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Measuring Superheat

Superheat is the temperature difference between the actual temperature of a vapour and its saturation temperature (ie the temperature at which it can change state). For reliable and efficient refrigeration the correct degree of superheat must be achieved at the evaporator exit. Too much and you will have insufficient capacity, too little and you could carry liquid out of the evaporator into the compressor leading to mechanical failures.

The importance of superheat

As you can see by the diagram in Figure 1 water boils at 100°C. Any heat added to the steam above this temperature superheats it (and any heat removed from the water below this temperature subcools it).

Figure 1

Remember superheat does not mean 'Hot' it simply means above its boiling point. R134a boils at approx -26°C at atmospheric pressure, so whenever R134a is warmer than - 26°C and at atmospheric pressure it is superheated.

You can calculate superheat by taking the difference between the actual exit temperature of the refrigerant from the evaporator (T2) and the saturated evaporating temperature (T1).

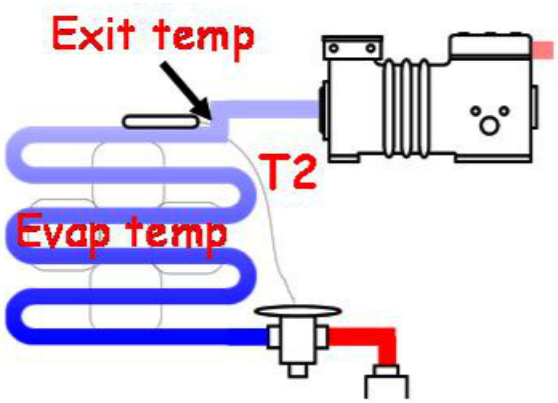


Figure 2: Superheat = exit temp - evap temp

This should be between 5 to 7K as shown in Figure 2. A superheat of between 5 and 7K will ensure that all the liquid refrigerant is boiled off in the evaporator and will not carry over to the compressor.

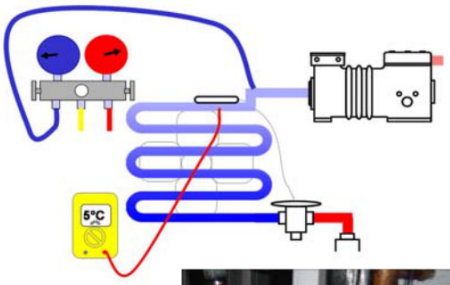
Superheat will help you to achieve

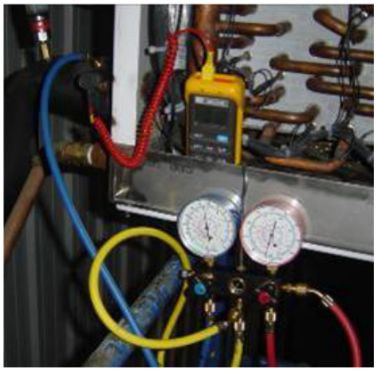
- Optimum evaporator performance
- Zero liquid return to compressor

How to measure superheat

You will need a set of accurate gauges, an accurate electronic thermometer with a suitable touch/contact probe and a refrigerant comparator (such as the Danfoss refrigerant slider phone app).

1. Put the gauges on the suction pipe as close to the evaporator outlet as possible. There is usually a connection.





2. Take the suction pressure and using your comparator convert it into a saturated temperature (T1). Check you are using the 'gauge scale' and NOT the 'Absolute' scale. When measuring superheats of blends make sure you use the dew or saturated gas scale.
3. Take the actual temperature at the evaporator exit using your thermometer adjacent to the expansion device phial or sensing probe (T2).
4. Superheat = T2 – T1.

Note – if you are using electronic gauges they will automatically display the dew temperature corresponding to the low pressure – remember to input the correct refrigerant!

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