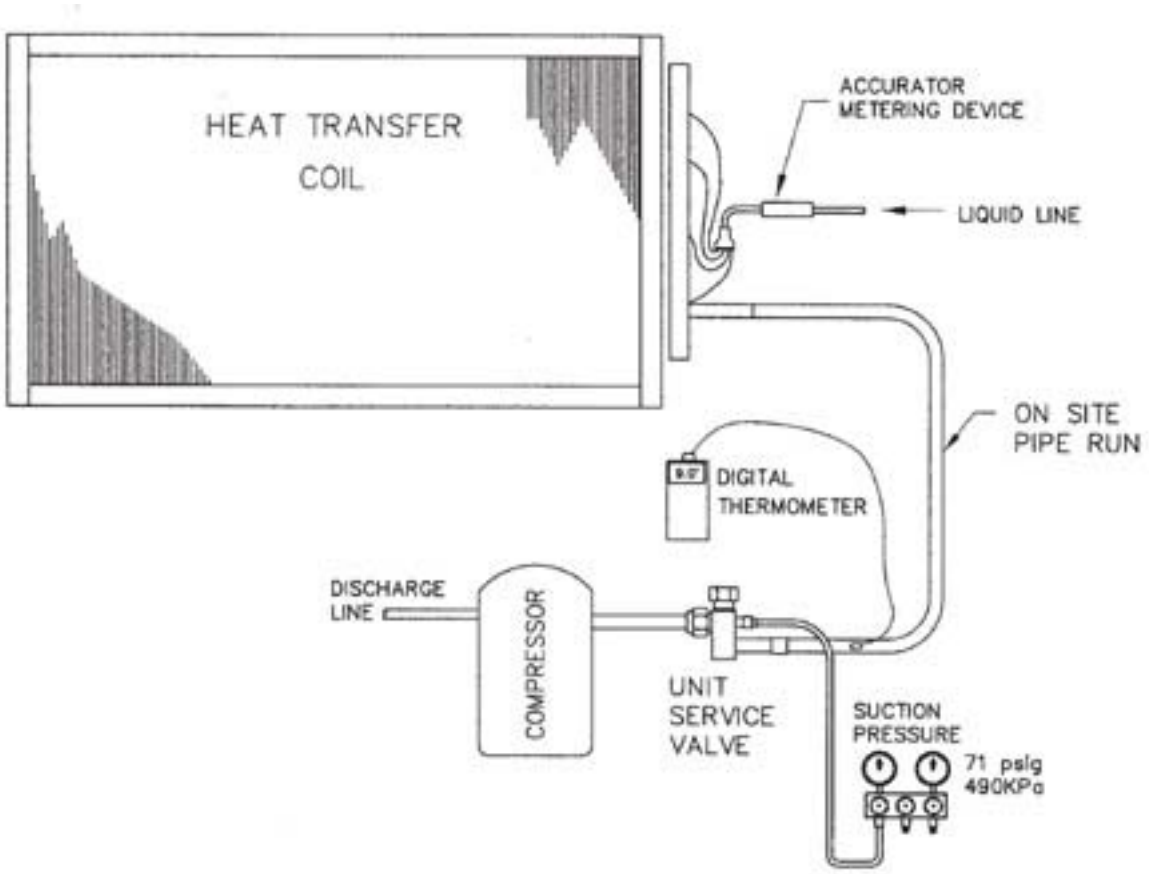
Understanding Superheat



Ever walked past an old Temperzone unit purring away that was built when Muldoon and Fraser were PM's and thought…they don't make em like that anymore? Truth is nowadays the technology is far superior to that of old. The issue could be to do with setup and understanding of the refrigeration cycle, particularly when it comes to superheat. This article is to help technicians to better understand what superheat is and how simple it is to check, but most importantly, to understand its purpose.

Checking superheat is as easy as adjusting superheat which should be done on all refrigeration systems.

Why is correct superheat so important?

The compressors lifespan!! If the superheat is set right then there is no reason why the compressor won't run for twenty or more years.
If it's not set right and is flooding or starving excessively, then expect as little as a year or two before failure.

The compressor needs the correct amount of returning refrigerant to keep its motor windings at the correct temperature and most importantly its oil at an optimum.

High Superheat: (starving)

In this scenario, the compressor will get too hot causing its sump oil to overheat, slowly break down and lose its viscosity (lubricating effect).
If you don't have the correct lubricating effect, the compressor bearing will wear and eventually seize.

Low Superheat (flooding)

In this scenario, there is too much refrigerant coming back. Some say that these new scroll compressors can withstand liquid flooding which they can, but it's the oil that can't.
What happens is the sump oil becomes diluted with the refrigerant and loses its viscosity (lubricating effect).

If you don't have the correct lubricating effect, the compressor bearing will wear and eventually seize.

Points to note:

1: Bearing failure often gets reported as a winding failure because the resulting locked rotors high current draw can cause the winding to short out. Its not until the compressor is cut open for inspection that you realize the seized bearing caused the winding to blow.

2: Superheat should be checked after the compressor has run continually for at least ten minutes to allow the system refrigerant and oil to settle.

3: The indoor units return air temperature and airflow should be as close to normal operating conditions as possible as well as the outdoor ambient.

Setting superheat

There is an article on this topic that you can view on our website www.temperzone.biz
If you haven't been onto this site before there is a wealth of information available once you have registered by simply filling out your email address etc. For superheat click on "Technical" then "Application Notices" and then scroll down to "02/02".

Checking and Setting Superheat

It is preferred to set superheat in cooling cycle when the indoor return air temperature is just above set point e.g 23°c plus or minus a couple of degrees. But sometimes this is not possible due to the variable temperatures and conditions during the winter months. So you may have no choice but to set the superheat during a heat cycle (Make sure you revisit the system again in early summer to re-check).

The target superheat temperature is generally 3°c to 6°c (4°c to 6°c for EEV's)

1: Fit your LP gauge to the common suction line port situated between the compressor and the reversing valve.

2: Convert this Low Pressure to temperature using a pressure/temperature conversion chart or the relevant refrigerant temperature scale on your manifold gauge.

3: Measure the same pipes external temperature with an "accurate" digital thermometer.

4: Subtract the converted pressures temperature away from the pipe surface temperature and that's the superheat.

Example 1: If the R410A units low pressure was 110psi (755kpa) and the suction pipe temperature was 12°c then:
110psi (755kpa) converted to temperature is 2°c so we then subtract 2 from the 12° pipe temperature which results in a superheat of 10°c. Indicating in this case it's a little high and requires lowering.

Example 2: If the R22 units low pressure was 55psi (380kpa) and the suction pipe temperature was 4°c then:
55psi (380kpa) converted to temperature is -1°c so the difference between this -1 and the 4° pipe temperature is a superheat of 5°c. Indicating in this case it is OK.

Adjusting superheat

TX Valve

Wind the valve stem OUT to increase or wind it IN to decrease, then wait approx ten minutes for it to settle before rechecking.

Accurators

ADD refrigerant to increase or remove refrigerant to decrease then wait approx ten minutes for the system to settle before rechecking.

EEV

Electronic expansion valves can only be adjusted by changing their internal program parameters which are usually factory set and chances are the problem is lack of system refrigerant or a fault elsewhere.
There are many influences associated with superheat like evaporator airflow, evaporator return & supply air temperatures and condensing temperature. So if you're unsure, don't hesitate to contact your Technical Service Engineers.

Compressor Discharge pipe temperature (hot gas)

The compressor discharge pipe temperature is in direct relationship to the superheat. A ball park figure that I have found (cross reference only) is that

this temperature on a scroll compressor is usually 60ºc to mid 70's when the superheat is acceptable and the operating conditions are normal.
As a crude rule of thumb, you will find that if the discharge pipe is cool enough to hold your hand on then you can almost guarantee that the refrigerant is flooding back (0ºc superheat). If it's too hot to touch then its superheat is probably too high (starving).
You should be able to touch the compressor discharge pipe for about half a second before the heat is unbearable. Next time you set the superheat, measure the discharge temperature and after a few settings you should see a pattern emerge.

Before closing I have a tip on another subject that could save you a lot of time: When you're about to start the process of changing a single phase compressor that has been diagnosed to have a locked rotor, change the capacitor and give it another try! You'll be surprised how many compressors miraculously burst back into life.
One of the great things about learning is that you never stop, so if you're not quite sure about anything written above or have any questions then contact your Technical Service Engineers at Temperzone where we'll be only to happy to help you out.