVA
(Other voltage and frequency on request)
Dimensions: 1700 × 600 × 1850 mm
Weight: 150 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. RECc/EV and mod. RECa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

BATCH REACTION (BR) PILOT PLANT

Mod. RE/EV manual
Mod. REc/EV manual with data logging
Mod. REa/EV automated

INTRODUCTION

This pilot plant concerns the batch reaction; the study of kinetics is carried out versus the variation of conductivity in the reactor.
This reactor includes a cooling jacket, an electric heater and a distillation column with variable reflux condenser and azeotropic separator.
The automated version mod. REa/EV is equipped with PID controller for the automatic control of reaction temperature and of the stirrer rpm.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of reaction kinetics
- Reaction thermodynamics
- Mass and energy balance
- Automatic temperature and rpm control with PID controller (for mod. REa/EV, only)
- Plant supervision by P.C. (for mod. REa/EV, only)
- Exercises than can be carried out:
  - kinetics of hydrolysis of ethyl acetate
  - preparation of p-Toluensulfonic acid
  - preparation of diethyl adipate
  - reaction of urea with nitrous acid
  - preparation of cyclohexanonoxime from hydroxylamine sulfate and cyclohexanone
  - transformation of acetic anhydride into acetic acid and display of reaction kinetics by measurement of conductivity
  - preparation of amide

TECHNICAL SPECIFICATIONS:

Mod. RE/EV

- Wheeled framework of AISI 304 stainless steel
- Jacketed reactor of borosilicate glass, with capacity of 10 l
- Stirrer of AISI 304 stainless steel
- Geared motor of the stirrer with tachogenerator, and variable speed of 0 to 400 rpm
- Electric heater for reactor, P = 2.5 kW
- Distillation column of borosilicate glass, DN 50, h = 600 mm
- Reflux head of borosilicate glass equipped with solenoid valve for the control of reflux ratio
- Over head condenserof borosilicate glass, with exchange surface of 0.3 m^2
- 2 flasks of borosilicate glass for collecting the condensate, with capacity of 5 l
- 2 graduated vessels of borosilicate glass for adding reagents
- Azeotropic separator of borosilicate glass
- 2 electronic temperature indicators
- 2 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- Microprocessor electronic conductivity transmitter
- 2 programmable timers for the control of reflux ratio
- Thyristor unit for the control of heating power
- Pneumatic valve of AISI 316 stainless steel
- Vacuum gauge of AISI 316 stainless steel with range of - 1 to 0 bar
- Circuit for the connection with vacuum pump (not included)
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. REc/EV

Besides being provided with all the characteristics of mod. RE/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. REa/EV

Besides being provided with all the characteristics of mod. RE/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2000 × 800 × 3000 mm
Weight: 290 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 7,5 kVA (Other voltage and frequency on request)
- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. REc/EV and mod. REa/EV, only
- Laboratory Vacuum Pump

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CONTINUOUS REACTION (CSTR) PILOT PLANT

Mod. REC1/EV manual
Mod. REC1c/EV manual with data logging
Mod. REC1a/EV automated

INTRODUCTION

This pilot plant concerns the continuous reaction; the study of kinetics is carried out versus the variation of conductivity in the reactor.
This reactor includes an electric heater and a distillation column with condenser.
The automated version mod. REC1a/EV is equipped with PID controller for the automatic control of reaction temperature.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of reaction kinetics
- Reaction thermodynamics
- Mass and energy balance
- Automatic temperature control with PID controller (for mod. REC1a/EV, only)
- Plant supervision by P.C. (for mod. REC1a/EV, only)
- Exercises than can be carried out:
  - kinetics of hydrolysis of ethyl acetate
  - transformation of acetic anhydride into acetic acid and display of reaction kinetics by measurement of conductivity

TECHNICAL SPECIFICATIONS:

Mod. REC1/EV

- Framework of AISI 304 stainless steel with castors
- 2 feeding tanks of AISI 316 stainless steel, with capacity of 10 litres
- Tank of AISI 316 stainless steel, with capacity of 20 litres, for product collection
- 2 metering pumps of AISI 316 stainless steel, with flow rate of 0-8.4 l/h
- Reactor of borosilicate glass, with capacity of 3 l, and electric heater of 1.0 kW
- Stirrer for reactor provided with mechanic seal lubricated with silicone oil, 0-400 rpm
- Board-type electronic rpm indicator of the stirrer
- Distillation column of borosilicate glass, DN25
- Over head condenser of AISI 304 stainless steel
- Tanks of borosilicate glass, with capacity of 1 l, for adding reagents
- 2 tanks of borosilicate glass, with capacity of 2 l, for collecting the distillation product
- 2 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 2 board-type electronic temperature indicators
- Electronic conductivity meter with automatic temperature compensation
- Circuit for the connection with vacuum pump, including check valve
- Vacuum gauge of AISI 304 stainless steel, with range of 0 to -1 bar
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. REC1c/EV

Besides being provided with all the characteristics of mod. REC1/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. REC1a/EV

Besides being provided with all the characteristics of mod. REC1/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 1700 × 700 × 1900 mm
Weight: 170 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. REC1c/EV and mod. REC1a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CONTINUOUS REACTION (PFR) PILOT PLANT

Mod. REC2/EV manual
Mod. REC2c/EV manual with data logging
Mod. REC2a/EV automated

INTRODUCTION

This unit is equipped with a tubular reactor thermostated and fed by two gear pumps; the flow rate of reagents is measured by two magnetic flowmeters.
The study of kinetics is carried out versus the variation of conductivity at the reactor outlet.
The automated version mod. REC2a/EV is equipped with PID controller for the automatic control of reaction temperature and of the flow rate of reagents.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of reaction kinetics
- Reaction thermodynamics
- Mass and energy balance
- Automatic temperature and flow control with PID controller (for mod. REC2a/EV, only)
- Plant supervision by P.C. (for mod. REC2a/EV, only)
- Exercises than can be carried out:
  - kinetics of hydrolysis of ethyl acetate

TECHNICAL SPECIFICATIONS:

Mod. REC2/EV

- Framework of AISI 304 stainless steel with castors
- 2 feeding tanks of AISI 316 stainless steel with capacity of 10 l
- Tank of AISI 316 stainless steel with capacity of 20 l, for collecting the product
- Tubular reactor, with capacity of 2 l and jacket of AISI 304 stainless steel
- Electronic conductivity meter
- 2 variable area flow meters (only for mod. REC2/EV)
- Tube-in-tube heat exchanger at the reactor outlet
- Tank of borosilicate glass, with capacity of 2 l, for the neutralization solution
- 2 gear pumps of AISI 316 stainless steel
- Metering pump for the neutralization solution
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. REC2c/EV

Besides being provided with all the characteristics of mod. REC2/EV, this model also includes the following additional items:

- 2 magnetic induction flow meters
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. REC2a/EV

Besides being provided with all the characteristics of mod REC2/EV, this model also includes the following additional items:

- 2 magnetic induction flow meters
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 1 kVA
(Other voltage and frequency on request)
Dimensions: 1800 × 600 × 1800 mm
Weight: 180 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. REC2c/EV and mod. REC2a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

CONTINUOUS REACTION PILOT PLANT (CSTRs in series)

Mod. REC3/EV manual
Mod. REC3c/EV manual with data logging
Mod. REC3a/EV automated

INTRODUCTION

This unit is equipped with two continuous stirred-tank reactors (CSTR) connected in series and fed by two metering pumps.
The study of kinetics is carried out versus the variation of conductivity at the reactor outlet.
The automated version mod. REC3a/EV is equipped with PID controller for the automatic control of reaction temperature.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determination of reaction kinetics
- Operation of reactors in series
- Reaction thermodynamics
- Mass and energy balance
- Automatic temperature control with PID controller (for mod. REC3a/EV, only)
- Plant supervision by P.C. (for mod. REC3a/EV, only)
- Exercises than can be carried out:
  - kinetics of hydrolysis of ethyl acetate

TECHNICAL SPECIFICATIONS:

Mod. REC3/EV

- Framework of AISI 304 stainless steel with castors
- 2 tanks of AISI 316 stainless steel , with capacity of 10 l, for storing reagents
- Tank of AISI 316 stainless steel, with capacity of 20 l, for collecting the reaction product
- Tank of borosilicate glass, with capacity of 2 l, for the neutralization solution
- 2 reactors of AISI 304 stainless steel, with capacity of 3 litres/each, with variable speed stirrer and electric heater
- 2 metering pumps of AISI 316 stainless steel, with flow rate of 0 to 8.4 l/h
- Metering pump for the neutralization solution, with max. flow rate of 1.5 l/h
- 2 electronic conductivity meters
- 4 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 4 electronic temperature indicators
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. REC3c/EV

Besides being provided with all the characteristics of mod. REC3/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. REC3a/EV

Besides being provided with all the characteristics of mod. REC3/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 2,5 kVA
(Other voltage and frequency on request)
Dimensions: 1750 × 700 × 2200 mm
Weight: 250 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 150 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. REC3c/EV and mod. REC3a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

THREE-PHASE CATALYTIC REACTOR

Mod. TFR/EV

INTRODUCTION

The heart of this unit consists of a three-phase reactor whose substrate is in liquid phase, the reagent is in gaseous phase and the solid catalyst is suspended in the liquid.
The unit enables to study the reaction kinetics and the effects of mass-transfer phenomena on reaction rate thanks to a data acquisition software.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Catalytic reactions in slurry reactors
- Analysis of the effects of mass transfer
- Kinetic pattern
- Effects on the reaction rate of:
  - catalyst concentration
  - substrate concentration
  - pressure
  - temperature
  - stirring rate

TECHNICAL SPECIFICATIONS:

- Bench-top framework of AISI 304 stainless steel
- Pressure reducer with transducer
- Reactor of AISI 316 stainless steel, capacity 300 ml, equipped with stirrer and heating jacket
- Thermostatic bath with digital thermostat
- Data acquisition software for Windows

Power supply:	230 Vac 50 Hz single-phase - 1 kVA (Other voltage and frequency on request)
Dimensions:	850 × 700 × 770 mm
Weight:	50 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Cylinder of hydrogen

ACCESSORIES (NOT INCLUDED)

- Personal computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

BIODIESEL PRODUCTION PILOT PLANT

Mod. UPB/EV
Mod. UPBa/EV automated

INTRODUCTION

Biodiesel is a liquid fuel obtained by transesterification from renewable raw materials such as, for instance, vegetable oils or animal fats. If compared to fossil fuels, this type of fuel offers a lot of advantages:

- Very low content of sulphur (< 0.001%) that provokes the phenomenon of acid rains
- Reduction of dust emissions down to 50%
- Absence of benzene and of other carcinogenic components
- As it has a high flash point, it is not classified as dangerous material, consequently it can be handled easily and safely
- High biodegradation (in case of dispersion it does not pollute)
- High lubricating power (it reduces the wear of engines)
- It develops a closed loop of CO_2 (the quantity of CO_2 released by its combustion is equal to that absorbed by plants from the air during their growing process).

This unit is mainly equipped with a multi-function reactor that enables to carry out all the typical operations of biodiesel production: esterification, transesterification, washing and restoring of methanol.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Transesterification of a vegetable oil
- Separation of glycerine
- Washing of biodiesel
- Restoring methanol

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Multi-function reactor of borosilicate glass and AISI 304 stainless steel, with capacity of 18 litres, equipped with motor-driven stirrer and condenser
- Heating system by electric heaters, provided with thermostat
- Tank of borosilicate glass and AISI 304 stainless steel for reagent/catalyst, including stirring system
- 2 restoring tanks of borosilicate glass
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB

Mod. UPBa/EV

Besides being provided with all the characteristics of mod. UPB/EV, this model also includes the following additional items:

- Microprocessor digital PID controller with serial card

- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 2 kVA (Other voltage and frequency on request)
Dimensions: 1300 × 700 × 1900 mm
Weight: 180 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Water drain
- Compressed air (valve with connection of ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UPBa only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Screw press for extracting oil from seeds mod. VIT/EV

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

BIOETHANOL PRODUCTION PILOT PLANT

Mod. FER/EV manual
Mod. FERc/EV manual with data logging
Mod. FERa/EV automated

INTRODUCTION

Bioethanol is ethanol obtained from the fermentation of agricultural products and it is mainly used as alternative fuel.
This equipment enables to carry out a realistic test of conversion of starch into ethanol through all the phases of this process in a multi-function reactor that can implement liquefaction, saccarification, fermentation and distillation.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Gelification
- Liquefaction with α-amylase
- Saccarification with glucoamylase
- Fermentation with yeast
- Separation of ethanol by distillation
- Automatic temperature control by PID controller (for mod. FERa/EV, only)
- Plant supervision by P.C. (for mod. FERa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. FER/EV

- Framework of AISI 304 stainless steel with castors
- Multi-function reactor of AISI 304 stainless steel, with capacity of 13 litres, equipped with:
  - stirrer of AISI 304 stainless steel, with mechanical seal, turning at variable speed
  - baffles
  - sight glass
  - cooling/heating coil
  - insulation with sheet steel
  - thrmoresistor Pt100
  - sensor for measuring pH
  - safety valve
  - distillation column of borosilicate glass with bubble cap trays and 2 thermoresistances Pt100
  - condenser of AISI 304 stainless steel with 2 thermoresistances Pt100
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. FERc/EV

Besides being provided with all the characteristics of mod. FER/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. FERa/EV

Besides being provided with all the characteristics of mod. FER/EV, this model also includes the following additional items:

- Pneumatic valve of AISI 316 stainless steel for controlling the flow rate of steam
- Pneumatic valve of AISI 316 stainless steel for controlling the flow rate of cooling water
- 2 electropneumatic converters 4 to 20 mA/ 0.2 to 1 bar
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA
(Other voltage and frequency on request)
Dimensions: 1500 × 700 × 2100 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Steam: 20 kg/h @ 4.5 bar
- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. FERa/EV, only): 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. FERc/EV and FERa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

DISCONTINUOUS ENZYMATIC REACTOR

Mod. ENZR/EV

INTRODUCTION

The unit consists mainly of a reactor in which glucose is isomerized into fructose by means of glucose isomerase, an enzymatic catalyst.

The unit enables to study the kinetics of enzymatic reactions and the effects of the operating conditions.

A polarimeter measures the angle of rotation of the solution from which the conversion of the reaction can be estimated.

An optional data acquisition software with interface (mod. SI-ENZR/EV) is also available.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Discontinuous enzymatic reactor operation
- Effect of operating conditions
- Polarimeter operation and Biot law
- Determination of conversion using a polarimeter

TECHNICAL SPECIFICATIONS

- Bench-top framework of AISI 304 stainless steel
- Discontinuous reactor with stirrer, temperature probe and heating resistance
- Peristaltic sampling pump with sample cooling system
- Polarimeter to measure the angle of rotation
- Electronic thermostat
- Switchboard of painted carbon steel with ELCB

Power supply: 230 Vac 50 Hz single-phase - 1 kVA
(Other voltage and frequency on request)
Dimensions: 850 x 700 x 770 mm
Weight: 70 kg

Data acquisition software with interface - mod. SI-ENZR/EV

- For Windows
- Synoptic with the values of the measured variables
- Real-time trend
- Historical trend

REQUIRED ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. SI-ENZR/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

CATALYTIC REACTOR
Mod. CATR/EV

INTRODUCTION

The unit is equipped with two column reactors containing catalyst (ion-exchange resin) of different granulometry and a third column reactor containing an enzymatic catalyst (invertase), enabling the study of the inversion of sucrose in glucose and fructose.

A polarimeter measures the angle of rotation of the solution from which the conversion of the reaction can be estimated.

The reaction yield can be also determined using the optional spectrophotometer mod. CATR1/EV.

An optional data acquisition software with interface (mod. SI-CATR/EV) is also available.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Fixed-bed catalytic reactor operation
- Mass balance
- Comparison between chemical and enzymatic catalyst
- Determination of the conversion

TECHNICAL SPECIFICATIONS

- Bench-top framework of AISI 304 stainless steel
- 2 jacketed column reactors for the chemical catalyst
- Jacketed column reactor for the biological catalyst
- Thermostatic bath
- Peristaltic feeding pump
- Polarimeter to measure the angle of rotation
- Electronic thermostat
- Switchboard of painted carbon steel with ELCB

Power supply: 230 Vac 50 Hz single-phase - 1 kVA
(Other voltage and frequency on request)
Dimensions: 850 x 700 x 770 mm
Weight: 70 kg

Data acquisition software with interface - mod. SI-CATR/EV

- For Windows
- Synoptic with the values of the measured variables
- Real-time trend
- Historical trend

REQUIRED ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. SI-CATR/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

- Spectrophotometer mod. CATR1/EV

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CORROSION STUDY APPARATUS
Mod. COR/EV

INTRODUCTION

Corrosion represents a fundamental factor, not only for the life cycle and security of the industrial plants, but also for all the constructions (buildings, machine, bridges, etc.) containing metallic components.

With this system it is possible to study the main factors that influence corrosion, using 8 cells which can contain up to six samples; cells are stirred by blowing air or inert gas.

A digital pH-meter enables to control correctness of the test solutions, while a low-voltage power supply enables to study the electrochemical corrosion.

TRAINING PROGRAM

- pH influence on corrosion
- Mechanical stress influence on corrosion
- Influence of oxygen and dissolved sodium chloride
- Galvanic corrosion
- Cathodic protection
- Electrolytic corrosion
- Corrosion inhibitors

TECHNICAL SPECIFICATIONS

- Stainless steel AISI 304 table
- 8 corrosion cells in borosilicate glass, 1 liter capacity
- Air pump, 400 l/h
- pH-meter, range 0-14 pH, resolution 0.01 pH
- Platinum electrode
- Samples: zinc, steel, copper, brass

Power supply: 230 Vac 50 Hz single phase - 0.3 kW
Dimensions: 1200 x 400 x 400 mm
Weight: 50 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Scale with resolution 0.001 g
- Stopwatch
- De-ioniser cartridge
- 1 liter graduated cylinder
- 10 ml graduated cylinder

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

24-B

FI

FILTRATION

FI

www.elettronicaveneta.com

Introduction:

This section includes the system mod. FP-1S/EV that enables to elaborate on the issues concerning two main types of filtration: the traditional filtration by filter press and the tangential filtration. A PID controller enables to carry out an automatic filtration process at constant pressure or with constant flow rate.

The system mod. UOU/EV is a compact and flexible unit for studying the reverse osmosis and ultrafiltration on a wide range of operating conditions.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

FILTRATION

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

FILTER PRESS AND MICROFILTER PILOT PLANT

Mod. FP-1S/EV

INTRODUCTION

This system is equipped with a filter press and a microfilter (tangential filtration) that are fed by a screw pump connected with a tank filled with the solution having to be filtered.
Then filtrate is collected into another tank.
A microprocessor PID controller enables to operate at constant pressure and flow rate. The supervision software enables to control the system from a PC.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Dead end filtration (filter press)
- Tangential filtration (microfilter)
- Characteristic equations of filtration
- Filtration at constant flow rate or pressure
- Display of plant operational parameters on the schematic diagram with real-time data
- Automatic flow and pressure control by PID controller
- Plant supervision by P.C.

- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Emergency button
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 1500 × 670 × 1900 mm
Weight: 150 kg

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Feeding tank of AISI 304 stainless steel, with capacity of 100 l, equipped with stirring system driven by submersible pump
- Tank of AISI 304 stainless steel, with capacity of 100 l, for collecting the filtered water
- Screw feeding pump with control system by electronic inverter
- Magnetic flowmeter of stainless steel with 4-20 mA output signal
- 3 electronic pressure transmitters of stainless steel with 4-20 mA output signal
- 2 safety pressure switches
- Filter press of AISI 304 stainless steel with frames of transparent Plexiglas for displaying the process
- Microfilter provided with housing of AISI 316 stainless steel
- Electronic turbidity meter with 4 - 20 mA output
- Microprocessor digital PID controller with serial card

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 3,5 kVA (Other voltage and frequency on request)
- Tap water (valve with ½" hose connector)
- Water floor drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

FILTER PRESS PILOT PLANT

Mod. FP-2S/EV

INTRODUCTION

This system is equipped with a filter press fed by a variable speed screw pump connected to a tank containing the solution to be filtered. The filtrate passes through a flowmeter and is then collected in another tank. The pump enables to operate at constant pressure and flow rate.

TRAINING PROGRAM

This unit enables an in-depth analysis of the following topics:

- Characteristic equations of filtration
- Filtration at constant flow rate or pressure
- Typical procedures of a filter press (assembly, filtration, disassembly and cleaning)

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Feeding tank of AISI 304 stainless steel, with 100 l capacity, equipped with stirring system driven by submersible pump
- Tank of AISI 304 stainless steel, with 100 l capacity, to collect the filtered water
- Screw feeding pump with speed variator
- Variable area flowmeter for the filtered liquid
- Filter press of AISI 304 stainless steel with transparent Plexiglas frames to display the process
- IP55 switchboard, complying with EC conformity mark, including synoptic diagram and ELCB
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Emergency pushbutton

Power supply: 230 Vac 50 Hz single-phase - 3,5 kVA
(Other voltage and frequency on request)
Dimensions: 1500 x 670 x 1900 mm
Weight: 150 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Water floor drain

OPTIONAL ACCESSORIES

- Portable turbidimeter

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

REVERSE OSMOSIS AND ULTRAFILTRATION PILOT PLANT

Mod. UOU/EV manual
Mod. UOUc/EV manual with data logging

INTRODUCTION

This unit is a flexible system for studying the reverse osmosis and ultrafiltration on a wide range of operating conditions.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Effect of the following operational parameters on the process:
  - feeding flow rate
  - feeding concentration
  - working pressure
  - temperature
- Pre-concentration and concentration of milk
- Clarification and concentration of fruit juice
- Desalination of water

TECHNICAL SPECIFICATIONS:

Mod. UOU/EV

- Framework of AISI 304 stainless steel with castors
- Feeding tank of AISI 304 stainless steel with capacity of 30 litres
- Tank of AISI 304 stainless steel, with capacity of 30 litres, for permeate
- Piston pump of AISI 316 stainless steel
- Centrifugal pump of AISI 316 stainless steel
- AISI 316 stainless steel housing for 2 membranes; typical flow of permeate = 5-50 ml/min
- Heat exchanger of AISI 304 stainless steel
- 2 variable area flowmeters for permeate and concentrate (for mod. UOU/EV, only)
- 4 Pt100 with sheath of AISI 316 stainless steel
- 2 Bourdon gauges of AISI 304 stainless steel
- Safety valve
- Safety pressure switch
- Switchboard with ELCB

Mod. UOUc/EV

Besides being provided with all the characteristics of mod. UOU/EV, this model also includes the following additional items:

- 2 flowmeters with transmitter
- 2 pressure transmitters of stainless steel
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Dimensions: 1700 x 800 x 1900 mm
Weight: 225 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 7,5 kVA (Other voltage and frequency on request)
- Tap water: max. 300 l/h (valve with ½" hose connector)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UOUc/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

24-B

EVAPORATION

Introduction:

The evaporation units shown in this section have been classified into three main categories, according to their construction typology:

- **falling-film evaporators;**
- **thin-film evaporators;**
- **rising-film evaporators.**

The category of falling-film systems includes the lines UME/EV and EDE/EV, available in manual version, manual version with data logging and automated version: these units enable to elaborate on the issues concerning single-effect and double-effect evaporators respectively.

The category of thin-film systems includes the lines UFS/EV and ESS/EV, available in manual version, manual version with data logging and automated version: these units enable to elaborate on the issues concerning thin-film evaporators. The line UFS/EV offers small-scale reproductions of the units of the line ESS/EV.

Rising-film systems are included in the line RFE/EV, available in manual version, manual version with data logging and automated version.
At last the unit mod. CT/EV represents a very good aid for the study of the issues concerning the evaporation in cooling towers.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

EVAPORATION

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

SINGLE-EFFECT FALLING-FILM EVAPORATION PILOT PLANT

Mod. UME/EV manual
Mod. UMEc/EV manual with data logging
Mod. UMEa/EV automated

INTRODUCTION

This unit consists of a falling-film evaporator equipped with a shell-and-tube condenser. The evaporator is fed by a metering pump and it operates under vacuum thanks to a liquid-ring vacuum pump.
The concentrated product and the evaporated solvent are collected into two glass tanks.

The automated version mod. UMEa/EV includes a PID controller that enables to control automatically the flow rate of steam sent to the evaporator and the vacuum degree of the plant.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balances
- Energy balances
- Determination of heat transfer coefficient
- Optimization of evaporation process
- Automatic flow and vacuum control by PID controller (for mod. UMEa/EV, only)
- Plant supervision by P.C. (for mod. UMEa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UME/EV

- Framework of AISI 304 stainless steel with castors
- Metering pump of AISI 316 stainless steel, flow rate: 0-24 l/h
- Feeding tank of borosilicate glass with capacity of 25 l
- Tank of borosilicate glass, with capacity of 10 l, for collecting the concentrated product
- Tank of borosilicate glass, with capacity of 10 l, for collecting the condensed solvent
- Steam trap of AISI 304 stainless steel
- Graduated tank of borosilicate glass, with capacity of 1 l, for measuring the condensate
- Bourdon pressure gauge, with range of 0 to 6 bar
- Bourdon pressure gauge, with range of 0 to 1.6 bar
- Bourdon vacuum gauge, with range of 0 to -1 bar
- Falling-film shell-and-tube evaporator of AISI 304 stainless steel, with exchange surface of 0.27 m^2
- Shell-and-tube condenser of AISI 304 stainless steel, with exchange surface of 1.1 m^2
- Tube-in-tube heat exchanger of AISI 304 stainless steel
- Pneumatic valve of AISI 316 stainless steel, Cv = 0.32, for the control of steam flow rate
- Calibrated diaphragm of stainless steel with AISI 316 differential pressure transmitter for measuring the steam flow rate
- 6 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 6 electronic temperature indicators
- Flowmeter of glass and steel, with range of 30 to 300 l/h
- Liquid-ring vacuum pump, P = 0.7 kW, equipped with air/water separator and solenoid valve for feeding water
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UMEc/EV

Besides being provided with all the characteristics of mod. UME/EV, this model also includes the following additional items:

- Residual pressure electronic transmitter of stainless steel and range of 0 to 1000 mbar
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UMEa/EV

Besides being provided with all the characteristics of mod. UME/EV, this model also includes the following additional items:

- Pneumatic valve of AISI 316 stainless steel, Cv = 2.5, for controlling the working pressure
- Residual pressure electronic transmitter of stainless steel and range of 0 to 1000 mbar, 4-20 mA output signal
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2000 × 850 × 2500 mm
Weight: 280 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 2 kVA (Other voltage and frequency on request)
- Tap water: 300 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Steam: 20 kg/h @ 4.5 bar
- Floor water drain
- Fume suction system

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for the analysis of the composition (e.g.: a refractometer)
- Personal Computer running Windows (for mod. UMEc/EV and mod. UMEa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

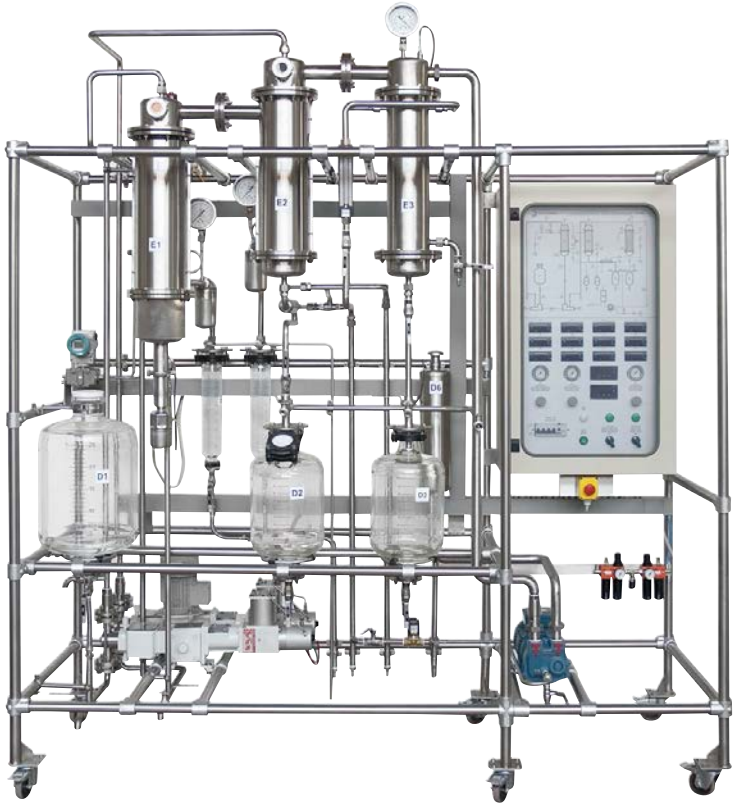
OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

DOUBLE-EFFECT FALLING-FILM EVAPORATION PILOT PLANT

Mod. EDE/EV manual
Mod. EDEc/EV manual with data logging
Mod. EDEa/EV automated



INTRODUCTION

This unit consists of two falling-film shell-and-tube evaporators and of a shell-and-tube condenser; the first stage is heated by steam, whereas the second stage is heated by the solvent vaporized in the first stage. The evaporator is fed by a metering pump and it works under vacuum thanks to a liquid-ring vacuum pump.

The concentrated product and the vaporized solvent are collected into two glass tanks.

The automated version mod. EDEa/EV is equipped with 2 PID controllers that enable to control the flow rate of steam reaching the evaporator, the vacuum degree in the system and the level of the first stage, automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balances
- Energy balances
- Determination of overall heat transfer coefficient
- Optimization of the evaporation process
- Automatic flow, level and vacuum control by PID controller (for mod. EDEa/EV, only)
- Plant supervision by P.C. (for mod. EDEa/EV, only)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. EDE/EV

- Framework of AISI 304 stainless steel with castors
- Metering pump with double body of stainless steel AISI316, flow rate of 0-32 l/h, and pneumatic actuator
- Feeding tank of borosilicate glass, with capacity of 25 l
- Tank of borosilicate glass, with capacity of 10 l, for collecting the concentrated product
- Tank of borosilicate glass, with capacity of 10 l, for collecting the condensed solvent
- 2 steam traps of AISI 304 stainless steel
- 2 graduated tanks of borosilicate glass for measuring the condensate, with capacity of 1 l
- Bourdon pressure gauge of AISI 304 stainless steel, with range of 0 to 6 bar
- Bourdon pressure gauge of AISI 304 stainless steel, with range of 0 to 1.6 bar
- Bourdon vacuum gauge of AISI 304 stainless steel, with range of 0 to -1 bar
- 2 falling-film shell-and-tube evaporators of AISI 304 stainless steel, each one with exchange surface of 0.27m^2
- Shell-and-tube condenser of AISI 304 stainless steel, with exchange surface of 1.1 m^2
- Tube-in-tube heat exchanger of AISI 304 stainless steel
- Electronic first-effect level transmitter, capacitance type, with board-type display
- Pneumatic valve of AISI 316 stainless steel, (Cv = 0.32) for the control of steam flow rate
- Calibrated diaphragm of stainless steel with differential pressure transmitter of AISI 316 stainless steel for measuring the steam flow rate
- 12 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 12 board-type electronic temperature indicators
- Flowmeter of glass and steel with range of 25 to 250 l/h
- Liquid-ring vacuum pump provided with air/water separator and solenoid valve for feeding water
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. EDEc/EV

Besides being provided with all the characteristics of mod. EDE/EV, this model also includes the following additional items:

- Residual pressure electronic transmitter of stainless steel and range of 0 to 1000 mbar
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. EDEa/EV

Besides being provided with all the characteristics of mod. EDE/EV, this model also includes the following additional items:

- Pneumatic valve of AISI 316 stainless steel, Cv = 2.5, for the control of working pressure
- Electronic transmitter of residual pressure, body of AISI 316 stainless steel , range of 0 to 1000 mbar and 4-20 mA output signal
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2300 × 850 × 2700 mm
Weight: 500 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 2,5 kVA (Other voltage and frequency on request)
- Tap water: 300 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 10 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Steam: 20 kg/h @ 4.5 bar
- Water floor drain

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for the analysis of the composition (e.g.: a refractometer)
- Personal Computer running Windows (for mod. EDEc/EV and mod. EDEa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

THIN FILM EVAPORATION PILOT PLANT

Mod. UFS/EV — manual
Mod. UFSc/EV — manual with data logging
Mod. UFSa/EV — automated

INTRODUCTION

This evaporator consists of a cylindrical tube provided with a steam heating jacket and with a three-blade inner rotor that produces a very thin film of liquid on the walls.
The solution having to be concentrated is transferred from the storage tank to the evaporator by a metering pump; the vaporized solvent is condensed in a shell-and-tube condenser and then it is collected into a tank.
This type of evaporator is widely used in the industries for concentrating thermosensitive, viscous products, or dirtying products such as solutions containing sugar, enzymes, vitamins, proteins, fruit juices, fermentation broths, etc…
The automated version mod. UFSa/EV is equipped with PID controller that enables to control the flow rate of steam to the evaporator and the vacuum degree of the unit, automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balances
- Energy balances
- Determination of overall heat transfer coefficient
- Optimization of evaporation process
- Automatic flow and vacuum control by PID controller (for mod. UFSa/EV, only)
- Plant supervision by P.C. (for mod. UFSa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UFS/EV

- Framework of AISI 304 stainless steel with castors
- Metering pump of AISI 316 stainless steel, Q_{max} = 8 l/h
- Feeding tank of borosilicate glass, with capacity of 5 l
- Tank of borosilicate glass, with capacity of 4 l, for collecting the concentrated product
- Tank of borosilicate glass, with capacity of 4 l, for collecting the solvent
- Steam trap of AISI 304 stainless steel
- Vacuum gauge of AISI 304 stainless steel, with range of -1 to 0 bar
- Thin film evaporator of AISI 316 stainless steel with variable speed rotor, water-cooled mechanical seal lubricated with silicone oil, exchange surface of 0.06 m^2
- Electronic r.p.m indicator
- Shell-and-tube condenser of AISI 304 stainless steel, with exchange surface of 0.26 m^2
- Pneumatic valve of AISI 316 stainless steel, Cv = 0.32, for the control of steam flow rate
- Graduated tank of borosilicate glass, with capacity of 1 l, for measuring the condensate
- 3 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 3 electronic temperature indicators
- Liquid-ring vacuum pump with air/water separator and solenoid on-off valve for the feeding water
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UFSc/EV

Besides being provided with all the characteristics of mod. UFS/EV, this model also includes the following additional items:

- Electronic flow transmitter, differential pressure type, of AISI 316 stainless steel , range of 0 to 1000 mmH_2O, 4-20 mA output signal
- Calibrated diaphragm of stainless steel for measuring the steam flow rate
- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UFSa/EV

Besides being provided with all the characteristics of mod. UFS/EV, this model also includes the following additional items:

- Electronic flow transmitter, differential pressure type, of AISI 316 stainless steel , range of 0 to 1000 mmH_2O, 4-20 mA output signal
- Calibrated diaphragm of stainless steel for measuring the steam flow rate
- Pneumatic valve of AISI 316 stainless steel, Cv = 2.5, for the control of working pressure
- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 1600 × 700 × 2300 mm
Weight: 200 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 2,5 kVA (Other voltage and frequency on request)
- Tap water: 300 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air (for mod. UFSa/EV, only): 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Steam: 20 kg/h @ 4.5 bar
- Water floor drain

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of (e.g.: a refractometer)
- Personal Computer running Windows (for mod. UFSc/EV and mod. UFSa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

THIN FILM EVAPORATION PILOT PLANT

Mod. ESS/EV — manual
Mod. ESSc/EV — manual with data logging
Mod. ESSa/EV — automated

INTRODUCTION

This evaporator consists of a cylindrical tube provided with a steam heating jacket and with a three-blade inner rotor that produces a very thin film of liquid on the walls.
The solution having to be concentrated is transferred from the storage tank to the evaporator by a metering pump; the vaporized solvent is condensed in a shell-and-tube condenser and then it is collected into a tank.
This type of evaporator is widely used in the industries for concentrating thermosensitive, viscous products, or dirtying products such as solutions containing sugar, enzymes, vitamins, proteins, fruit juices, fermentation broths, etc…
The automated version mod. ESSa/EV is equipped with PID controller that enables to control the flow rate of steam to the evaporator and the vacuum degree of the plant, automatically.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balances
- Energy balances
- Determination of global heat transfer coefficient
- Optimization of evaporation process
- Automatic flow and vacuum control by PID controller (for mod. ESSa/EV, only)
- Plant supervision by P.C. (for mod. ESSa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. ESS/EV

- Framework of AISI 304 stainless steel with castors
- Feeding tank of borosilicate glass, with capacity of 10 l
- Tank of borosilicate glass, with capacity of 10 l, for collecting the concentrated solution
- Tank of borosilicate glass, with capacity of 10 l, for collecting the evaporated solvent
- Thin-film evaporator of AISI 316 stainless steel, provided with 3-blade rotor 0.5 mm far from the wall; speed variable from 0 to 1500 rpm by inverter; exchange surface: 0.12 m^2; evaporating capacity: 10 kg/h of H_2O; double mechanical seal lubricated with silicone oil and water cooled
- Shell-and-tube condenser of AISI 304 stainless steel with exchange surface of 1.1 m^2
- Feed metering pump of AISI 316 stainless steel (0 to 20 l/h), equipped with pneumatic actuator that can be driven by a signal of 0.2 to 1 bar
- Liquid-ring vacuum pump with air/water separator and solenoid on-off valve for feeding water
- Steam trap of AISI 304 stainless steel
- Pneumatic valve of AISI 316 stainless steel, Cv = 0.32, for the control of steam flow rate
- Differential-pressure transmitter of AISI 316 stainless steel for measuring the steam flow rate, with calibrated diaphragm of AISI 304 stainless steel
- 2 pressure gauges of AISI 304 stainless steel, with range of 0 to 1.6 and of 0 to 6 bar
- Vacuum gauge of AISI 304 stainless steel, with range of –1 to 0 bar
- 2 sight glasses of stainless steel
- 6 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 6 electronic temperature indicators
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. ESSc/EV

Besides being provided with all the characteristics of mod. ESS/EV, this model also includes the following additional items:

- Electronic flow transmitter of differential pressure type, with body of AISI 316 stainless steel , range of 0 to 1000 mm H_2O, 4-20 mA output signal
- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Mod. ESSa/EV

Besides being provided with all the characteristics of mod. ESS/EV, this model also includes the following additional items:

- Pneumatic valve of AISI 316 stainless steel, Cv = 2.5, for the control of working pressure
- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2100 × 800 × 3000 mm
Weight: 260 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 5,5 kVA (Other voltage and frequency on request)
- Tap water: 300 l/h @ 2 bar (valve with ½" hose connector)
- Compressed air: 10 Nm^3/h @ 6 bar (valve with connection of ¼" F)
- Steam: 20 kg/h @ 4.5 bar
- Floor water drain

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of (e.g.: a refractometer)
- Personal Computer running Windows (for mod. ESSc/EV and mod. ESSa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

RISING FILM EVAPORATION PILOT PLANT

Mod. RFE/EV — manual
Mod. RFEc/EV — manual with data logging
Mod. RFEa/EV — automated

INTRODUCTION

Rising film evaporators can ensure a high heat-transfer coefficient and short residence time to the solution having to be concentrated.
They are used especially to concentrate thermosensitive products such as antibiotics, fruit juices, milk, etc…

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balances
- Energy balances
- Evaporation operations on food liquids, organic solutions, etc...
- How the following parameters affect the process:
  - feeding flow rate
  - vacuum degree
  - recycling of the product
  - flow rate/pressure of steam
- Overall heat transfer coefficient
- CIP (clean in place) procedures

TECHNICAL SPECIFICATIONS:

Mod. RFE/EV

- Framework of AISI 304 stainless steel with castors
- Evaporator of AISI 304 stainless steel, with exchange surface of 0.06 m^2
- Evaporation capacity: 10 l/h (referred to pure water)
- Maximum pressure of steam in the jacket: 3 bar (g)
- Steam trap of AISI 304 stainless steel
- Safety valve
- Cyclone of AISI 304 stainless steel
- Shell-and-tube condenser of AISI 304 stainless steel, with exchange surface of 0.26 m^2
- Tube-in-tube heat exchanger of AISI 304 stainless steel for cooling the concentrated product
- Feeding metering pump of AISI 316 stainless steel, with flow rate of 0 to 16 l/h
- CIP pump of AISI 316 stainless steel, 30 l/min @ 2 bar
- Feeding tank of AISI 304 stainless steel , with capacity of 30 litres
- Graduated tank of borosilicate glass with washing sprayball and capacity of 5 l, for the concentrated solution
- Graduated tank of borosilicate glass with washing sprayball and capacity of 5 l, for the evaporated solvent
- Graduated tank of borosilicate glass, with capacity of 1 litre, for measuring the condensate
- Liquid-ring vacuum pump with air/water separator and solenoid on-off valve for feeding water
- Variable area flowmeter for the condenser cooling water
- 6 thermoresistances Pt 100, with sheath of AISI 316 stainless steel
- 3 Bourdon pressure gauges of AISI 304 stainless steel
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. RFEc/EV

Besides being provided with all the characteristics of mod. RFE/EV, this model also includes the following additional items:

- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. RFEa/EV

Besides being provided with all the characteristics of mod. RFE/EV, this model also includes the following additional items:

- Electronic vacuum transmitter of AISI 316 stainless steel, with range of 0 to 1000 mbar and 4-20 mA output signal
- Microprocessor PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 2200 × 800 × 2400 mm
Weight: 260 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 3,5 kVA (Other voltage and frequency on request)
- Tap water: 300 l/h @ 2 bar (valve with ½" hose connector)
- Steam: 20 kg/h @ 4.5 bar
- Water floor drain
- Compressed air (for mod. REFa/EV, only): 1 Nm^3/h @ 6 bar (valve with connection of ¼" F)

ACCESSORIES (NOT INCLUDED)

- Analytical instruments for analyzing the composition of (e.g.: a refractometer)
- Personal Computer running Windows (for mod. RFEc/EV and mod. RFEa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

STEAM GENERATOR WITH SOFTENER
mod. SCT04/EV or SCT03/EV

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

COOLING TOWER APPARATUS

Mod. CT/EV manual
Mod. CTc/EV manual with data logging

INTRODUCTION

This equipment has been designed to experience with the construction principles and operational characteristics of cooling towers and it mainly consists of a packed tower of transparent metacrylate.

The water heated in a tank is pumped to the top of the tower and its flow rate is measured by a variable area flowmeter; then the water is distributed onto the packing uniformly to avoid any "channeling" phenomenon.

The cooled water is collected at the tower bottom and then it is sent again to the heated tank.
An additional tank will keep the level of heated tank constant compensating the water lost by evaporation.

A forced air flow is blown by a centrifugal fan onto the column bottom; the flow rate of air can be controlled by an air lock and measured by a diaphragm at the column top.
After leaving the packing, the air will cross a demister.

The heated tank is equipped with 3 electric heaters and with a safety thermostat.
Process temperatures are measured by digital thermometers; a differential pressure gauge will measure the pressure drops on the packing and on the diaphragm.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Fluodynamics of different packings with different flow rates of air and water
- Measurement of operational parameters in steady-state conditions
- Representation of the state of the system on psychrometric chart and energy balance
- Effect of the packing surface on the approach to wet bulb and on the pressure drops
- Performance with different cooling loads and inlet temperatures

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

- Rectangular tower of Plexiglas; height of 550 mm
- 3 packings of different specific surface (92, 131 and 235 m^2/m^3) being included in the tower and easily interchangeable
- Additional water tank of Plexiglas, with capacity of 1 litre
- Centrifugal fan, with max. flow rate of 1340 m^3/h and maximum head of 80 mmH_2O
- Tank of AISI 304 stainless steel for hot water, with capacity of 9 litres and 3 electric heaters of 500 W
- Pump for water, Q_{max} = 3 m^3/h, H_{max} = 5 m H_2O
- Switchboard IP55, complying with EC standards and including digital thermostat, fan controls, resistors and ELCB

Power supply: 230 Vac 50 Hz single-phase - 2,6 kVA
(Other voltage and frequency on request)
Dimensions: 100 × 650 × 1400 mm
Weight: 72 kg

For Mod. CT/EV only

- 6 digital thermometers with Liquid-Crystal Display (LCD)
- Flowmeter, with range of 20-200 l/h
- Inclined manometer, with range of 0-60 mm H_2O

For Mod. CTc/EV only

- 4 thermoresistances Pt100 with sheath of AISI 304 stainless steel
- 2 digital thermohygrometers
- Flowmeter with transmitter
- Electronic transmitter of differential pressure
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Distilled water: 10 litres + 2 l/h

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. CTc/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

24-B

24-B

CHEMICAL ENGINEERING

CRYSTALLIZATION

CRYSTALLIZATION UNIT

MOD. CRU1/EV **CR**2

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CRYSTALLIZATION UNIT
Mod. CRU1/EV

INTRODUCTION

The unit allows to demonstrate the cooling crystallisation process to the students within a typical laboratory period. Interface and data logging software for Win are included.

TRAINING PROGRAM

- Understanding the principle of crystallization
- Mass and energy balance
- Fractional crystallization
- Efficiency and kinetics of crystallization
- Effect of stirring and cooling speeds
- Particle size distribution of crystals

TECHNICAL SPECIFICATIONS:

- Jacketed crystallisation vessel in borosilicate glass with temperature control and agitation
- Hot water recirculation system, 2.4 kW
- Electronic thermostat
- Set of test sieves with a range of mesh sizes
- Conductivity meter, range 0 - 200 mS/cm
- Flow meter for cooling water
- Interface and data logging software for Windows

Power supply: 230 Vac 50 Hz single-phase
(Other voltage and frequency on request)
Dimensions: 850 x 700 x 770 (h) mm
Weight: 50 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 250 l/h @ 2 bar
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows
- Buchner vacuum filtration apparatus
- Laboratory oven to dry the crystals sample
- Laboratory balance

SUPPLIED WITH

INSTRUCTION MANUAL

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

24-B

DRYING

DR

www.elettronicaveneta.com

Introduction:

The dryer mod. TD/EV, also available in computerized version mod. TDc/EV, has been designed to study the commonest industrial drying method of solids consisting in blowing a jet of hot air onto some trays of wet materials.

The spray dryer mod. MSD/EV, is a unit designed for educational and research laboratories and it enables to obtain the product micronized in short time, as well as valid data for scale up.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

DRYING

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TRAY DRYER APPARATUS

Mod. TD/EV manual
Mod. TDc/EV manual with data logging

INTRODUCTION

This dryer has been designed to study the commonest industrial drying method of solids consisting in blowing a flow of hot air onto some trays where wet material is arranged.
The unit consists of a tunnel equipped with an axial fan at one of its ends. A battery of electric resistors installed after the fan will heat the air flow entering the drying chamber. The chamber with transparent inlet door contains a set of trays suspended on the pan of a balance mounted above the dryer. The total capacity of these trays is of approximately 3.5 kg of solid.
Varying the air speed by an inverter and the power of resistors by a thyristor will enable to vary the temperature of inlet air.
Temperature and relative humidity are measured before and after the drying chamber thanks to two transmitters of temperature/humidity.
The heating elements are completely protected from overheating by a safety switch and they can be switched on only if the fan is turning. Moreover a minimum speed for the fan has been preset.
A digital anemometer will measure the air flow rate.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Psychrometric chart
- Energy balance
- Mass balance
- Drying regimes
- Analogies between mass and heat transfer
- How air speed and temperature can affect drying

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Horizontal duct of AISI 304 stainless steel with window (450×450 mm)
- Fan with digital speed control, 0 to 4 m/s
- 4 aluminium trays, 400×300 mm
- Adjustable battery of electric heaters, P_{max} = 2.7 kW
- 2 digital thermohygrometers with displays
- Digital anemometer with display
- Electronic balance, with range of 0 to 10 kg, division 0.1 g
- Digital chronometer
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Power supply: 230 Vac 50 Hz single-phase - 3,1 kVA
(Other voltage and frequency on request)
Dimensions: 1830 × 800 × 1700 mm
Weight: 100 kg

For Mod. TDc/EV only

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

REQUIRED ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. TDc/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

SPRAY DRYER

Mod. MSD/EV

INTRODUCTION

Spray drying is a rapid and efficient method for obtaining powdered products from solutions. If compared to freeze-drying, this technique ensures higher production potentialities and shorter execution times.
Very short residence times and the refrigerating effect due to solvent evaporation make it the ideal method for drying thermosensitive products.

This spray dryer has been designed for educational and research laboratories and it enables to obtain the product micronized in short time, as well as valid data for scale up.
All the parts in contact with the product are of stainless steel and of borosilicate glass.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Drying of aqueous solutions by atomization

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Temperature programmable up to 250°C
- Touch screen control panel
- Built-in compressor
- Variable speed fan
- Heating system of 3000 W
- Peristaltic pump adjustable up to 1500 ml/h
- Atomization system with spray nozzle of stainless steel and cleaning device
- Drying chamber of borosilicate glass with vessel of borosilicate glass for collecting bottom product
- Cyclone of borosilicate glass with bottle of borosilicate glass for collecting the sample
- Exhaust pipe for exhausted vapours

Power supply: 230 Vac 50 Hz single-phase - 3 kVA
(Other voltage and frequency on request)
Dimensions: 780 × 560 × 1300 mm
Weight: 110 kg

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

FLUID BED DRYER
Mod. FBD/EV

INTRODUCTION

The unit allows to gently dry organic, inorganic, chemical or pharmaceutical materials, which can be coarse, fine, crystalline, fibrous or flaky shaped.
The powerful air flow allows to gently and quickly mix the product.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Establishing moisture content and drying time
- Establishing the drying curve
- Calculation of the heat transfer coefficient

TECHNICAL SPECIFICATIONS

- Short drying time (5-20 min)
- Granulometry > 63 micron
- Quick closing system
- Temperature 40-150° C
- 6 l glass drying container
- Digital parameter monitoring
- Memory for 9 programs

Power supply: 230 Vac 50 Hz single-phase
(Other voltage and frequency on request)
Dimensions: 400 x 480 x 1000 mm
Weight: 25 kg

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Lab scale (5000 g, 0.1 g)

SOLID HANDLING

SOLID HANDLING STUDY

MOD. SHS/EV **SH** 2

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

SOLID HANDLING STUDY
Mod. SHS/EV

INTRODUCTION

The unit allows to study the behavior of granular materials using 3 units: a V mixer with a ball-mill mod. SHS1/EV, a solid handling unit mod. SHS2/EV and a vibrating sieve mod. SHS3/EV.

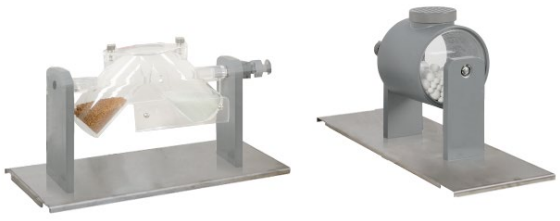
TRAINING PROGRAM

This unit enables to deepen the following issues:

- Reducing the granulometry of a solid with a ball-mill (mod. SHS1/EV)
- Mixing granular material with a V mixer (mod. SHS1/EV)
- Establishing angle of repose, stratification and moisture effect (mod. SHS2/EV)
- Flowing of granular material through orifices and moisture effect (mod. SHS2/EV)
- Pneumatic transport and cyclone separation (mod. SHS2/EV)
- Granulometric analysis with a vibrating sieve (mod. SHS3/EV)

TECHNICAL SPECIFICATIONS

V mixer with a ball-mill Mod. SHS1/EV



- Variable speed motor with quick coupling
- V mixer
  - Clear plastic
  - Volume = 1,2 liters
- Ball-mill
  - Clear plastic
  - Volume = 3,5 liters
- Grinding balls
- Dimensions and weight: 700 x 400 x 400 mm, 40 kg

Solid handling unit Mod. SHS2/EV

- Hele-Shaw cell in clear plastic
- Glass cylinder with conical bottom and 4 bottom orifices (5, 10, 15, 20 mm) for tank discharging experiments or as cyclone separator
- Dimensions and weight: 500 x 400 x 700 mm, 45 kg

Vibrating sieve Mod. SHS3/EV

- Vibrating sieve with 1-60 minutes timer and 0.25, 0.35, 0.5, 0.71, 1 e 2 mm sieves (DIN standard ISO 3310-1 and BS 410-1)
- Dimensions and weight: 300 x 300 x 500 mm, 35 kg

Power supply: 230 Vac 50 Hz single-phase
(Other voltage and frequency on request)

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Compressed air: 1 bar

ACCESSORIES (NOT INCLUDED)

- Chronometer
- Lab scale
- Solid material (sand, rock, rice, etc.)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Conductivity meter

24-B

HE

HEAT EXCHANGE

HE

www.elettronicaveneta.com

Introduction:
This section includes a set of units for the study of the most important types of industrial heat exchangers.

The line UTC-1/EV, available in manual version, manual version with data logging and in automated version, is equipped with a plate-type heat exchanger and with a U-tube heat exchanger.

The line UTC-2/EV, available in manual version, manual version with data logging and in automated version, is equipped with a shell-and-tube heat exchanger and with a spiral plate heat exchanger.

The unit mod. UTC-2S/EV is equipped with a shell-and-tube exchanger and it also includes a hot water generator.

The line mod. UTC-3/EV, available in manual version, manual version with data logging and in automated version, is equipped with a shell-and-tube heat exchanger and with an air heat exchanger.

The equipment mod. HESU/EV, available in a relatively cheap bench-top version, enables to study the tube-in-tube, shell-and-tube, plate-type exchangers, as well as jacket tank exchangers mounting these different exchangers onto the same service unit.

The line mod. SCT/EV, available in manual version, manual version with data logging and in automated version, is equipped with tube-in-tube, shell-and-tube and plate-type heat exchangers.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

HEAT EXCHANGE

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

HEAT EXCHANGERS APPARATUS

Mod. HESU/EV

INTRODUCTION

This equipment consists of a service unit (mod. HES/EV) that supplies the necessary utilities and measuring instruments to carry out tests on five types of heat exchangers: tube-in-tube exchanger (mod. HE1/EV), plate exchanger (mod. HE2/EV), shell-and-tube exchanger (mod. HE3/EV), jacketed tank (mod. HE4/EV) and crossflow exchanger (mod. HE5/EV).

The minimum purchasable configuration includes the service unit (mod. HES/EV) and one of these four exchangers.
A data acquisition software with interface system (mod. SI-HE/EV) is available as optional item.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers

TECHNICAL SPECIFICATIONS:

Service unit Mod. HES/EV

- Bench-top framework of AISI 304 stainless steel
- Hot water generator of AISI 304 stainless steel with electronic temperature control, pump, heater of 2 kW and level switch
- Pressure controller of cold water
- 2 electronic flowmeters
- 6 thermoresistances Pt100
- Switchboard of painted carbon steel with ELCB
- All data can be acquired by PC via the optional data acquisition software with interface system (mod. SI-HE/EV)

Power supply: 230 Vac 50 Hz single-phase - 3 kVA
(Other voltage and frequency on request)
Dimensions: 850 × 700 × 770 mm
Weight: 70 kg

Tube-in-tube heat exchanger Mod. HE1/EV

- 6 sections of double pipes (outer pipe of transparent Plexiglas, inner pipe of stainless steel)
- Possibility of using 2, 4 or 6 sections to change the total exchange surface (0.027, 0.054 and 0.081 m^2)
- Pipes can easily be disassembled for cleaning

Plate-type heat exchanger Mod. HE2/EV

- 10 plates of stainless steel with exchange surface of 0.1 m^2

Shell-and-tube heat exchanger Mod. HE3/EV

- Shell of transparent Plexiglas with two baffles
- 7 (removable) inner pipes of stainless steel
- Surface of 0.02 m^2

Jacket tank heat exchanger Mod. HE4/EV

- Tank with jacket and coil
- Stirrer of variable speed with baffle

Crossflow heat exchanger Mod. HE5/EV

- Rectangular duct
- Radiator with fan
- Air speed sensor

Supervision software with interface Mod. SI-HE/EV

- for Windows
- Synoptic with the values of the measured variables
- Real-time trend
- Historical trend

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 400 l/h @ 2 bar (valve with ½" hose connector)
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. SI-HE/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

HEAT TRANSFER PILOT PLANT WITH PLATE AND U-TUBE HEAT EXCHANGER

Mod. UTC-1/EV manual
Mod. UTC-1c/EV manual with data logging
Mod. UTC-1a/EV automated

INTRODUCTION

This unit enables to study heat exchanges by using a U-tube exchanger and a plate-type exchanger.
The automated version (mod. UTC-1a/EV) includes a PID controller that controls the flow rates automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers
- Automatic flow control by PID controller (for mod. UTC-1a/EV, only)
- System supervision by P.C. (for mod. UTC-1a/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UTC-1/EV

- Framework of AISI 304 stainless steel with castors
- U-tube heat exchanger with pipes of AISI 304 stainless steel and shell of borosilicate glass, exchange surface of 0.6 m^2
- Plate-type heat exchanger of AISI 316 stainless steel, with exchange surface of 0.6 m^2
- 2 variable area flowmeters of glass and steel, with range of 100 to 1000 l/h (for mod. UTC-1/EV, only)
- 4 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 4 electronic temperature indicators
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UTC-1c/EV

Besides being provided with all the characteristics of mod. UTC-1/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UTC-1a/EV

Besides being provided with all the characteristics of mod. UTC-1/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- 2 pneumatic valves of AISI 316 stainless steel (Cv = 2.5) for flow control
- Microprocessor digital PID controller, with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA
(Other voltage and frequency on request)
Dimensions: 1500 × 700 × 1800 mm
Weight: 130 kg

REQUIRED
UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Hot water: 1000 l/h @ 2 bar and 90 °C
- Water drain
- Compressed air (for mod. UTC-1a/EV, only): 0.6 Nm^3/h @ 6 bar (valve with connection ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UTC-1c/EV and UTC-1a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

HOT WATER GENERATOR
mod. SCT01/EV

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

HEAT TRANSFER PILOT PLANT WITH SHELL-AND-TUBE AND COIL HEAT EXCHANGERS

Mod. UTC-2/EV manual
Mod. UTC-2c/EV manual with data logging
Mod. UTC-2a/EV automated

INTRODUCTION

This unit enables to study heat exchanges using a coil heat exchanger and a shell-and-tube heat exchanger.
The automated version (mod. UTC-2a/EV) includes a PID controller that controls the flow rates automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall in co-current and counter-current
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers
- Automatic flow control by PID controller (for mod. UTC-2a/EV, only)
- System supervision by P.C. (for mod. UTC-2a/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UTC-2/EV

- Framework of AISI 304 stainless steel with castors
- Coil heat exchanger with pipes of AISI 304 stainless steel and shell of borosilicate glass, exchange surface of 0.1 m^2
- Shell-and-tube heat exchanger with tubes of AISI 304 stainless steel and shell of borosilicate glass, exchange surface of 0.1 m^2
- 2 variable area flowmeters of glass and steel, with range of 100 to 1000 l/h (for mod. UTC-2/EV only)
- 4 thermoresistances Pt 100 with sheath of AISI 304 stainless steel
- 4 electronic temperature indicators
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UTC-2c/EV

Besides being provided with all the characteristics of mod. UTC-2/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UTC-2a/EV

Besides being provided with all the characteristics of mod. UTC-2/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- 2 pneumatic valves of AISI 316 stainless steel, Cv = 2.5, for flow control
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA
(Other voltage and frequency on request)
Dimensions: 1500 × 700 × 2000 mm
Weight: 130 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Hot water: 1000 l/h @ 2 bar and 90 °C
- Water drain
- Compressed air (for mod. UTC-2a/EV, only): 0.6 Nm^3/h @ 6 bar (valve with connection ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UTC-2c/EV and UTC-2a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

HOT WATER GENERATOR
mod. SCT01/EV

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

HEAT TRANSFER PILOT PLANT WITH SHELL-AND-TUBE EXCHANGER

Mod. UTC-2S/EV manual
Mod. UTC-2Sc/EV manual with data logging
Mod. UTC-2Sa/EV automated

INTRODUCTION

This unit consists of a shell-and-tube heat exchanger and of a tank heated by an electric heater for the production of hot water pumped by a centrifugal pump.
Tests can be carried out in co-current and counter-current.
The automated version (mod. UTC-2Sa/EV) includes a PID controller that controls flow rates automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall in co-current and counter-current
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers
- Automatic flow control by PID controller (for mod. UTC-2Sa/EV, only)
- System supervision by P.C. (for mod. UTC-2Sa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UTC-2S/EV

- Framework of AISI 304 stainless steel with castors
- Shell-and-tube heat exchanger with tubes of AISI 304 stainless steel and shell of borosilicate glass, exchange surface of 0.1 m^2
- 2 variable area flowmeters of glass and steel, with range of 100 to 1000 l/h (for mod. UTC-2S/EV, only)
- 5 thermoresistances Pt 100 with sheath of AISI 304 stainless steel
- 4 electronic temperature indicators
- Digital thermostat
- Insulated tank for hot water of AISI 304 stainless steel with capacity of 120 l,
- Electric heater, P = 6 kW
- Centrifugal pump of AISI 304 stainless steel for hot water
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UTC-2Sc/EV

Besides being provided with all the characteristics of mod. UTC-2S/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UTC-2Sa/EV

Besides being provided with all the characteristics of mod. UTC-2S/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel, range of 0 to 1000 l/h, 4-20 mA output signal
- 2 pneumatic valves of AISI 316 stainless steel (Cv = 2.5) for flow control
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Dimensions: 1500 × 700 × 2000 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 8,5 kVA (Other voltage and frequency on request)
- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Water drain
- Compressed air (for mod. UTC-2Sa/EV, only): 0.6 Nm^3/h @ 6 bar (valve with connection ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UTC-2Sc/EV and UTC-2Sa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

HEAT TRANSFER PILOT PLANT WITH TUBE-IN-TUBE AND AIR EXCHANGERS

Mod. UTC-3/EV manual
Mod. UTC-3c/EV manual with data logging
Mod. UTC-3a/EV automated

INTRODUCTION

This unit enables to study heat exchanges by using a tube-in-tube exchanger and an air exchanger.
Tests can be carried out in parallel and counter flow.
The automated version (mod. UTC-3a/EV) includes a PID controller that controls flow rates automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall co-current and counter-current
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers
- Automatic flow control by PID controller (for mod. UTC-3a/EV, only)
- System supervision by P.C. (for mod. UTC-3a/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. UTC-3/EV

- Framework of AISI 304 stainless steel with castors
- Tube-in-tube heat exchanger of AISI 304 stainless steel, with exchange surface of 0.3 m^2
- Radiator with fan of variable speed
- Electronic anemometer
- 2 variable area flowmeters, with range of 100 to 1000 l/h (only for mod. UTC-3/EV)
- 6 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 6 board-type electronic temperature indicators
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. UTC-3c/EV

Besides being provided with all the characteristics of mod. UTC-3/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel , range of 0 to 1000 l/h, 4-20 mA output signal
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. UTC-3a/EV

Besides being provided with all the characteristics of mod. UTC-3/EV, this model also includes the following additional items:

- 2 electronic magnetic induction flow transmitters of AISI 316 stainless steel , range of 0 to 1000 l/h, 4-20 mA output signal
- 2 pneumatic valves of AISI 316 stainless steel, Cv = 2.5, for flow control
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Power supply: 230 Vac 50 Hz single-phase - 1,5 kVA
(Other voltage and frequency on request)
Dimensions: 1400 × 800 × 1800 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Hot water: 1000 l/h @ 2 bar and 90 °C
- Water drain
- Compressed air (for mod. UTC-3a/EV, only): 0.6 Nm^3/h @ 6 bar (valve with connection ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. UTC-3c/EV and UTC-3a/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

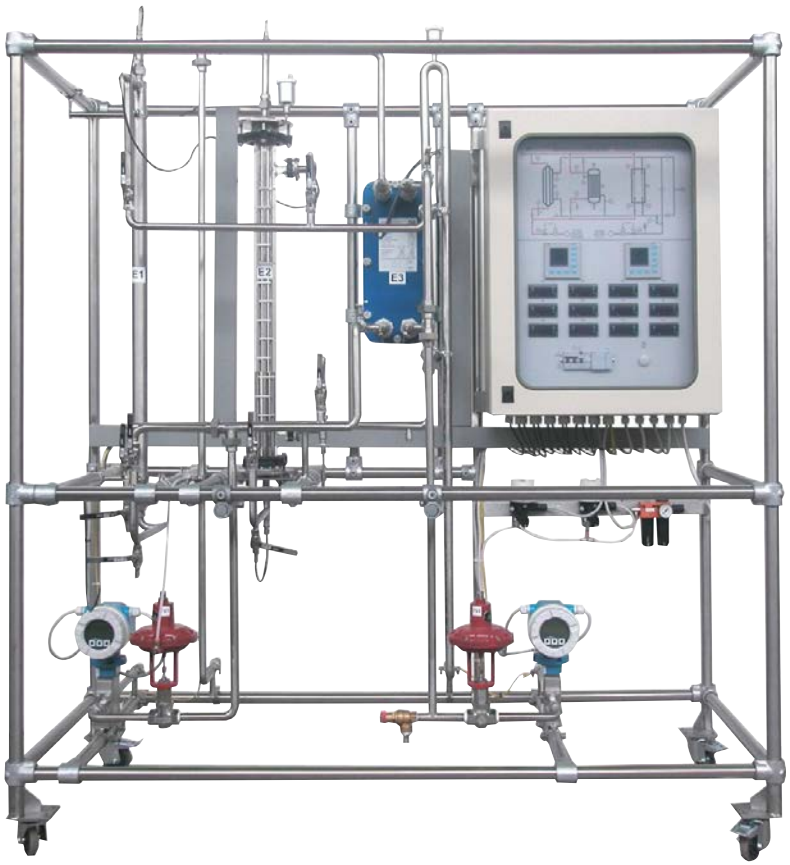
The equipment can be modified on request of the Customer.

OPTIONAL

HOT WATER GENERATOR
mod. SCT01/EV

HEAT TRANSFER PILOT PLANT WITH TUBE-IN-TUBE, SHELL-AND-TUBE AND PLATE EXCHANGERS

Mod. SCT/EV manual
Mod. SCTc/EV manual with data logging
Mod. SCTa/EV automated



INTRODUCTION

This unit enables to study heat exchanges by using a tube-in-tube exchanger, a shell-and-tube exchanger or a plate heat exchanger.
The automated version (mod. STCa/EV) includes a PID controller that controls flow rates automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Heat transfer between fluids separated by a wall in co-current and counter-current
- Energy balance and calculation of efficiency
- Log Mean Temperature Difference (LMTD)
- Overall heat transfer coefficient (U)
- How flow rate and of temperature difference can affect the transfer coefficient
- Comparing the operating modes and performance of different types of heat exchangers
- Automatic flow control by PID controller (for mod. STCa/EV, only)
- System supervision by P.C. (for mod. STCa/EV, only)

TECHNICAL SPECIFICATIONS:

Mod. SCT/EV

- Framework of AISI 304 stainless steel with castors
- Tube-in-tube heat exchanger of AISI 304 stainless steel, with exchange surface of 0.1 m^2
- Shell-and-tube heat exchanger with shell of borosilicate glass and tubes of AISI 304 stainless steel, with exchange surface of 0.1 m^2
- Plate-type heat exchanger of AISI 304 stainless steel, with exchange surface of 0.1 m^2
- 2 magnetic induction flow meters with range of 0 to 1000 l/h, 4-20 mA output signal
- 2 pneumatic control valves of AISI 316 stainless steel, DN 15, Cv = 2.5
- 12 temperature sensors Pt 100 with sheath of AISI 316 stainless steel
- 12 electronic temperature indicators
- 2 manual controls for adjusting pneumatic valves (for mod. SCT/EV, only)
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA
(Other voltage and frequency on request)
Dimensions: 2000 × 800 × 2200 mm
Weight: 275 kg

Mod. SCTc/EV

Besides being provided with all the characteristics of mod. SCT/EV, this model also includes the following additional items:

- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. SCTa/EV

Besides being provided with all the characteristics of mod. SCT/EV, this model also includes the following additional items:

- 2 microprocessor digital PID controllers with serial cards
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water: 1000 l/h @ 2 bar (valve with ½" hose connector)
- Hot water: 1000 l/h @ 2 bar and 90 °C
- Compressed air: 0.6 Nm^3/h @ 6 bar (valve with connection ¼" F)
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. STCc/EV and STCa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

HOT WATER GENERATOR
mod. SCT01/EV

24-B

24-B

SORPTION

Introduction:

This section concerns the gas/liquid absorption that is studied thanks to a wetted wall column, in the unit mod. WWA/EV, and to a packed column, in the unit mod. UAD/EV and in the line mod. ADS/EV.

The unit mod. UAD/EV is a relatively cheap equipment, available only in manual version and with essential instruments, but it enables an easy and close investigation of the issues concerning absorption.

The line mod. ADS/EV is available in manual version, manual version with data logging and in automated version.

The mod. F-BAU/EV allows instead to study the process of adsorption of a gas on a solid.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

SORPTION

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

WETTED WALL ABSORPTION PILOT PLANT

Mod. WWA/EV

INTRODUCTION

Wetted wall columns have been designed to study the absorption of air oxygen into deoxygenated water prepared with nitrogen.
Absorption enthalpy and solubility are low in this system, and saturating the inlet air with water, will eliminate the effect of autoevaporation; absorption occurs isothermally in these conditions. The system components are assembled on a framework of stainless steel with castors.
The wetted wall column consists of a vertical tube of glass where the entering liquid is distributed uniformly onto the inner surface.
The absorbing liquid is stored in a tank and is pumped to the top of a deoxygenation column available aside the absorption column; injecting nitrogen into the column bottom will deoxygenate the water.
Then the deoxygenated water will be pumped to the top of the absorption column after crossing a variable area flowmeter.
The air is pumped by a compressor to the bottom of the absorption column through a variable area flowmeter and it goes up in the column transferring oxygen to the water.
The concentration of dissolved oxyigen and the inlet and outlet temperatures of the liquid are measured by two sensors.
The water coming out of the column is collected into the feeding tank so that it can be recycled to the deoxygenation column by a pump.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Calculation of mass transfer coefficient in liquid film
- How flow rates of water and air can affect the mass transfer coefficient

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Tank of AISI 304 stainless steel with capacity of 45 litres
- Wetted wall column of borosilicate glass, H = 900 mm, DN 40 (inside diameter = 34 mm)
- Deoxygenation column of transparent Plexiglas, H = 1600 mm, DN25
- Variable area flowmeter for water with glass tube and range of 1.9-19 l/h
- Variable area flowmeter for air with glass tube and range of 30-300 l/h
- Pump for deoxygenator
- Pump for absorption column
- Air compressor
- 2 board-type industrial oxymeters, 0-20 mg/l or 0-200%, resolution of mg/l or 0.1% SAT
- 2 industrial measuring sensors of dissolved oxygen
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Power supply: 230 Vac 50 Hz single-phase - 0,5 kVA
(Other voltage and frequency on request)
Dimensions: 1400 × 650 × 2500 (h) mm
Weight: 130 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Distilled water (50 litres) or tap water (50 litres)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

ABSORPTION PILOT PLANT

Mod. UAD/EV

INTRODUCTION

This absorption unit has been designed to explain the principles of gas-liquid absorption, and for the practical training on absorption plants. The absorption packed column of borosilicate glass is installed vertically on a framework of stainless steel with castors. This column is packed with glass Raschig rings for gas absorption. The liquid used in the process is stored in a tank of stainless steel and it is sent to the column top by a centrifugal pump of stainless steel. Then the liquid flows down the column wetting the packing and returns to the tank. A variable area flowmeter enables to measure the flow rate of liquid.

Generally the gas to be absorbed is carbon dioxide, stored in a cylinder (not included in the equipment) placed near the unit. The gas crosses a variable area flowmeter and it is mixed with an air flow of known flow rate coming from a compressor installed on the framework. Then the composition of the mixture entering the column is known and it can be modified easily.

This gaseous mixture enters the column bottom, then it mounts the column meeting the liquid falling down the column in counter flow. Some test points available at the top, at the centre and at the bottom of the column enable to measure the pressure drop on the packing with some pressure gauges. These test points can also be used to sample the gaseous phase.

The content of carbon dioxide in gaseous phase is determined by an Hempl apparatus. Flowmeters, pressure gauges and gas analysis system are installed at a suitable height for operation.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Study of the main principles of the absorption of a gas into a liquid through a packed column
- Demonstration of quantitative methods of analysis of gaseous and liquid phase
- Mass balance for an absorption column
- Determination of mass transfer coefficient
- Study of hydrodynamic characteristics of a packed column
- Determination of flooding and loading points

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Absorption column of borosilicate glass DN80, consisting of 2 sections of 750 mm, with inside diameter of 80 mm, with 10 mm Raschig rings packing of borosilicate glass
- Feeding tank of AISI 304 stainless steel, with volume of 50 litres

- Centrifugal feeding pump of AISI 316 stainless steel, Q_{max} = 28 l/min, H_{max} = 1 bar
- Rotary compressor, Q_{max} = 10 m³/h, P_{max} = 0.8 bar
- Flowmeter for water, with range of 60-600 l/h
- Flowmeter for CO_2 with range of 2-22 Nl/min
- Flowmeter for air with range of 20-200 Nl/min
- 2 differential U-tube pressure gauges, with range of 0-500 mm H_2O
- Hempl apparatus for gas analysis

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 650 × 1000 × 3200 mm
Weight: 130 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Distilled water or tap water (50 litres)
- Cylinder of CO_2 with pressure reducer
- Fume suction system or venting duct

ACCESSORIES (NOT INCLUDED)

- Laboratory glassware for titration

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

ABSORPTION AND STRIPPING PILOT PLANT

Mod. ADS/EV manual
Mod. ADSa/EV automated

INTRODUCTION

This absorption and stripping system enables to study the mass transfer from a gaseous phase to a liquid phase (absorption) and vice versa (stripping).
The absorbing liquid is fed by a metering pump to the top of a column with glass Raschig rings packing.
The gaseous phase is the result of the mixture between the gas to be absorbed and a carrier gas; the flow rates of these two gases are measured by mass flowmeters.
The automated version (mod. ADSa/EV) includes a PID controller that controls the flow rates of gases automatically via two pneumatic valves.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Checking the absorption degree with different liquid substances at different temperatures
- Desorption of liquid phase into gaseous phase with a gas
- Calculation of the number of theoretical stages
- Automatic flow control by PID controller (for mod. ADSa/EV, only)
- System supervision by P.C. (for mod. ADSa/EV, only)
- Absorption of NH_3 with H_2O
- Absorption of CO_2 with solution of NaOH
- Stripping of NH_3 with air

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. ADS/EV

- Framework of AISI 304 stainless steel with castors
- Column of borosilicate glass DN 80, H = 1000 mm, packed with Raschig rings
- Heat exchanger of borosilicate glass, with exchange surface of 0.5 m^2, installed at the bottom of the column
- Feeding tank of AISI 304 stainless steel, with capacity of 30 l
- Metering pump of AISI 316 stainless steel, Q_{max} = 270 l/h, including pneumatic actuator, that can be driven by a signal of 0.2 to 1 bar
- 2 pneumatic control valves of AISI 316 stainless steel, DN 15, Cv = 0.2 and 0.08
- Electronic thermal mass flowmeter of AISI 316 stainless steel, with range of 0 to 600 Nl/h and board-type display, for measuring the flow rate of the gas to be absorbed
- Electronic thermal mass flowmeter of AISI 316 stainless steel, with range of 0 to 6000 Nl/h and board-type display, for measuring the flow rate of the carrier gas
- Electronic differential pressure transmitter of AISI 316 stainless steel, range of 0 to 200 mm H_2O, 4-20 mA output signal, board-type display
- 3 thermoresistances Pt 100 with sheath of AISI 316 stainless steel
- 3 electronic temperature indicators
- 3 pneumatic manual controls (for mod. ADS/EV, only)
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Dimensions: 1900 × 800 × 3000 mm
Weight: 270 kg

Mod. ADSa/EV

Besides being provided with all the characteristics of mod. ADS/EV, this model also includes the following additional items:

- 3 electropneumatic converters (4 to 20 mA/0,2 to 1 bar)
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 1,5 kVA (Other voltage and frequency on request)
- Tap water (valve with ½" hose connector)
- Hot water: 150 l/h @ 2 bar and 90 °C (only for stripping operations)
- Water drain
- Compressed air: 15 Nm^3/h @ 6 bar (valve with connection ¼" F)
- Cylinder for the transfer gas (e.g.: nitrogen) with pressure reducer
- Cylinder for the gas to be absorbed (e.g.: CO_2) with pressure reducer
- Fume suction system or venting duct

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. ADSa/EV, only)
- Laboratory glassware for titration

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

OPTIONAL

HOT WATER GENERATOR

mod. SCT01/EV (only for stripping operations)

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

FIXED BED ADSORPTION UNIT

Mod. FBAU/EV

INTRODUCTION

The adsorption bed is contained in a stainless steel column with six thermoresistances mounted at regular intervals on the column's length to measure the temperature profile of the adsorbent.

Feed to the column is supplied by two cylinders (not supplied), one of pure helium (He), and the other of pure carbon dioxide (CO_2).

The flow of each gas is measured by a mass flow meter and regulated by a pneumatic valve controlled by a PID controller.

The operating pressure is measured by a pressure transmitter and regulated by a pneumatic valve controlled by a PID controller.

The adsorption and desorption/regeneration process are monitored using the temperature sensors and an infra red detector to measure the composition of outlet gas.

A supervision and data acquisition software (SCADA) for Win allows to control the unit via PC simply connecting the serial cable of the unit with the PC.

TRAINING PROGRAM

- Adsorption/desorption at different:
  - temperatures
  - flow rates
  - compositions
  - pressures
- Breakthrough curve for adsorption/desorption

TECHNICAL SPECIFICATION

- AISI 304 stainless steel framework with castors
- AISI 304 stainless steel adsorption column with jacket for temperature control with hot water
- Hot water generator with pumps and electronic thermostat
- 2 thermal mass flow meters with 4-20 mA output signal
- 3 pneumatic control valves with body in AISI 316 stainless steel
- 3 electro-pneumatic converters
- 6 thermoresistances Pt100 in AISI 316 stainless steel
- Pressure transmitter
- IR transmitter
- Microprocessor PID controller with LCD display
- Piping and valves in AISI 304 - 316 stainless steel
- IP55 switchboard with E.L.C.B. and in accordance with EC directives
- Supervision and control software for Win

Note: The unit should be used in a (artificially or naturally) ventilated room.

Power supply: 230 Vac 50 Hz single-phase - 1 kVA
(Other voltage and frequency on request)
Dimensions: 1600 × 700 × 2100 mm
Weight: 110 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Compressed air: 1,5 Nm^3/h @ 6 bar
- CO_2 cylinder with pressure reducer
- He cylinder with pressure reducer

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

24-B

CHEMICAL ENGINEERING

OIL & GAS

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CATHODIC PROTECTION TRAINER

Mod. CPT/EV

INTRODUCTION

Cathodic protection is a technique used to control the corrosion of a metal surface by making it work as a cathode, coupling it with a less noble metal (sacrificial anode) or with a cathodic power supply.
Cathodic protection techniques are commonly used to protect steel pipelines, structures and storage tanks, ships, oil platforms and structural elements of oil wells.
This trainer enables the study of the cathodic protection with sacrificial anode or impressed current (at constant potential and at constant current).
The experiments can be carried out at different temperature and oxygen concentration, using different kinds of reference electrodes and sacrificial anodes as well as various metal samples with or without surface treatment.
The trainer can be connected to a PC (not supplied) running Windows and a dedicated software for the experiments data acquisition and storage.

TRAINING PROGRAM

This unit enables an in-depth analysis of the following topics:

- How to use a digital multimeter
- Measurement of the difference of potential of a sample into electrolyte
- Reference electrode
- Galvanic cell
- First and second species conductors
- Cathodic Protection criteria
- Sacrificial anodes in Zn, Mg and Al
- Cathodic Protection impressed current systems
- Consumable impressed current anode (Fe)
- Inert impressed anode (Ti/Pt and MMO)
- Resistance concept, circuit for the first and second species conductors
- Introduction to the specific resistance concept over three different first species conductors (Fe; Cu; Fe – Ni)
- Introduction to the concept of interference due to the presence of external electric fields on buried or submerged structures (Stray Currents)
- Air presence influence on resistivity (insufflate air effect)
- Current density introduction and Tafel Curves construction
- Temperature effect over the Current density (thermostatic cell)
- Air presence influence over the Current density (insufflate air effect)
- Coating and current density

TECHNICAL SPECIFICATIONS:

- Wheeled bench including:
  - Console with measuring instrument and mains connection (Vac)
  - Waterproof top surface
  - Locked cabinet
- The console includes:
  - 4 digital voltmeters
  - 2 digital ammeters
  - 2 DC power supplies, potential or constant current mode, base current adjustment
  - Thermostat with Pt100 temperature sensor
  - Air compressor with sprayer
  - PC interface for data acquisition and storage
- The cabinet can be used to store the following items:
  - Safety glasses and glows
  - Handheld digital multimeter
  - Cu/$CuSO_4$ reference electrode
  - Ag/AgCl reference electrode
  - Zn reference electrode
  - 6 copper electrodes

- 2 carbon steel electrodes
- Basin for the electrolytic test bath
- Basin for the electrolytic test bath with electrical resistance
- 7 zinc anodes
- 5 magnesium anodes
- 2 aluminum anodes
- 2 Ti/Pt anodes
- 2 Ti/MMO anodes
- Copper wire, 6 meters
- Iron wire, 12 meters
- Galvanized iron wire, 10 meters
- Resistivity cell
- PVC brick for the study of resistance

- Fully epoxy resin-coated Carbon steel electrode, Ø 15 x 200 mm
- 6 carbon steel electrodes, 15 x 200 x 2 mm
- 2 fully epoxy resin-coated Carbon steel electrodes, 15 x 200 x 2 mm
- 2 partially epoxy resin-coated Carbon steel electrodes, 15 x 200 x 2 mm
- Various reagent with plastic containers and safety data sheet
- Set of spare fuse
- Set of connecting leads
- 2 beakers, capacity 600 ml each
- Salt bridge

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 1280 x 800 x 1350 mm
Weight: 170 kg

OPTIONAL ACCESSORIES

- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

THREE PHASE SEPARATION TRAINER

Mod. TPST/EV

INTRODUCTION

In this trainer air, water and oil are mixed to emulate a crude oil stream.

This fluid mixture flows into a horizontal separator vessel fabricated of clear Plexiglas and equipped with industry-typical process measurement devices.

Separator works on the principle that the three components have different densities, which allows them to stratify when moving slowly with gas on top, water on the bottom and oil in the middle.

The separator vessel is equipped of diverter baffle, demister and control loop for air and oil flow rate, for the level of oil, water and a loop for controlling the gas pressure.

The liquid separated products are recollected by gravity to feed tanks and gas (air) vented.

The system is equipped with two PID controllers with electric and pneumatic system and it is integrated with computerized control system (SCADA).

Note that the process uses safety fluid in operation (water, oil, air) and have emergence push button.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Mass balance and separator design
- Measurements, instrumentation and PID control
- Automatic flow rate control
- Automatic level control
- Automatic pressure control
- Functioning of separator in different operative condition (flow of water, oil, air, pressure)

TECHNICAL SPECIFICATIONS:

- AISI 304 stainless steel structure with castors
- 50 litres AISI 304 stainless steel water tank
- 50 litres AISI 304 stainless steel oil tank
- Clear plastic horizontal separator, d = 300 mm, L = 600 mm
- Metering pump for water
- Gear pump for oil
- Compressor for air feeding
- Thermal mass flow meter for air
- Gear flowmeter for oil
- Differential pressure transmitter, made of AISI 316 stainless steel, range 0-500 mmH_2O
- Differential pressure transmitter, made of AISI 316 stainless steel, range 0-300 mmH_2O
- Pressure transmitter, made of AISI 316 stainless steel, range 0-0.5 bar
- Pneumatic control valve for air flow control, AISI 316 stainless steel
- Pneumatic control valve for pressure control, AISI 316 stainless steel
- Pneumatic control valve for water level control, AISI 316 stainless steel
- Pneumatic control valve for oil level control, AISI 316 stainless steel
- Pressure safety valve calibrated @ 0.5 bar
- High level switch
- Connecting lines and valves of AISI 304 and 316 stainless steel
- 2 microprocessor PID controllers
- IP 55 switchboard with E.L.C.B. and plant synoptic
- Emergency pushbutton

Power supply: 230 Vac 50 Hz single-phase - 0,5 kVA
(Other voltage and frequency on request)
Dimensions: 1750 x 800 x 1900 (h) mm
Weight: 164 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

24-B

CHEMICAL ENGINEERING

www.elettronicaveneta.com

24B-E-OG

24-B

FM

FLUID MECHANICS

FM

www.elettronicaveneta.com

Introduction:
This section concerns a group of systems for the study of fluid mechanics in different situations.

The line mod. ΔP/EV, available in manual version, manual version with data logging and automated version, enables to study minor and friction losses by the installation of the element under examination in a closed circuit.

The line mod. DYF/EV too, available in manual version, manual version with data logging and automated version, enables to study the minor and major losses, but in this case all the elements are mounted onto the hydraulic circuit and they are selected via some valves.

The equipment mod. CP/EV is a compact and relatively cheap unit that enables to study the operation of a centrifugal pump. The apparatus mod. SPCP/EV is analogous to the unit mod. CP/EV, but is equipped with two pumps so that their series and parallel operation can be studied.

The units mod. BP/EV and BP-1S/EV represent upgraded versions of the plants mod. CP/EV and SPCP/EV respectively and they are equipped with torque measuring system.

The systems mod. FUN/EV, LM/EV and FFB/EV are relatively cheap bench-top units enabling to study centrifugal fans, mixing of liquids, as well as fixed and fluidized beds, respectively.

24B-E-FM

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com


www.elettronicaveneta.com

FLUID MECHANICS

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

PRESSURE LOSSES PILOT PLANT

Mod. ΔP/EV manual
Mod. ΔPc/EV manual with data logging
Mod. ΔPa/EV automated

INTRODUCTION

This equipment consists of a hydraulic circuit including pump and flowmeter and enabling to be connected with various hydraulic components, where the pressure drops on these elements can be measured.
The automated version mod. ΔPa/EV includes a PID controller for the automatic control of the flow rate of the water crossing the circuit.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determining pressure drops in pipes of different diameter
- Determining pressure drops in bends and elbows
- Determining pressure drops in pipe expansions and restrictions
- Measuring the flow rate with calibrated orifice and computing the discharge coefficient α
- Measuring the flow rate with Venturi tube and computing the discharge coefficient α
- Checking the laminar, transition and turbulent flows by tracer
- Verifying Bernoulli's theorem

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. ΔP/EV

- Framework of AISI 304 stainless steel with castors
- Centrifugal pump, with body and impeller of bronze, flow rate of 10 m^3/h
- Electronic frequency inverter for the control of pump r.p.m.
- Tank of AISI 304 stainless steel, with capacity of 80 l
- Stainless steel differential mercury gauge (mercury not supplied; the instrument can be replaced with a digital pressure gauge on request during order placement)
- Flowmeter of steel and glass, with range of 1 to 10 m^3/h
- Pipe of AISI 304 stainless steel of ½"
- Pipe of AISI 304 stainless steel of ¾"
- Pipe of AISI 304 stainless steel with U bends
- Pipe of AISI 304 stainless steel with L bends
- Pipe of AISI 304 stainless steel with sudden expansion and restriction
- Pipe of AISI 304 stainless steel with calibrated orifice
- Pipe of AISI 304 stainless steel with Venturi tube of Plexiglas
- Pipe of borosilicate glass for checking the laminar and turbulent flows by tracer
- Tank of borosilicate glass, with capacity of 1 l, for tracer
- Bourdon gauge of AISI 304 stainless steel with range of 0 to 6 bar
- Thermometer with range of 0 to 120 °C
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Power supply: 230 Vac 50 Hz single-phase - 3,2 kVA (Other voltage and frequency on request)
Dimensions: 2000 × 700 × 2100 mm
Weight: 200 kg

Mod. ΔPc/EV

Besides being provided with all the characteristics of mod. ΔP/EV, this model also includes the following additional items:

- Electronic differential pressure transmitter of AISI 316 stainless steel, range of 0 to 10000 mm H_2O and 4-20 mA output signal
- Electronic variable area flow transmitter of AISI 304 stainless steel, with range of 1 to 10 m^3/h and 4-20 mA output signal
- Thermoresistance Pt 100 with sheath of AISI 316 stainless steel
- Interface for the connection with a PC included in the switchboard
- Data acquisition software for Windows

Mod. ΔPa/EV

Besides being provided with all the characteristics of mod. ΔP/EV, this model also includes the following additional items:

- Electronic differential pressure transmitter of AISI 316 stainless steel, range of 0 to 10000 mm H_2O and 4-20 mA output signal
- Electronic variable area flow transmitter of AISI 304 stainless steel, with range of 1 to 10 m^3/h and 4-20 mA output signal
- Thermoresistance Pt 100 with sheath of AISI 316 stainless steel
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Water drain

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. ΔPc/EV and ΔPa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

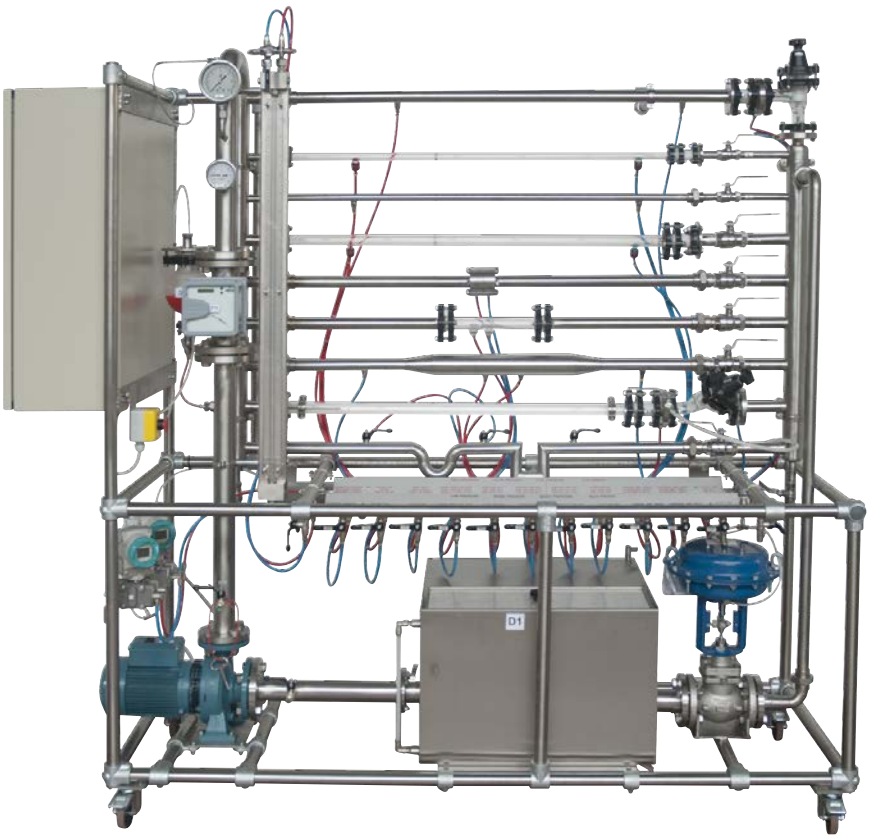
VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

PRESSURE LOSSES PILOT PLANT

Mod. DYF/EV manual
Mod. DYFc/EV manual with data logging
Mod. DYFa/EV automated



INTRODUCTION

This equipment consists of a hydraulic circuit including pump and flowmeter and enabling to be connected with various hydraulic components, where the pressure drops on these elements can be measured.
The automated version mod. DYFa/EV includes a PID controller for the automatic control of the flow rate of the water crossing the circuit.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determining pressure drops in pipes of different diameter
- Determining pressure drops in bends and elbows
- Determining pressure drops in pipe expansions and restrictions
- Measuring the flow rate with calibrated orifice and computing the discharge coefficient α
- Measuring the flow rate with Venturi tube and computing the discharge coefficient α
- Checking the laminar, transition and turbulent flows by tracer
- Verifying Bernoulli's theorem

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

TECHNICAL SPECIFICATIONS:

Mod. DYF/EV

- Framework of AISI 304 stainless steel with castors
- Centrifugal pump with body and impeller of bronze, Q_{max} = 10 m³/h, H = 18 m
- Tank of AISI 304 stainless steel, with capacity of 80 l
- Variable area flowmeter of AISI 304 stainless steel, with range of 1 to 10 m³/h
- Angle valve (DN 25) of borosilicate glass, with plug of PTFE
- Diaphragm valve of borosilicate glass - DN 25
- Pipe of AISI 304 stainless steel of ½"
- Pipe of AISI 304 stainless steel of 1"
- Pipe of borosilicate glass DN15
- Pipe of borosilicate glass DN25
- Pipe of AISI 304 stainless steel with U and L bends
- Pipe of AISI 304 stainless steel with sudden expansion and restriction
- Pipe of AISI 304 stainless steel with calibrated orifice
- Pipe of AISI 304 stainless steel with Venturi tube of Plexiglas
- Pipe of borosilicate glass for checking the laminar and turbulent flows by tracer
- Tank of borosilicate glass, with capacity of 1 l, for tracer
- Bourdon gauge of AISI 304 stainless steel
- Stainless steel differential mercury gauge (mercury not supplied; the instrument can be replaced with a digital pressure gauge on request during order placement)
- Thermometer with range of 0 to 100 °C
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Power supply: 230 Vac 50 Hz single-phase - 2 kVA (Other voltage and frequency on request)
Dimensions: 2200 × 760 × 2200 mm
Weight: 200 kg

Mod. DYFa/EV

Besides being provided with all the characteristics of mod. DYF/EV, this model also includes the following additional items:

- Pneumatic valve of stainless steel
- Electronic differential pressure transmitter of AISI 316 stainless stee, range of 0 to 1000 mm H_2O and 4-20 mA output signal
- Electronic differential pressure transmitter of stainless steel, range of 0 to 10000 mm H_2O and 4-20 mA output signal
- Thermoresistance Pt 100 with sheath of AISI 316 stainless steel
- Microprocessor digital PID controller with serial card
- Supervision software for Windows: it enables to control ON-OFF signals, analog signals coming from PID controller, real-time trend and historical trend

Mod. DYFc/EV

Besides being provided with all the characteristics of mod. DYF/EV, this model also includes the following additional items:

- Electronic differential pressure transmitter of AISI 316 stainless stee, range of 0 to 10000 mm H_2O and 4-20 mA output signal
- Thermoresistance Pt 100 with sheath of AISI 316 stainless steel
- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Water drain
- Compressed air (for mod. DYFa/EV, only): 1 Nm³/h @ 6 bar (valve with connection of ¼" F)

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. DYFc/EV and DYFa/EV, only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CENTRIFUGAL PUMP DEMONSTRATION UNIT

Mod. CPDU/EV

INTRODUCTION

The unit is composed by a centrifugal pump mounted on a stainless steel basement and connected to a continuous circulation tank. The front part of the pump is in clear plastic to see inside.
The suction and discharge pipes are transparent too and each one has a flow control valve.
It has two interchangeable impellers, a forward curved impeller and a backward curved one, in order to compare their performances.
The digital instruments allow to measure suction and discharge pressure to the pump, as well as flow rate and water temperature.
The pump speed is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates torque and power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Operation of a centrifugal pump
- Measurement of pump performance according to the motor speed (head, power, efficiency)
- Characteristic curve of a pump
- Introduction to similarity laws
- Effect of the impellers design
- Pump efficiency

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel basement
- 10 l clear Plexiglas tank
- Centrifugal pump, Qmax = 4.8 m^3/h, H = 12 mH_2O, 2900 rpm
- 2 pressure transmitter
- Pt100 thermoresistance
- Flowmeter

Dimensions: 900 x 500 x 500 mm
Weight: 30 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

CENTRIFUGAL PUMPS APPARATUS

Mod. CP/EV manual
Mod. CPc/EV manual with data logging

INTRODUCTION

This unit has been designed to experience with the main equations correlating power, head, number of r.p.m. and flow rate of a centrifugal pump.

TRAINING PROGRAM

This unit enables to deepen the following issues:

Performance of the pump according to the following parameters:

- head
- power absorbed by the motor
- number of revolutions

TECHNICAL SPECIFICATIONS

- Framework of AISI 304 stainless steel with castors
- Water tank of AISI 304 stainless steel with capacity of 70 litres
- Centrifugal pump of AISI 304 stainless steel, Q_{max} = 80 l/min (4.8 m_3/h), H_{max} = 22 mH_2O
- Electronic flowmeter with 4 - 20 mA output and range of 0 to 90 l/min
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of -1 to 0.6 bar
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of 0 to 2.5 bar
- Electronic inverter for the control of pump r.p.m.
- Switchboard of painted carbon steel with ELCB
- Piping and valves of AISI 304 and AISI 316 stainless steel

Mod. CPc/EV

Besides being provided with all the characteristics of mod. CP/EV, this model also includes the following additional items:

- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 850 × 600 × 1500 mm
Weight: 50 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. CPc/EV)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CENTRIFUGAL PUMP TEST BENCH

Mod. BP/EV manual
Mod. BPc/EV manual with data logging

INTRODUCTION

Transfer and circulation of liquids in networks and pipes is a very important problem for both the common civil applications (e.g. aqueducts) and industry.

This unit includes a water feeding tank, a pump and a set of instruments suitable to detect the main operating characteristics of a pump.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Performance of the pump according to the following parameters:
  - head
  - power absorbed by the motor
  - number of r.p.m.
- Torque measurement and calculation of efficiency

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Feeding tank of AISI 304 stainless steel, with capacity of 250 l
- Centrifugal open-impeller pump with body and impeller of bronze, Q_{max} = 15 m³/h, H_{max} 19 m
- Motor with torque measurement system by load cell
- Digital torque indicator with selector
- Digital r.p.m. indicator
- Check of the number of r.p.m. of the pump by electronic frequency inverter
- Pressure gauge of AISI 304 stainless steel, with range of 0 to 6 bar
- Vacuum gauge of AISI 304 stainless steel, with range of -1 to 3 bar
- Variable area flowmeter with glass tube, range 5 to 15 m³/h (mod. BP/EV only)
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. BPc/EV

Besides being provided with all the characteristics of mod. BP/EV, this model also includes the following additional items:

- Stainless steel variable area flow meter, 4-20 mA, range 1÷16 m³/h
- Pressure transmitter, 0÷6 bar
- Pressure transmitter, -1÷3 bar
- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Dimensions: 1700 x 850 x 2300 mm
Weight: 300 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 7 kVA (Other voltage and frequency on request)
- Tap water

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. BPc/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

SERIES AND PARALLEL CENTRIFUGAL PUMPS DEMONSTRATION UNIT

Mod. SPCPDU/EV

INTRODUCTION

The unit is composed by two centrifugal pumps mounted on a stainless steel basement and connected to a continuous circulation tank.
The pumps can be configured for single, in series and in parallel operation by adjusting the valves mounted on the pipes.
The front part of the pump is in clear plastic to see inside.
The suction and discharge pipes are transparent too and each one has a flow control valve.
It has two interchangeable impellers, a forward curved impeller and a backward curved one, in order to compare their performances.
The digital instruments allow to measure suction and discharge pressure to the pump, as well as flow rate and water temperature.
The pump speed is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates torque and power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Operation of a centrifugal pump
- Operation of two centrifugal pumps in series and in parallel
- Characteristic curve of a pump
- Measurement of pump performance according to the motor speed (head, power, efficiency)
- Effect of the impellers design
- Pump efficiency

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel basement
- 10 l clear Plexiglas tank
- 2 Centrifugal pumps, Qmax = 4.8 m^3/h, H = 12 mH_2O, 2900 rpm
- 3 pressure transmitters
- Pt100 thermoresistance
- Flowmeter

Dimensions: 900 x 500 x 500 mm
Weight: 40 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

SERIES AND PARALLEL CENTRIFUGAL PUMPS APPARATUS

Mod. SPCP/EV manual
Mod. SPCPc/EV manual with data logging

INTRODUCTION

This unit has been designed to experience with the main equations correlating power, head, number of r.p.m. and flow rate of a centrifugal pump and to show the advantages of operating in series and in parallel.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Performance of the pump according to the following parameters:
  - head
  - power absorbed by the motor
  - number of revolutions
- Operations in series, in parallel and with only one pump

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Water tank of AISI 304 stainless steel with capacity of 70 litres
- 2 centrifugal pumps of AISI 304 stainless steel, Q_{max} = 80 l/min (4.8 m^3/h), H_{max} = 22 mH_2O
- 2 electronic flowmeters with 4 - 20 mA output and with range of 0 to 90 l/min
- 2 pressure transmitters of AISI 304 stainless steel with 4 - 20 mA output and range of -1 to 0.6 bar
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of 0 to 2.5 bar
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of 0 to 6 bar
- 2 electronic inverters for the control of the number of revolutions of pumps
- Switchboard of painted carbon steel with ELCB
- Piping and valves of AISI 304 and AISI 316 stainless steel

Mod. SPCPc/EV

Besides being provided with all the characteristics of mod. SPCP/EV, this model also includes the following additional items:

- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Power supply: 230 Vac 50 Hz single-phase - 3 kVA
(Other voltage and frequency on request)
Dimensions: 850 × 600 × 1500 mm
Weight: 60 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. SPCPc/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

SERIES AND PARALLEL CENTRIFUGAL PUMPS APPARATUS

Mod. SPCP-1/EV manual
Mod. SPCP-1c/EV manual with data logging

INTRODUCTION

This unit has been designed to experience with the main equations correlating power, head, number of r.p.m. and flow rate of a centrifugal pump and to show the advantages of operating in series and in parallel.
Unlike the previous mod. SPCP/EV, this model features only one Variable Speed Pump.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Performance of the pump according to the following parameters:
  - head
  - power absorbed by the motor
  - number of revolutions
- Operations in series, in parallel and with only one pump

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Water tank of AISI 304 stainless steel with capacity of 70 litres
- 2 centrifugal pumps of AISI 304 stainless steel, Q_{max} = 80 l/min (4.8 m^3/h), H_{max} = 22 mH_2O
- 2 electronic flowmeters with 4 - 20 mA output and with range of 0 to 90 l/min
- 2 pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of -1 to 0.6 bar
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of 0 to 2.5 bar
- Pressure transmitter of AISI 304 stainless steel with 4 - 20 mA output and range of 0 to 6 bar
- Electronic inverter for the regulation of the number of turns of the pump
- Switchboard of painted carbon steel with ELCB
- Piping and valves of AISI 304 and AISI 316 stainless steel

Mod. SPCP-1c/EV

Besides being provided with all the characteristics of mod. SPCP-1/EV, this model also includes the following additional items:

- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Power supply: 230 Vac 50 Hz single-phase - 3 kVA
(Other voltage and frequency on request)
Dimensions: 850 × 600 × 1500 mm
Weight: 60 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. SPCP-1c/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CENTRIFUGAL PUMPS IN SERIES AND PARALLEL TEST BENCH

Mod. BP-1S/EV manual
Mod. BP-1Sc/EV manual with data logging

INTRODUCTION

Transfer and circulation of liquids in networks and pipes is a very important problem for both the common civil applications (e.g. aqueducts) and industry.
This unit includes a water feeding tank, two pumps and of a set of instruments suitable to detect the main operating characteristics of the pumps.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Performance of the pump according to the following parameters:
  - head
  - power absorbed by the motor
  - number of r.p.m.
- Torque measurement and calculation of efficiency
- Operations in series, in parallel and with only one pump

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Feeding tank of AISI 304 stainless steel with capacity of 250 l
- 2 centrifugal open-impeller pumps, with body and impeller of bronze, Q_{max} = 15 m^3/h, H_{max} 19 m
- Motor with load cell for torque measurement system
- Digital torque indicator
- Digital r.p.m. indicator
- Control of pump r.p.m. by electronic frequency inverter
- 2 pressure gauges of AISI 304 stainless steel, with range of 0 to 6 bar
- 2 vacuum gauges of AISI 304 stainless steel, with range of -1 to 3 bar
- Variable area flowmeter with glass tube, range 5 to 15 m^3/h (mod. BP-1S/EV only)
- Piping and valves of AISI 304 and AISI 316 stainless steel
- Switchboard IP55, complying with EC conformity mark, including plant synoptic and ELCB
- Emergency button

Mod. BP-1Sc/EV

Besides being provided with all the characteristics of mod. BP-1S/EV, this model also includes the following additional items:

- Stainless steel variable area flow meter, 4-20 mA, range 1÷16 m^3/h
- 2 pressure transmitters, 0÷6 bar
- 2 pressure transmitters, -1÷3 bar
- Interface (included in the switchboard) for the connection with a PC
- Data acquisition software for Windows

Dimensions: 1700 x 850 x 2300 mm
Weight: 300 kg

REQUIRED

UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 9 kVA (Other voltage and frequency on request)
- Tap water

ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows (for mod. BP-1Sc/EV only)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

GEAR PUMP DEMONSTRATION UNIT
Mod. GPDU/EV

INTRODUCTION

The unit is composed by a gear pump mounted on a stainless steel basement and connected to a continuous circulation tank. The front part of the pump is in clear plastic to see inside. On the discharge pipe there is a flow control valve and a safety valve to protect the system from potential overpressures.
The digital instruments allow to measure suction and discharge pressure to the pump, as well as flow rate and water temperature.
The pump speed is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates torque and power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Operation of a gear pump
- Performance of the pump (flow, power, speed) according to the pressure
- Efficiency

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel basement
- 10 l clear Plexiglas tank
- Gear pump, Qmax = 390 l/h, H = 25 m
- Pressure transmitter
- Pt100 thermoresistance

Dimensions: 900 x 500 x 500 mm
Weight: 30 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

PISTON PUMP DEMONSTRATION UNIT
Mod. PPDU/EV

INTRODUCTION

The unit is composed by a piston pump mounted on a stainless steel basement and connected to a continuous circulation tank. The front part of the pump is in clear plastic to see inside. On the discharge pipe there is an adjustable back-pressure valve, a needle valve and a safety valve to protect the system from potential overpressures.
An additional valve allows to include a pulsation damper in the circuit.
The digital instruments allow to measure head and discharge pressure of the pump, as well as flow rate and water temperature.
The pump speed is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates torque and power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Operation of a piston pump
- Measurement, according to the plunger displacement, of the discharge and head pressure of the pump
- Efficiency
- Performance of the pump according to the adjustment of the back-pressure valve, the needle valve and the pulsation damper

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel basement
- 10 l clear Plexiglas tank
- Metering pump, Qmax = 43 l/h, H = 4 bar
- 2 pressure transmitters
- Pt100 thermoresistance
- Back-pressure pump
- Needle valve

Dimensions: 900 x 500 x 500 mm
Weight: 30 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

FAN STUDY UNIT
Mod. FUN/EV

INTRODUCTION

This unit consists of a centrifugal fan equipped with cylindrical suction and discharge ducts. The suction duct is provided with a static pressure tap connected with a differential pressure gauge, besides including a temperature sensor and an air damper (for varying the duct characteristic). The discharge pipe is provided with a static pressure tap connected with a differential pressure gauge, besides including a Pitot tube connected with a micromanometer, a temperature sensor and an air damper.
Motor r.p.m. can vary continuously thanks to a digital inverter that also indicates the number of r.p.m. and the absorbed power.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Determining flow rate with Pitot tube
- Plotting the characteristic curve of a fan at different r.p.m. values
- Checking the laws of similarity (rpm vs m/s, rpm2 vs mmH_2O, etc...)
- Determining the power absorbed by the motor versus r.p.m. and flow rate

TECHNICAL SPECIFICATIONS:

- Bench-type framework of AISI 304 stainless steel
- Centrifugal fan, P = 950 W, Q_{max} = 1340 m^3/h, H = 80 mmH_2O
- Suction and discharge ducts of transparent Perspex
- 2 temperature sensors with digital display
- 2 pressure gauges of glass, with range of 200 to 0 to 200 mm
- Micromanometer of glass, with range of 0 to 100 mm
- Portable digital anemometer, with range of 0.4 to 30 m/s
- 2 adjustable air dampers of AISI 304 stainless steel
- Digital inverter with digital display and possibility of indicating the number of r.p.m. and the powers
- Switchboard IP55 complying with EC standards and including ELCB

Power supply: 230 Vac 50 Hz single-phase - 2 kVA
(Other voltage and frequency on request)
Dimensions: 1000 × 600 × 1300 mm
Weight: 80 kg

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

CENTRIFUGAL FAN DEMONSTRATION UNIT

Mod. CFDU/EV

INTRODUCTION

The unit is composed by a centrifugal fan mounted on a stainless steel structure with inlet and outlet ducts in clear plastic to see inside.
An adjustable aperture allows to modify the air flow, which can be measured using the calibrated orifice plate on the discharge duct.
It has two interchangeable impellers, a forward curved impeller and a backward curved one, in order to compare their performances.
The digital instruments allow to measure the fan head pressure, the pressure loss across the calibrated orifice plate (and hence the flow rate) and the air temperature.
The speed of the fan is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates the torque and the power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Studying the performance of the fan according to the motor speed
- Efficiency measurement
- Introduction to similarity laws

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel structure
- Centrifugal fan, Qmax = 244 l/s, H = 50 mmH_2O, 2800 rpm
- Inlet and outlet ducts in clear plastic
- 2 pressure transmitters
- Pt100 thermoresistance

Dimensions: 900 x 500 x 1000 mm
Weight: 30 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

AXIAL FAN DEMONSTRATION UNIT
Mod. AFDU/EV

INTRODUCTION

The unit is composed by an axial fan mounted on a stainless steel basement with inlet and outlet ducts in clear plastic to see inside.
An adjustable aperture allows to modify the air flow, which can be measured using the calibrated orifice plate on the discharge duct.
The digital instruments allow to measure the fan head pressure, the pressure loss across the calibrated orifice plate (and hence the flow rate) and the air temperature.
The speed of the fan is accurately controlled by an industrial inverter within the interface console mod. IFC/EV (necessary accessory) and also indicates the torque and the power consumption.
The interface console mod. IFC/EV also has a data acquisition software (PC not included) to study the values of the parameters measured by the electronic instruments.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Studying the performance of the fan according to the motor speed
- Efficiency measurement
- Introduction to similarity laws

TECHNICAL SPECIFICATIONS

- AISI 304 stainless steel basement
- Axial fan, Qmax = 38 l/s, H = 6 mmH_2O, 2600 rpm
- Inlet and outlet ducts in clear plastic
- 2 pressure transmitters
- Pt100 thermoresistance

Dimensions: 900 x 500 x 400 mm
Weight: 25 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Interface console mod. IFC/EV
- Personal Computer running Windows

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

INTERFACE CONSOLE
Mod. IFC/EV

INTRODUCTION

The unit allows to operate some models (for example mod. CFDU/EV) by interfacing them with a Personal Computer (not included); it allows data acquisition from the sensors on the equipment and it supplies the motors if any.
Moreover, the unit has a three-phase industrial inverter for accurate motor-speed control.

TECHNICAL SPECIFICATIONS

- Output for three-phase motor control by industrial inverter
- Fixed voltage output to supply a second motor
- Supervision software for Windows

Power supply: 230 Vac 50 Hz single-phase
(Other voltage and frequency on request)
Dimensions: 500 x 300 x 200 mm
Weight: 10 kg

REQUIRED ACCESSORIES (NOT INCLUDED)

- Personal Computer running Windows

SUPPLIED WITH

USER MANUAL

LIQUID MIXING APPARATUS

Mod. LM/EV

INTRODUCTION

This equipment has been designed to study the concepts concerning the mixing of liquids and it consists of a transparent cylindrical vessel equipped with a variable speed stirrer, electronic speed control, torque and speed measurement system.

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Absorbed power
- Displaying the mixing patterns
- Correlation between power and speed for different types of impellers
- Mixing a slurry
- Mixing immiscible liquids
- Mixing in an aerated vessel (only by the optional diffuser)
- Scaling up a stirrer

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Vessel of transparent plastic material, with capacity of 25 litres, including removable baffles and drain valve
- Stirring shaft of AISI 304 stainless steel with interchangeable stirrer
- 8 stirrers of AISI 304 stainless steel with different design:
  - Rushton turbine
  - 4 turbines with 2 flat blades
  - turbine with 4 flat blades
  - turbine with 4 pitched blades
  - turbine with 6 flat blades
- Variable speed motor with digital indicator of r.p.m. and of torque

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA (Other voltage and frequency on request)
Dimensions: 710 × 500 × 1300 mm
Weight: 70 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Tap water (valve with ½" hose connector)
- Compressed air (only with the optional diffuser)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Diffuser for compressed air
- Portable conductivity meter

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

FIXED AND FLUIDIZED BEDS APPARATUS

Mod. FFB/EV

INTRODUCTION

This equipment has been designed to study how a water or air flow crosses fixed and fluidized beds of solid particles and to observe the difference between "aggregative" and "particulate" fluidization. Moreover this unit can be used to obtain experimental data of fluidization of real beds (catalyst beds, filtration beds, etc...).

TRAINING PROGRAM

This unit enables to deepen the following issues:

- Pressure drop in fixed or fluidized bed with water or air
- Ergun equation and simplified forms (Carman-Kozeny and Burke-Plummer equations)
- Determining bed porosity
- Checking the different types of fluidization (particulate and aggregative)

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel
- 2 measuring pipes of transparent Plexiglas with support and filter of sintered steel; height = 550 mm, inside diameter = 44 mm, range: 0 to 500 mm
- 2 beds of material with different granulometry
- Double-diaphragm compressor, Q_{max} = 39 l/min, P_{max} = 2 bar, with air storing reservoirs
- Water tank of AISI 304 stainless steel with capacity of 6 litres
- Pump of AISI 316 stainless steel, Q_{max} = 1500 l/h, H_{max} = 2 bar
- Variable area flowmeter with control micro-valve and range of 7 to 70 l/h
- Variable area flowmeter with control micro-valve and range of 300 to 1700 Nl/h
- Double-pipe pressure gauge, with range of 0 to 500 mmH_2O
- U-tube pressure gauge for air, with range of 0 to 300 mmH_2O
- Safety valve adjusted at 0.5 bar

Power supply: 230 Vac 50 Hz single-phase - 0.5 kVA
(Other voltage and frequency on request)
Dimensions: 750 x 600 x 1000 mm
Weight: 50 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Distilled water (5 litres)

SUPPLIED WITH

THEORETICAL – EXPERIMENTAL HANDBOOK

OPTIONAL

- Analytical sieves of stainless steel

VARIATIONS OF THE PLANT ON REQUEST

The equipment can be modified on request of the Customer.

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

ACCESSORIES

HOT WATER GENERATOR	MOD. SCT01/EV	**AC** 2
STEAM GENERATOR	MOD. SCT03/EV	**AC** 3
STEAM GENERATOR	MOD. SCT04/EV	**AC** 4

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

HOT WATER GENERATOR

Mod. SCT01/EV

INTRODUCTION

This generator is able to supply hot water to the systems needing it.

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel with castors
- Insulated tank of 200 l for hot water
- Maximum temperature of water: 90 °C
- 2 electric resistors; P = 6 kW/each
- Centrifugal recirculation pump of AISI 304 stainless steel
- Double thermostat
- 3 thermometers with range of 0 to 100 °C
- Switchboard IP 55

Dimensions: 1450 × 800 × 1600 mm
Weight: 130 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 13 kVA (Other voltage and frequency on request)
- Tap water

SUPPLIED WITH

INSTRUCTION MANUAL

STEAM GENERATOR

Mod. SCT03/EV

INTRODUCTION

This steam generator is able to supply steam to the systems needing it. Its potentiality enables to supply steam to two systems at the same time.

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel
- Production: 47 kg/h of steam at 4.5 bar
- Centrifugal pump
- Safety valve
- 3 pressure switches
- Pressure gauge with range of 0 to 10 bar
- Softener for inlet water
- Switchboard complying with EC standards, IP 55 protection degree

Dimensions: 1300 × 800 × 1500 mm
Weight: 230 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 32 kVA
  For softener: 230 Vac 50 Hz single-phase - 0.5 kVA
  (Other voltage and frequency on request)
- Tap water: 50 l/h max. (valve with ½" hose connector)
- Floor water drain

SUPPLIED WITH

INSTRUCTION MANUAL

ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

STEAM GENERATOR

Mod. SCT04/EV

INTRODUCTION

This steam generator is able to supply steam to the systems needing it. Its potentiality enables to supply steam to only one system at a time.

TECHNICAL SPECIFICATIONS:

- Framework of AISI 304 stainless steel
- Production: 17 kg/h of steam at 4.5 bar
- Centrifugal pump
- Safety valve
- 3 pressure switches
- Pressure gauge with range of 0 to 10 bar
- Softener for inlet water
- Switchboard complying with EC standards, IP 55 protection degree

Dimensions: 1300 × 800 × 1500 mm
Weight: 230 kg

REQUIRED UTILITIES (PROVIDED BY THE CUSTOMER)

- Power supply: 400 Vac 50 Hz three-phase - 16 kVA
  For softener: 230 Vac 50 Hz single-phase - 0.5 kVA
  (Other voltage and frequency on request)
- Tap water: 20 l/h max. (valve with ½" hose connector)
- Floor water drain

SUPPLIED WITH

INSTRUCTION MANUAL

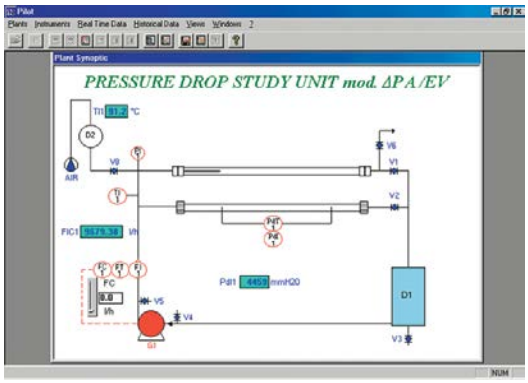
SOFTWARE

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

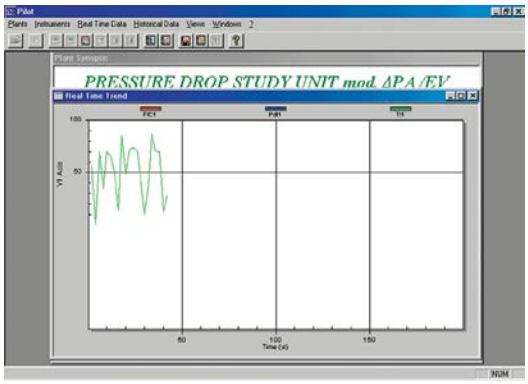
DATA ACQUISITION SOFTWARE:
PILOT FOR WINDOWS ACQUISITION

Data acquisition software systems, specific for each plant, operate in Windows environment and they are supplied with the equipment of manual plants with data logging.
They enable:

- to display the synoptic of the plant with the instantaneous values of process parameters



- to display the real-time trend of process parameters
- to display the historical trend of process variables



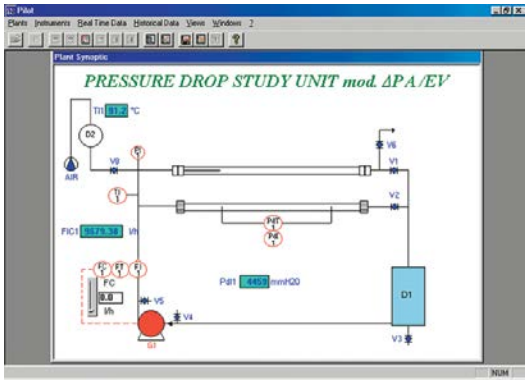
There is no need of inserting any card in the PC to use this software; it is sufficient to connect the plant with the serial port (COM1 or COM2) of the P.C. via the serial cable of the equipment.

SUPERVISION SOFTWARE:
PILOT FOR WINDOWS SUPERVISION

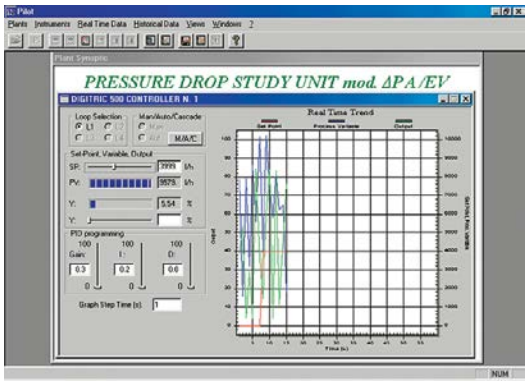
Supervision software systems, specific for each plant, operate in Windows environment and they are supplied with the equipment of automated plants.

These software systems have been developed by Elettronica Veneta S.p.a. with the characteristics of industrial SCADA software and they enable:

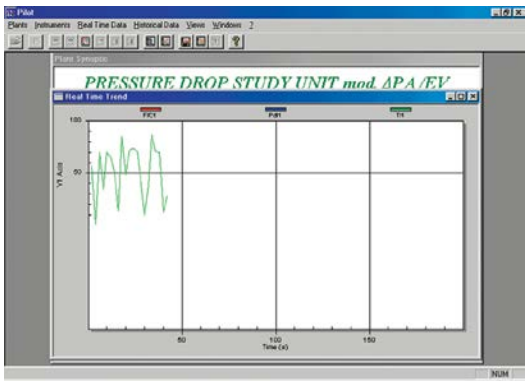
- to display the synoptic of the plant with the instantaneous values of process parameters
- to control ON–OFF signals, that is to switch pumps, compressors, resistors, etc…, on and off by PC



- to communicate with the microprocessor PID controller included in the plant, that is to acquire all the data coming from the controller and to carry out all the operations that can be enabled from the fore panel of the instrument, by PC (setting the set point and the PID parameters, selecting automatic or manual operation, setting the output of every loop, etc...)



- to display the real-time trend of process parameters
- to display the historical trend of process variables



There is no need of inserting any card in the PC to use this software: it is sufficient to connect the plant with the serial port (COM1 or COM2) of the P.C. via the serial cable of the equipment.

 ELETTRONICA VENETA S.P.A. - 31045 Motta di Livenza (TV) Italy - Via Postumia 16 - Tel. +39 0422 765 802 - Fax +39 0422 861 901 - E-mail: export@elettronicaveneta.com

PRODUCTS INDEX
SORTED ALPHABETICALLY BY MODEL

ElettronicaVeneta

Elettronica Veneta S.p.A.
Via Postumia, 16
31045 Motta di Livenza (Treviso) Italy
Tel. +39 0422 765 802 - Fax +39 0422 861 901
E-mail: export@elettronicaveneta.com
www.elettronicaveneta.com