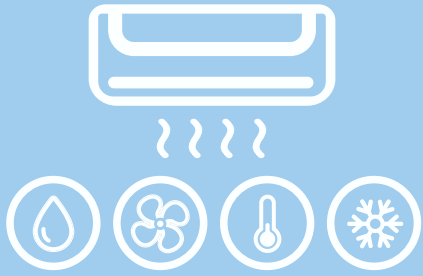


Refrigeration / Air Condition Equipment





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KR-101

Refrigerator Model Training System



The Refrigerator Model Training System (KR-101) is in fact a real refrigerator. Once students understand the operation principles of a refrigerator, they will be able to connect the components correctly and easily because KR-101 locates all essential refrigerator components on the front panel of the system. The meters are also located on the front panel to allow students to record the status of the components during the operation of KR-101.

The four major elements, including Condenser, Compressor, Evaporator, and Capillary Tube are located at the rear side of the system for students to touch and feel them. Through observing these 4 elements, students can also draw the Mollier Chart to record the characteristics of the refrigerant during different phases of the refrigeration cycle.

● Features

1. For the sake of quick demonstration, the teacher board can be inserted into the side slot to make the system running without considering whether the wire connections on the front panel are correct or not.
2. The major elements of the refrigeration system, including condenser, compressor, evaporator, capillary tube, filter, and drier, are unfolded to allow clearer observation.
3. The system consists of various electronic components. The symbols of these components are located at the front panel, allowing students to construct a circuit to control the system.
4. The control circuit of the refrigeration system is made of several parts, including system fuses, fan indicators, evaporator door switches.
5. Various meters, such as high pressure gauge, low pressure gauge, AC Voltmeter, AC Ammeter, and temperature meter, are located at the front panel. Students can use these meters to record the status of the components during system operation.
6. In order to easily identify the refrigerant paths, the high pressure tube is painted in red whereas the low pressure tube is in blue.

● Specifications

1. Compressor
 - (1) Motor : 1/10 HP
 - (2) Input : 220VAC, 50Hz / 60Hz available
 - (3) Refrigerant : R-134a
2. Condenser
 - (1) Cooling type : nature cooling
 - (2) Refrigerant contact : input 3mm, output 5mm
3. Evaporator
 - (1) Cooling type : direct expansion
 - (2) Refrigerant contact : input 1/4", output 1/4"
 - (3) Internal volume : 412(W)x310(D)x290(H)mm ±10%
4. Refrigerant Controller
 - (1) Type : capillary tube
 - (2) Size : 2.54Ø x 0.55t mm

5. Filter and Drier

- (1) Liquid & service : 3/16", 1/8"
- (2) Output : 2.1Ømm

6. Service Valve

- (1) High pressure service : 1/4"
- (2) Low pressure service : 1/4"

7. Pressure Gauge

- (1) Material : steel
- (2) Unit : Psi & kg/cm²
- (3) Oil filled type

8. AC Voltmeter

Range : 0~300V

9. AC Ammeter

Range : 0~10A

10. Temperature Display

- (1) Display : 2 ½ digital temperature display
- (2) Thermocouple : 25°C : 10KΩ ±5%
0°C : 27KΩ ±5%
- (3) Range : -50°C~+50°C

11. Dimension : 500(W) x 430(D) x 1530(H)mm ±10%

● Experiments

1. Hands-on practice in wiring for the compressor
2. Construction of control circuits for the refrigerator system
3. Management of the refrigerator system
4. Understanding of the refrigerator characteristics
5. Plotting of the Mollier Chart
6. Calculation in the performance of the refrigerator

Please refer to the appendix table for the accessories set and optional equipment of KR-101.



KR-102 Refrigerator Training System



The Refrigerator Training System (KR-102) is designed for the skill training of a refrigerator, including refrigerator circuit constructing, system processing, and copper tube welding. Modified from an actual refrigerator, KR-102 is installed with safety plug and terminals. In addition, for welding and refrigeration process exercises, the system consists of 3 low pressure manual valves and 1 high pressure manual valves.

● Specifications

1. Power : 1Ø 110V/220V, 50Hz/60Hz
2. Single-Door Refrigerator (70L or above)
3. The Circuit Elements, Including
 - (1) Overheat protection switch
 - (2) Capacitance : 88M ~ 108M
 - (3) Defrost timer
 - (4) Overload
 - (5) Temperature switch
 - (6) PTC start relay
 - (7) 2P3cm fuse holder
 - (8) 75 °C temperature fuse
 - (9) Defrost heater
 - (10) Button switch
 - (11) 22 φ LED lamp
 - (12) 4P copper grounding
4. Oil-Filled Stainless Steel Pressure Gauge
5. 1 / 10HP Compressor, R134a Refrigerant
6. PID Temperature Controller
7. 300V Voltmeter
8. 10A Ammeter
9. 4 Hand Valves
10. Dimension :
710(W) x 1040(D) x 1760(H)mm ±10%

● Experiments

1. Copper processing
 - (1) Pipe cutting
 - (2) The tube flaring making
 - (3) The tube overlap making
 - (4) Bended tube
 - (5) Sealed tube
2. Copper tube welding
 - (1) Specifying a location where a tube welding method is chosen
 - (2) Tube welding methods: silver soldering, brazing, aluminum welding
 - (3) Practicing tube welding with and without nitrogen flow Devices required for tube welding: oxyacetylene, Soldering Guns, hydroxide flame (not included in the system)
3. System processing of refrigerators

Exercises of processing the refrigerant, including pressurized leak detecting, pressure stabilizing, vacuum making, and refrigerant filling.
4. Circuit processing
 - (1) Testing of electrical components
 - (2) Circuit connecting and inspecting
5. Testing for the running of the refrigerator
6. The equipment complies with the "Taiwan Refrigerating & Air-Conditioning Skills Test Standard"

Please refer to the appendix table for the accessories set and optional equipment of KR-102.



KR-105

Compressor Training System



The Compressor Training System (KR-105) provides a training platform for circuit wiring of compressors. The system has 2 start-up methods (current-mode and PTC). Students are able to comprehend the operating principles of the start-up circuit by observing and measuring the signals from the terminals of the circuit.

Inside KR-105, there is a refrigeration system, so the start-up circuit can successfully drive a real compressor after the correct wiring is complete. Besides, several meters are embedded in the front panel and connected with the compressor at the back for convenient observation and measurement during the operation of the system.

● Features

1. A transparent acrylic cover is provided to protect the components inside and allow a clear view for observing structures of the components.
2. Several temperature wells are reserved for measuring the temperature of the copper tubes.
3. The condenser and evaporator fan coils are installed together for simulating the dehumidifier, which students can understand the process of air dehumidification.
4. Safety plugs are used for each component.
5. High / Low pressure gauges are embedded in the front panel for observing the change of pressure.
6. The service valve can be used to practice refilling the refrigerant.
7. Along with the relatively small size of the system, it is very convenient to operate it with almost all kinds of workbenches.

● Specifications

- | | | | |
|---------------------------|-----------------------------|-----------------|------------------------------------|
| 1. Compressor | | 8. AC Voltmeter | |
| (1) Motor | : 1/10HP | Range | : 0~300V |
| (2) Input | : 220V, 50Hz/60Hz available | 9. AC Ammeter | |
| (3) Refrigerant | : R-134a | Range | : 0~10A |
| 2. Condenser | | 10. FAN | |
| (1) Cooling type | : fan coil | (1) Power | : AC 220V |
| (2) Refrigerant contact | : input 1/4", output 1/4" | (2) Size | : 120 x 120 mm ±10% |
| 3. Evaporator | | 11. Dimension | : 600(W) x 580(H) x 350(D) mm ±10% |
| (1) Cooling type | : fan coil | | |
| (2) Refrigerant contact | : input 1/4", output 1/4" | | |
| 4. Refrigerant Controller | | | |
| (1) Type | : capillary tube | | |
| (2) Size | : 2.54Ø x 0.55t mm | | |
| 5. Filter and Drier | | | |
| (1) Input | : 1/4" | | |
| (2) Output | : 1/4" | | |
| 6. Service Valve | | | |
| Low pressure service | : 1/4" | | |
| 7. Pressure Gauge | | | |
| (1) Material | : steel | | |
| (2) Unit | : Psi & kg/cm ² | | |
| (3) Oil filled type | | | |

● Experiments

1. Testing of in-Circuit components
2. PTC Start-Up practicing
3. Current-mode Start-Up practicing
4. Operating of refrigeration system
5. Understanding of desiccant air conditioning principles
6. Plotting of the Mollier Chart
7. Evaluating of refrigeration performance

Please refer to the appendix table for the accessories set and optional equipment of KR-105.



KR-112 Mini Ice Plant Training System



* Notebook is excluded

The Mini Ice Plant Training System (KR-112) provides a learning platform for students to understand various freezing methods in terms of Industrial 4.0 practice through wireless transmission and remote control, the structures of the components, and the operating principles of ice plant systems.

The system allows students to learn how to operate the brine cycle refrigeration and practice adjusting the concentration in brine, which can be made by various raw materials, such as salt, alcohol, and ethylene glycol. Furthermore, students can examine the influence of brine concentration on different frozen objects.

KR-112 adopts an industrial way of ice plant. Forced air cooling and water cooling are two cooling methods in the system. Different from forced air cooling by a fan under similar room temperature at a time, our transparent cooling tower enables users to simulate different heat dissipation capacity by water cooling and with variable air volume. Students can observe different effects on ice plant from changes in surrounding temperature. The Forced air cooling and water cooling can be used at the same time or separately to test different effects.

System should include the Human Machine Interface with build in programs which are the standard control method for the system operation, and the control interface is modifiable (the system provides the original program).

● Specifications

1. Power : 1Ø AC220V, 50Hz/60Hz
2. Compressor : reciprocating compressor (3/4HP or above)
3. Evaporator :
 - (1) The brine freeze mode is used
 - (2) Two ice cubes can be produced simultaneously (size: 40 x 20 x 20cm)
 - (3) Brine concentration can be adjusted
4. Expansion Valve : thermal type
5. Filter drier : flare type filter drier SAE
6. Receiver : refrigerant capacity R404a/R507-2.5LBS
7. Accumulator : refrigerant holding cap R404a/R507-3.4LBS 0°F SAT
8. Oil separator : 1/2" ODS / DIA. 4"
9. Water pump : capacity : 10 L/min
Max. head: 2m
10. Condensers :
 - (1) Air-cooled coil cooling fan with more than 1HP
 - (2) Double-tube water-cooled condenser with a desktop cooling tower
 - (3) These two condensers can be used at the same time
11. Cooling tower : dimension 600(W) x 300(D) x 600(H) mm
Fan parameter : motor speed 2700rpm/3100rpm, 50Hz/60Hz
Volume rate of flow : 84CFM/105CFM, 50Hz/60Hz
Waterproof rating : IPX7
12. Protection switch : low pressure, high pressure, over load flow switch (min. start flow 1 LPM)
13. Pressure transmitter : low pressure :-1bar ~ 16 bar
high pressure:-1bar ~ 40 bar
14. HMI Control Interface :
 - (1) 7 "TFT LCD touch-human machine interface with MMC (Multi-channels Modular Controller) control
 - (2) The screen displays temperatures, pressures and control of the machine
 - (3) You can use the computer to read the data of the system

● Experiments

1. Calculation of cooling water
Using the refrigeration capacity to calculate the required amount of the cooling water Learning how to select suitable water pumps in the future
2. Calculation of chilled water
Learning how much brine volume is required for different ice and various frozen products that would like to be produced
3. Calculation of refrigeration capacity
Using the discharge capacity of compressor to calculate the refrigeration capacity
4. Adjustment of brine concentration
Adjusting the brine concentration to change the temperature of the sink
5. Calculation of condenser capacity
Using the Mollier Chart to calculate the capacity of the condenser and compare it with the capacity of the cooling tower
6. Study the rate of change in ice plant
Adjusting the brine flow to adjust the speed of making ice
7. Testing of the capacity of the cooling tower
 - (1) Adjusting the cooling capacity by changing the air volume of the cooling tower
 - (2) Observing the temperature changes of water in the high pressure area of the system
8. Testing of the capacity of the evaporator
Adjusting the temperature of the evaporator by changing refrigerant pressure and observing the effects
9. Testing of the capacity of the compressor
 - (1) Adjusting the temperature of the evaporator by changing refrigerant pressure
 - (2) Observing the changes in output power on the compressor
10. Troubleshooting practices
Adjusting the refrigerant pressure or protection switch to simulate fault

Please refer to the appendix table for the accessories set and optional equipment of KR-112.



KR-115

Refrigeration Cycle and Heat Pump System



KR-115 is designed to learn the theory of Heat Transfer in refrigeration engineering. With proper setup, KR-115 can be emulated as a Refrigeration or Heat Pump system. All system components are mounted on the front panel so students can directly observe, touch the components, and hear the noise produced by the components while it is running under either Refrigeration or Heat Pump cycle.

KR-115 offers three expansion devices available for the refrigerant to pass through; they are pressure expansion valve, capillary tube, and thermal expansion valve. Students can use the control panel to switch the preferred expanding path from three expansion devices and compare the corresponding performance under Refrigeration or Heat Pump cycle.

The state of the refrigerant can be clearly observed through 6 sight glasses at different phases of the Refrigeration / Heat Pump cycle. 5 hand valves are used to manually control the flowing direction of the refrigerant circulating through the system. Student must use the valves to lead the refrigerant to the appropriate flowing direction so that the system can operate in corresponding cooling / heating condition. If students mislead the refrigerant to wrong flowing direction, the pressure protection switches will detect the conflict and halt the compressor to prevent the system from being damaged.

● Features

1. All system components, including condenser, compressor, evaporator, capillary tube, filter, refrigerant receiver, accumulator, hand valves, pressure gauges, expansion devices, are mounted on the front panel for direct operation and observation
2. Use control panel to select heat pump cycle (cooling or heating), fan speed of evaporator and condenser, and expanding path of the refrigerant
3. Use control box to monitor the system voltage and current as well as heat pump status.
4. Provide three types of expansion devices, including capillary tube, pressure expansion valve, and thermal expansion valve for refrigerant to pass through.
5. Provide 6 sight glasses to observe the refrigerant status before and after passing evaporator, condenser, expansion devices, and compressor.
6. Provide 5 hand valves to control the flowing direction of the refrigerant.
7. Provide high and low pressure protection switches to automatically halt the compressor when detecting wrong refrigerant flowing path.
8. The refrigerant path for high pressure tube is painted in red and low pressure tube in blue.

● Specifications

1. Compressor : 1HP 220VAC, 50Hz/60Hz
2. Refrigerants : R-134a
3. High Pressure Gauge(0~500psig) and Low Pressure Gauge(0~200psig)
4. Capillary Tube
5. Pressure Expansion Valve
6. Thermal Expansion Valve (-40°C~+10°C Cap. Tube 1.5m)
7. 4-Way Valve 220VAC Max 2.5Mpa Min 0.25Mpa Discharge 3/8" Suction & Coils 5/16"
8. High Pressure Switch 110psig~430psig with Manual Reset
9. Low Pressure Switch 0~80psig with Manual Reset

10. Refrigerant Receiver
11. Refrigeration Accumulator
12. 6 Sight Glasses
13. 5 Hand Valves
14. 4 Solenoid Valves
15. Forced Fan : 220VAC, 50Hz/60Hz
16. Dimension : 1600(W)x580(D)x1890(H)mm ± 10%

Electric Box

1. Miniature Circuit Breaker
2. Ammeter 0~20A and Voltmeter 0~300V
3. 4 Way Switch
4. Condenser and Evaporator 4 Range Fan Switch
5. Solenoid Valve Switch
6. Compressor Power

● Experiments

1. Refrigeration circulation system with capillary tube
2. Refrigeration circulation system with pressure expansion control valve
3. Refrigeration circulation system with thermal expansion control valve
4. Reverse cycle heat pump system
5. Reverse cycle heat pump system without refrigerant receiver
6. Drawing Mollier Chart
7. Calculating system performance
8. Comparison of system performance
9. Comparison of energy between cooling and heating experiments
10. Coefficient of performance (COP) and energy efficiency ratio (EER)

Accessories set and optional equipments refer to the appendix table.



KR-201

Air Conditioner Training System



The main composition of KR-201 is a window type air conditioner just like real one in our daily life. What makes it special is that students are able to observe the operation of the internal components and the state of the refrigerant while the air conditioner is running.

From the front panel, there are four refrigerant sight glasses, which provide students an excellent view to observe the state of the refrigerant before and after passing through four major elements Compressor, Condenser, Capillary Tube, and evaporator.

Students can also use built-in gauges/meters to draw the Mollier Chart and so as to understand the performance of this air conditioner. Combining the observation of refrigerant state during different phase of the refrigeration cycle, KR-201 helps students to understand the operating principle of the window type air conditioner easier and faster.

● Features

1. The operation of the system is based on a real window-type air conditioner behind the front panel.
2. The metal case of the air conditioner is replaced by plastic acrylic so that students can observe its internal structure even when it is operating.
3. Major components including condenser, evaporator and capillary tube of the air conditioner are extended to the front panel and covered by plastic acrylic to satisfy experimental needs.
4. Provide 4 sight glasses at front panel to observe the refrigerant status before and after passing through compressor, condenser, evaporator, and capillary tube.
5. Provide voltmeter and ammeter at front panel to monitor instant system power.
6. Provide high and low pressure gauge at front panel to monitor instant inlet/outlet pressure of the compressor.
7. Provide a 6-channel temperature meter at front panel to instantly display different refrigerant temperature before and after passing through compressor, condenser, evaporator, and capillary tube.
8. Provide a temperature meter at the front panel to display the temperature from a moveable sensor.
9. A Mollier Chart is clearly printed on the front panel for quick reference.

● Specifications

1. Compressor
 - (1) Power source : 220VAC, 50Hz/60Hz
 - (2) Refrigerant : R-410A
2. Condenser
 - (1) Cooling type : forced cooling
 - (2) Heat exchange capacity : 3.5KW
3. Evaporator
 - (1) Cooling type : direct expansion
 - (2) Cooling capacity : 2.9KW

4. Refrigerant Controller

- (1) Type : capillary tube
- (2) A set independent capillary tube on the panel

5. Filter and Drier

- (1) Weld type
- (2) Install a service valve at inlet

6. Service Valve

- (1) High pressure service : 3/8" or 1/4" charging valve
- (2) Low pressure service : 3/8" or 1/4" charging valve

7. Pressure Gauge

- (1) Material : steel
- (2) Unit : Psi & kg/cm²
- (3) Oil filled type

8. AC Voltmeter

Range : 0 ~ 300V

9. AC Ammeter

Range : 0 ~ 20A

10. Temperature Display

- (1) Range : -100°C~200°C
- (2) Sampling time : 0.5sec
- (3) 5 channels temperature display
- (4) Bead probe K-type thermocouple

11. Power Source : 220VAC, 50Hz/60Hz

12. Dimension : 1105(W)×790(D)×1495(H)mm ±10%

● Experiments

1. Specialty of window type air conditioner
2. Measuring and collecting experimental data
3. Drawing Mollier Chart
4. Application of Psychrometric Chart
5. Calculating system performance

Accessories set and optional equipments refer to the appendix table.



KR-212 Single-Split Type Cooling / Heating Air Conditioner Training System



Due to its lower level of indoor noise and higher flexibility of installation, Split Type Air Conditioner becomes more and more popular in nowadays. KR-212 itself is a real split type air conditioner especially designed for teaching purpose. Both indoor and outdoor units are installed on the demonstration stand so students can learn the operating principle of both units at the same time. User can easily observe and record the status of both units while running under different setup by remote controller such as temperature, fan speed, or operating mode (cooler, heater, dehumidifier...)

Four valves are intentionally designed to be located at the front panel of the demonstration stand to allow students handily install the connection pipes (gas pipe and liquid pipe) between indoor and outdoor units. This helps students further to realize how Indoor and Outdoor Units cooperate with each other as well as to understand the refrigerant path during its circulation cycle.

Students can use the built-in gauges/meters and additional measurement tools to record the experimental data and further to draw the Psychrometric Chart and Mollier Chart so as to understand the performance of this air conditioner.

● Features

1. The operation of the system is based on a real split-type air conditioner including one indoor unit and one outdoor unit installed on a same stand.
2. The system can be operated as either cooler or heater modes.
3. Provide 4 fixing valves at the front panel to enable students handily install the connection pipes (gas pipe and liquid pipe) between indoor and outdoor units.
4. Provide voltmeter and ammeter at the front panel to monitor instant system power.
5. Provide high and low pressure gauge at the front panel to monitor instant inlet/outlet pressure of the compressor.
6. Both indoor and outdoor units are powered by an isolated power supply with overload protection.
7. The circuit diagram of the system and a Mollier Chart are clearly printed on the front panel for quick reference.
8. Both indoor unit and outdoor unit are installed on an aluminum stand with wheels for easy movement.
9. Pressure Gauge
 - (1) Material : steel
 - (2) Unit : Psi & kg/cm²
 - (3) Oil filled type
10. AC Voltmeter
 - Range : 0 ~ 300V
11. AC Ammeter
 - Range : 0 ~ 20A
12. Power Source : 220VAC, 50Hz/60Hz
13. Dimension : 1140(W)×810(D)×1522(H)mm ± 10%
14. Show the 5 points temperature and frequency on the display

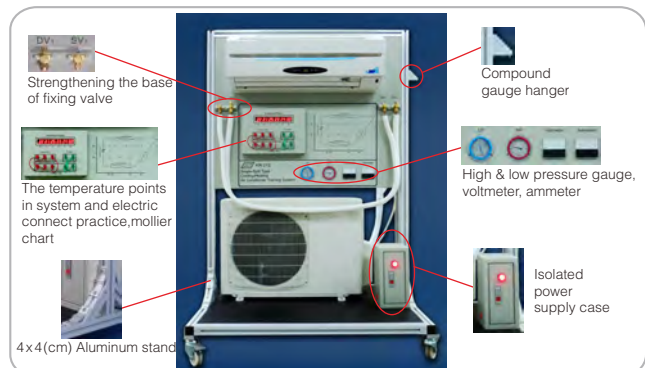
● Experiments

1. Learning components in split type air conditioner
2. Installation of split type air conditioner
3. Measuring and collecting experimental data
4. Drawing Mollier Chart
5. Application of Psychrometric Chart
6. System fault determination
7. Calculating system performance
8. Analysis and discussion

● Specifications

1. Compressor
 - (1) Power source : 220VAC (variable frequency)
 - (2) Refrigerant : R-410A
2. Condenser
 - (1) Cooling type : forced cooling
 - (2) Heat exchange capacity : 4.1 KW
3. Evaporator
 - (1) Cooling type : direct expansion
 - (2) Cooling capacity : 3.5 KW
4. Refrigerant Controller
 - (1) Type : capillary tube
 - (2) The outdoor expansion type
5. Filter and Drier
 - Weld type
6. Three Way Service Valve
 - (1) Gas line service valve : 3/8"
 - (2) Low pressure service liquid line : 1/2"
 - (3) 2 sets on the panel

Accessories set and optional equipments refer to the appendix table.





KR-221

Packaged Air Conditioner Training System



● Features

1. The Packaged Air Conditioner Training System used is the same equipment as that of market one teaching and market no gap. The design of this system is consistent with Packaged Air Conditioners available on the market. So it is not only suitable for educational training, but also applicable for professional practice in student's future career.
2. Designed to facilitate the operation of the overall equipment at a glance, So students can clearly see the water pipe connection and understand the direction of water flow and how to use the water pump.
3. There are flow meters and thermometers in the water pipe line, students can understand the state of water flow and analyze the operation status of KR-221 from the data.
4. Designed to bring together devices that were originally installed around the building to facilitate the teaching process and interpretation of the system. Moreover, the trainees are more likely to understand the relevance of each device and can easily move their equipment.
5. The connection lines are extended to the front panel for easy practice and a clear understanding of how the board is connected to the line.

● Specifications

1. Packaged Air Conditioner Fan Unit
 - (1) Type: water cooling type
 - (2) Power : 3Ø 220V or 3Ø 380V
 - (3) Capacity : 10KW
 - (4) Refrigerant : R-410A
 - (5) Running Amp : 6A~10A
 - (6) Start Amp : 90A ±5A
 - (7) Compressor type : scroll type
 - (8) Refrigerant controller : capillary tube
 - (9) Electric control panel unit
 - (10) Fan output : direct type

2. Cooling Tower

- (1) Type : counter flow, bottle type cooling tower
- (2) Inlet pipe dimension : 1 1/2" ~ 3/4"
- (3) Outlet pipe dimension : 1 1/2" ~ 3/4"
- (4) Water flow : 39 L/min
- (5) Capacity : 3RT
- (6) Fan motor : around 1/6 HP

3. Water Pump

- (1) Power source : 3Ø 220V or 3Ø 380V
- (2) Capacity : 1/2 HP
- (3) Pipe dimension : 1" ~ 3/4"
- (4) Pump head : 10M
- (5) Water flow : 50 L/min
- (6) Amp : 1.6A/1.5A
- (7) Temperature meter : screw-in liquid thermometers
- (8) Flow meter : area flow meter

4. Pressure Gauge :

- (1) Material : steel
- (2) Unit : Psi & kg/cm²
- (3) Oil filled type

5. AC Voltmeter :

Range : 0~300V(for cooling tower and water pump)

6. AC Ammeter :

Range : 0~20A(for cooling tower and water pump)

7. Service Valve :

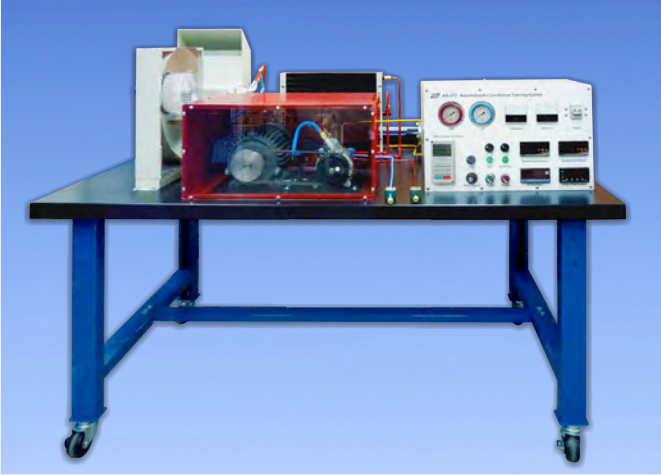
- (1) High pressure : 1/4"hand valve
- (2) Low pressure: 1/4"hand valve

Accessories set and optional equipments refer to the appendix table.



KR-270

Automotive Air Conditioner Training System



The structure of KR-270 is based on a real air conditioner of an automotive system. The evaporator is protected by plastic acrylic so that students can easily observe the internal structure of the evaporator. It also allows students to safely observe how fan door switches the function of air conditioner between cooler and heater when the system is operating.

The system adopts a three phase motor with varied speed to simulate the function of the engine so as to drive the air compressor. The circulating water originally heated by hot engine for heater application is completed by an integrated heating coil.

● Features

1. Understanding the principle of automotive air condition system
2. Understanding the components in an automotive air condition system
3. Understanding the difference between automotive air condition system and building air condition system

● Specifications

1. Compressor
 - (1) Source : DC 12V
 - (2) Refrigerant : R-134a
2. Motor
 - (1) Input voltage : from motor speed controller
 - (2) Output power : 1.5 KW
3. Motor Speed Controller (Inverter)
 - (1) Input voltage : AC 220V/1.5KW, 50Hz/60Hz
 - (2) Output voltage : 3Ø 220VAC, 270KVA
4. Condenser
 - (1) Cooling type : forced cooling
 - (2) Structure type : flat tube
 - (3) Fan power : 12 VDC
 - (4) Fan size : 14"
5. Evaporator
 - (1) Cooling type : direct expansion
 - (2) Structure type : laminated
 - (3) Fan power : 12 VDC
 - (4) Fan size : 6"
6. Refrigerant Controller
 - (1) Type : thermostatic expansion valve
 - (2) Structure type : combined
7. Service Valve
 - Low pressure service : 3/8" or 1/4" charging valve
8. Pressure Gauge
 - (1) Material : steel
 - (2) Unit : Psi & kg/cm²
 - (3) Oil filled type
9. AC Voltmeter : range 0~300V
10. AC Ammeter : range 0~20A
11. Digital Display
 - (1) 5 channels temperature display x 2
 - (2) 1 set temperature display : 0~200°C
 - (3) Watt digital meter : 0~2KW
 - (4) ACA digital meter : 0~10A
 - (5) DCA digital meter : 0~10A

12. Plate Heat Exchanger
 - (1) Design pressure : 3MPa
 - (2) Design temperature : -196°C/+200 °C
 - (3) Heat exchange area: 1.080 m²
13. Water Pump
 - Max. capacity : 16L/min /19 L/min, 2.4m/3.4m
14. Water Tank : 130(W) x 400(D) x 300(H) mm
15. Dimension : 1800(W) x 900(D) x 1500(H)mm ± 10%

● Experiments

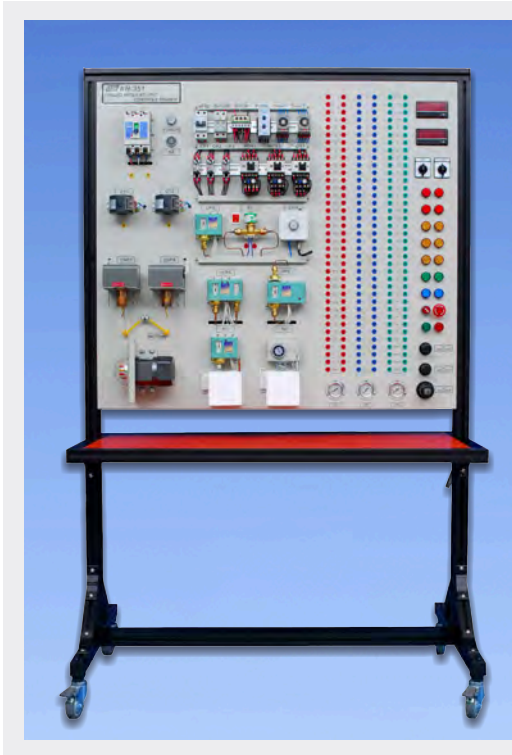
1. Motor speed and refrigerating capacity experiment
 - Understanding motor speed and refrigerating cycle of every index related
2. Hot water coil exchange performance experiment
 - (1) Learning water circle process and water pump performance
 - (2) Learning hot water coil exchange performance
3. Maximum warm air capacity test
 - (1) Understanding the change of the air property after being warmed up by the coil
 - (2) Understanding the heat exchange performance of the hot water coil
4. Automotive air conditioner mix and warm air capacity experiment
 - (1) Learning the standard process of dehumidifying the air
 - (2) Learning the dehumidification capacity difference during the progress of air processing
5. The heat recover capacity experiment
 - (1) Learning plate heat exchanger structure
 - (2) Calculating benefit from plate heat exchanger
6. Plate heat exchanger performance experiment
 - (1) Learning plate heat exchanger feature
 - (2) Learning the difference of choosing plate heat exchanger or not
7. Compare the consumption power between the heat recover by the plate heat exchanger and electric heat

Accessories set and optional equipments refer to the appendix table.



KR-351

Chilled Water Refrigeration System Control Trainer



● Features

1. The commonly-used control components of chilled water unit are mounted on the panel layout for easy learning.
2. Three-phase motor is used in place of compressor. The learner can proceed their hands-on practicing step by step from basics like interlocking circuit, motor start-up and control circuit of forward /reverse rotation, to the advanced exercises such as the complete control circuit of reciprocating/ screw type chilled water unit, etc..
3. The pressure component used on this trainer is triggered by direct vapor-pressurizing so the system can be close to the real one. On the contrary, the traditional components used for teaching in the past that have to be actuated by bolt or screwdriver can be discarded.
4. The input vapor-pressure, which is divided into 3 mimic pressures like low-pressure, high-pressure and oil pressure, can be used and adjusted separately so the learner would have clearer understanding of functionality of each component accordingly.
5. The E.O.C.R is built in inner circuit system to ensure the security and avoid the damage of equipment due to wiring error.
6. The equipment is equipped with 3 magnetic switches, 3 auxiliary relays, 14 indicators, 2 timing relays, 3 different types switches and digital voltage/ current meters. Moreover, the learner can use these components to take a lot of practices of low-voltage power control circuit and to test their own designed circuit.

● Specifications

1. Source
 - (1) Voltage : 3 ϕ AC220V
 - (2) Frequency : 50Hz/60Hz
 - (3) Pressure source : 10Kg/cm²
2. Motor
 - (1) Power source : 3 ϕ AC220V, 50Hz/60Hz
 - (2) Revolution : 1750rpm
 - (3) Output : 60Watt
 - (4) Rated current : 0.4A
3. Current Transformer
 - (1) ACC. Class : 1.0
 - (2) Frequency : 50Hz/60Hz
 - (3) PRI. Current : 10A
 - (4) SEC. Current : 5A
 - (5) Through : 2T
4. Electronic Over-Current Relay(EOCR)
 - (1) Current setting : 0.5A~6A
 - (2) Over time : 1sec ~ 50sec
 - (3) Delay time : 0.2sec ~ 10sec
 - (4) Contact : 2-SPST
5. Phase & Voltage Protection Relay(PVPR)
 - (1) Power : 1 ϕ AC220V, 50Hz/60Hz
 - (2) Reset time : open delay 0.5sec, close delay 3sec
 - (3) Output contact capacity : AC250V, 5A (P.F. = 1)
6. Low Pressure Switch(LPS)
 - (1) Automatic reset type
 - (2) Pressure range : -0.06MPa ~ 0.3MPa
 - (3) Differential pressure:
 - Min. : 0.035 Mpa
 - Max. : 0.2 Mpa
7. Dual Pressure Switch(HLPS)
 - (1) Manual reset type
 - (2) Low side pressure range : -50cmHg ~ 6cmHg
 - (3) High side pressure range : 8Kg/cm² ~ 30Kg/cm²
8. Oil Protection Switch(OPS)
 - (1) Pressure range : 0.5Kg/cm² ~ 3.5Kg/cm²
 - (2) Differential : 0.5Kg/cm²
 - (3) Electrical range : AC125V/250V, 3.5A
 - (4) Timer specification :
 - Delay time : 90sec
 - Timer voltage : AC110V/220V
 - (5) Switch : SPDT
9. Freeze Up Switch(FU)
 - (1) Manual rest type
 - (2) Temperature range : -15°C ~ 15°C
 - (3) Electrical range : AC125V/250V, 3.5A
 - (4) Switch : SPDT



10. Thermostat (TH)
 - (1) Temperature range : $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$
 - (2) Electrical range : AC250V, 5A
 - (3) Switch : SPDT
11. Flow Switch (CHFS/CDFS)
 - (1) Full load ampere : AC240V, 2.5A
 - (2) Locked rotor ampere : AC240V, 15A
 - (3) Non-inductive ampere : AC240V, 15A
12. Solenoid Valve(SV)

Electrical range : AC220V/50Hz/7W,
AC220V/60Hz/6W
13. Dimension : 1180(W) x 690(D) x 1880(H)mm $\pm 10\%$

● Experiments

1. Knowledge of electric components

Various commonly-used electric components are introduced in detail for teaching purpose including micro circuit breaker, PVPR, timing relay, auxiliary relay, magnetic contactor, thermal relay, current transformer, and voltage/current switch with 3 ϕ power.
2. Knowledge of protective equipment

Offering not only the function description and instruction of the pressure protective switch that is commonly-used in chilled water unit is offered, but also the instruction manual and operational concept about the HLP, OLP, anti-freeze switch, and temperature switch, etc. The learner can understand the complete protection measures of chilled water unit.
3. Y- Δ manual lower-voltage start control circuit of 3 ϕ induction motor

Students can realize the advantages of lower-voltage during practice and experience the speed change of motor by manual switch. Besides, students would be more familiar with the usage of relays by adopting other electric components.
4. Y-Y / Y- Δ circuit of chilled water unit

Students can manipulate the Y-Y starting control circuit of small and middle size chilled water unit as well as the lower-voltage starting circuit used in units above 7.5HP. They would be more familiar with the usage condition of various protective switches.
5. Circuit of chilled water unit

The practice for circuit of chilled water unit is almost the same as that of the system in industry. Students would grasp full control concepts about chilled water unit by using the electric components and protective switches.
6. Pressure auto-start, manual-start switch circuit, chain circuit practice

Students would gradually familiarize themselves with the usage of components during the practice of basic chain circuit and switch circuit. Moreover, they can look into these circuits through designing and testing the circuit by the manual or pressure-triggered switch.
7. Forward/reverse rotation control circuit of 3 ϕ induction motor, automatic forward/reverse rotation cycle control circuit

With the practice of motor control circuit, students become skilled in motor usage and each electric component; moreover, users can utilize this equipment to verify their own designed circuit.

Accessories set and optional equipments refer to the appendix table.

Remark :
System Transformer (EM-3340-3B) must be purchased at extra charge if 3 ϕ 220V power is not available in the Lab.



EM-3340-3B

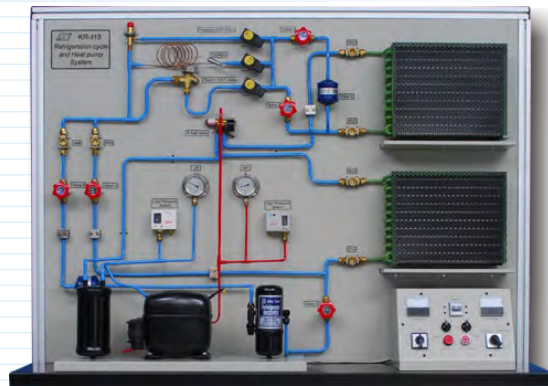


Appendix Table

Accessories Sets										
Items	KR-101	KR-102	KR-105	KR-112	KR-115	KR-201	KR-212	KR-221	KR-270	KR-351
Manifold Gauge	●	●	●	●	●	●	●	●	●	
Digital Thermal Meter	●			●	●			●	●	
Digital Anemometer			●	●	●	●	●	●	●	
AC Current Clamp Meter	●	●	●					●		●
Wrench Set		●		●			●			
Flaring & Swaging Kit		●					●			
Others		Leak Detector		Concentration meter			Leak Detector			
Tool Box	●	●	●	●	●	●	●	●	●	●

Optional										
Items		Soldering Set					Washing tools Set			
Specific Tools Set										
Vacuum Pump	●	●	●		●	●	●	●	●	
Air Compressor				●						●
Wire Rack										●

Self-Provide										
Refrigerant	R-134a	R-134a	R-134a	R-404A	R-134a	R-410A	R-410A	R-410A	R-134a	

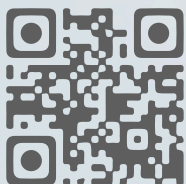


Refrigeration / Air Condition Equipment

KNOWLEDGE AND HOPE



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