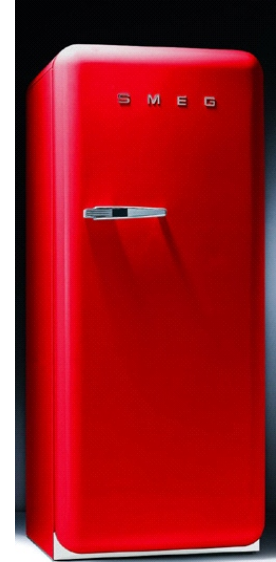


FOR INFORMATION ONLY

THE REFRIGERATION SYSTEM

The basic components of a refrigerator are:

- Compressor
- Thermostat (cold control)
- Evaporator (cooling plate)
- Condenser
- Suction line
- Drier
- Capillary tube
- Hot tube



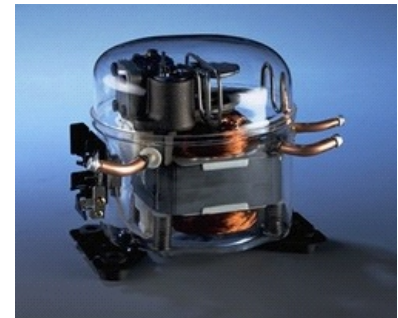
HOW THE HERMETIC SYSTEM WORKS

The series of components that are linked together to form small refrigeration systems for domestic use are entirely sealed from the normal atmosphere.

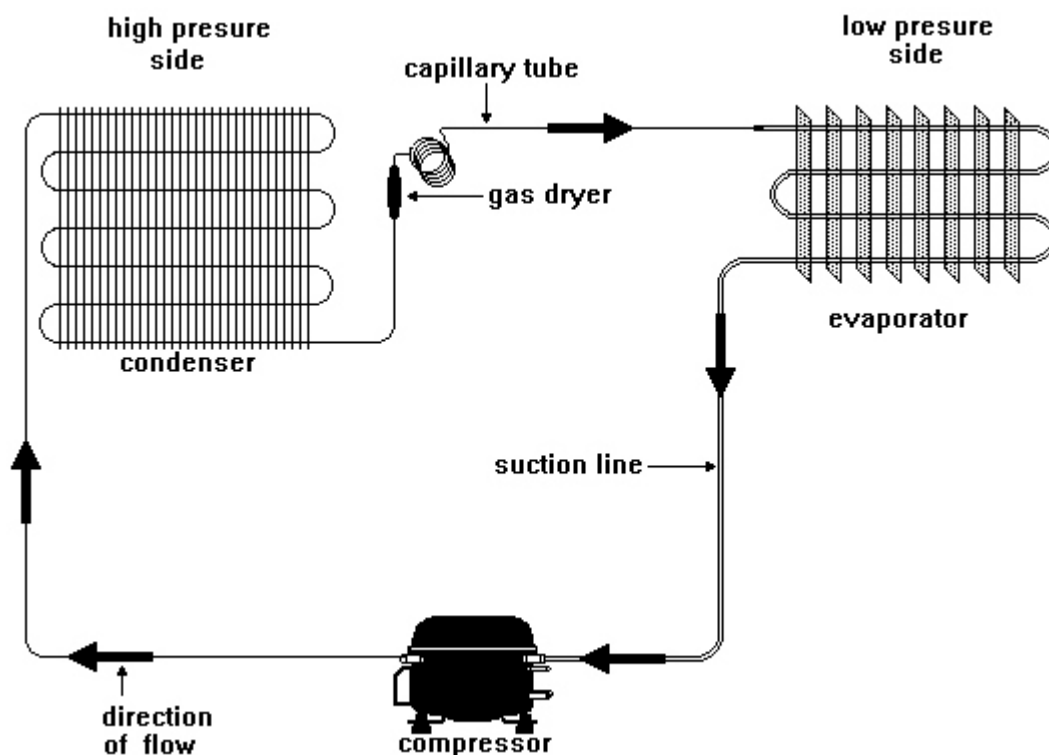
An electric motor inside the compressor case actually runs in the atmosphere of the refrigerant. The only connection from the motor to the outside world is the three electrical terminals that carry electricity to the motor. Small diameter pipes made of steel or copper and in some cases aluminium, carry the circulating refrigerant inside them in a continuous loop through the various components of the system.

This type of refrigeration is referred to as a vapour compression system.

The purpose of the hermetic system on a refrigerator is to supply a cold surface inside the cabinet that will absorb heat. Heat from your food flows onto this cold surface because of the principal of heat transfer. Some designs of refrigerators circulate the air carrying this heat through the cabinet with a fan (Frost-Free), while others rely on simple convection to do the job (heat rises). This cold surface situated inside the cabinet, is sometimes called the evaporator, the evaporator is just one of the many components of the hermetic system. To reduce the possibility of condensation forming on the exterior of the cabinet in high humidity areas, a refrigerant tube (Hot tube), part of the refrigerating system, extends across the top and down the insides of the cabinet. When the compressor operates, warm refrigerant flows through the hot tube warming the front exterior of the cabinet preventing condensation forming. This tube is part of the high pressure side of the system and is before the condenser panel.



This diagram below shows the various components that make up a working hermetic system, and the direction of flow of the refrigerant through them.



THE HERMETIC CYCLE

When the cold control (thermostat) senses heat above its adjustable set point, a set of electrical contacts close and the electric motor in the compressor starts. The compressor pumps vaporized refrigerant into the condenser, exposed black grill you may have noticed placed on the rear of some refrigerators.

At the end of the condenser the refrigerant meets up with high resistance to flow provided by the capillary tube which is a very small diameter pipe between six and twelve feet long. Due to the compressor pumping into the condenser at one end and the resistance to flow at the other, the refrigerant pressure inside the condenser tubing becomes very high, typically from 130 to 300 pounds per square inch. This high pressure and the cooling effect of the air surrounding the condenser cause the refrigerant vapour to turn into a liquid. This process of state change is known as condensation, when a vapour changes into a liquid. The condenser and its associated tubing and circuits are what are known as the "high side" of the refrigerator. Whilst the compressor is pumping refrigerant into the condenser, it is also pumping refrigerant out of the low side. This is the component inside the cabinet that absorbs heat called the evaporator, freezer coils, freezer box, or humid plate, depending on the design. The amount being pumped out is again more than the capillary lets in, so the pressure on this side of the compressor becomes low, typically from 0 to 8 pounds per square inch. The effect on the liquid refrigerant entering the evaporator from the capillary line is exactly the opposite as in the condenser; it changes state from a liquid to a vapour.

If you listen very closely when the compressor is running, you should be able to actually hear the refrigerant boiling in the evaporator, Try not to associate the term "boiling" with "hot" as when water boils. Different substances change state at different temperatures. The boiling temperature of the refrigerants used in domestic applications is about -20°F (-28.8°C).

We now have a device that changes the state of the refrigerant from a vapour to a liquid and then back to a vapour again, there is one final physics principle you should understand that takes place that makes the hermetic system operate. When a substance changes state, it gives off, or absorbs, an enormous amount of heat fuelled by what happens to the substance on the molecular scale of things. Scientists call this the latent heat of evaporation or condensation. This is the main physics principle that causes the hermetic system on your refrigerator to transfer heat from the inside, to the outside of the cabinet.

Once enough heat is removed from the cabinet the cold control contacts open and the compressor stops running. After a few moments of refrigerant still flowing through the capillary tube, pressures in the high and low side of the system equalize and become the same.

PROBLEMS WITH THE HERMETIC SYSTEM

Besides the compressor eventually wearing out or a refrigerant leak developing, which is rare unless punctured, there is very little that goes wrong with a factory sealed hermetic system. Almost all hermetic system problems happen after the system has been repaired, tampered with, accidentally punctured, or develops a leak because of a design fault.

These include but are not limited to:

- moisture in the system
- presence of entrapped air
- pin holes and leaks in solder joints
- too much refrigerant
- not enough refrigerant
- leaking access valves
- contaminated refrigerant
- oil cooling circuit not hooked in when the compressor was replaced
- new gas dryer not installed after the system was opened to the atmosphere