Superheat the "Compressor Killer"!

Ever walked past an old air conditioning unit purring away that was built 25 or 30 years ago 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.

Checking and setting superheat at commissioning is important to ensure the efficient running and long life of the equipment. This is critically important with split systems to ensure that the refrigerant volumes are correct particularly where additional refrigerant charge is required. Whilst modern air conditioning equipment from Temperzone makes checking Superheat as simple as plugging our "UC6 Service Interface" into the UC6 or reading the built in Seven Segment display on our UC7 control board (see below) there is still plenty of equipment in the field with older style control systems that require manual superheat testing process outlined below.

So what exactly is superheat?

Superheat is an indication of the amount of extra heat (or superheating) the refrigerant vapour has received after it has passed through its latent phase in the heat transfer coil.

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 the compressor 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.
Checking Superheat

It is preferred to set superheat in cooling cycle when the indoor return air temperature is just above set point e.g 23oc plus or minus a couple of degrees. The target superheat temperature is generally 3oc to 5oc (4ºc to 6oc 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 temperature of the suction line as it enters the condensing unit 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 755kpa and the suction pipe temperature was 12ºc then: 755kpa converted to temperature is 2ºc so we then subtract 2 from the 12ºc pipe temperature which results in a superheat of 10ºc. Indicating in this case it’s a little high and requires lowering.

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

Adjusting superheat

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

Accurators
Add refrigerant to decrease Superheat or Remove refrigerant to increase Superheat, then wait approximately 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 Temperzone 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 is that this temperature on a scroll compressor is usually 60º 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.

Testing Superheat on a Temperzone system fitted with a UC6 controller (multiple compressors) or UC7 (single compressor)

An increasing number of Temperzone units are fitted with UC6 or UC7 controller boards. With either of these Temperzone unique control boards, testing superheat is simple.

With A UC6, connect to either our "UC6 Service Interface" or a “Mini UC6 Service interface”. Superheat is one of the standard display outputs – amongst many other things!

The UC7 has a built in 7 segment display. Depress the display switch 4 times and the Suction Side Superheat is displayed.

For more information on UC6 and UC7 controllers go to:
For UC6: Click Here
For UC7: Click Here

Above Left: Temperzone’s UC6 Service interface
Above Right: Temperzone’s Mini UC6 Service Interface.
Both are available from Temperzone.
These new diagnostic displays make commissioning and servicing much easier as the calculations are very accurate and you don’t require gauges, thermometers or calculation tables to work out the superheat.