



Corporate Thermostatic Expansion Valve

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This specification establishes the minimum corporate requirements for the Thermostatic Expansion Valve (TXV).

1.2 Applicability. The functions, performance, reliability and validation required of the TXV to be used for the Corporate Managed TXV are defined in this document. Refrigerant R1234yf and R134a in either a parallel charge or a cross charge configuration are included.

1.3 Remarks. None.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASHRAE 17	AHRI 751	DIN 4563/A1	IEC 61672-1
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2.2 GM Standards/Specifications.

9986181	GMW3600	GMW14872	GMW15920
9986277	GMW14089	GMW15760	GMW16331
GMW3059	GMW14156 (ID)	GMW15779	GMW17626
GMW3116	GMW14157 (ID)	GMW15787	

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2.3 Additional References.

- CG2062 Thermostatic Expansion Valve VCRI SOR Appendix G3 Template
- GM Part Number 9273590: SP-A2
- GM Part Number 9986364: PAG-PSD1
- GM Part Number 9986365: PAG-46
- GM Part Number 9986366: PAG-ND12
- GM Part Number 9986479: Zerol HD46
- GM Supply Power website; www.gmsupplypower.com
- GM1738 Form (D2UG-S1-RH) (ID)
- Statement of Requirements (SOR)

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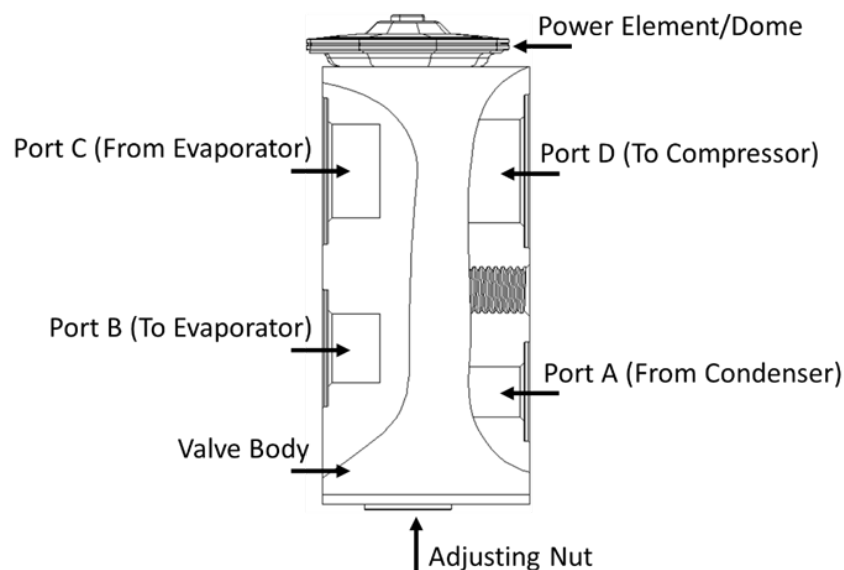
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3 Requirements - Component Definition

3.1 Nomenclature and Convention. The features of the TXV are shown in Figure 1 (Ports A through D are referenced throughout document).

- The valve body is the component which contains all the internal components. It is the component which the ports are machined from.
- The power element (also known as the power dome) is threaded and sealed to the valve body. It contains the diaphragm and the sealed sensing fluid. Based on the temperature and pressure of the refrigerant exiting the evaporator, the diaphragm applies opening pressure to the internal components to control refrigerant flow into the evaporator.
- The adjusting nut threads into and seals against the valve body. It is rotated clockwise or counter-clockwise to compress or release the internal spring. This spring applies closing force to the valve, which is in balance with the opening force of the power element.
- The interior components (not shown in Figure 1) may include a spring, seals, plunger head, plunger rod, dampers, and/or washers.
- See ASHRAE 17 and AHRI 751 (or their most recent replacements) for additional industry standard definitions and convention.

Figure 1: TXV Nomenclature



3.2 Function. The functions of the TXV include:

- Regulating refrigerant flow to the evaporator based on a preset evaporator outlet superheat,
- Accepting high pressure, high temperature refrigerant from condenser,
- Providing low pressure, high temperature refrigerant to the evaporator,
- Providing provisions for adequate connections to the evaporator pipes and refrigerant system plumbing via slim line seal washers.

3.3 Application. For typical automotive A/C systems, there will be one (1) TXV used for the front HVAC evaporator. For large vehicles or vehicles with special cooling requirements, one (1) or two (2) additional TXVs may be used in the same or a separate A/C system to regulate refrigerant through additional heat exchangers.

3.4 Design Release Structure. A new GM Part Number must be released for each TXV assembly with differing static superheat set points, valve capacities, charge gasses, or Bills of Materials (including studs, labels, and internal components).

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4 Validation – Requirements

4.1 Product Characteristics.

4.1.1 Ambient Environment. The TXV shall withstand ambient air temperature ranging from 40 °C to 121 °C and humidity of 0% to 100% without damage to function or appearance. The TXV shall operate per specification when the evaporator air inlet temperature is between 0 °C and 70 °C.

4.1.2 Orientation. The TXV performance shall function to specification if the application requires any mounting position within 90 degrees from vertical (power element upright).

4.1.3 Design, Dimensions, and Additional Constraints. The TXV shall satisfy all the dimensions and notes prescribed on the released GM TXV drawing. The TXV supplier shall maintain a drawing which includes all the requirements from the GM TXV drawing in addition to a chart. The chart on the supplier drawing shall indicate the TXV GM Part Number, the GM vehicle program designation, GM sales region (Indicate “Global” if there are no regional valve differences for a program), the GM program system refrigerant, the Tier 1 HVAC supplier, the Tier 1 HVAC supplier Part Number if applicable, the TXV supplier Part Number if applicable, a unique visual valve identifier if applicable, the static superheat setting in kilopascals (kPa) at 0 °C, 10 °C, and 40 °C bath temperatures according to 4.2.1, the valve maximum operating pressure in kPa according to 4.2.1, the valve capacity in kilowatts (kW) according to 4.2.12 based on the system refrigerant, the Global Warming Potential (GWP) of the sensing fluid, and the latest released revision level and date for each part number. Additional details may be included on the supplier drawing as desired.

Note: No detrimental foreign debris, burrs, or damage shall be permissible on the internal and external surfaces.

4.1.4 Mass. The maximum mass for the TXV is 125 g without shipping cap and stud.

4.1.5 Material Guidelines. Materials shall be recyclable per GMW3116. Attempts should be made to minimize the variety of materials used to make recycling more viable. Material changes to the body or any other components may not be made without authorization from GM engineering.

The TXV must be compatible with refrigerants R134a and R1234yf. The TXV must be compatible with commercially available polyalkylene glycol (PAG) and polyolester (POE) compressor lubricants, especially the oils with GM Part Numbers; 9273590 (SP-A2), 9986181 (PAG), 9986277 (Ze-GLES RB68), 9986364 (PAG-PSD1), 9986365 (PAG-46), 9986366 (PAG-ND12), and 9986479 (Zerol HD46).

4.1.6 Identification and Marking. The TXV labeling shall comply with GMW14089 and GMW16331. The TXV shall be labeled with the TXV GM Part Number in human-readable text, TXV assembly date, and a 2-D barcode. At a minimum, the barcode shall include information on the TXV GM Part Number, and the TXV build date or a sequence number that can be linked back to a TXV build date. The barcode may also include any additional supplier part numbers, sequence numbers, or details desired by the supplier. These details may be printed directly rather than imbedded in the barcode with agreement from GM Engineering and the Tier 1 HVAC supplier. The identification shall not be removed when exposed to by normal vehicle environments or exposure to oils listed in 4.1.5. The information may be printed directly on the valve body or onto a label material, depending on cost and an agreement from the Tier 1 HVAC supplier. A unique visual identifier to sort TXV of different settings may be added if desired. If the visual identifier is used, it should be added to the TXV supplier charted drawing.

4.1.7 Sensing Fluid Requirement. Sensing fluids utilizing Chlorofluorocarbons (CFC), Hydrofluorocarbons, or other fluorinated greenhouse gasses with a Global Warming Potential > 150 are not allowed. The sensing fluid must not violate the most recent versions of all government and regulatory requirements.

4.1.8 Serviceability. The TXV shall be capable of service with normal GM service tools. The service TXV kit shall have any necessary design features to ensure it will remain fully functional when stored for 15 years in a field environment of -40 °C to 100 °C.

4.1.9 Attachment Interfaces. Slim line seal washers and block fittings used for the evaporator and line set connections for testing and production shall satisfy GMW15779 and GMW15787.

4.2 Performance Requirements.

4.2.1 Static Superheat Set Point and Maximum Operating Pressure (MOP). Install the TXV in a test fixture representative of the setup shown in Figure 2. Additional system elements may be required to ensure proper air drying, pressure or flow measurements, etc. This test shall be run with the Table 1 conditions:

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Table 1: MOP Test Conditions

Medium	Dry air or nitrogen
Inlet Pressure	1.03 MPaG $\pm$ 0.030 MPaG
Ambient Room Temperature	23 °C $\pm$ 5 °C
Outlet Orifice Diameter	0.8 mm
Bath Temperature	0 °C $\pm$ 0.3 °C, 10 °C $\pm$ 0.5 °C, 40 °C $\pm$ 1 °C

4.2.1.1 Submerge the power element in an ice water bath stabilized at 0 °C. Apply air pressure to system inlet. Cycle the outlet solenoid valve open a minimum of three (3) times, for 5 s each time, until the outlet pressure measures the same value for to achieve the lowest setting. Open the valve a final time and record the outlet pressure (see 4.5 and 4.5.1). Repeat this procedure at the 10 °C and 40 °C bath temperatures per Table 1. The 40 °C point is considered the valve's Maximum Operating Pressure (MOP).

4.2.1.2 The TXV shall ensure a static superheat set point to agreed program requirements with the following tolerances for the specified bath temperature test points, see Table 2:

Table 2: Bath Temperature Set Point Tolerances

Bath Temperature	Static Superheat Set Point Tolerance
0 °C	$\pm$ 0.010 MPaG
10 °C	$\pm$ 0.015 MPaG
40 °C	$\pm$ 0.025 MPaG

4.2.1.3 The selection of the TXV static superheat set point for the specific GM application is the responsibility of GM Engineering.

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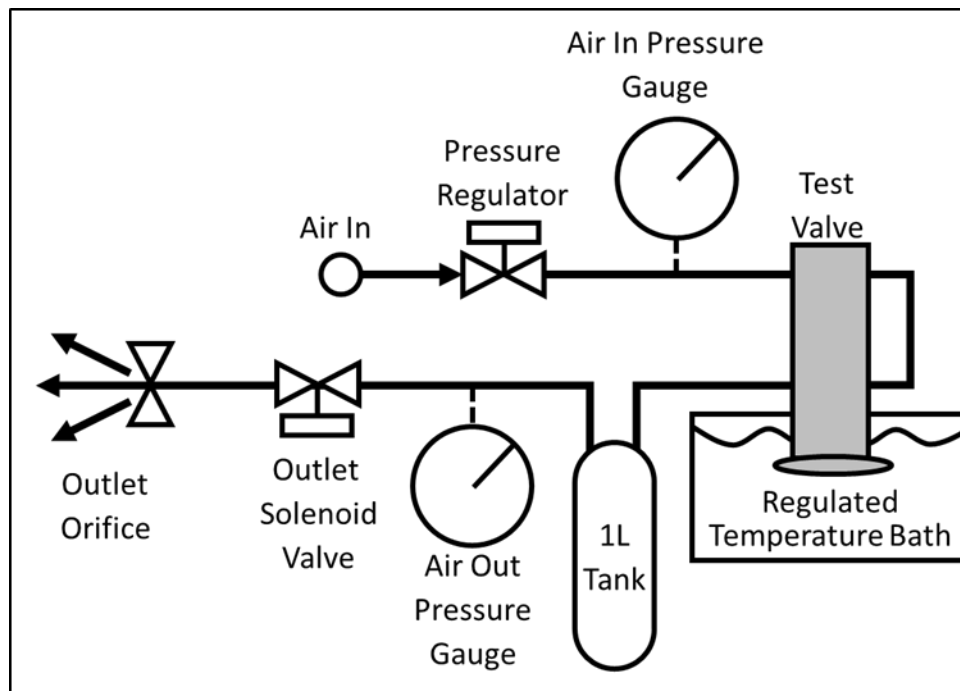
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Figure 2: Test Fixture for 4.2.1 and 4.2.2



4.2.2 Seat Bleed. Install the TXV in test fixture representative of the setup shown in Figure 2. Additional system elements may be required to ensure proper air drying, pressure or flow measurements, etc. This test shall be run with the Table 3 conditions:

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