

## REFRIGERATION INSTALLATION WITH TWO STAGE COMPRESSOR



### Experimental capabilities

- Identification of the components of a refrigerating system with two stage compressor
- Commissioning and verification of operation
- Study of the basic concept of a refrigeration installation R454C, with two stages.
- Study of the thermodynamic cycle on enthalpic diagram.
- Calculation of cooling power to the condenser and evaporators.
- Overall efficiency of the unit.
- Preventive and curative maintenance
- Study of oil circuit

## Operating principle

The BIE100 trainer allows the study of a low-pressure refrigeration cycle with a two-stage compressor.

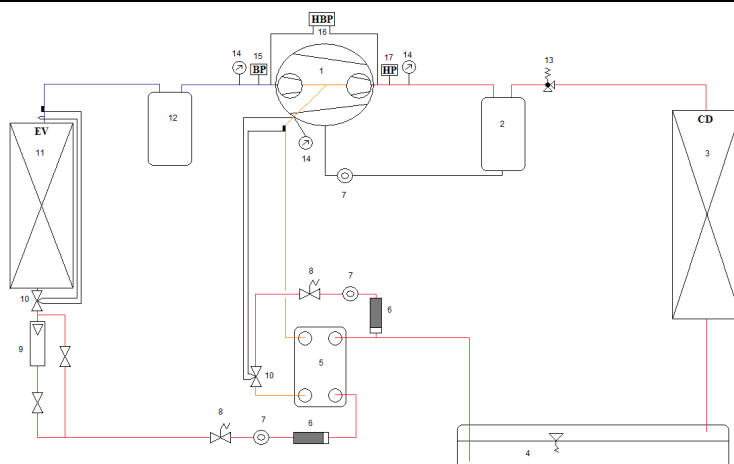
The system allows you to visualize the two compression stages and validate the difference in performance compared to a traditional compressor. The students will have to commission the system and take temperature readings with different operating modes.

They will have to analyze the data and understand how the different components influence the system.

The rugged design of this equipment makes it perfectly suited for use in a school setting.

Its anodized aluminum structure on wheels gives it a very high robustness as well as great flexibility of integration into your premises. The manufacture of this equipment complies with the European Machinery Directive

## Illustrations



## Technical details

1. Semi-hermetic compressor accessible two-stage  
Industrial type  
Refrigerant: R454C  
Condensing temperature + 35°C  
Evaporating temperature -35°C  
Cooling capacity: 6000 W approx.
2. Oil Separator
3. Air condenser
4. Liquid receiver with service valve
5. Brazed plate exchanger
6. Drier filter
7. Sight glass
8. An electromagnetic valve
9. Refrigerant flowmeter 40-400kg/h with bypass valve
10. Thermostatic expansion valve with external equalizer
11. Evaporator with forced ventilation of ceiling type.  
The evaporator is installed in a cold chamber of interior dimensions of 1230x1030x2030mm. The chamber is equipped with standard components (anti panic bar, valve ...). The load is simulated by electrical heater of 2000W with ON/OFF thermostat
12. Suction line accumulator.
13. Safety valve
14. High pressure, medium pressure and low pressure gauge with dual scale pressure temperature
15. Low pressure switch (control pump down)
16. Combined pressure switch HLP (safety)
17. High pressure switch (control of the condenser fan)
18. Oil differential pressure switch

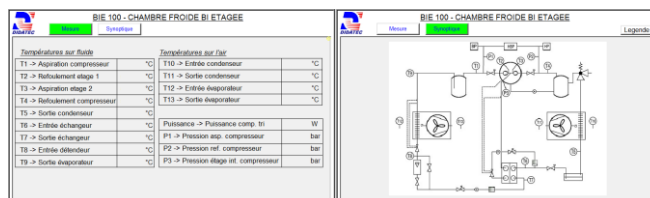
### Structure:

all the components are assembled on a screwed anodized aluminium profile structure equipped with directional wheels with brake

### Electric box:

The electrical enclosure is made according to the European standards. It includes safety elements such as GFCI, main switch, emergency stop button, earthing, start buttoning ...

It is equipped with a touch screen 7" which displays the temperatures, the electric power consumed and the P&ID of the machine



A refrigeration temperature controller manages the operation of the unit, the regulation of the temperature of the cold room and the defrosting phases

## Instrumentation:

The bench has the following instrumentation:

### 1. Thermocouple type temperature sensors (x13):

On the refrigerant circuit:

- compressor suction
- stage 1 discharge
- stage 2 suction
- compressor discharge
- condenser outlet
- exchanger inlet
- exchanger outlet
- expansion valve inlet
- evaporator outlet

On the air:

- condenser inlet
- condenser outlet
- evaporator inlet
- evaporator outlet

### 2. Pressure gauges on the refrigeration circuit (x3):

- low pressure (compressor suction)
- medium pressure (intermediate stage)
- High pressure (compressor discharge)

### 3. Refrigerant Flow Sensor with Magnetic Transmission 40-400kg / h (x1):

### 4. Network analyser for measuring the electrical power consumed by the system (x1)

## Services required

- Power supply: 400Vac – 50 Hz – 25 A
- Power supply type: 3 phase(s) + Neutral + Earth.
- Dimensions: (LxWxH mm): 3830 x 1300 x 2500
- weight (Kg): 400

Note : if the equipment installation is operated by our staff, all supplies and exhaust connections required must stand at less than 2m from the machine

## Documentation

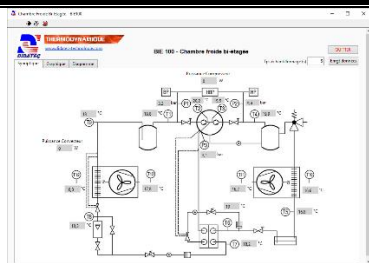
- User's manual
- Pedagogical manual
- Technical documentation of the components
- Lab exercises
- Wiring diagram
- Fluidic diagram
- Certificate of conformity CE

## Options

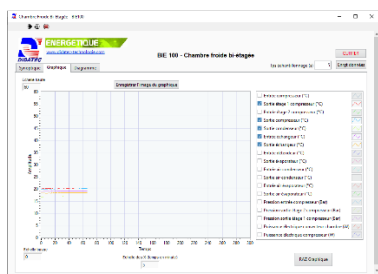
- Data acquisition system and real-time cycle trace

- Ref : BIE101

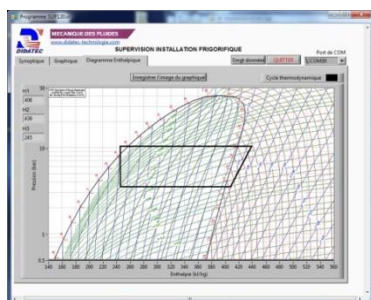
## Illustrations



Synoptic diagram



Graph versus time



Real-time enthalpy diagram

## Technical specifications

The data acquisition option has the following features:

1. Addition of measurement equipment:
  - Addition of three pressure sensors
  - Addition of analog transmission on the flow meter
2. Measurements connected to the acquisition system:
  - Temperatures:
    - On the refrigeration circuit:
      - suction compressor
      - Discharge stage 1
      - Suction stage 2
      - compressor discharge
      - condenser outlet
      - exchanger inlet
      - exchanger outlet
      - expansion valve inlet
      - evaporator outlet
    - On the air:
      - condenser inlet
      - condenser outlet
      - evaporator inlet
      - evaporator outlet
  - Pressures:
    - low pressure (compressor suction)
    - medium pressure (intermediate stage)
    - High pressure (compressor discharge)
  - Refrigerant flow sensor
  - Network analyzer for measuring the electrical power consumed by the system
3. Software features:
  - Visualize the measured values on a synoptic diagram (pressures, temperatures, etc.)
  - Draw the curves of data evolution as a function of time.
  - Plot the evolution of measurements on an enthalpy diagram in real time
  - Save the data to a spreadsheet file.
  - the software provided is license-free.

The connection between the PC (not included) and the machine is WIFI.

4. Accessories
  - The acquisition system is delivered with a USB key including the software.