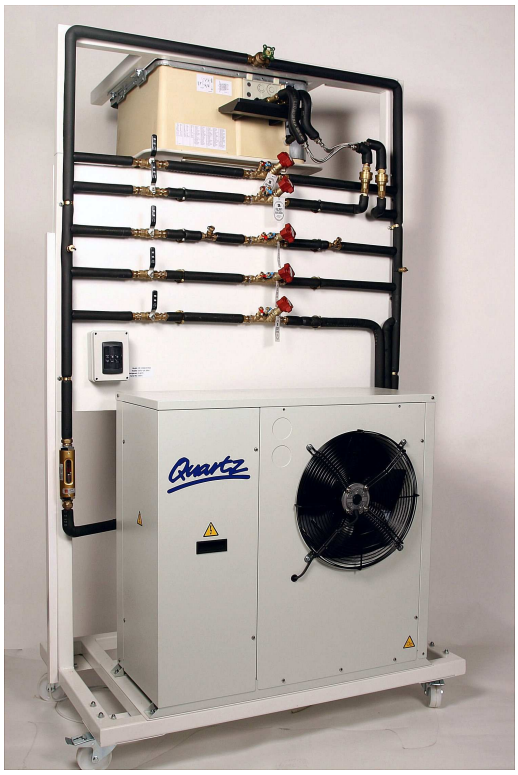
Chilled Water Air Conditioning Skills Trainer 39-310



The Feedback Instruments Chilled Water Air conditioning Skills Trainer 39-310 is a complete chilled water A.C. system integrated onto a single frame.

The plant is capable of demonstrating the principles of air conditioning using chilled water as a cooling medium and is a training platform for practising the balancing of chilled water circuits.

The training equipment comprises a 5 kW water chiller and five chilled water circuits. Each of these incorporate terminal fan coil units and dummy sections, which have been adapted to provide technicians with a teaching facility for understanding typical air conditioning systems.

The student can connect instruments to the system via the incorporated self-sealing ports, and adjust the balancing valves while monitoring the pressure differential and flow across each individual leg. This process enables the students to practically adjust the system for optimum performance.

As a demonstrator, the unit can be used to demonstrate chilled water applications with and individual thermostatic control. The electronic thermostats control electric water valves to allow individual temperatures for each zone.

The system would be an ideal source of practical learning on air conditioning courses and any training for building management courses.

The system comprises:

1. The Water Chiller — producing chilled water at the required flow rate and temperature to enable cooling within the building to be achieved.

2. A Primary Circuit - coupled to the chiller, the primary circuit distributes chilled water to the conditioned zones within the building. It provides the total water flow required for correct chiller operation and to service the complete building system. The primary circuit is fed by the water pump within the chiller.

3. Secondary Circuit - coupled to the primary circuit, this section contains the balancing valves, control valves and air handling units which allow cool air to be distributed within the space to be conditioned using chilled water as the energy sink.

Subject Areas

- Considerations in system selection, i.e. DX, ducted air or Chilled Water.
- Advantages and disadvantages of chilled water.
- Considerations in defining the load.
- Considerations in calculating capacity / checking.

- Typical water circuits, system components, valve requirements.
- Typical systems design in line with building regulations and requirements.
- Identification of the major components.
- Applications and equipment selection, chillers, fan coil units etc.
- Component selection, pumps, valves etc.
- Considerations for pipe work sizing.
- Control systems.
- Considerations for installing, setting up and commissioning chilled water systems.
- Instrumentation, measurements and systems testing.
- System balancing.
- Trouble shooting and fault-finding on chilled water systems.

1. The Water Chiller

The chiller unit consists of a scroll compressor generating a total of 5kW capacity, operating on R407C refrigerant. This rig has a chiller with single stage refrigerant circuit; other larger chillers may provide variation in capacity between 10% and 100% to more closely simulate larger installations, by using several individual or variable capacity compressors. The fin and tube condenser which rejects the absorbed heat from the refrigerant gas is mounted on the back of the chiller unit. The required airflow is achieved by a single axial fan mounted on the front of the unit.

Condensed liquid refrigerant leaving the condenser passes through the liquid line which incorporates a filter drier, solenoid valve, site glass with moisture indicator, and finally enters the expansion valve. A low pressure switch is fitted to protect the compressor from running at abnormal low-pressure conditions that would subsequently cause compressor damage due to lack of lubrication caused by low swept volume.

The system is also fitted with a high pressure safety "cut- out" switch to prevent the system pressures exceeding the compressor maximum working pressure of 32 bar. An automatic pressure relief valve is also fitted to the dis- charge line as a fail-safe. Service ports are fitted to the suction and discharge lines to allow service manifold gauges to be fitted for system diagnosis, and to allow refrigerant to be added to, or removed from, the system.

A line valve is fitted to the liquid line at the condenser outlet to allow the system to be pumped down. This is a process that allows the refrigerant to be stored in the receiver tank and condenser, allowing work to be carried out on the low- pressure side of the system without having to recover the entire refrigerant charge.

The thermostatic expansion valve is sized to maintain a positive super heat (circa 5°C) based upon the temperature and pressure sensed by the capillary and bulb attached to the valve. Heat from the returning water is transferred to the refrigerant gas via the evaporator plate heat exchanger. Subsequently this heat is rejected to atmosphere via the condenser. The heat exchanger is fitted with trace heating to prevent damage in the event of frosting in low ambient temperatures.

Water flow through the heat exchanger and primary circuit is maintained by a fixed capacity pump. Chilled water temperature control, which is maintained by the microprocessor controller, is sensed by the return water temperature sensor. A flow sensor ensures that the chiller pump is operating correctly prior to compressor start up. Should the water flow stop or fall to a critical level at any time, the compressor will shut down to prevent damage to the heat exchanger caused by freezing.

2. Primary Circuit Section

The primary circuit consists of: -

- The inlet and outlet isolating valves.
- Water flow meter.
- Automatic bleed valve.
- Y Strainer.
- System drain valve.

The primary circuit is connected to the chiller and its function is to supply and maintain a constant flow of water through the chiller and to the secondary parts of the system; the flow rate being set via the regulating valve.

Each fan coil is equipped with a fan speed control (three switchable speeds) and a room thermostat. A gravity drain circuit is fitted to discharge condensate from the air handlers. The control panel houses a power on/off switch. When the thermostat senses that the room set point temperature has been reached, the appropriate fan coil water flow is shut off, controlled by an individual valve.

The four port chilled water valves can be clearly seen on the outside of the units.

3. Secondary Circuit

The secondary circuit, coupled to the primary circuit comprises:

1 wall mounted fan coil unit.
1 ceiling mounted cassette fan coil.
3 dummy circuits for load balancing simulation.

Each of the five individual circuits is fitted with an isolating valve, flow control regulator and pressure and temperature measuring points. Each fan coil is fitted with its own four port chilled water control valve.

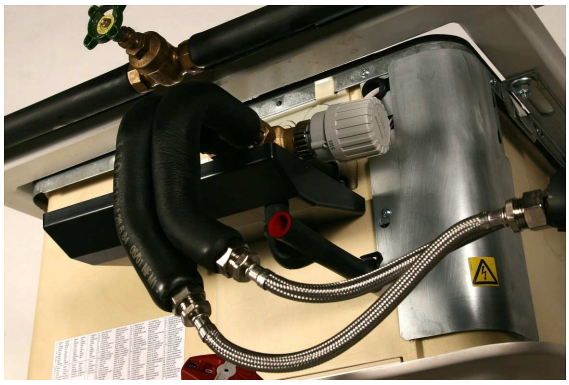
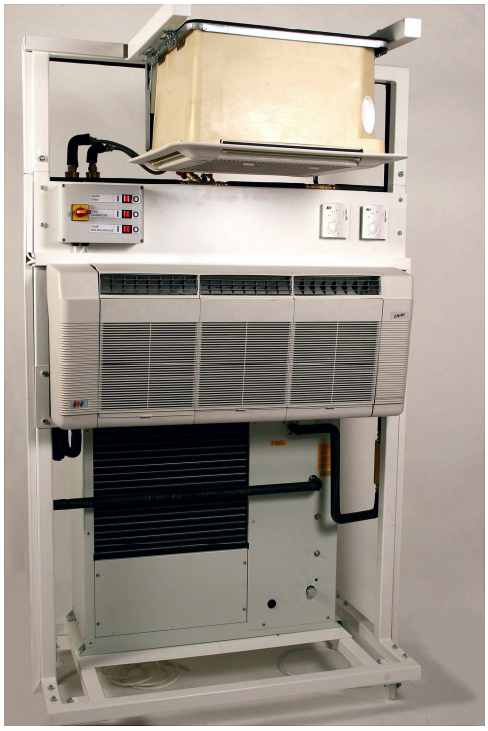


Image showing the detail of the cassette fan coil

Installation Notes

The unit is designed to fit through a pair of standard swing double doors if the cassette unit and top frame is removed. The cassette unit is coupled onto the hydronic system via two self-sealing couplers, to allow the cassette to be removed without loss of glycol in the system. The top frame is also easily removable to allow the rig to be moved through a standard double door. The full size rig has to be assembled and charged with glycol in the room that it is to be used in. The system has to be drained and disassembled in order to move it into storage or into another room.



It is recommended that students studying the chilled water programm have previous refrigeration experience or have previously studied the fundamentals of refrigeration, understand the refrigeration cycle and the key components. These include but are not limited to, the compressor, expansion device, the function of the evaporator and condenser, thermostat controls and safety devices that are to be found in a chiller.

Image showing detail of the rear of the unit

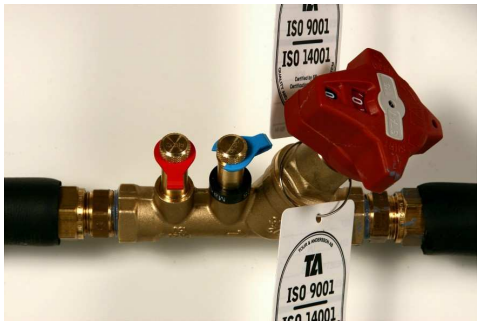


Image showing detail of the ball valve

Specifications

Power Requirements

Line voltage:	220-230 V rms, 50 or 60 Hz.
Consumption:	3.2 kW (at full load).

Dimensions and Weight (packed)

Width: 148 cm Height: 220 cm Depth: 138 cm
Weight: 230 kg

Ordering Information

39-310 — Chilled Water Air Conditioning Skills Trainer

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