

# Expansion devices

Profession



Page 1 of 4 Expansion Devices I. Introduction Expansion devices are basic components of a refrigeration system which carry out two major purposes: (1) the pressure reduction from the condenser to evaporator pressure and (2) the regulation of refrigerant flow into the evaporator. These expansion devices can be generally classified into two types which are namely the fixed opening type (flow area is fixed) and the variable opening type (flow area changes correspondingly with a change in mass flow rates).

There are about seven basic types of expansion devices for a refrigerant in a refrigeration system. These include capillary tubes and orifice which are under the fixed opening type and the manual expansion valves, automatic expansion valve (AEV), thermostatic expansion valve (TEV), electronic expansion valve and float type expansion valve which are all under the variable opening type. The float type expansion valve is further classified into high side float valve and low side float valve (Arora, 2006).

One of the most commonly used expansion device is the capillary tube. For the purpose of this exercise, a computation related to it will be performed. In a lesson guide on expansion devices prepared by Prof. R. C. Arora in 2006, he/she defined a capillary tube as "...a long, narrow tube of constant diameter. The word „ capillary? is a misnomer since surface tension is not important in refrigeration application of capillary tubes. Typical tube diameters of refrigerant capillary tubes range from 0.5 mm to 3 mm and the lengths range from 1.0 m to 6 m. II. Objectives The exercise was conducted to familiarize the students with expansion devices, its functions and its importance. Specifically, the objectives were: 1. ) to examine the construction of some commonly-used expansion devices; and 2. ) to assess

the performance of some commonly-used expansion devices. III. Methodology A. Lab-Scale Refrigeration System A lab-scale set-up for a refrigeration system in the refrigeration laboratory was observed for the effects of expansion devices on the pressures at various points within the system.

Three different types of expansion devices which are namely the capillary, constant-pressure and thermostatic expansion devices are activated by opening their corresponding valves. The reading at each of the five pressure reading points was recorded for every 2 to 3 minutes until they become stable. An image of the observed set- Page 2 of 4 up was taken and the locations of the pressure-reading points were labelled. See Appendix A for the image. B. Computation: Capillary Tube For the stabilized values of the condenser and evaporator pressures measured, the required theoretical length of the capillary tube was computed.

The results were then compared with the actual length of the capillary tube observed in the laboratory. See Appendix B for the value of the computed and measured length of capillary tube. IV. Answers to Questions 1. In the computation part above, is there a discrepancy between the actual and the calculated length of capillary tube? Explain. Based on Table 1, there is a discrepancy between the computed and measured value of the capillary tube. First, it must be noted that throughout the computation, assumptions were made.

Upon realizing the difficulty of obtaining a value for the mass flow rate, a reasonable value of it was assumed. This could affect the obtained theoretical length of capillary tube since some of the parameters involved in <https://assignbuster.com/expansion-devices/>

the computation require its use. Simply said, the theoretical length would either increase or decrease depending on the assumed value but never equal to the actual length, unless the same mass flow rate completely applies to the actual system (which might not really be the case).

This is the same explanation behind the other assumed parameters. Additionally, the measurement of quantities necessary for computing the length of capillary tube is also subject to many possible errors. This may include errors due to the limitation of the instruments or devices or due to some human inflicted errors. From the computed percent error, it can be inferred that the two values for capillary tube length deviate from each other at the specified percentage. V. References Arora, 2006. Expansion Devices. [pdf file] Available at . VI.

Appendix A. Figure with labels Page 3 of 4 PRESSUREREADING POINT 5 PRESSUREREADING POINT 1 PRESSUREREADING POINT 2 PRESSURE READING POINT 3 PRESSUREREADING POINT4 Fig 1. An image showing the pressure reading points in a lab-scale set-up for a refrigeration system B. Tabulated data Table 1. Measured and computed length of capillary tube

Quantities	Actual length (m)	Theoretical length (m)	Percent error (%)
Values	4.17	7.17	42.82

Note: Computations on how I arrived with these values are in the spreadsheet submitted with this report. Page 4 of 4