edibon

Engineering and Technical Teaching Equipment

Computer Controlled **Closed Hydrodynamic Tunnel for Hight Speed, 150 x 150 mm,** with SCADA

HTHS150/150C

SCADA

② Control Interface Box

③ Data Acquisition Board

④ Software for: Computer Control - Data Acquisition - Data Management

⑤ Cables and Accessories

⑥ Manuals

* *Minimum supply always includes:*
1 + 2 + 3 + 4 + 5 + 6 *(Computer not included in the supply)*

① Unit: HTHS150/150C. Computer Controlled Closed Hydrodynamic Tunnel for High Speed, 150 x 150 mm

OPEN CONTROL + MULTICONTROL + REAL TIME CONTROL

POWERED BY NATIONAL INSTRUMENTS LabVIEW

Key features:

- **Advanced Real-Time SCADA.**
- **Open Control + Multicontrol + Real-Time Control.**
- **Specialized EDIBON Control Software based on LabVIEW.**
- **National Instruments Data Acquisition board (250 KS/s, kilo samples per second).**
- **Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.**
- **Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.**
- **Capable of doing applied research, real industrial simulation, training courses, etc.**
- **Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).**
- **Designed and manufactured under several quality standards.**

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PRODUCTS
8.- FLUID MECHANICS

For more information about Key Features, click here

ISO 9001: **Quality Management** (for Design, Manufacturing, Commercialization and After-sales service)

European Union Certificate (total safety)

Certificates ISO 14001 and ECO-Management and Audit Scheme (environmental management)

"Worlddidac Quality Charter" and Platinum Member of Worlddidac

INTRODUCTION

Hydrodynamics is the part of hydraulics that focuses on the study of fluid motion, as well as the interactions of moving fluids with their. It has numerous industrial applications, such as canal design, harbor and dam construction, shipbuilding, turbines, etc.

Cavitation is a hydrodynamic effect that occurs when vapor cavities are created within water or any other fluid in a liquid state where forces act in response to pressure differences boundaries. It is one of the main reasons for the deterioration of propellers or turbomachines, and is therefore a fundamental factor to be taken into account in their design.

Cavitation tunnels are facilities to optimize propeller design by testing and studying cavitation generation, erosion risk, pressure fluctuations and noise production inherent to cavitation.

The Computer Controlled Closed Hydrodynamic Tunnel for High Speed, 150 x 150 mm, "HTHS150/150C", allows the study of complete hydrodynamics. In addition, being sealed and being able to reduce or increase its internal static pressure, it allows cavitation studies to be carried out.

GENERAL DESCRIPTION

The Computer Controlled Closed Hydrodynamic Tunnel for High Speed, 150 x 150 mm, "HTHS150/150C", is a closed circuit cavitation tunnel with water flowing in the vertical plane. The water is circulated by a computer controlled variable speed axial propeller pump located at the bottom of the tunnel.

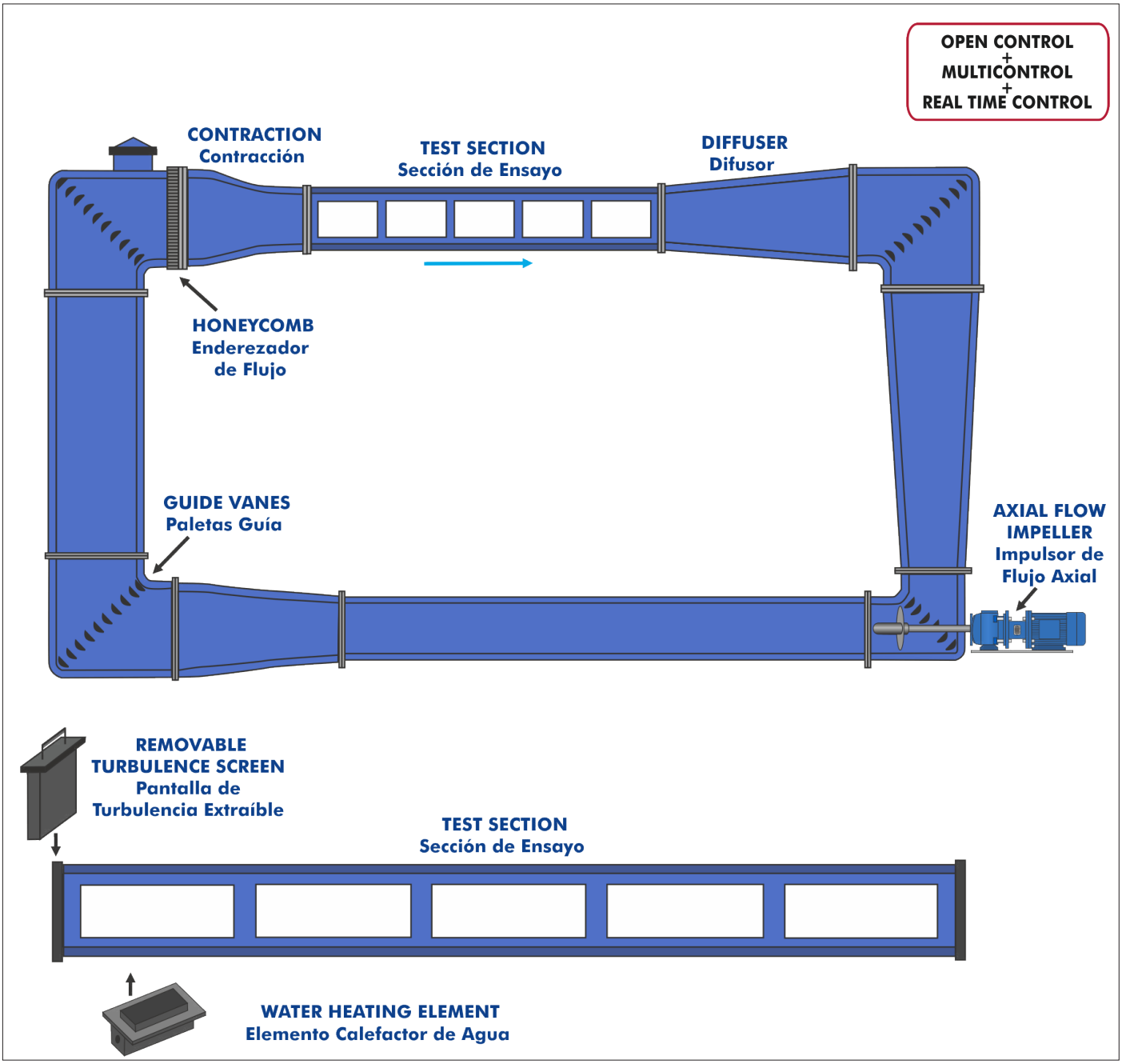
The unit includes several tunnel sections to reduce flow interference. A contraction upstream of the working area with a perfectly studied contraction curve contour ensures a well-developed water flow in the working area.

A honeycomb flow stabilizer is located in the section upstream of the shrinkage for greater flow uniformity in the working area.

The working area is located downstream of the shrinkage. It consists of a constant section section, where the models for testing are mounted. It is made with fused silica (quartz) windows on the front, back and top face for optical testing. This section includes a Pitot tube in its upper part to study static pressure, dynamic pressure and total pressure. It also includes a removable screen at the inlet to increase the turbulence of the flow.

A diffuser is included at the tunnel outlet to avoid the generation of turbulence that can damage the quality of the flow in the working area.

This Computer Controlled Unit is supplied with the EDIBON Computer Control System (SCADA), and includes: The unit itself + a Control Interface Box + a Data Acquisition Board + Computer Control, Data Acquisition and Data Management Software Packages, for controlling the process and all parameters involved in the process.


OPEN CONTROL
+
MULTICONTROL
+
REAL TIME CONTROL
CONTRACTION
Contracción
TEST SECTION
Sección de Ensayo
DIFFUSER
Difusor
HONEYCOMB
Enderezador
de Flujo
GUIDE VANES
Paletas Guía
AXIAL FLOW
IMPELLER
Impulsor de
Flujo Axial
REMOVABLE
TURBULENCE SCREEN
Pantalla de
Turbulencia Extraíble
TEST SECTION
Sección de Ensayo
WATER HEATING ELEMENT
Elemento Calefactor de Agua

With this unit there are several options and possibilities:

- Main items: 1, 2, 3, 4, 5 and 6.

Let us describe first the main items (1 to 6):

① HTHS150/150C. Unit:

Hydrodynamic tunnel in closed water circuit flowing in the vertical plane.

Made of high quality material.

Steel suport frame.

Panels made of painted steel.

Main metallic elements in stainless steel.

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

Generals dimensions:

Five meters in length between vertical tunnel parts and 1.6 m in height between horizontal parts.

HTHS150/150C. Unit

Channel:

Working area of 150 x 150 mm and 3000 mm in length (consult other measures) to assemble and perform tests with the different models.

Fused silica (quartz) windows on the front, back and top face for optical tests.

Five 500 x 150 mm windows per side, which can be replaced if necessary.

Honeycomb flow straightener before the working section.

Inlet section to the working area with a shrinkage ratio of 2.3:1.

Outlet section with diffuser to avoid the generation of turbulence, which can damage the quality of the flow in the working area.

Guide vanes on the elbows to stabilize the flow.

Pumping system:

Variable speed, computer controlled axial propeller pump: Power: 10 – 20 kW.

Instrumentation:

Temperature sensors along the work area.

Temperature sensors at the inlet and outlet of the cooling coil.

Pressure sensors at key points.

The complete unit includes as well:

Advanced Real-Time SCADA.

Open Control + Multicontrol + Real-Time Control.

Specialized EDIBON Control Software based on LabVIEW.

National Instruments Data Acquisition board (250 KS/s, kilo samples per second).

Calibration exercises, which are included, teach the user how to calibrate a sensor and the importance of checking the accuracy of the sensors before taking measurements.

Projector and/or electronic whiteboard compatibility allows the unit to be explained and demonstrated to an entire class at one time.

Capable of doing applied research, real industrial simulation, training courses, etc.

Totally safe, utilizing 4 safety systems (Mechanical, Electrical, Electronic & Software).

Designed and manufactured under several quality standards.

Recommended additional elements (Not included):

- HTHS1/150. Single-Bladed Propeller Model.
- HTHS2/150. Two-Bladed Propeller Model.
- HTHS3/150. Three-Bladed Propeller Model.
- HTHS4/150. Four-Bladed Propeller Model.
- HTHS5/150. Five-Bladed Propeller Model.
- HTHS6/150. Six-Bladed Propeller Model.
- HTHS150/150C-HS. Heating System.

  Heating elements on the lower face with variable and independent power for each one computer controlled.
- HTHS150/150C-CS. Cooling System.

  Water cooling coil before passing through the pump and the working section.
- HTHS150/150C-FCP. Filter for the Collection of Study Particles.
- HTHS150/150C-TARC. Force Measurement Interface and Sensors.

② HTHS150/150C/CIB. Control Interface Box:

The Control Interface Box is part of the SCADA system.

Control interface box with process diagram in the front panel and with the same distribution that the different elements located in the unit, for an easy understanding by the student.

All sensors, with their respective signals, are properly manipulated from -10V. to +10V. computer output.

Sensors connectors in the interface have different pines numbers (from 2 to 16), to avoid connection errors.

Single cable between the control interface box and computer.

The unit control elements are permanently computer controlled, without necessity of changes or connections during the whole process test procedure.

HTHS150/150C/CIB

Simultaneous visualization in the computer of all parameters involved in the process.

Calibration of all sensors involved in the process.

Real time curves representation about system responses.

Storage of all the process data and results in a file.

Graphic representation, in real time, of all the process/system responses.

All the actuators' values can be changed at any time from the keyboard allowing the analysis about curves and responses of the whole process.

All the actuators and sensors values and their responses are displayed on only one screen in the computer.

Shield and filtered signals to avoid external interferences.

Real time computer control with flexibility of modifications from the computer keyboard of the parameters, at any moment during the process.

Real time computer control for pumps, compressors, heating elements, control valves, etc.

Real time computer control for parameters involved in the process simultaneously.

Open control allowing modifications, at any moment and in real time, of parameters involved in the process simultaneously.

Three safety levels, one mechanical in the unit, another electronic in the control interface and the third one in the control software.

③ DAB. Data Acquisition Board:

The Data Acquisition board is part of the SCADA system.

PCI Express Data acquisition board (National Instruments) to be placed in a computer slot. Bus PCI Express.

Analog input:

Number of **channels= 16** single-ended or 8 differential. **Resolution=16 bits**, 1 in 65536.

Sampling rate up to: 250 KS/s (kilo samples per second).

Input range (V)=±10 V. Data transfers=DMA, interrupts, programmed I/0. DMA channels=6.

Analog output:

Number of **channels=2**. **Resolution=16 bits**, 1 in 65536.

Maximum output rate up to: 900 KS/s.

Output range (V)=±10 V. Data transfers=DMA, interrupts, programmed I/0.

Digital Input/Output:

Number of **channels=24 inputs/outputs**. D0 or DI Sample Clock frequency: 0 to 100 MHz.

Timing: Number of **Counter/timers=4**. Resolution: Counter/timers: 32 bits.

DAB

The Data Acquisition board model may change at any moment, providing the same or better features than those required for the unit.

④ **HTHS150/150C. Computer Control + Data Acquisition + Data Management Software:**

The three softwares are part of the SCADA system.

Compatible with actual Windows operating systems. Graphic and intuitive simulation of the process in screen. **Compatible with the industry standards.**

Registration and visualization of all process variables in an automatic and simultaneous way.

Flexible, open and multicontrol software, developed with actual windows graphic systems, acting simultaneously on all process parameters.

Management, processing, comparison and storage of data.

Sampling velocity up to 250 KS/s (kilo samples per second).

Calibration system for the sensors involved in the process.

It allows the registration of the alarms state and the graphic representation in real time.

Comparative analysis of the obtained data, after the process and modification of the conditions during the process.

Open software, allowing the teacher to modify texts, instructions. Teacher's and student's passwords to facilitate the teacher's control on the student, and allowing the access to different work levels.

This unit allows the 30 students of the classroom to visualize simultaneously all the results and the manipulation of the unit, during the process, by using a projector or an electronic whiteboard.

HTHS150/150C/CCSOF

⑤ **Cables and Accessories**, for normal operation.

⑥ **Manuals:**

This unit is **supplied with 8 manuals**: Required services, Assembly and Installation, Interface and Control Software, Starting-up, Safety, Maintenance, Calibration & Practices manuals.

∗References 1 to 6 are the main items: HTHS150/150C + HTHS150/150C/CIB + DAB + HTHS150/150C/CCSOF + Cables and Accessories + Manuals are included in the minimum supply for enabling normal and full operation.

EXERCISES AND PRACTICAL POSSIBILITIES TO BE DONE WITH THE MAIN ITEMS

1.- Extensive study of hydrodynamics and water flow studies.

2.- Study of flow visualization.

3.- Study of static pressure, dynamic pressure and total pressure using a Pitot tube.

4.- Study of the measurement of velocity using a Pitot tube.

5.- Study of turbulent and laminar flow.

Additional practical possibilities:

6.- Calibration of sensors.

Additional practical possibilities to be carried out with the recommended additional elements (Not included):

7.- Study of cavitation in different models.

8.- Thrust and torque measurement.

9.- Study of cavitation as a function of the number of propeller blades.

10.-Study of the noise production inherent to cavitation.

11.-Study of the pressure fluctuations due to cavitation.

12.-Performance losses due to cavitation.

Other possibilities to be done with this unit:

13.- Many students view results simultaneously.

To view all results in real time in the classroom by means of a projector or an electronic whiteboard.

14.- Open Control, Multicontrol and Real Time Control.

This unit allows intrinsically and/or extrinsically to change the span, gains; proportional, integral, derivate parameters; etc, in real time.

15.- The Computer Control System with SCADA and allow a real industrial simulation.

16- This unit is totally safe as uses mechanical, electrical and electronic, and software safety devices.

17.- This unit can be used for doing applied research.

18.- This unit can be used for giving training courses to Industries even to other Technical Education Institutions.

19.- Control of the HTHS150/150C unit process through the control interface box without the computer.

20.- Visualization of all the sensors values used in the HTHS150/150C unit process.

- Several other exercises can be done and designed by the user.

REQUIRED SERVICES

- Electrical supply: single-phase 200 VAC – 240 VAC/50 Hz or 110 VAC – 127 VAC/60 Hz.
- Computer.

DIMENSIONS AND WEIGHTS

HTHS150/150C:

Unit:

- Dimensions: 6000 x 1000 x 1900 mm approx. (236.21 x 39.36 x 74.80 inches approx.)
- Weight: 1000 Kg approx. (2204 pounds approx.)

Control Interface Box:

- Dimensions: 490 x 450 x 470 mm approx. (19.29 x 17.71 x 18.50 inches approx.)
- Weight: 20 kg approx. (44 pounds approx.)

ADDITIONAL RECOMMENDED ELEMENTS (Not included)

- HTHS1/150. Single-Bladed Propeller Model.
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- HTHS150/150C-HS. Heating System.
- HTHS150/150C-CS. Cooling System.
- HTHS150/150C-FCP. Filter for the Collection of Study Particles.
- HTHS150/150C-TARC. Force Measurement Interface and Sensors.

** Other models available on request.*

SIMILAR UNITS AVAILABLE

Offered in this catalog:

- HTHS150/150C. Computer Controlled Closed Hydrodynamic Tunnel for High Speed, 150 x 150 mm.

Offered in other catalog:

- HTLS150/150C. Computer Controlled Closed Hydrodynamic Tunnel for Low Speed, 150 x 150 mm.

** Other dimensions available on request.*

ORDER INFORMATION

Main items (always included in the supply)

① **Unit: HTHS150/150C. Computer Controlled Closed Hydrodynamic Tunnel for Hight Speed.**

② **HTHS150/150C/CIB. Control Interface Box.**

③ **DAB. Data Acquisition Board.**

④ **HTHS150/150C/CCSOF. Computer Control + Data Acquisition + Data Management Software.**

⑤ **Cables and Accessories**, for normal operation.

⑥ **Manuals.**

*IMPORTANT: Under HTHS150/150C we always supply all the elements for immediate running as 1, 2, 3, 4 ,5 and 6.

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✱ Specifications subject to change without previous notice, due to the convenience of improvement of the product.

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Edition: ED01/23
Date: February/2023

REPRESENTATIVE: