

Thermostatic Expansion Valves (TXVs) regulate the flow of refrigerant into the evaporator. Relative to pistons and other fixed orifice metering devices, they improve system efficiency and performance. Due to this, manufacturers have shifted to using TXVs and most traditional residential AC and heat pump split systems in the US utilize them today.

Working Principle of TXVs

At its most basic, a refrigeration system has four components – a compressor, a metering device, and two coils, one for the evaporator and one for the condenser. The compressor serves as a pump and does the work of compressing refrigerant after it leaves the evaporator where it absorbs heat from the space being cooled. The metering device manages the flow of liquid refrigerant into the evaporator after heat is rejected as it passes through the condenser coil.

TXVs differ from more basic fixed orifice metering devices (like pistons and capillary tubes) because they modulate the flow of refrigerant based on a superheat setting. They do this by sensing the pressure at the outlet of the evaporator using a sensing bulb. As the pressure in the evaporator increases and decreases, the temperature of the evaporator outlet changes, resulting in an increase or decrease in the pressure in the sensing bulb. That increase or decrease in pressure is transmitted via capillary tube to the power element, where it applies (or reduces) pressure on a diaphragm. This drives a pushpin up or down, opening and closing the valve orifice. As the orifice is opened and closed, the flow of refrigerant from the liquid line into the evaporator is increased or reduced. By basing the flow of refrigerant on the superheat setting, the valve ensures that the system is operating at peak performance and efficiency.

MARS Universal AC/HP TXV Kit

MARS offers eight valve kits - two for R-410A, four for R-22/R-407C, and two for R-454B ranging from 1.5 to 5 tons. To select the right valve, the technician just needs to know the refrigerant and system capacity.

Each kit includes three evaporator connections – Aeroquip, Chatleff, and 3/8" flare. The valve has a 3/8" connection, so it can be brazed directly into some systems, but typically the correct fitting must be brazed onto the valve prior to installing it into the system. MARS also includes 3/4" and 7/8" evaporator tees in case the

valve is being installed into a system with no existing external equalization connection.

Refrigerant	System Capacity (Tons)	Part No.
R410A	1-1/2 – 3	72001
	3-1/2 – 5	72003
R22/R407C	1-1/2 – 2	72004
	2-1/2 – 3	72005
	3-1/2 – 4	72006
	5 – 6	72007
R454B	1-1/2 – 3	72008
	3-1/2 – 5	72009

Common Challenges and Solutions

Some technicians have found TXVs troubling to use in the field. The truth of the matter is that TXVs rarely fail. Analysis of valves returned from field installation typically show that they operate correctly. When they do fail, the most common causes are failed power elements, overheated valves, or clogged orifices/screens.

- Valve overheating can be prevented by using a wet rag or thermal paste when brazing the valve.
- Clogged orifices can be prevented by using industry best practices such as replacing the filter drier and removing any moisture (as well as preventing its access) whenever the system is opened, and the use of a nitrogen purge while brazing.
- Power element failure can be prevented by minimizing rubbing of the capillary tube with valves using a copper capillary tube or through the use of a stainless steel power element assembly, as you will find on a MARS Universal AC/HP TXV.

Lastly, care should also be taken to install a TXV correctly. The sensing bulb must be securely fastened and placed so that it is sensing evaporated refrigerant temperature, not liquid refrigerant or oil. When the equalization line is installed, care should be taken to remove any Schrader core if the valve doesn't include a Schrader depressor. If proper care is used when installing or servicing a system equipped with a TXV, it will help maximize system performance and efficiency.