



Body Pressure Relief Valve, PRV

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 Scope. This specification establishes the minimum corporate requirements for the pressure relief valve (PRV) to be used in GM vehicles. The functions, performance, reliability and validation required of the PRV to be used for the Corporate PRV are defined in this document.

For quotation purposes, the releasing platform must clearly identify specific requirements of the PRV to be quoted. The supplier should not make this determination independently. All requirements of this specification must be met in order to demonstrate design and production validation. The supplier is 100% responsible for the component level testing. The system level testing is a collaboration effort between General Motors and the PRV supplier.

1.2 Mission/Theme. Not applicable.

1.3 Classification. Not applicable.

2 References

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

2.1 External Standards/Specifications.

ASTM D624	SAE J726	SAE J1960	SAE J3000
SAE J200	SAE J1703	SAE J1976	

2.2 GM Standards/Specifications.

9985809	GMW3116	GMW14650	GMW15813
9985912	GMW3232	GMW14671	GMW16528
GM7400M	GMW14124	GMW15572	
GMW3059	GMW14334	GMW15760	

2.3 Additional References.

2.3.1 GM Best Practices.

ID 103574	ID 108458	ID 110380	ID 114499
ID 104655	ID 108459	ID 110715	
ID 108454	ID 110353	ID 113134	

Note: GM Best Practices listed are for general information, supporting section 5.3. (The supplier shall work with the GM Design Responsible Engineer (DRE) to comprehend this requirement).

2.3.2 Drawings.

13502040	13502348	15816854	15927978
13502347	13502349	15927977	94774350

2.3.3 Reference Part Numbers.

1050429	13502350	22693250	92036681
1052107	13502351	22702778	
11518861	15143603	22729855	
13502346	15196388	22788177	

3 Requirements

3.1 System/Subsystem/Component/Part Definition. The PRV assembly can be described as a plastic housing with an orifice or multiple orifices with a means of closing off flow in the reverse direction. The means is usually a rubber flap that is attached to the housing in such a way to cover the orifice when there is no differential pressure across the valve. The valve is attached to the vehicle body by means of integral attachments (snap-fits). The valve is sealed to the vehicle body in such a way as to prevent any backflow leakage at that interface.

3.1.1 Appearance. Color: Typical appearance of the PRV body is a black color. The color of the PRV must be approved by the engineer(s) of the GM program.

No burrs shall be permissible on the internal and external edges.

3.1.2 Content. The paragraphs in this section specify the requirements for the physical and functional content of the PRV.

3.1.2.1 Physical Content. See Figure 1 for typical PRV physical content.

- PRV housing (including flaps hinges and features such as water deflector and spacers).
- Flaps
- Lip type seal

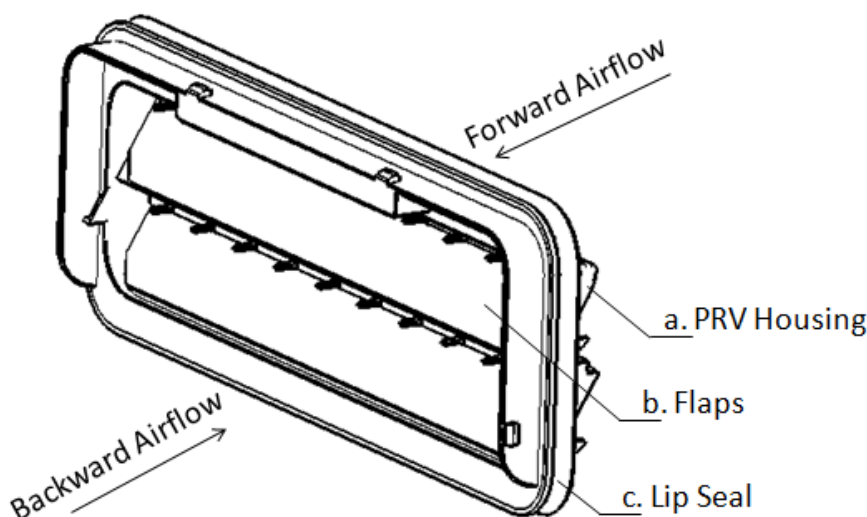


Figure 1: Typical PRV

3.1.2.2 Functional Content. The functional characteristics of the PRV such as forward air flow, reverse air flow leakage, flap noise, water intrusion must be optimized, validated, and released for specific GM applications. Responsibility for these items is defined in the Responsible-Approve-Support-Information-Communicate (RASIC) of the Statement of Requirements (SOR).

The supplier's PRV drawing with GM part number and GM engineer's approval in accordance with the drawing requirements in SOR should be released for GM production.

The PRV assembly must conform to all requirements in this specification as well as the released PRV drawings.

3.1.2.2.1 Inlet. The side of the valve that would be exposed to the interior of the vehicle when installed.

3.1.2.2.2 Outlet. The side of the valve that would be exposed to the exterior of the vehicle when installed.

3.1.2.2.3 Differential Pressure. The difference of static air pressures between the inlet and outlet side of the valve.

3.1.2.2.4 Airflow Volume. The volume of air moving through the valve. The volume flow should be corrected to a density of 1.2 kg/m³.

3.1.2.2.5 Lip Type Seal. The seal contacts the sheet metal opening of the body and seals against the body constantly.

3.1.3 Ambient Environment. The PRV shall withstand ambient air temperature from -40 °C to +70 °C indefinitely, +80 °C for 4 hours and humidity from 0% to 100% without damage to function or appearance.

3.2 Design and Construction. The PRV body must have Integrated distance provision (spacer) in order to assure minimum gap to surrounding parts and avoid forward airflow issues.

The PRV housing must be designed with water deflector to drive water away from the top of PRV.

The PRV body must have provision for additional cover in front of it to avoid dust intrusion on specific applications. The housing must have also provision for NVH cover in the back of it.

3.2.1 Restricted and Reportable Chemicals. All materials supplied to this specification must comply with the requirements listed in GMW3059.

3.2.2 Recycling. Materials shall be recyclable per GMW3116. Attempts should be made to minimize the variety of materials used to make recycling more viable.

3.2.3 Identification and Marking. The valve identification and GM part number must be shown on the PRV at the specified location per the requirements on the PRV drawing.

3.2.4 Failure Mode and Effects Analysis (FMEA). Detailed design and process FMEAs shall be submitted to the release engineer who will maintain as part of the records of the Design and Product Validation. The FMEAs shall be updated each time a change occurs. FMEAs shall be submitted with the GM Production Part Approval Process (PPAP) documentation.

3.2.5 Storage Temperature. The valve shall not be damaged due to exposure at storage temperature of -40 °C to +70 °C and humidity of 0% to 100%.

3.3 Product Characteristics.

3.3.1 Performance Requirements. See Table 1 and Table 2.

Table 1: GM Common PRV Size and Required Air Flow

File Number (Drawings)	Size (mm) and Sheet Metal Opening Area (mm ²)	Mounting Position	Forward Air Flow (L/s) (± 5%)		Reverse Air Flow (L/s) (Maximum)	Reference Part Number
			25 Pa Differential	125 Pa Differential	125 Pa Differential	
15816854	35 × 287 = 10045	Vertical	10	27	0.25	11518861 13502351
15927977 (w/o cover) 15927978 (with cover)	73 × 231.5 = 16899.5	Vertical	8	62	0.25	15196388 13502350
13502349	100 × 170.5 = 17050	Vertical	30	79	0.25	22693250
13502348 (w/o cover) 94774350 (with cover)	117.5 × 110.5 = 12983.8	Horizontal	10	43	0.25	92036681
13502347	228.5 × 73 = 16680.5	Horizontal	12	64	0.25	22729855 and 15143603)
13502040	190 × 90 = 17100	Horizontal	24	84	0.25	22702778 13502346 22788177

w/o = without

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3.3.2 Performance. To test for the primary functionality of the valve, a flow test fixture must be used to measure the airflow volume flowing through the valve at specified differential pressures. The flow test fixture must be constructed such that static pressure alone is the cause of air movement through the valve and not velocity pressures due to localized flow phenomena. To accomplish this, a diffuser screen can be used, or the geometry of the fixture can assure an even flow field in the test fixture. The pressure sensing system must use a multi-port arrangement so that it is insensitive to local velocities. Test equipment requirements for range, accuracy, and resolution are shown in Table 2.

Table 2: Required Range, Accuracy, and Resolution of Test Equipment

Parameter	Range	Resolution	Accuracy
Airflow	2 L/s to 100 L/s	5%	5%
Pressure	-125 Pa to +500 Pa	1%	2%
Gas Concentration	1 PPM to 1500 PPM	1%	2%
Acceleration	$\pm 5G$	0.1G	5%

3.3.2.1 Forward Airflow. The PRV is to be bench tested for positive air flow through the component, when mounted in normal vertical orientation with any required baffles included, over a differential pressure range of 0 Pa to 250 Pa. The data will be documented and graphed with flow, Liters per second (L/s) vs. pressure, pascal (Pa). The curve of the airflow must be shown on the production drawing of the PRV. The airflow variation of the production PRVs must not exceed 5 percent of the airflow shown on the curve of the production drawing. The airflow must also be reported in a numerical table at pressures of 25 Pa and 125 Pa. The angle of opening for each flow control element (flap) shall be recorded in a numerical table at pressures of 25 Pa and 125 Pa. The differential pressure that initially opens each flow control element (flap) shall be recorded. Six pieces (minimum), random samples should be run. The required minimum airflow for GM standard sized PRVs are listed in Table 1. A typical air flow test setup schematic is shown in Figure 2.

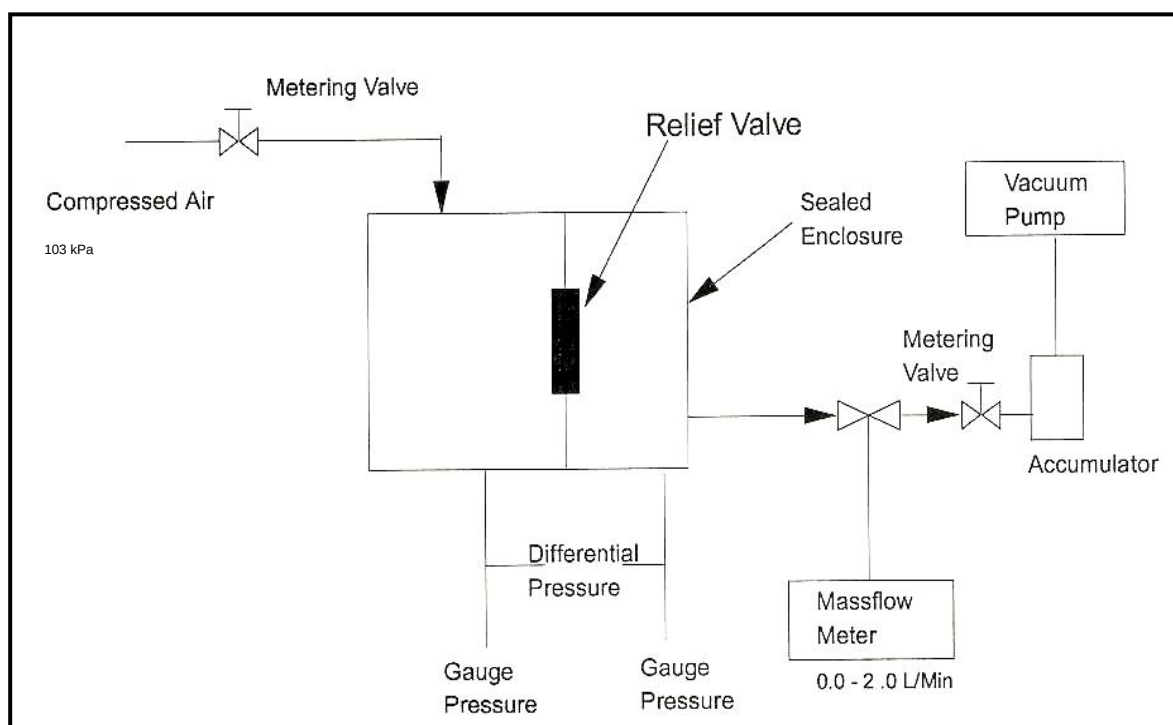
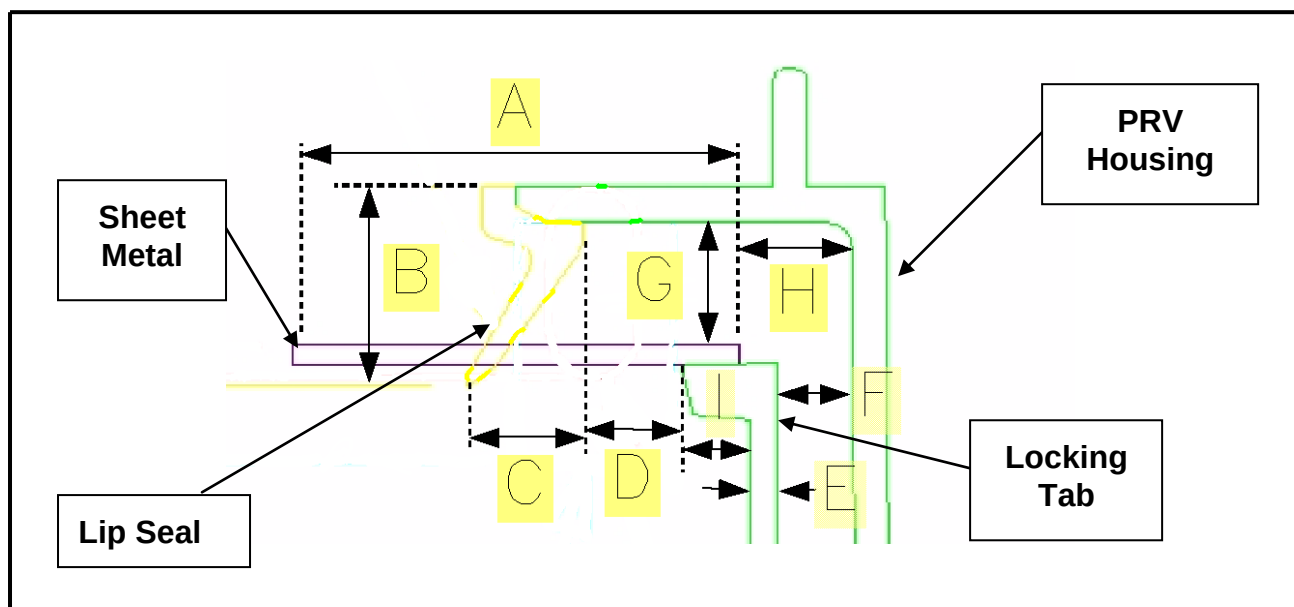


Figure 2: Typical Air Flow Test Setup Schematic

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3.3.2.2 Reverse Airflow Leakage. The maximum reverse flow leakage of 0.25 L/s at 125 Pa shall be measured and reported. The reverse flow leakage shall be measured using the test conditions of negative 125 Pa differential pressure. The PRV is to be bench tested when mounted in vertical position, over a differential pressure range of 0 Pa to 250 Pa. The data will be documented and graphed with flow, Liter per second (L/s) vs. pressure, pascal (Pa). Acceptance is a flow ≤ 0.25 L/s at a pressure of 125 Pa. Six pieces (minimum), random samples should be run. See Figure 3.



Recommended Dimensions:

A = 15 mm (Minimum) to 20 mm (Maximum)

B = 8.2 mm C = 4.9 mm

D = 4.0 mm E = 1.3 mm

F = 3.1 mm G = 4.9 mm

H = 4.7 mm I = 2.8 mm

Figure 3: Sheet Metal to PRV Sealing

3.3.2.3 Insertion and Removal Force. Each attachment point or any sequence of individual attachments of the PRV (locking tab) shall require a force of not more than 45 N (as measured by a Hunter Gauge with a 15 mm diameter probe, or equivalent) when snapped into position. This test is to evaluate the seal compression resistance and tab engagement efforts as part of total force resistance to install the PRV. A design and material representative seal is to be part of this test. This test must be conducted with the minimum size of the sheet metal opening.

The force exerted by the operator to assemble the PRV shall require a force of less than 80 N with a uniform compressive force - perpendicular to sealing plane - on the PRV. The PRV shall be designed with the assembly plant process in mind with the insertion force being generated by an operator's thumb or palm.

The PRV shall withstand a static load rip out force of > 222.5 N as measured by a strain gauge pulling perpendicular to the PRV attached to the full outer perimeter of the PRV.

3.3.2.4 Seal to Housing Peel Strength. Lip seal of PRV should be withstanding a peeling force 50 N/0.01 m without any deterioration and separation from the housing. See Figure 3.

3.3.2.5. Impact Resistance. For PRVs with cosmetic covers or part that are visually exposed to the exterior, the PRVs must stay seated to the body panel and not be damaged such that the functionality does not change when subjected to an impact (kinetic energy pulse) of a 25 mm diameter object with an average density of 0.8 gm/cm^3 traveling at 50 m/s (a 25 mm hail stone at terminal velocity). The energy of this impact is equivalent to an impact of a 25.4 mm diameter ball bearing weighting 0.454 kg dropped from a height of 2 m and allowed to accelerate under gravity on to the outlet side of the PRV. The outlet side of the PRV shall be tested as shown below with impacts in the normal and 4 tangent positions to the valve mounted in the vehicle orientation. See Figure 4.

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