

BRTPP | Basic Refrigeration Trainer and Program for System Performance



A. FEATURE

1. Teaching methodology using animation and narration explanation voice completed with job sheet and manual equipment.
2. Cycle composition: compressor – condenser – filter dryer – sight glass – expansion valve – evaporator – compressor.
3. Can be operated manually or using PLC control system, equipped by textbook and manual experiment.
4. Completed with software for Specification or Refrigerator Performance Automatic Measuring and Data Acquisition and System Monitoring Program.
 - Measure temperature at compressor inlet and outlet, condenser inlet and outlet, expansion valve inlet and outlet, evaporator outlet, inside and outside chamber using thermo couple sensors.

- Measure of pressure within the range of -1 bar up to 35 bar at each of compressor inlet and outlet, condenser outlet, expansion valve outlet and evaporator inlet by pressure sensors.
 - Measure of factors: refrigeration effect, compressor work, condensing effect, evaporating latent heat, amount of flash gas at expansion valve outlet, dry rate and humidity at expansion valve outlet and coefficient of performance (COP) in the abstract with measured temperature and pressure data.
5. Completed with textbook related with refrigeration (theory, performance test and troubleshoot) and automatic control experiment (sequence, PLC)
 6. Windows based automatic measurement system, Excel transfer capability using RS232 interface.
 7. Training how to use equipment for teacher.

B. TECHNICAL DATA

Mechanical Device Part

1. Compressor: ½ HP (min), non-CFC, single phase 220 V, control box.
2. Condenser and fan motor: ½ HP (min), air cooled, single phase 220 V, 50 Hz, 10 W (max)
3. Evaporator and fan blower
 - Evaporator chamber: transparent acrylic
 - Evaporator: air cooling of finned-tube type
 - Blower: 220-240 V, AC 50/60 Hz, 0,274 A (max), airflow (690-760m³/hr) / 220 CFM (min), noise 66 dB (max), reinforced plastic impeller, aluminum alloy frame.
4. Nipple each of high and low pressure.
5. Expansion valve: manual type 3/2tons (max), temperature -10°C (min)
6. Solenoid valve: range 3/8 inch (max) welding type.
7. Filter dryer: 3/8 inch (max) welding type
8. Pressure gauges each of high and low pressure, oil type.
9. Sight glass: welding type.
10. Receiver: cylinder type, include a service valve.
 - ½ Hp (min.), 22 kgf / cm² G, pressure test (33 kgf/ cm² G)
 - Evaporator: air cooling of finned-tube type.
11. Table:
 - Cover: aluminum profile.

- *Drawer and cabinet.*
- *Rollers include fixing device.*

Automatic Control Device

1. Power, lamp, pressure module

- a) *S.M.P.S : 24V, 3,1 – 3,7A*
- b) *N.F.B : 10 -20A, single*
- c) *Volt Meter : DC 30 V Full Scale*
- d) *Am Meter : DC 3 A Full Scale*
- e) *Buzzer : DC 24 V*
- f) *AC Lamp : 220 – 240 V*
- g) *Lamp : DC 24 V*
- h) *Toggle Switch*
- i) *Fuse & Holder*
- j) *D.P.S*
- k) *Terminal*

2. Contactor, Relay, Terminal Module

- a) *Magnetic Contact : DC 24 V, 13 A, 5a, 2b*
- b) *Relay base : DC 24 V, 8 Pin min*
- c) *Relay : DC 24 V, 8 Pin min*
- d) *Terminal.*

3. Switch, Temperature Module

- a) *Electronic digital temperature meter : AC 220 V, -40 up to 100°C*
- b) *Electronic digital temperature controller : AC 220 V, -40 up to 100°C*
- c) *Toggle Switch*
- d) *Push button Switch*
- e) *Relay : DC 24 V, 8 Pin min*
- f) *Terminal.*

Teaching Material

Teaching material cover detail and comprehensive explanation:

1. *Operation description of circuit using a switch, contact circuit using a Magnetic contactor, contact circuit using a relay, a basic refrigeration circuit using a magnetic contactor and relay.*

2. *Operation of a basic refrigeration system by a self return circuit for priority stopping and running.*
3. *Description of circuit for low and high temperature control by a thermal switch.*
4. *Description of circuit for low and high pressure control (LPS) by a pressure switch.*
5. *Description of a series circuit for low temperature and low pressure by a thermal switch and a pressure switch in basic refrigeration system.*
6. *Description of a circuit for pump down control in basic refrigeration system.*

Automatic Measuring Device

Interface between mechanical device part and data acquisition system program using mother board and CPU equivalent to ATMEGA 128 TQFP type with RS232 equipped by SMPS system and temperature sensor and pressure with serial FX cable.

C. DATA ACQUISITION & PROGRAM MONITORING SYSTEM

1. Function

- a. *Real-time temperature, pressure data and view*
- b. *Real time data of enthalpy on a diagram (P-H chart) of standard refrigeration system.*
- c. *Real-time monitoring factors like as refrigeration effect, compressor work, condensing heat in condenser, evaporating latent heat, amount of flash gas, dry ratio, humidity at expansion valve outlet, coefficient of performance (COP) in the abstract with temperature and pressure data.*
- d. *Temperature, pressure and enthalpy data automatically saved every minute.*
- e. *Evaporation experiment: various evaporation loads, various evaporation pressure, various evaporation temperature and super heating.*
- f. *Condensation experiment: over condensing operation and over condensing load operation.*
- g. *Compressing experiment: wet compressing operation, super heat compressing operation and dry saturation compressing operation.*

2. Page Composition:

Main page, display of temperature data, graph chart of temperature display of pressure data, graph chart of pressure flow diagram of standard refrigeration system display the P-H chart of standard refrigeration system on real time, sector of setting interval for saving data and operation starter.

D. ACCESORIES

- 1. Power cable*
- 2. Connection cable*
- 3. Circuit jack (banana jack)*
- 4. Laptop : Dual core T3200, 2GB DDR2, 250 GB HDD, DVD/RW, WiFi, VGA integrated 256 MB, 14,1" WXGA Minimum (10ea).*
- 5. Printer : Inkjet, 9600 x 2400 dpi, Print Speed black 25 ppm print speed color 17 maximum resolution 9600 (1ea).*