

## Refrigerant Expansion & Control Devices

Dr. M. Zahurul Haq

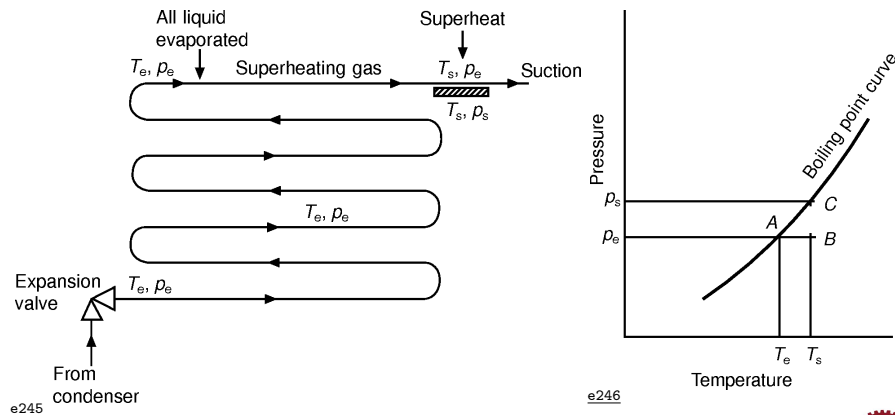
Professor  
Department of Mechanical Engineering  
Bangladesh University of Engineering & Technology (BUET)  
Dhaka-1000, Bangladesh

zahurul@me.buet.ac.bd  
http://teacher.buet.ac.bd/zahurul/

ME 415: Refrigeration & Building Mechanical Systems



## Superheat Sensor on Dry Expansion Circuit



e246



## Refrigerant Flow Control

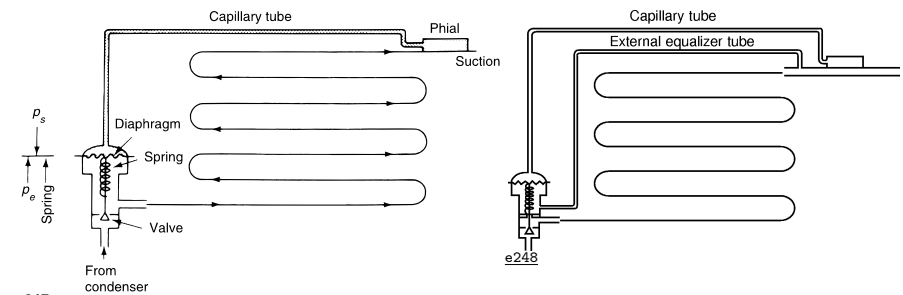
- 1 To meter the liquid refrigerant from liquid line into the evaporator at a rate commensurate with the rate at which vaporization of liquid is occurring in the later unit.
- 2 To maintain a pressure differential in the system to permit the refrigerant to vaporize at desired low pressure in the evaporator while condensing at a high pressure in the condenser.

Refrigerant flow control devices include the following:

- Automatic Expansion device
- Thermostatic Expansion device
- Thermal Electric Expansion device
- Electronic Expansion device
- High-side & Low-side float valves



## Thermostatic Expansion Valve (TXV)

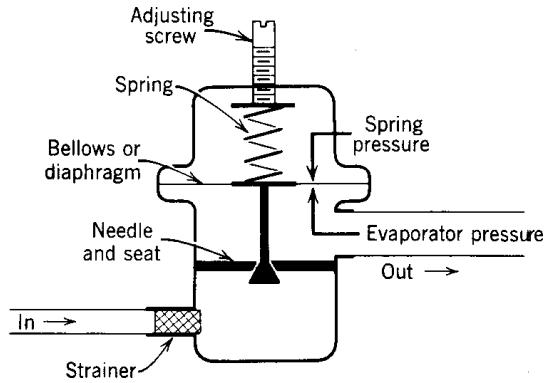


e247

TXV's are the most widely used refrigerant flow control device. Operation is based on maintaining a constant degree of suction superheat at the evaporator outlet. In case of possible large pressure drop in evaporator, equalizing connectors are often used.



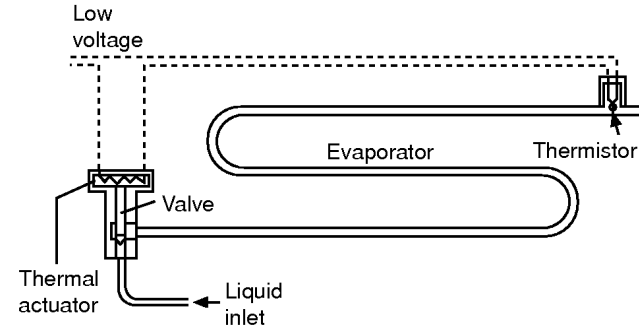
## Automatic Expansion Valve



e249

AXV's maintain a constant pressure in the evaporator by flooding more or less of the evaporator surface in response to the refrigeration load. It closes off tightly when the compressor cycles off and remains closed until the compressor cycle is on.

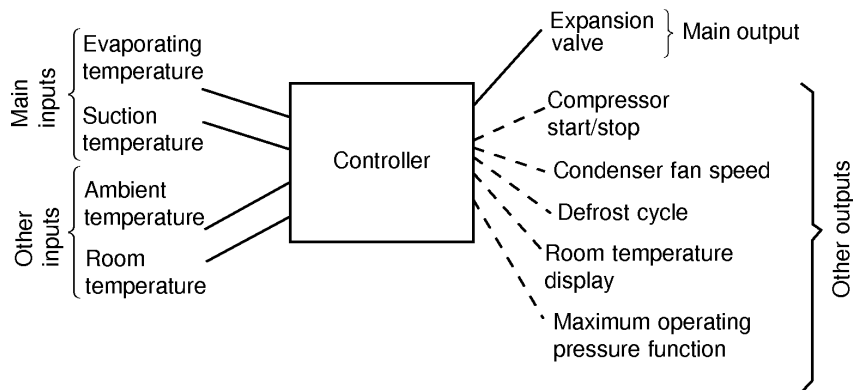
## Thermal Electric Expansion Valve



e250

Signal from a suitable thermistor placed at the evaporator outlet will vary, depending on whether it senses dry refrigerant gas or liquid traces. It can be used to control the current through a thermal element to modulate the expansion valve.

## Electronic Expansion Valve (EXV)



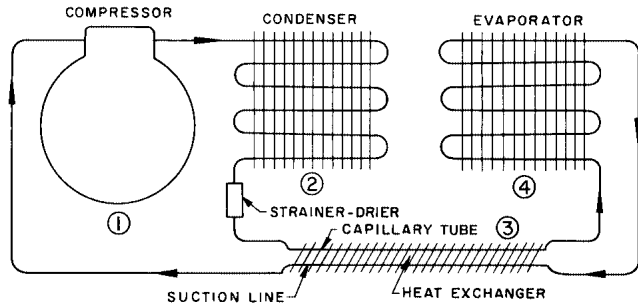
e251

Electronic expansion devices are now widely used on automatic system in an integrated control circuit.

## Benefits of EXVs

- Precise flow control over a wide range of capacities.
- Rapid response to load changes.
- Better control at low superheats so that less evaporator surface is required for superheat. More surface for evaporation results in higher evaporating temperature and better efficiency.
- Electrical connection between components offers greater flexibility in system layout, which is important for compact systems.
- The valve can close when the system shuts down, which eliminates the need for an additional shut-off solenoid valve.

## Capillary Tube

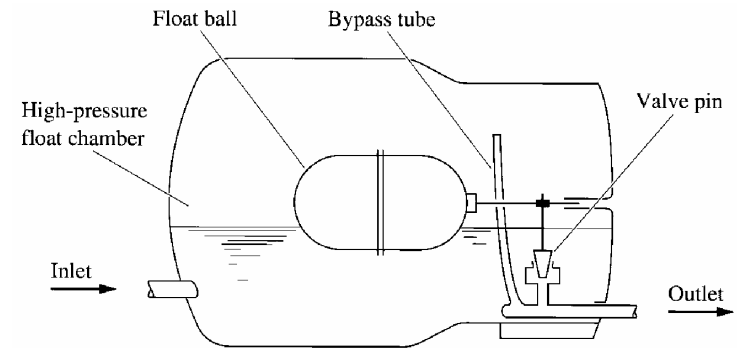


e252

- Simplest/no moving parts/inexpensive.
- Consists of merely fixed length of small diameter tube.
- Not adjustable to changing load; susceptibility to clogging by foreign particles.
- Equalize pressure during off cycle.



## High-Pressure Float Valve

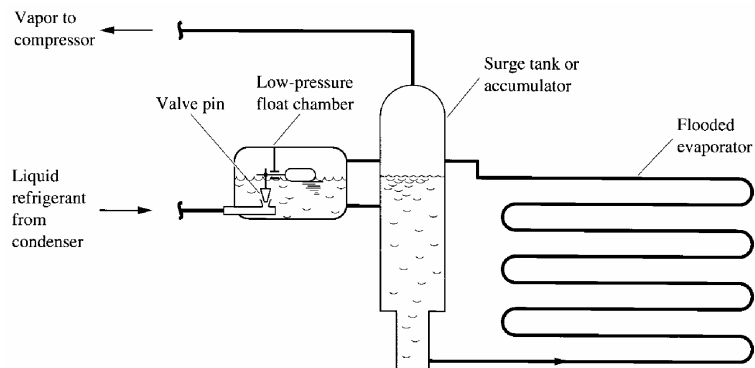


e253

A high-side float valve is located at the high pressure side of the system, between the compressor discharge outlet and the inlet of the TXV. It control the refrigerant feed to the evaporator indirectly by maintaining a constant liquid level in it.



## Low-Pressure Float Valve



e254

It controls the liquid refrigerant feed to maintain a constant liquid level in the evaporator. As the liquid level in the evaporator drops, the float ball moves downward and opens the float valve wider so that more refrigerant is feed to the evaporator.

