Fuel tanks made of plastic material for passenger cars

1. Scope

This standard stipulates the test methods and performance for evaluating the safety of fuel tanks made of plastic material for passenger cars (hereinafter referred to as "fuel tanks").

Remark 1: The standards quoted in this standard are as follows.

JIS D 0101: Glossary of terms relating to kinds of automobiles

JIS K 2202: Motor gasoline

JIS K 2204: Diesel fuel

2: Units or figures used within this standard are SI-defined units or figures, and units or figures indicated within brackets "{ }" are traditional units or figures included for reference purposes.

2. Definitions

The definitions of the main terms used in this standard are listed below.

(1) **Passenger car:** A motor vehicle designed or equipped primarily for the transport of passengers or goods, with no more than 10 seats, including the driver's seat.

(2) **Fuel tank:** The fuel tank itself, together with the filler inlet and cap, pipe connectors, and attached equipment.

(3) **Fuel tanks made of plastic material:** Fuel tanks in which the fuel tank unit is made of plastic.

(4) **Standard fuel:** The fuel as specified in **JIS K 2202** for gasoline-fueled vehicles and **JIS K 2204** for diesel-fueled vehicles.

(5) **Tray:** A flat container for the combustion fuel used in fire resistance testing. The length and width are to be 200 mm to 500 mm larger than horizontal cross-section of the fuel tank used in the tests. The sides are to be no more than 80 mm higher than the surface of the fuel, and the tray must be able to hold sufficient fuel (commercial gasoline) to burn freely for at least five minutes.

(6) **Screen:** A flat sheet of fireproof material with a thickness of 70 mm ±3 mm, able to cover the entire tray, with a number of holes 15 mm x 30 mm in size corresponding to 60% ±1% of the fuel combustion area of the tray.

(7) **Nominal capacity:** The figure indicated on the fuel tank or the catalog figure.

(8) **Unladen state:** The state in which the vehicle carries the full amount of fuel, lubrication oil, and coolant required for the engine and fuel systems, and is equipped with the fixed items necessary to perform the vehicle's intended purpose.

3. Performance

The performance of the fuel tank is as follows.

3.1 Fuel permeability

Fuel loss must not exceed 20 g per 24 hours during the test described in **4.1**.

3.2 Impact resistance

There must be no leakage during the test described in **4.2**.

3.3 Pressure resistance

There must be no leakage or rupturing during the test described in **4.3.** However, permanent deformation is

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acceptable.

3.4 Fire resistance

There must be no fuel leakage during the test described in **4.4**.

3.5 Heat resistance

There must be no leakage or significant localized deformation during the test described in **4.5.**

4. Testing

4.1 Fuel permeability test

4.1.1 Test conditions

The test conditions are as follows.

(1) Fill the fuel tank with standard fuel to 50% ±1 L of the nominal capacity, and leave unsealed in a constant-temperature test chamber or tank at an ambient temperature of 40°C ±2°C until the weight loss rate becomes constant. The fuel tank should be allowed to stand for no more than four hours. However, if the temperature fluctuates outside the specified range for any reason, the period outside the specified temperature range is to be subtracted from total time for purposes of calculation.

It is acceptable to leave part of the constant-temperature test chamber or tank open to the atmosphere to vent fuel vapor if this fills the constant-temperature test chamber or tank. Even in this case, the ambient temperature inside the constant-temperature test chamber or tank must be 40°C ±2°C.

(2) The fuel weight loss rate is normally to be measured (1) at the start of testing, (2) in the first week, (3) in the second week, and (4) at 48-hour intervals subsequently. The test is to be concluded at four weeks even if the fuel weight loss does not become constant.

4.1.2 Test method

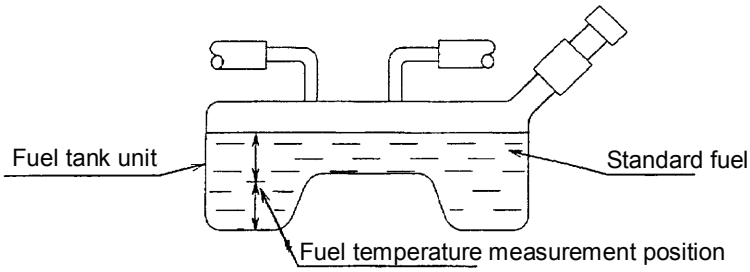
(1) The fuel tank used in **4.1.1** is to be emptied and then refilled with fresh standard fuel to 50% ±1 L of the nominal capacity before being left sealed in a constant-temperature test chamber or tank at an ambient temperature of 40°C ±2°C until the weight loss rate becomes constant.

(2) Once the fuel inside the fuel tank has reached a temperature of 40°C ±2°C, open and then reseal the fuel tank before measuring the ambient temperature. Measure once the ambient temperature has reached 40°C ±2°C, and then measure the subsequent fuel weight loss over the eight-week test period.

Measurements should normally be taken (1) at the start of testing and (2) at weekly intervals subsequently.

(3) The fuel temperature is to be measured at the midway point of the vertical line at the deepest section of the fuel tank. (See **Figure 1**.)

Figure 1: Fuel temperature measurement position



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(4) The ambient temperature inside the constant-temperature test chamber or tank should be controlled at a number of locations, and the temperatures should be recorded continuously during the test period.

4.2 Impact test

4.2.1 Test apparatus

The test apparatus is as follows.

(1) Fuel tank mounting jig

(2) A swinging test rig formed of a pyramid-shaped impact device with equilateral triangular sides and a square base. The pyramid-shaped impact device is to be made of steel with an effective weight of 15 kg and have points and edges rounded with a radius of 3 mm.

4.2.2 Test conditions

The test conditions are as follows.

(1) Use the fuel tank used in 4.1.

(2) The fuel tank is to be mounted securely using a mounting jig.

4.2.3 Test method

The test method is as follows.

(1) Drain the standard fuel from the fuel tank, and fill the fuel tank to the nominal capacity ±1 L with a mixture of water and glycol or a similar liquid with a low freezing point that will not affect the fuel tank material properties. Cool the fuel tank to a temperature of -40°C ±2°C. The fuel tank temperature here must be measured close to the impact point.

(2) The pyramid-shaped impact device is to be impacted into the fuel tank in this state at a number of locations considered easily damaged applying impact energy of at least 30.4 J {3.1 kgf • m}. Locations considered easily damaged are exposed parts considered to be weak based on fuel tank configuration and vehicle mounting method.

(3) The impact point precision is to be within a radius of 3 mm from the target impact point, and the same point must be impacted twice in the test.

(4) Separate fuel tanks may be tested for each impact point.

(5) Check the fuel tank visually for leakage after the impact.

4.3 Pressure resistance test

4.3.1 Test conditions

The test conditions are as follows.

(1) Use the fuel tank used in **4.1.**

(2) The fuel tank, drained of standard fuel, is to be mounted securely in the same configuration as on the actual vehicle.

4.3.2 Test method

The test method is as follows.

(1) Fill the fuel tank to the nominal capacity ±1 L with water at a temperature of 53°C ±2°C, and maintain the constant-temperature test chamber or tank ambient temperature and temperature of the fluid inside the fuel tank at 53°C ±2°C while pressurizing the fuel tank interior to a gauge pressure of at least 29.5 kPa {0.3 kgf/cm^2} for at least five hours.

The fluid temperature is to be measured at the midway point of the vertical line at the deepest section of the fuel tank.

(2) The test is to be initiated once the temperature of the fluid inside the fuel tank has been confirmed as constant at

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