GM	WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW15048

Diesel Fuel Cooler Assembly

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 component level requirements for a fuel air type cooler assembly. This document shall be used in conjunction with and complement other requirements documents included in the Statement of Requirements (SOR).

1.2 Applicability. This specification applies only to diesel and biodiesel fueled vehicles.

1.3 Remarks. The primary function of a fuel cooler assembly is to cool the return fuel from the engine before it enters the fuel tank.

The fuel cooler assembly shall carry out this function while meeting specific requirements of the customer, the Powertrain, other interfaces, mandated safety and emission standards, and corporate objectives.

1.3.1 With direct injection fuel systems being implemented on diesel engines, cooling the return fuel from the engine before it enters the fuel tank is becoming a necessity. There are several options available to cool the fuel: using fuel air coolers and using fuel coolant coolers. This document provides standard technical requirements for air fuel coolers and shall only be used when invoked by program specific technical specifications, CG1723. References to the program specific technical specifications are included in this document where program specific requirements are expected to exist.

Note: Program specific technical specifications may include additional requirements that are not referenced in this document and may supercede 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.

2 References

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

2.1 External Standards/Specifications.

ASTM D4169	SAE J400	SAE J2044	SAE J2886
EN 590	SAE J1739		

2.2 GM Standards/Specifications.

GMW3059	GMW14890	GMW15357	GMW15862
GMW14234	GMW14911	GMW15359	GMW16331
GMW14555	GMW15272	GMW15570	
GMW14872	GMW15311	GMW15760	

2.3 Additional References.

- CG1723 Program-Specific Component Technical Specification, Diesel Fuel Cooler Assembly
- CG2024 Validation Cross Reference Index, Diesel Fuel Cooler Assembly
- Statement of Requirements (SOR)

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2.3.1 Fuels.

- GMPT-1-005B
- GMPT-5-006
- GMPT-5-008
- GMPT-5-020
- GMPT-5-025
- GMPT-5-036A

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. Not applicable.

3.1.2 Content.

3.1.2.1 Physical Content. There are several types of fuel air coolers:

- Tube and plate cooler: This is the simplest of all coolers, where the return line in a specified shape and length is attached to a plate, and this plate is mounted to underbody or frame.
- Plate and fin cooler: In this type of cooler, fuel passes through a series of plates, which are brazed together to provide a sealed system. The fins provide strength to the plates and also increase the heat transfer rate.
- Tube and fin cooler: In this type of cooler, fuel passes through the tube which is bent in a particular shape to fit a certain vehicle application. This tube is supported by several fins, and these fins increase surface area for heat dissipation.

The specifications listed in this document apply to all these types of coolers.

3.1.2.2 Functional Content. The fuel cooler assembly shall cool return fuel from engine before it enters the fuel tank. The cooler shall have mounting provisions to mount it on underbody or frame.

3.1.3 Ambient Environment. Sections 3.1.3.1 through 3.1.3.3 specify the environmental conditions that the fuel cooler assembly will be exposed to during its lifetime.

3.1.3.1 Operating Environment. The fuel cooler assembly shall be capable of operating in the environments described in Table 1 without adverse effect to functional performance.

Table 1: Operating Environment

Underbody Temperature	-40 °C to 90 °C
Underhood Temperature	-40 °C to 180 °C
Relative Humidity	2% to 100%
Barometric Pressure	56.9 kPa to 106.3 kPa
Precipitation	≤ 4.6 mm/minute
Grade	≤ 30%
Ozone	≤ 0.40 ppm
Altitude	-150 m to 4600 m

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3.1.3.2 Corrosives – Chloride Exposure. This requirement applies only to polymers with external exposure. Polymers exposed to the underbody and lower underhood environment must be compared against Table 2 to determine the need for further chloride exposure testing (see 3.1.3.2.1 and 3.1.3.2.2). If the polymer is not identified within the list, GM Materials Engineering shall be consulted to determine the appropriate disposition.

Table 2: Chloride Exposure

Testing Required	Testing Not Required
Polyamide, Polyketone (PK)	Polyacetal (POM), Polyethylene (PE), Polyester (PBT), Polypropylene (PP), Polyphenylene Sulfide (PPS)

3.1.3.2.1 Resistance to Calcium Chloride. 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.

3.1.3.2.2 Resistance to Zinc Chloride. 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.

3.1.3.3 Types of Diesel Fuels. Table 3 includes fuels to which the fuel cooler assembly may be exposed. These fuels shall be considered in component design and analysis in considering coatings for fuel cooler. Information regarding GPS fuels can be obtained by contacting GPS, Materials Engineering.

3.1.3.3.1 Fuel Circulation Test. The cooler assembly shall be leak tight as per 3.2.1.6 after 1000 h fuel circulation at +80 °C using GMPT-5-020 fuel at 90 Liters per Hour (LPH) flow rate. Fuel shall be changed every 200 h. Test fuels shall be purchased from an approved supplier.

Table 3: Types of Fuels

Fuel Name	Fuel Type
EN 590	European Diesel Fuel
GMPT-1-005B	General Purpose Summer US Diesel
GMPT-5-006	US Cert Fuel
GMPT-5-008	European Stage 4 Cert Fuel (RF-06-99)
GMPT-5-020	Ultra-Low Sulfur B20 Biodiesel
GMPT-5-025	European Biodiesel; B10
GMPT-5-036A	Soy based deposit forming and peroxide B20 Biodiesel

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