

Heat Exchanger Process Control Trainer



Model: 607D

DAC Worldwide's Heat Exchanger Process Control Trainer (607D) is a full-sized, working fluid system that allows for hands-on training in measurement and control as it relates to temperature in an industrial fluid process system. Using optional instruments, the device allows control loops to be configured employing feedback and feed-forward control methods, which incorporates thermocouple or RTD inputs. When coupled with a comprehensive student manual, the trainer creates a complete, self-paced learning system that reflects realistic industrial and commercial applications.

Using four (4) industrial-quality heat exchangers and two immersion process heaters, learners will allow for the creation of dynamic temperature control systems. Both the hot and utility legs can be controlled using industrial-quality pneumatic control valves. Common cold tap water can be used as a cooling water source, and is incorporated through quick-disconnect fittings and valves at the rear of the training aid. An optional chiller can also be provided, creating greater temperature differentials and more dynamic control experiments.

In general, the training device has the look and feel of actual industrial hardware, and allows for a broad range of exercises in temperature and flow measurement and control. Additionally, the training aid provides a framework for study of the heat transfer process. Through its standard features and its adaptability to optional, specialized control and measurement equipment, the system can replicate many unique industrial control arrangements.

Practice Hands-On Instrumentation Skills for Various Applications

This instrumentation training system features a one-piece, welded tubular steel frame with four (4) four-inch diameter casters. Standing 76 inches tall, the Heat Exchanger Process Control Training System features an integral instrument mounting rack with instrument and controller panels. The front panels of the trainer are fabricated from ½-inch MDF board and are covered with a high-durability laminate. Clear PVC and CPVC piping components are used throughout the system.

Areas within the piping system that are subject to elevated temperatures are CPVC, providing protection from elevated process heat levels. The balance of the system incorporates clear PVC piping, allowing the process flow to be seen directly. The device also contains a 24-volts DC power supply and two (2) air regulators with gauges creating an instrument air supply. All 24-volt power sources, air sources, and operational switches are conveniently located on the front panel face.

Additionally, the training aid can be used to study the fundamentals of heat transfer within industrial heat exchangers in depth. Four industrial heat exchanges are provided with the trainer, including a plate-type exchanger, and three (3) varieties of shell and tube heat exchangers. The piping system includes multiple thermowells, allowing for temperature measurement at inlet points and outlet points on both process sides of the exchangers. A system of solenoid valves and piping manifolds allows for selection of individual heat exchangers for use and study. These same features allow for flow reversal creating both concurrent and countercurrent flow capabilities. Four digital temperature meters are provided, which allow for direct indication and study of each exchanger using modular RTD's in tube-side and shell-side flow as required.

The trainer also includes a primary 208/230 VAC, 3-phase, 5 wire, 60 Hz, or a 220 VAC, single-phase, 50 Hz. Other electrical configurations are possible, as well. Standard accessories include twenty (20) 36-inch test leads, twenty (20) 60-inch test leads, 150-feet of ¼" diameter instrument connection tubing, fifteen (15) quick-disconnect nipples, four (4) bi-metal thermometers, ten (10) tubing tees, ten (10) tubing couplers, and a three-piece orifice plate set.

Hands-On Exercises and Learning Activities Lead to Realistic Results

DAC Worldwide's Heat Exchanger Process Control Training System also features exercises and learning activities that focus more on results and less on secondary academic background information. This comprehensive training system offers content in instrumentation principles, with individual learning activities provided in a self-paced or instructor-led format. The integrated course features multiple activities, all of which include background information on the topic, hands-on experiments, and related review questions.

The curriculum includes several units of activities relating to instrumentation components, application, and physical properties. Individual topics discussed within the course include investigating thermocouple operating characteristics, calibration of a flow transmitter, determining a flow process' operating characteristics, notch tuning of a flow process, open-loop/closed-loop integral controller characteristics, and much more!

Optional Student Activity Guide Available to Enhance Learning

A copy of this course's Student Activity Guide is available with the training system. Sourced from the Exercises and Learning Activities, the Student Activity Guide takes the technical content contained in the learning objectives, and combines it into one perfectly-bound book. Several optional textbooks are also available for order. If you would like to inquire about purchasing additional Student Activity Guides or Textbooks for your program, please contact your local DAC Worldwide Representative for more information.

FEATURES & SPECIFICATIONS

- One-piece, welded 1/8" wall tubular steel frame
- 3/16" steel mounting floor

- Four (4) 4" diameter casters, two (2) with locks
- Integral 19" x 70" high, instrument mounting rack with silk-screened instrument and controller panels
- Front panel faces fabricated from 1/2" MDF board and covered with a high-durability laminate
- 3/4" diameter CPVC and clear PVC piping components throughout
- Front panel-mounted operator control panel, includes switches and pilot lights for: pumps, solenoid valves, and immersion heaters, as well as control relay connections for equipment, 24 VDC power supply terminals and electric "free line" connections. A regulator with gauge controlling a 0-60 psi air supply with associated fittings and a second instrument air gauge with associated fittings is also mounted on this panel. An operator panel is also provided allowing for manual or semi-automatic operation, via contacts, of flow control solenoid valves.
- Master instrument air supply regulator
- Circuit breaker with GFI protection
- Two (2) variable-area flow meters
- Five (5) brass thermowells, facilitating temperature measurement at each heat exchanger
- Two (2) orifice flow assemblies with associated flanges and tubing connections
- Power distribution panel mounted in instrument rack, including on/off power switch, GFI receptacle, fuses for all primary circuits, and 12 electric "free line" connections to front panel
- Quick-disconnect fittings throughout, allowing for convenient attachment of instruments
- One diaphragm-type, industrial control valve
- One diaphragm-type, industrial, three-way control valve
- Multiple solenoid valves allowing for heat exchanger selection and concurrent/crosscurrent operations
- Four (4) thermowell-type bi-metal, thermometers
- Industrial-quality multi-pass shell and tube heat exchangers including: u-tube, single-pass, and multipass, straightflow varieties
- One plate-type heat exchanger
- Pipe stanchion, allowing for attachment of differential pressure transmitters and pressure transmitters at varying heights
- Primary reservoir - 20 gallon capacity - high-temperature polypropylene.
- Four (4) on-board digital thermometers with related RTDs, allowing for measurement at any location on the device
- Centrifugal pump, 1/2 HP
- Two (2) immersion-type heaters, 4 KW each
- 24 VDC Power supply
- Process quick-disconnect hose fittings, allowing for connection to other process control trainers

- Packaging for shipment via motor freight

PRODUCT DIMENSIONS

- **Product Dimensions**
(L x W X H)
33.5in x 48in x 76in (860 x 1210 x 1930 mm)
425 lbs. (193 kg)
- **Shipping Dimensions**
750 lbs. (340 kg)

UTILITIES

- 208/230 VAC, 3-phase, 5 wire, 60 Hz OR 220 VAC, single-phase, 50 Hz,
- City water
- Floor drain
- Other electrical configurations are possible

OPTIONS

- #581-007 - Instrumentation, 5th Ed.
- #600-006A - Test and Calibration Package, Hand-Held, Economy
- #600-007 - PLC Interface Panel
- #600-010 - AC Variable Speed Drive Upgrade
- #600-011A - Economy Chiller System
- #600-111 - Dry Well Temperature Calibrator
- #600-031 - Pitot tube flow assembly
- #600-032 - Venturi tube flow assembly
- #600-040 - Valve Positioner, Pneumatic
- #600-041 - Control valve positioner, electro-pneumatic

ACCESSORIES

- Twenty (20) 36" test leads
- Twenty (20) 60" test leads
- 150', 1/4" Diameter instrument connection tubing, of two colors

- Fifteen (15) quick-disconnect nipples
- Four (4) Bi-metal Thermometers
- Ten (10) tubing tees
- Ten (10) tubing couplers
- Orifice plate set, 3-piece
- Use/Exercise Guide

COURSE CONTENT The courseware, useful in both an instructor-led and or a self-directed format, includes one of several optional textbooks, a course guide and hands-on exercises.

Exercises include:

- Introduction to the Process Trainer, Heat Exchanger
- Review of process instrumentation terms, abbreviations and designations
- Investigating thermocouple operating characteristics
- Temperature measurements using a thermocouple in a process
- Investigating RTD operating characteristics
- Temperature measurements using a RTD in a process
- Flow versus differential pressure for an orifice plate
- Calibration of a flow transmitter
- Calibration of a square root extractor
- Installation and calibration of an electronic flow measurement channel
- Review of process control theory terms, abbreviations, and designations
- Introduction to the Honeywell UDC 3300 universal digital controller
- Introduction to the Foxboro 762 digital controller
- Determining a temperature process' operating characteristics
- Determining a flow process' operating characteristics
- Open loop integral controller characteristics
- Closed loop integral control in a temperature process
- Closed loop integral control in a pressure process
- Closed loop integral control in a flow process
- Open loop proportional controller characteristics

- Closed loop proportional control in a temperature process
- Closed loop proportional control in a flow process
- Open loop proportional plus integral controller characteristics
- Closed loop proportional plus integral control in a temperature process
- Closed loop proportional plus integral control in a flow process
- Open loop proportional plus integral plus derivative controller characteristics
- Closed loop proportional plus integral, plus derivative control in a temperature process
- Closed loop proportional plus integral, plus derivative control in a flow process
- Notch tuning of a flow process
- Ultimate tuning of a flow process
- Open loop tuning of a temperature process
- Cascade control of a temperature process
- Additional lessons to come specific to heat exchanger study

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