GM	WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW17966

Diesel Exhaust Fluid Tank Mounting Hardware Component Technical Specification

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 document provides standard technical requirements and establishes the component level requirements for Diesel Exhaust Fluid (DEF) tank attachments. This document shall be used in conjunction with program-specific technical specifications, CG2139, and complement other requirements documents included in the Statement of Requirements (SOR). References to the program-specific technical specifications are included in this document where program-specific requirements are expected to exist.

1.2 Applicability. The primary function of the DEF tank attachments is to:

- Retain the DEF tank to the vehicle.
- Minimize transfer of noise and vibration to the vehicle body/chassis.

The DEF tank attachments shall carry out these functions while meeting specific requirements of the customer, powertrain, other interfaces, mandated safety and emission standards, and company objectives.

1.3 Remarks. Program-specific technical specifications may include additional requirements that are not referenced in this document and may supersede any requirements included in this document. In the case of any conflicts between this document and the program-specific technical specifications, the program-specific technical specifications take precedence.

1.3.1 Terminology. The component described and specified in this document is part of a system that has differing naming nomenclatures dependent on market. The component referred to in this document supports and integrates the DEF tank in the vehicle, and is part of the DEF system. The DEF system is alternatively referred to as:

- Selective Catalytic Reduction System (SCR).
- AdBlue System (registered trademark of Verband der Automobilindustrie).
- Urea System.
- Emission Reduction Fluid System.
- Agente Reductor Liquido Automotivo (ARLA 32).

2 References

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

2.1 External Standards/Specifications.

ASTM D903	ISO 527-1	ISO 9001	SAE J400
ISO 179	ISO 1431-1	ISO 16750-5	SAE J1960
ISO 179/1eA	ISO 3167	ISO 22241-1	

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2.2 GM Standards/Specifications.

GMW3059	GMW4710	GMW14872	GMW15311
GMW3091	GMW8518	GMW14889	GMW15570
GMW3097	GMW14264	GMW14911	GMW15760
GMW3110	GMW14669	GMW15272	GMW15862

2.3 Additional References.

- CG2139 Exhaust Fluid Program Specific Component Technical Specifications (ID)
- CG2135 (GM1829) Diesel Emission Fuel System (DEF) Validation Cross Reference Index (VCRI) (ID)
- Statement of Requirements (SOR)

(ID) = This document is limited to internal use within General Motors and shall not be accessed outside this company. Contact the GM Lead Engineer for further instructions.

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. DEF tank attachments shall be black in color unless otherwise specified in the program-specific Component Technical Specification (CTS). The DEF tank attachments for passenger vehicles shall not be visible.

3.1.2 Content. Sections 3.1.2.1 through 3.1.2.2 describe the physical and functional content of the DEF tank attachments.

3.1.2.1 Physical Content. The DEF attachments may consist of (but are not limited to):

- Brackets.
- Straps.
- Weld nuts or weld studs.

3.1.2.2 Functional Content. The DEF tank attachments shall provide the following primary functions while meeting specific requirements of the vehicle and powertrain electrical and hydraulic interfaces and respecting the safety and emission standards:

- Retain the DEF tank to the vehicle.
- Limit transfer of noise and vibration to the vehicle body/frame.
- Enable DEF tank serviceability requirements.

3.1.3 Ambient Environment. The following paragraphs specify the environmental conditions that the DEF tank attachments will be exposed to during its lifetime. The values in Table 1 should be used in the selection of materials and application of engineering judgment throughout the design process.

3.1.3.1 Operating Environment. The DEF tank attachments shall be capable of exposure to temperatures for their sales regions as defined in Table 1 and operating in the environments described in Table 2 without adverse effect to functional performance.

3.1.3.1.1 Continuous Temperature. The DEF tank attachments shall be designed to work without any performance or durability issues for 3020 h/30000 cycles, as per the temperatures in Table 2 during continuous vehicle operation, based on the Reliability Evaluation Point (REP) of the vehicle (refer to 3.2.3.1). Component functionality and performance shall not be compromised under continuous thermal conditions.

3.1.3.1.2 Excursion Temperature. The DEF tank attachments shall be designed to work without any durability issues for 120 h/800 cycles at 110 °C underbody or 150 °C underhood temperature during vehicle operation on an infrequent basis, based on the REP. If the vehicle REP is other than 321 900 km (200 000 mi), then scale the required cycles accordingly. No single excursion event shall be longer than 20 minutes. Occupant safety shall not be compromised during excursion thermal conditions.

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Table 1: Ambient Temperature

Region	Minimum Temperature	Maximum Temperature
Worldwide Default	-48 °C (-55 °F)	52 °C (125 °F)
Russia (Siberia)	-51 °C (-60 °F)	Not applicable
Middle East	Not applicable	55 °C (130 °F)

Table 2: Operating Environment

Underbody	-40 °C to 90 °C continuous
Underhood	-40 °C to 125 °C continuous
Relative Humidity	2% to 100%
Barometric Pressure	56.9 kPa to 106.3 kPa
Precipitation	≤ 4.6 mm/minute
Grade/Inclination	≤ 15%
Electromagnetic	GMW3091, GMW3097
Ozone	≤ 0.40 ppm
Altitude	-150 m to 4600 m

3.1.3.2 Non-Operating Environment. The DEF tank attachments shall meet all operating performance requirements, without loss of function or degradation of service life, after exposure to the following non-operating conditions:

- Transport by airplane at altitudes up to 13 700 m, validated according to ASTM D6653-01.
- Transport by rail.

3.1.3.3 Ultraviolet Radiation. Ultraviolet radiation, accelerated weathering, applies for incomplete vehicles (i.e., cab chassis trucks, cutaway vans, etc.,) and any exterior exposed components (i.e., brackets or shields mounted in such a manner that they are exposed to Ultra Violet (UV) during normal vehicle operation).

3.1.3.3.1 Plastic Attachments. The exposed materials shall retain 75% of their original properties for Tensile Strength (ISO 527-1/2) and Notched Charpy Impact (ISO 179/1eA) after 2500 kJ/m^2 of accelerated exposure using a Xenon arc weathering apparatus, as described in SAE J1960. Tensile bars shall be prepared using ISO 3167, 4 mm thick Type A. Charpy Impact bars shall be 80 mm × 10 mm × 4 mm Machined V notch, r = 0.25 mm. For complete vehicle applications where the DEF tank attachments are completely protected from UV, this requirement does not apply.

3.1.3.3.2 Coated Metal Attachments. Coated metal attachments shall meet all accelerated weathering requirements per GMW14669.

3.1.3.4 Robustness to Ozone. This requirement applies to parts made of highly unsaturated materials, such as diene rubber (polyisoprene, styrene-butadiene rubber, etc.) that have exposure to the external ambient environment. The parts shall be checked for stabilization against ozone per ISO 1431-1 (100 pphm, test duration 336 h).

3.1.3.5 Type of Fluid and Material Compatibility. The DEF tank attachments shall be compatible with the DEF fluid as per ISO 22241-1 quality requirements and shall work in the operating environment listed in Table 2.

3.1.3.6 Corrosives - Chloride Exposure: Polymers. Where polymers are used for DEF tank attachments and exposed to the underbody and lower underhood atmosphere, they must be compared against Table 3 to determine the need for further testing. If the polymer is not identified within the list, GM Materials Engineering shall be consulted to determine the appropriate disposition.

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Table 3: Chloride Exposure

Testing Required	Testing Not Required
Polyamide (PA6, PA66, PA12, etc.,) Polyketone (PK)	Polyacetal (POM), Polyethylene (PE), Polyester Polybutylene or Polyethylene Terephthalate (PBT or PET), Polypropylene (PP), Polyphenylene Sulfide (PPS)

3.1.3.7 Corrosives – Chloride Exposure: Metals. All metallic components shall meet the following requirements.

3.1.3.7.1 Resistance to Calcium Chloride. This requirement applies to components with external exposure. The sample shall be fixtured during the test such that a simulated 44 N side load is applied to the part, representative of the part's usage in the assembly. The external surfaces of the fixtured assembly are immersed in a 50% aqueous solution (by weight) of calcium chloride for 200 h at 60 °C ± 2 °C with the ports sealed. The sample is then stored out of solution for 200 h at 60 °C ± 2 °C. The sample may be rinsed with fresh water to clear salt residue. There shall be no cracking, crazing, or other damage to the plastic parts. Parts need to functional tests after exposure.

3.1.3.7.2 Resistance to Zinc Chloride. This requirement applies to components with external exposure. The sample shall be fixtured during the test such that a simulated 44 N side load is applied to the part, representative of the part's usage in the assembly. The external surfaces of the fixtured assembly are immersed in a 50% aqueous solution (by weight) of zinc chloride for 200 h at 23 °C ± 2 °C with the ports sealed. The sample may be rinsed with fresh water to clear salt residue. There shall be no cracking, crazing, or other damage to the plastic parts. Parts need to pass functional tests after exposure.

3.1.3.8 Stone Impingement. The DEF tank attachments shall be capable of withstanding stone and gravel impact, as tested per SAE J400 at an angle of attack of 45 degrees below the bottom surface of the DEF system in the driving direction. After, the test components shall meet functional checks. Following a teardown and a detailed analysis of every exposed component, there shall be no indication of perforation and no damage that could impact the functionality of the components.

3.1.3.9 Gravel Entrapment. The DEF tank attachments shall successfully comply with the criteria for vehicle-level gravel entrapment test when tested per GMW14889 with no degradation to component functions or visible damage. Parts need to pass functional tests after exposure and have no visible damage to component that will contribute to noise, vibration, or squeak and rattle concerns.

3.1.3.10 Automotive Fluids Compatibility. The DEF tank attachments shall be designed to withstand prolonged exposure to automotive fluids, as outlined in ISO 16750-5 and exposure to DEF. Components must exhibit no visible cracking or crazing.

3.1.3.11 Thermal Integrity. The DEF tank attachments shall be designed to avoid auto-ignition conditions involving components of the DEF System or other vehicle components, as evaluated per GMW14911.

3.1.4 Interfaces. Interface between the DEF tank attachments and other vehicle subsystems and components may constrain or drive the design of the system and, therefore, must be addressed during design and development. The entire DEF system implementation and operation in the vehicle must also successfully accommodate the identified interfaces. These physical interface requirements are further detailed in the program specific documents.

3.1.4.1 DEF Tank Attachments to DEF Tank. The DEF tank attachments shall be designed to accommodate the appropriate interfacing features (i.e., shell, shield, tab, or vibration mounts, etc.,). The interface shall be such that relative movement between the two (2) shall be eliminated. Where the bracket is mounted to a tab and there is relative motion between the body of the tank and the bracket possible, the bracket shall be designed to prevent contact between the two (2).

3.1.4.2 DEF Tank Attachments to Body/Frame. The DEF tank attachments shall be designed to accommodate the appropriate interfacing body/frame components.

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