

# NATIONAL METAL AND ENGINEERING CURRICULUM

<b><u>MODULE:</u></b>	REFRIGERANT CONTROLS (NR10)
<b><u>PURPOSE:</u></b>	This module aims to provide the student with knowledge of refrigerant flow controls.
<b><u>NOMINAL DURATION:</u></b>	One Module

*This module is designed on the assumption that most of the students will achieve the competencies specified in 35 to 40 hours.  
The length of time taken to complete a module will vary depending on factors such as teaching method used, knowledge and skills at entry and individual students ability.*

<b><u>PREREQUISITES:</u></b>	Refrigeration System Components (NR04)
<b><u>LEARNING OUTCOMES:</u></b>	On completion of this module, the student will be able to: <ol style="list-style-type: none"><li>1. Describe the types and application and operation of the various liquid flow controls found in a refrigeration system.</li><li>2. Describe the types, and application and operation of the various vapour flow controls found in a refrigeration system.</li><li>3. Demonstrate the ability to test and adjust liquid flow controls.</li><li>4. Test and adjust vapour flow controls.</li><li>5. Remove/install refrigerant flow controls from operating systems with due regard to safety and refrigerant conservation.</li><li>6. Select/size refrigerant controls according to capacity requirements.</li></ol>

**STUDENTS SHOULD BE MADE AWARE OF OCCUPATIONAL HEALTH AND SAFETY ISSUES IN ALL SITUATIONS AND BE EXPECTED TO DEMONSTRATE SAFE WORKING PRACTICES AT ALL TIMES.**

**OUTLINE OF CONTENT:**

**This module contains:**

1. (a) **Types of liquid flow controls**
    - liquid line solenoids
    - capillary tubes
    - high side floats
    - low side floats
    - manual expansion valves
    - automatic expansion valves
    - thermostatic expansion valves, including:
      - internal equalised
      - externally equalised
      - M.O.P.
      - crossed charged
      - gas charged
      - direct operated
      - pilot operated
      - thermal-electric
      - evaporator control system (ie) Danfoss AK10
      - distributors
  - (b) **Application of the types of liquid flow controls listed above.**
  - (c) **Description of operation of liquid flow controls listed in 1 (a).**
2. (a) **Types of vapour flow controls, NOTE - including direct and pilot operation of the following.**
    - EPR valves
    - CPR valves
    - reversing valves
    - solenoid valves
    - condensor bypass
  - (b) **Application of the types of vapour flow controls listed above.**
  - (c) **Description of operation of liquid flow controls listed in 2 (a) and (b).**
3. **Liquid control testing procedures and adjustment criteria.**
  4. **Vapour control testing procedures and adjustment criteria.**
  5. **Safety procedures with regard to personal safety and good working practice with regard to refrigerant less to atmosphere.**
  6. **Selection criteria considering.**
    - plant capacity
    - pressure drop caused through installation of components and the effects on system
    - operating temperature of evaporator
    - refrigerant condensing temperature
    - manufacturer's catalogues and charts
      - selection
      - cross reference

**ON-THE-JOB TRAINING:**

For consolidation, the material in this module should be linked with and complemented by relevant on-job skill practice or other equivalent experience.

**PERFORMANCE CRITERIA:**

The criteria for each learning outcome should be:

**Learning Outcome 1**

**Assessment:**

Short answer test/assignment.

**Performance:**

- a. Identify various liquid controls from diagrams or actual items.
- b. Determine the correct position of various liquid controls in a system.
- c. Determine the correct use of various liquid controls in a system.
- d. Describe the operation of liquid flow controls in a system.

**Learning Outcome 2**

**Assessment:**

Short answer tests/assignment.

**Performance:**

- a. Demonstrate the ability to identify various vapour controls from diagrams or actual items.
- b. Determine the correct position of various vapour controls in a system.
- c. Determine the correct use of various vapour controls in a system.
- d. Describe the operation of repair flow controls in a system.

**Learning Outcome 3**

**Assessment:**

Practical projects/tests.

**Performance:**

- a. Test superheat settings on various types of thermostatic expansion valves.
- b. Test superheat on evaporators using liquid controls other than TX valves.
- c. Adjust TX valve superheat settings to a required set point achieving prescribed standards.
- d. Adjust superheat experienced on evaporators using liquid controls other than TX valves ie, varying refrigerant charge on capillary systems.
- e. Determine whether a liquid control is adjustable or faulty and unservicable.

#### Learning Outcome 4

**Assessment:** Practical projects/tests.

- Performance:**
- a. Test settings on EPR and CPR valves.
  - b. Determine appropriate EPR settings to control refrigerant vapourising temperature therefore achieving desired cabinet liquid temperatures.
  - c. Set an EPR valve to achieve control of cabinet/liquid temperatures.
  - d. Set a CPR valve to achieve control of maximum current drawn by an electric motor under high load conditions.
  - e. Test reversing valve for correct operation.
  - f. Determine whether a vapour control is adjustable, faulty or unservicable.

#### Learning Outcome 5

**Assessment:** Practical projects/tests.

- Performance:**
- a. Remove/install refrigerant flow controls from operating systems utilizing safety equipment and working procedures which will ensure personal safety.
  - b. Remove/install refrigerant flow control from operating systems utilizing working procedures which will ensure loss of refrigerant to the atmosphere is kept to absolute minimums.

#### Learning Outcome 6

**Assessment:** Practical projects/tests.

- Performance:**
- a. Given refrigerant plant capacity and operating conditions select liquid controls from manufacturer's charts, ie. capillary length, TX size etc.
  - b. Given details of a liquid control determine suitable alternative from manufacturer's catalogues.
  - c. In exercises relating to plant capacity and operating conditions, determine appropriate valve/port sizing to ensure excessive pressure drop does not occur.