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A **thermal expansion valve** (often abbreviated as TXV or TX valve) is a component in [refrigeration](http://en.wikipedia.org/wiki/Refrigeration) and [air conditioning](http://en.wikipedia.org/wiki/Air_conditioning) systems that controls the amount of refrigerant flow into the evaporator thereby controlling the [superheat](http://en.wikipedia.org/wiki/Superheat) at the outlet of the [evaporator](http://en.wikipedia.org/wiki/Evaporator). This is accomplished by use of a temperature sensing bulb filled with a similar gas as in the system that causes the valve to open against the spring pressure in the valve body as the temperature on the bulb increases. As temperatures in the evaporator decrease, so does the pressure in the bulb and therefore on the spring causing the valve to close. An air conditioning system with a TX valve is often more efficient than other designs that do not use one.

A thermal expansion valve is a key element to a refrigeration cycle; the cycle that makes air conditioning, or air cooling, possible. A basic refrigeration cycle consists of four major elements, a compressor, a condenser, a metering device and an evaporator. As a refrigerant passes through a circuit containing these four elements, air conditioning occurs. The cycle starts when refrigerant enters the compressor in a low pressure, low temperature, gaseous form. The refrigerant is compressed by the compressor to a high pressure and temperature gaseous state. The high pressure and temperature gas then enters the condenser. The condenser condenses the high pressure and temperature gas to a high temperature liquid by transferring heat to a lower temperature medium, usually ambient air. The high temperature liquid then enters the expansion valve where it undergoes an adiabatic expansion, resulting in a low pressure and temperature liquid. The low pressure and temperature liquid is now suitable for cooling. The low temperature and pressure liquid enters an evaporator where heat is transferred from the air or another fluid to the refrigerant, causing it to boil and change state to a low temperature gas. The low pressure gas enters the compressor and the cycle repeats.

###  Refrigeration cycle





A simple stylized diagram of the refrigeration cycle: 1) [condensing coil](http://en.wikipedia.org/wiki/Condensing_coil), 2) [expansion valve](http://en.wikipedia.org/wiki/Thermal_expansion_valve), 3) [evaporator coil](http://en.wikipedia.org/wiki/Evaporator_coil), 4) [compressor](http://en.wikipedia.org/wiki/Gas_compressor).

In the refrigeration cycle, a [heat pump](http://en.wikipedia.org/wiki/Heat_pump) transfers heat from a lower-[temperature](http://en.wikipedia.org/wiki/Temperature) heat source into a higher-temperature [heat sink](http://en.wikipedia.org/wiki/Heat_sink). Heat would naturally flow in the opposite direction. This is the most common type of air conditioning. A [refrigerator](http://en.wikipedia.org/wiki/Refrigerator) works in much the same way, as it pumps the heat out of the interior and into the room in which it stands.

This cycle takes advantage of the way [phase changes](http://en.wikipedia.org/wiki/Phase_change) work, where [latent heat](http://en.wikipedia.org/wiki/Latent_heat) is released at a constant temperature during a [liquid](http://en.wikipedia.org/wiki/Liquid)/[gas](http://en.wikipedia.org/wiki/Gas) phase change, and where varying the [pressure](http://en.wikipedia.org/wiki/Pressure) of a pure substance also varies its [condensation](http://en.wikipedia.org/wiki/Condensation)/[boiling point](http://en.wikipedia.org/wiki/Boiling_point).

The most common refrigeration cycle uses an [electric motor](http://en.wikipedia.org/wiki/Electric_motor) to drive a [compressor](http://en.wikipedia.org/wiki/Gas_compressor). In an automobile, the compressor is driven by a [belt](http://en.wikipedia.org/wiki/Belt_%28mechanical%29) over a [pulley](http://en.wikipedia.org/wiki/Pulley), the belt being driven by the engine's [crankshaft](http://en.wikipedia.org/wiki/Crankshaft) (similar to the driving of the pulleys for the [alternator](http://en.wikipedia.org/wiki/Alternator), [power steering](http://en.wikipedia.org/wiki/Power_steering), etc.). Whether in a car or building, both use electric fan motors for air circulation. Since [evaporation](http://en.wikipedia.org/wiki/Evaporation) occurs when heat is absorbed, and condensation occurs when heat is released, air conditioners use a compressor to cause [pressure](http://en.wikipedia.org/wiki/Pressure) changes between two compartments, and actively condense and pump a [refrigerant](http://en.wikipedia.org/wiki/Refrigerant) around. A refrigerant is pumped into the [evaporator](http://en.wikipedia.org/wiki/Evaporator) coil, located in the compartment to be cooled, where the low pressure causes the refrigerant to evaporate into a vapor, taking heat with it. At the opposite side of the cycle is the [condenser](http://en.wikipedia.org/wiki/Heat_exchanger), which is located outside of the cooled compartment, where the refrigerant vapor is compressed and forced through another heat exchange coil, condensing the refrigerant into a liquid, thus rejecting the heat previously absorbed from the cooled space.

By placing the condenser (where the heat is rejected) inside a compartment, and the evaporator (which absorbs heat) in the ambient environment (such as outside), or merely running a normal air conditioner's refrigerant in the opposite direction, the overall effect is the opposite, and the compartment is heated. This is usually called a [heat pump](http://en.wikipedia.org/wiki/Heat_pump), and is capable of heating a home to comfortable temperatures (25 C; 70 F), even when the outside air is below the freezing point of water (0 C; 32 F).

Cylinder unloaders are a method of load control used mainly in commercial air conditioning systems. On a semi-[hermetic](http://en.wikipedia.org/wiki/Hermetic) (or open) compressor, the heads can be fitted with unloaders which remove a portion of the load from the compressor so that it can run better when full cooling is not needed. Unloaders can be electrical or mechanical

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