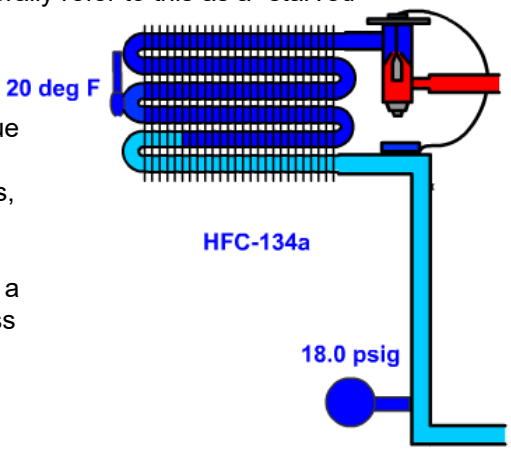
Evaporator Superheat

Generally, the term "superheat" is used to describe the state of a refrigerant. Refrigerant in its vapor state is said to be superheated because it is at a temperature above its saturation (boiling point) temperature. The degree at which a refrigerant is superheated is the temperature difference between its actual temperature and its saturation temperature. For example, if the saturation temperature of a refrigerant is 20ºF and its actual temperature is 30ºF, then the refrigerant is said to be superheated by 10º. This could be also stated as "the refrigerant has 10º of superheat.“

In a properly operating system the refrigerant will be in a superheated state from the last section of the evaporator to the first section of the condenser. Technicians can measure the superheat condition anywhere along this path. One common location is at the outlet of the evaporator. This is typically referred to as the “evaporator’s superheat”.

Measuring the evaporator’s superheat value is an important part of analyzing a system’s performance. If a lower-than-normal value is measured, too much refrigerant is entering the evaporator for the heat load. Many technicians refer to this as a "flooded evaporator." If a higher-than-normal value is measured, too little refrigerant is entering the evaporator for the heat load. Technicians generally refer to this as a "starved evaporator."

Part of effectively troubleshooting a refrigeration system should always include looking at the performance of the evaporator. This means measuring the evaporator’s superheat value. If this is overlooked, the true system problem can be misdiagnosed. For example, a system with a lower-than-normal suction pressure can be the result of several problems, two of which are a low refrigerant charge and a lack of airflow across the evaporator. The difference between these two problems can be seen by looking at the evaporator’s superheat. A low refrigerant charge will have a higher-than-normal evaporator superheat value; and lack of airflow across the evaporator will cause the evaporator’s superheat to be lower than normal.



Below is a procedure for calculating an evaporator’s superheat value:

First, measure the pressure of the refrigerant at the outlet of the evaporator. If this is not possible measure the pressure at the next closest location (usually at the inlet of the compressor) and then estimate the pressure at the outlet of the evaporator by estimating the pressure drop from the measured location to the outlet of the evaporator. For many systems a 2 PSIG pressure drop can be assumed from the outlet of the evaporator to the inlet of the compressor.

Next, convert the measured pressure to its saturation temperature, using a P/T chart.

Then, measure the temperature of the refrigerant at the outlet of the evaporator. This is done by measuring the refrigerant line temperature, which is assumed to be the same as the refrigerant passing thorough.
Finally, subtract the measured refrigerant temperature from the converted saturation temperature. The difference is the superheat value of the refrigerant.

What is the correct superheat value of the refrigerant leaving an evaporator? It is based on the system’s application and the manufacturer’s design. As a rule of thumb refrigeration systems, medium temperature systems will generally have a superheat of 8°F to 10°F and low temperature applications 4°F to 6°F. But again, always check with the system’s manufacturer for the recommended values.

Technicians should include measuring the evaporator superheat when diagnosing a system problem. Failing to include this measurement can lead to misdiagnosing the true system problem.