



Refrigeration Trainer



Air Conditioning Trainer



Ice Plant Trainer



Cold Storage Trainer



Window Air Conditioning



Ambros

## REFRIGERATION & AIR CONDITIONING LAB



**1500 (A) Refrigeration Trainer - General Cycle Type**

The unit consists of vapor compression refrigeration cycle provided with components normally used in refrigeration system so that students can get familiar with the components. Various measurement provided enable students to estimate the performance of the system.

**SPECIFICATIONS**

1. Compressor- Hermetically sealed compressor, having capacity of 0.3 T.
2. Expansion Devices
  - Thermostatic Expansion Valve
  - Capillary tube.
3. Evaporator coil.
4. Controls:
  - Services Valve
  - Solenoid Valve
  - Filter-Drier for refrigerant
  - High/Low pressure cutout
  - Thermostat.
5. Measurements:
  - Thermometers (mercury in glass) - 4 Nos.
  - Pressure gauges for condensing and evaporating pressure.
  - Energymeter for compressor
  - Voltmeter and Ammeter for compressor.
  - Rotameter for liquid refrigerant flow measurement.

*A technical manual accompanies the unit.*

**SERVICES REQUIRED**

- Floor surface area - 1m x 2m x 2m height.
- 220V, 15Amp, Single Phase Stabilized power supply.

**1500 (B) Refrigeration Trainer - Domestic Type**

The unit enables students to study the various parameters affecting the performance of a domestic refrigerator. It consists of refrigeration cycle of domestic refrigerator, a hermetically sealed compressor, air-cooled condenser, capillary tube and a natural convection type evaporator. The evaporator is fitted with a small heater to simulate different load conditions various measurements are provided so that power consumption, COP, theoretical and actual refrigerating effects refrigerant flow rate and effect of door opening on power consumption can be studied and also students can visualize automatic operation of unit using a thermostat.

**SPECIFICATIONS**

1. Compressor - Hermetically sealed, Kirloskar make having capacity of approx. 1/25 ton of refrigeration.
2. Air - cooled condenser with natural convection airflow.
3. Capillary tube of matched length as expansion device.
4. Evaporator coil with an electric heater inside and adequate glass wool insulation on all sides.
5. Measurement
  - Energy meter To measure compressor input power measurement.
  - Pressure gauge for condensing and evaporating pressure.
  - Flow meter for liquid refrigerant flow
  - Digital Temperature indicator for measurement of temperature
6. Safety & Controls
  - High & low pressure cutout.
  - Thermostat.
  - Necessary Switches.

*A technical manual accompanies the unit. Also, the unit is provided with an attractive and rust proof powder coating.*

**SERVICES REQUIRED**

- Floor space of 2m x 1m
- 230V AC stabilized supply with earthing connection



### 1500 (C) Refrigeration Trainer - Electrolux Type

This type of refrigeration is usually used for domestic purposes only as it is complex in the construction and working. This type of refrigerator was developed in 1925 by Munters and Battzervan when they were studying at Royal Institute of Technology At Stockholm for their undergraduate course. This type of refrigerator was known as three fluid refrigeration system. The elimination of aqua pump from the absorption system with the complete absence of moving parts and work input. The main purpose of removing the pump was to make the machine noiseless. It uses refrigerant as a solvent and an inlet gas for inlet of the system. The inert gas is continued to the lower side of system only by its system. It is possible to maintain the uniform pressure throughout the system and after sometime permitting the refrigerant to evaporate at low temperature corresponding to its partial pressure. In the high pressure side system (generator and condenser), there exists only the refrigerant which is subject to total pressure of the system so that it is condensed by using normal cooling water as air as it is done in other system.

The strong aqua ammonia solution is heated in generator by the application of external heat source. The water vapor carried with ammonia vapor is removed in separate form as shown in figure. Then the dry ammonia vapor is passed into the condenser and it is condensed by using external cooling source. The liquid ammonia flows under gravity in the evaporator and it evaporates. The mixture of hydrogen and ammonia vapor is passed into the absorber and the weak solution from aqua ammonia from the separator is allowed to flow into the absorber, through tray this weak aqua ammonia solution comes into contact with hydrogen separated. This strong solution is further passed to the generator and it completes the cycle.



### 1501 (A) Air Conditioning Trainer - General Cycle Type

The unit consists of ducting fitted with various air conditioning components. Airflow is generated by an axial flow fan and in the airflow, heaters, cooling coil and steam humidifier connection is provided. Cooling circuit consists of a hermetic compressor; air cooled condenser, thermostatic expansion valve and evaporator (i.e. cooling coil). Measurements of various parameters Torn cooling cycle and heating cycle are provided and students can easily visualize and understand the basic principles of air conditioning.

#### SPECIFICATIONS

1. Cooling circuits - It consists of:
  - Hermetic compressor, having the capacity of 2/3 ton of refrigeration (approx.) using R-22 refrigerant.
  - Rotameter for liquid refrigerant flow measurement.
  - Pressure gauges for high and low pressure.
  - Prescott (i.e. high and low pressure cut-out).
  - Thermometers for temperature measurement at various points in the cycle.
  - Energymeter for compressor input measurement.
  - Condensate measuring arrangement.
2. Heating Circuit - Air heaters with input control provided with energymeter for input measurement. Maximum heating capacity 1 KW.
3. Steam generator and injector for humidification of air. All above components are connected to a duct of size 200mm x 200mm in which airflow is generated by axial flow fan.
4. Anemometer for measurement of air velocity, (range 0-15 m/sec).  
Following experiments can be conducted on the unit
  - Cooling of atmospheric air.
  - Heating of atmospheric air.
  - Humidification of atmospheric air.
  - Dehumidification and heating of atmospheric air.

(Cooling coil acts as dehumidifier at reduced airflow.)



FRONT VIEW



SIDE VIEW

#### SERVICES REQUIRED

- 440V, 15 A, 3 Phase supply with earthing connection.
- Floor space area about 3 m. X 2 m.

**1501 (B) Air Conditioning Trainer - Window Type**

Window air conditioner is becoming now a day's a necessity. The unit demonstrates the application of window air conditioner & evaluation of its performance. It consists of a small room to which a small air conditioner is connected. The room is provided with a transparent front cover with a heater inside to simulate heat load in the room. Various measurements are provided so that performance of system that is COP of system, actual & theoretical cooling capacity of system & power consumption of unit with different load conditions.

**SPECIFICATIONS**

1. Compressor - Hermetically sealed, Kirloskar make, having the capacity of 1/10 ton of refrigeration using R-12 refrigerant to keep room temperature between 20 to 30 c.
2. Condenser - Finned tube type, with forced air flow over the tubes,
3. Capillary tube of matched length as expansion device.
4. Evaporator - Finned tube type with forced air flow,
5. Room - 0.6 X 0.7 X 0.7 m. height, provided with transparent front wall. A heater with input control is provided inside the room. Which simulates different load conditions.
6. Measurements and Controls
  - H.P. / L.P. Pressure gauges
  - Digital temperature indicator to measure the temperatures at various points.
  - Energy meters to measure input to compressor & heater.
  - High and low pressure cutout.
  - Thermostat to put off the compressor at set room temperature.
  - Necessary switch for electrical components.

**SERVICES REQUIRED**

- Floor area of 2m X 1 m.
- 230V, 15AC stabilized supply with earthing connection

**1502 Ice Plant Trainer**

The Plant uses ice can system. The cans filled with fresh wafer are kept in a tank in which brine is circulated. The brine is cooled by the refrigerant, which in turn cools the water in can and ice formation takes place.

**SPECIFICATIONS**

1. Compressor : Kirloskar make hermetically sealed compressor using R 12 Refrigerant.
2. Condenser : 4 row type air cooled.
3. Expansion Valve : 0.5 TR capacity.
4. Evaporator : 1/2" O.D. copper tube - 75 feet long.
5. Filter - Drier : Silica gel filled - 3/8" flare connections.
6. Main Tank : 600 mm X 375 mm
7. Total Ice Cane Capacity : 7 Kg
8. Ice Making Capacity : 7 Kg / 4 Hours.
9. Theromocol insulation : 6.5"
10. Brine Stirrer : Motor driven fan, 1 phase, 1/10 HP, 1440.

**INSTRUMENTATION**

1. Temperature Indicator : Digital Type 0300°C, with 1 °C least count, using Cr/Al thermocouples. Accuracy 1 % of full reading.
2. Compressor Energy Meter : Single Phase, 10 - 20 Amp. Capacity.
3. Pressure Gauge:
  - 0-21 Kg/cm<sup>2</sup>
  - -1 to 10.6 Kg/cm<sup>2</sup>
  - Both of 65 mm dial.
4. Digital Thermometer

**CONTROLS**

1. HP/LP Cutout : Auto reset type.
2. Thermostat : Auto reset type.

**SERVICES REQUIRED**

- Floor Area - 2m X 1.5m X 1.5m Height.
- 220 V., 15 Amp. Single Phase Stabilized power supply.

*A technical manual accompanies the unit.*



### 1503 Water Cooler Trainer

The apparatus consists of a storage water tank, embraced by evaporator coil of the cooling unit. Cooling cycle comprises of a hermetically sealed compressor, air-cooled condenser, a capillary tube as expansion device and an evaporator cell. The stainless steel water tank is provided with insulation on air Sides and a door is provided at the top. Cold water can be taken out from the top provided and inlet water supply is controlled by a ball-operated top. Various measurements provided, enable students to determine the theoretical and actual COP, power consumption, actual cooling capacity refrigerant flow and compressor volumetric efficiency of compressor.

#### SPECIFICATIONS

- Cooling Cycle**
  - Compressor Hermetically sealed type, having the capacity of 1/3 ton of refrigeration using R-12 refrigerant.
  - Finned tube type air cooled condenser with forced air flow.
  - Filter cum drier for refrigerant.
  - Capacity expansion device.
  - Evaporator coil embraced on stainless steel water tank, Provided with glass wool Insulation.
- Water drain tap and float operated inlet water tap are provided for water tank with insulated lift door at top.
- Measurement**
  - Pressure gauges for evaporating and condensing pressure.
  - Thermometers to measure refrigerant temperatures at inlet and out let of condenser and evaporator.
  - Dial type thermometer for water temperature.
  - Rotameter to measure liquid refrigerant flow.
  - Energy meter to measure compressor Input.
- Safety & Controls**
  - Thermostat to put off compressor at set water temperature.
  - Pressostat to put off compressor if high or low pressure Goes out of set limit.
  - Over load protector for compressor.



#### SERVICES REQUIRED

- Floor space of 1.5m X 1.5m
- Water supply of 5 lit/min.
- 230 V, 15A AC stabilized supply.

*A technical manual accompanies the unit.*

### 1505 Desert Cooler Trainer

Desert Cooler Trainer works on the principle of evaporative cooling. It is used mostly in the dry hot regions; it consists of a fan which sucks the air from atmosphere through the pads which are used in desert coolers. The difference in DBT & WBT at inlet and outlet can be measured hence, the RH from the charts. Also the amount of water evaporated can be calculated by knowing the water level difference in the reservoir.

#### SPECIFICATIONS

- Fan connected to 1/2 HP motor.
- Air Cooler Pump to circulate water.
- DBT & WBT Measuring Thermometer at inlet and outlet.
- Orifice meter with manometer to measure the air flow.

#### SERVICES REQUIRED

- Floor Area - 1m X 1 m X 1.5m Height.
- 220 V., 15 Amp., Single Phase Stabilized power supply.

*A technical manual accompanies the unit.*

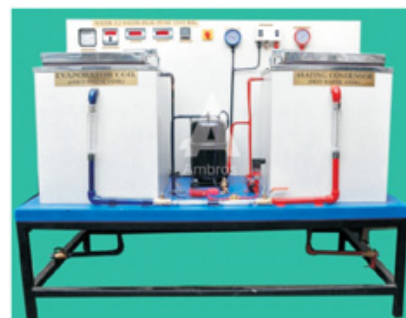


### 1507 Mechanical Heat Pump Trainer

Heat Pump is a device to pump heat from one source to another. The heat obtained by heat pump is more than that could be obtained by direct electrical heating. The apparatus consists of refrigeration system with water cooled shell and coil type evaporator and condenser.

#### SPECIFICATIONS

- Compressor - Hermetically sealed compressor using R-12 refrigerant, having capacity 0.3 tons of refrigeration. Condensing pressure - max. 15 Kg/cm<sup>2</sup> (Actual pressures will depend upon working conditions).
- Condenser - Shell and coil type with continuous water flow arrangement.
- Evaporator - Shell and coil type with continuous water flow arrangement.
- Expansion Valve - Internally equalized thermostatic expansion valve.
- Measurements -
  - Rotameter for condenser & evaporator water flow rate measurement.
  - Rotameter for liquid refrigerant flow measurement.
  - Pressure gauges for condensing and evaporating pressure - 2 Nos.
  - Thermometer for refrigeration cycle & water temp, measurement - 7
  - Wattmeter for compressor input measurement.
  - Ammeter for compressor current measurement.
- Controls -
  - HP/LP cutout for compressor.
  - Overload protector for compressor.
  - Gate valve to control water flow rates.
  - Necessary switches and fuse.



#### SERVICES REQUIRED

- Floor surface area - 2m X 2m X 1.5m height.
- 220V, 15Amp. Single Phase Stabilized power supply.

*A technical manual is accompanies the unit.*



### 1503 Water Cooler Trainer

The apparatus consists of a storage water tank, embraced by evaporator coil of the cooling unit. Cooling cycle comprises of a hermetically sealed compressor, air-cooled condenser, a capillary tube as expansion device and an evaporator cell. The stainless steel water tank is provided with insulation on air Sides and a door is provided at the top. Cold water can be taken out from the top provided and inlet water supply is controlled by a ball-operated top. Various measurements provided, enable students to determine the theoretical and actual COP, power consumption, actual cooling capacity refrigerant flow and compressor volumetric efficiency of compressor.

#### SPECIFICATIONS

- Cooling Cycle**
  - Compressor Hermetically sealed type, having the capacity of 1/3 ton of refrigeration using R-12 refrigerant.
  - Finned tube type air cooled condenser with forced air flow.
  - Filter cum drier for refrigerant.
  - Capacity expansion device.
  - Evaporator coil embraced on stainless steel water tank, Provided with glass wool Insulation.
- Water drain tap and float operated inlet water tap are provided for water tank with insulated lift door at top.
- Measurement**
  - Pressure gauges for evaporating and condensing pressure.
  - Thermometers to measure refrigerant temperatures at inlet and out let of condenser and evaporator.
  - Dial type thermometer for water temperature.
  - Rotameter to measure liquid refrigerant flow.
  - Energy meter to measure compressor Input.
- Safety & Controls**
  - Thermostat to put off compressor at set water temperature.
  - Pressostat to put off compressor if high or low pressure Goes out of set limit.
  - Over load protector for compressor.



#### SERVICES REQUIRED

- Floor space of 1.5m X 1.5m
- Water supply of 5 lit/min.
- 230 V, 15A AC stabilized supply.

*A technical manual accompanies the unit.*

### 1505 Desert Cooler Trainer

Desert Cooler Trainer works on the principle of evaporative cooling. It is used mostly in the dry hot regions; it consists of a fan which sucks the air from atmosphere through the pads which are used in desert coolers. The difference in DBT & WBT at inlet and outlet can be measured hence, the RH from the charts. Also the amount of water evaporated can be calculated by knowing the water level difference in the reservoir.

#### SPECIFICATIONS

- Fan connected to 1/2 HP motor.
- Air Cooler Pump to circulate water.
- DBT & WBT Measuring Thermometer at inlet and outlet.
- Orifice meter with manometer to measure the air flow.

#### SERVICES REQUIRED

- Floor Area - 1m X 1 m X 1.5m Height.
- 220 V., 15 Amp., Single Phase Stabilized power supply.

*A technical manual accompanies the unit.*

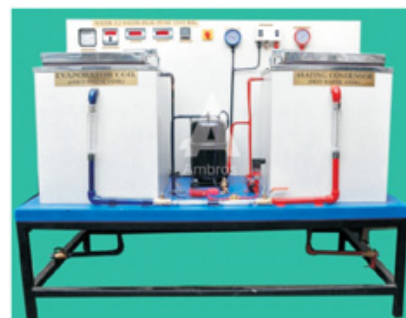


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#### SPECIFICATIONS

- Compressor - Hermetically sealed compressor using R-12 refrigerant, having capacity 0.3 tons of refrigeration. Condensing pressure - max. 15 Kg/cm<sup>2</sup> (Actual pressures will depend upon working conditions).
- Condenser - Shell and coil type with continuous water flow arrangement.
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  - Rotameter for condenser & evaporator water flow rate measurement.
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  - Pressure gauges for condensing and evaporating pressure - 2 Nos.
  - Thermometer for refrigeration cycle & water temp, measurement - 7
  - Wattmeter for compressor input measurement.
  - Ammeter for compressor current measurement.
- Controls -
  - HP/LP cutout for compressor.
  - Overload protector for compressor.
  - Gate valve to control water flow rates.
  - Necessary switches and fuse.



#### SERVICES REQUIRED

- Floor surface area - 2m X 2m X 1.5m height.
- 220V, 15Amp. Single Phase Stabilized power supply.

*A technical manual is accompanies the unit.*

### 1509 (B) Car Air Conditioning - (Actual Cut Section)

This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.



Actual Working

### 1510 Window Air Conditioning (Actual Cut Section)

This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.



### 1511 Domestic Refrigerator (Actual Cut Section)

This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.





**1512 Reciprocating Compressor****(Actual Cut Section)**

This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.

**1513 Rotary Compressor****(Actual Cut Section)**

This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.

**1515 Refrigerant Gas Leak Detector**

In old times refrigerant gas leakage was detected with the help of soap foam but with the help of refrigerant gas leak detector we can do the same job in more professional and reliable way.

**1516 Refrigerant Charging Unit**

This charging unit is fitted with motorised vacuum pump and other safety devices like pressure gauge. With the help of this charging unit students can charge the refrigerant gases into compressor or store the gas of a refrigerator or air conditioner inside the cylinder fitted inside the charging unit that can be used later.

**1517 Refrigeration & Air Conditioning Tool Kit****(Set Of 20)**

This tool kit is a set of twenty tools used in refrigeration & air conditioning. With the help of this tool kit students can learn how to operate these tools & also understand their applications.

**1518 Refrigeration & Air Conditioning Components****Actual Cut Section - Display Board (Set Of 30)**

This actual cut section model is a set of thirty components used in refrigeration & air conditioning. With the help of this model students can understand the working parts of the components used in refrigeration & air conditioning. This model will be made out of original parts. The model will be suitably sectioned to demonstrate the internal construction details showing the minute information, and working of the same, the model will be suitably painted and mounted on a metal or wooden base & supplied with key card & very interesting literature regarding working of the same.

**1519 (A) Handheld Anemometer**

This apparatus is used to calculate the wind or air velocity. We can place the anemometer in front of air vent of a window air conditioner and record the air velocity.

**Digital****1519 (B) Probe Type Anemometer**

This apparatus is used to calculate the wind or air velocity. It has a special probe that can easily enter into air ducts. We can place the anemometer inside the air ducts of air conditioner and record the air velocity.

**Digital****1520 Wet & Dry Thermometer****1521 Psychrometer**