

**Attachment 86****TECHNICAL STANDARD  
FOR DEFROSTING AND DEMISTING SYSTEMS**

## 1. Scope

This technical standard shall apply to the defrosting and demisting systems of an ordinary-sized motor vehicle used exclusively for carriage of passengers or a small-sized motor vehicle or a mini-sized motor vehicle (except motor vehicles with a riding capacity of 11 persons or more, motor cycles with or without sidecar, mini-sized motor vehicles with caterpillar and sled, motor vehicles with a maximum speed of less than 20 km/h and trailers).

## 2. Definitions

2-1 “Defrosting” means the elimination of frost or ice covering the glazed surface by the operation of the defrosting and demisting system (referring to the defroster set forth in Paragraph 2 of Article 45 of the Safety Regulations, not including the windshield wiper freeze preventing device. Hereinafter the same.) or the melting of the said frost or ice to such a degree that the windshield wipers can remove it or the removal of the said frost or ice by the windshield wipers.

2-2 “Defrosted area” means the area of the glazed surfaces having a dry surface or covered with frost or ice that has been melted by the operation of the defrosting system to such a degree that it can be removed by the windshield wipers or the area of the glazed surface from which the said frost or ice has been removed by the windshield wipers.

2-3 “Mist” means a film of minute water droplets which is formed when the water in the air is condensed on the inside face of the glazed surface.

2-4 “Demisting” means the elimination of the mist covering the inside face of the glaze surface by the operation of the demisting system.

2-5 “Demisted area” means the area of the glazed surfaces which has been demisted by the operation of the demisting system.

2-6 “Zone A” and “Zone B” mean the respective zones that are determined on the outside face of the windshield in accordance with the Annex, “Determining Procedure for Zones A and B,” of the Attachment 70, “Technical Standard for Windshield Wiping and Washing Systems for Passenger Motor Vehicles, etc.,” or the zones that are determined by means of plotting under

conditions equivalent to the procedure above.

2-7 “Human manikin” means a manikin corresponding to a fiftieth percentile adult male which is provided for in the JIS D 4607-1977 (Three Dimensional Manikins for Use in Defining Automobile Seating Accommodations) or the ISO 6549-1980 (Road Vehicles Procedure for H-point Determination).

2-8 “R-point” means the hip point (pivotal axis of thigh) of a human manikin or the equivalent design standard position set up on the seat when the human manikin is seated in accordance with the seating procedure prescribed in the JIS D 4607-1977 or ISO 6549-1980. In this case, the seats shall be adjusted to the following positions, respectively; in the case of a seat adjustable in a fore-and-aft direction, the rearmost position in design; in the case of a seat adjustable in an up-and-down direction, the lowest position; in the case of a seat, the angle of whose reclining section is adjustable, the design standard angle or the angular position at which the torso line (referring to a line representing the inclination of the torso) becomes as close to 25 degrees backward from the vertical line as possible; and in the case of a seat having other adjusting mechanisms, the design standard position.

2-9 “Fuel cell system” means a power generation system comprised of a fuel cell stack and an air supply system.

2-10 “Fuel cell stack” means a device which generates electricity directly by causing hydrogen to react chemically with oxygen.

### 3. Test Procedure

#### 3-1 Defrosting performance test

##### 3-1-1 General test conditions

- (1) The test shall be conducted in a low-temperature test chamber that is large enough to accommodate the test vehicle adequately and in which the chamber inner temperature is maintained at  $-8 \pm 2^{\circ}\text{C}$ . (This temperature shall be measured at a point not affected by the heat emitted from the test vehicle.) However, the test may be conducted in a test chamber whose temperature is maintained below the specified temperature.
- (2) A voltage may be applied by means of an external power supply device to the input terminal of the blower motor of the test vehicle during the test. However, the said voltage at the input terminal of the blower motor shall not exceed a voltage that is obtained when the nominal rating

voltage is multiplied by 1.2.

- (3) When the frost or ice that covered the outside face of the windshield glazed surface has melted during the test by means of the defrosting system, it is permissible to use the windshield wipers for the purpose of removing such melted frost or ice.

### 3-1-2 Conditions of test vehicle

- (1) Except for the fresh air inlet and outlet ports of the defrosting system, all of those devices of the test vehicle which can be opened or closed, such as the engine hood, doors, windows, luggage compartment, sunroof, canvas top and side vents, shall be in a closed state. Of those side windows at the driver's seat and seats parallel thereto, however, two windows may be opened, provided that the total height of the opened portions is within the upper limit of 25 mm.
- (2) The controls related to the air conditioner of the test vehicle shall be set to the following operating positions specified below:
  - ① Defroster mode;
  - ② Fresh air inlet or inner air recirculating mode;
  - ③ Maximum temperature;
  - ④ Maximum air flowrate.
- (3) If a defroster, other than the air conditioning, is provided, the device concerned shall be set to the operating position recommended by the manufacturer, etc.

### 3-1-3 Test procedure

The test shall be conducted, following the procedure given below.

- (1) Prior to the test, the outside face of the windshield of the test vehicle shall be cleaned and dried so that no grease or foreign matter, etc. may remain on the glaze surface.
- (2) Draw contours of the Zone A, a comparable zone of the windshield that is symmetrical with the Zone A in respect of the longitudinal centre line of the vehicle and Zone B on the inside face of the windshield.

- (3) The test vehicle, with the engine (the fuel cell system in the case of fuel cell vehicles. Hereinafter referred to as the “power generation system”) stopped, shall be soaked in the low-temperature test chamber whose temperature is kept at  $-8 \pm 2^{\circ}\text{C}$  for at least 10 hours. However, if it is confirmed that the temperatures of the engine coolant and lubricant (the engine coolant, cooling oil or coolant of the fuel cell stack in the case of fuel cell vehicles) have stabilized at  $-8 \pm 2^{\circ}\text{C}$ , the soak time concerned may be shortened.
- (4) Apply an even and thin layer of ice whose ice mass is  $44 \text{ mg/cm}^2$  per unit area over the entire outside face of the windshield by means of a waterspray gun whose operating pressure is  $350 \pm 20 \text{ kPa}$ . In this case, the spray nozzle of the waterspray gun shall be so adjusted that the maximum flowrate may be obtained. Furthermore, waterspray shall be applied from a point at a distance of between 200 and 250 mm from the outside face of the windshield. As regards a waterspray gun to be employed for the test, it shall have a nozzle of 1.7 mm diameter and a liquid flowrate of 0.395l/min and capable of producing a spray pattern of approximately 300 mm width on the glazed surface when sprayed at a distance of approximately 200 mm from that surface, or it shall have an equivalent performance.
- (5) Again, the test vehicle, with the power generation system stopped, shall be placed in the low-temperature test chamber whose temperature is kept at  $-8 \pm 2^{\circ}\text{C}$  for 30 to 40 minutes.
- (6) One or two inspectors shall enter the test vehicle and start the engine. (Here, the engine shall be in an unloaded state.) However, this engine starting may be performed by applying a voltage from the outside. In the case of fuel cell vehicles, either the fuel cell system is started or, when the test is conducted without operating the fuel cell system, a voltage, which does not exceed the voltage supplied during the normal running, is applied from the outside to the electrical system of the heat source of the defroster. Furthermore, the cooling air velocity in the test chamber shall be less than 2.2 m/s, when measured at a point approximately 300 mm forward of the lower edge of the windshield of the test vehicle and approximately at the same level as the mid-point of the windshield.
- (7) After the elapse of 5 minutes after the engine has started, the revolution speed of the engine shall not exceed a speed that is obtained when the engine speed at which the engine concerned delivers the maximum output (hereinafter the maximum output revolution speed) is multiplied by 0.5. (This provision shall not apply to fuel cell vehicles.) In this case, if the test vehicle is equipped with an engine tachometer, the said

tachometer may be used for the measurement of the revolution speed of the engine.

- (8) The inspector(s) shall draw the contour of the defrosted area on the inside face of the windshield when 20 minutes, 25 minutes and 40 minutes respectively have elapsed after the start of the **power generation system or the start of the voltage application (hereinafter referred to as the “start of the power generation system, etc.”) according to Item (6)**. Furthermore, if all portions of the Zone B are defrosted within 40 minutes after the start of the **power generation system, etc.**, the test may be terminated at this point.
- (9) After completion of the test, measure the areas of portions that are in the defrosted areas drawn in (8) and that are enclosed by the contours of the Zone A, the comparable zone of the windshield that is symmetrical with the Zone A in respect of the longitudinal centre line of the vehicle and Zone B in Item (2), respectively.

### 3-2 Demisting performance test

#### 3-2-1 General test conditions

- (1) The test shall be conducted in a low-temperature test chamber that is large enough to accommodate the test vehicle adequately and in which the chamber inner temperature can be maintained at  $-3 \pm 2^{\circ}\text{C}$  during the test. (This temperature shall be measured at a point not affected by the heat emitted from the test vehicle.) However, the test may be conducted in a test chamber whose temperature is maintained below the specified temperature.
- (2) A voltage may be applied by means of an external power supply device to the input terminal of the blower motor of the test vehicle during the test. However, the said voltage shall not exceed a voltage that is obtained when the nominal rating voltage is multiplied by 1.2.

#### 3-2-2 Conditions of test vehicle

- (1) Except for the fresh air inlet and outlet ports of the demisting system, all of those devices of the test vehicle which can be opened or closed, such as the engine hood, doors, windows, luggage compartment, sunroof, canvas top and side vents, shall be in a closed state. Of those side windows at the driver's seat and seats parallel thereto, however, two windows may be opened, provided that the total height of the opened portions is within the upper limit of 25 mm.

- (2) The controls related to the air conditioner of the test vehicle shall be set to the following operating positions specified below:
  - ① Defroster mode;
  - ② Fresh air inlet or inner air recirculating mode;
  - ③ Maximum temperature;
  - ④ Maximum air flowrate;
  - ⑤ Operation of the air conditioner stopped. However, cases where the operation of the air conditioner is interlocked with the demisting mode shall be excluded.
- (3) If a defroster, other than the air conditioning, is provided, the device concerned shall be set to the operating position recommended by the manufacturer, etc.

### 3-2-3 Test procedure

The test shall be conducted, following the procedure given below.

- (1) Prior to the test, the inside face of the windshield of the test vehicle shall be cleaned and dried so that no grease or foreign matter, etc. may remain on the glaze surface.
- (2) Draw contours of the Zones A and B on the outside face of the windshield.
- (3) The test vehicle, with the **power generation system** stopped, shall be preconditioned in the low-temperature test chamber whose temperature is kept at  $-3 \pm 2$  °C, until the engine coolant and lubricant (**the engine coolant, cooling oil or coolant of the fuel cell stack in the case of fuel cell vehicles**) have stabilized at the specified test temperature.
- (4) Place a steam generator provided for in the “Annex, Steam Generator” (hereinafter referred to as “the steam generator”) in such a way that its steam outlets in the longitudinal centre plane may come at a point  $580 \pm 80$  mm above the R-point of the driver’s seat and the distance backward from the rear edge of the seatback of the driver’s seat adjusted to the design standard angle may be 200 mm or less. Furthermore, in the case of a motor vehicle having three rows or more of seats, another steam generator (hereinafter referred to as “the auxiliary steam generator”) may be placed so that its steam outlets in the longitudinal centre plane may

come at a point  $580 \pm 80$  mm above the R-point of the driver's seat and at a point forward of the centre of the outboard seat in the third row. However, if it is impossible to position the steam generator or the auxiliary steam generator in the way described above because of the construction of the test vehicle, they may be positioned in the nearest convenient location to that prescribed above.

- (5) Operate the steam generator so that the steam generating rate per unit time may become  $\{(70 \pm 5) \times (\text{Riding capacity})\}$  g/h. Furthermore, if the auxiliary steam generator is employed, the steam generating rate per unit time from a steam generator other than the auxiliary steam generator (hereinafter referred to as "the main steam generator") shall be  $\{(70 \pm 5) \times (\text{Riding capacity} - \text{Riding capacity of seats at the third and following rows})\}$  g/h. Furthermore, the steam generating rate per unit time from the auxiliary steam generator shall be  $\{(70 \pm 5) \times (\text{Riding capacity of seats at the third and following rows})\}$  g/h.
- (6) After the steam generator has been operating for 5 minutes, one or two inspectors shall enter the test vehicle. After this time onward, the steam generating rate per unit time of the steam generator shall be  $\{(70 \pm 5) \times (\text{Riding capacity} - \text{Number of inspectors})\}$  g/h. Furthermore, if the auxiliary steam generator is employed, the steam generating rate per unit time from the main steam generator shall be  $\{(70 \pm 5) \times (\text{Riding capacity} - \text{Riding capacity of seats at the third and following rows} - \text{Number of inspectors})\}$  g/h. Furthermore, the steam generating rate per unit time from the auxiliary steam generator shall be  $\{(70 \pm 5) \times (\text{Riding capacity of seats at the third and following rows})\}$  g/h.
- (7) One minute after the inspector(s) have entered the test vehicle, start the engine. However, this engine starting may be performed by applying a voltage from the outside. **In the case of fuel cell vehicles, either the fuel cell system is started or, when the test is conducted without operating the fuel cell system, a voltage, which does not exceed the voltage supplied during the normal running, is applied from the outside to the electrical system of the heat source of the defroster.** Furthermore, the cooling air velocity in the test chamber shall be less than 2.2 m/s, when measured at a point approximately 300 mm forward of the lower edge of the windshield of the test vehicle and, approximately at the same level as the mid-point of the windshield.
- (8) **The engine shall be in an unloaded state during the test.** The revolution speed of the engine shall not exceed a speed that is obtained when the maximum output revolution speed is multiplied by 0.5. **(This provision shall not apply to fuel cell vehicles.)** In this case, if the test vehicle is

equipped with an engine tachometer, the said tachometer may be used for the measurement of the revolution speed of the engine.

- (9) Ten minutes after the **start of the power generation system, etc. according to Item (7)**, the inspector(s) shall draw the contour of the demisted area on the outside face of the windshield. Furthermore, if all portions of the Zone B are demisted within 10 minutes after the start of the **power generation system, etc.**, the test may be terminated at this point.
- (10) After completion of the test, measure the areas of portions that are in the demisted areas drawn in (9) and that are enclosed by the contours of the Zones A and B in Item (2), respectively.

#### 4. Requirements

4-1 When subjected to the test of Paragraph 3-1, the defrosted area shall comply with the following requirements given below:

- (1) Twenty minutes after the **start of the power generation system, etc.** of the test vehicle, the defrosted area shall include 80% or more of the Zone A;
- (2) Twenty five minutes after the **start of the power generation system, etc.** of the test vehicle, the defrosted area shall include 80% or more of the comparable zone of the windshield that is symmetrical with the Zone A in respect of the longitudinal centre line of the vehicle;
- (3) Forty minutes after the **start of the power generation system, etc.** of the test vehicle, the defrosted area shall include 95% or more of the Zone B.

4-2 When subjected to the test of Paragraph 3-2, the demisted area shall comply with the following requirements given below:

- (1) Ten minutes after the **start of the power generation system, etc.** of the test vehicle, the demisted area shall include 90% or more of the Zone A.
- (2) Ten minutes after the **start of the power generation system, etc.** of the test vehicle, the demisted area shall include 80% or more of the Zone B.



## ANNEX

## STEAM GENERATOR

The steam generator to be employed for the demisting performance test of Paragraph 3-2 shall comply with the following constructional and performance requirements enumerated below:

- (1) The construction of the steam generator shall be similar to one indicated in the next illustration.
- (2) The heat loss at the boiling point of water in the steam generator shall not exceed 75 W in an ambient temperature of  $-3 \pm 2^\circ\text{C}$ .
- (3) The capacity shall be 2 liters or more.
- (4) The air delivery capacity of the centrifugal blower shall be 0.05 to 0.10  $\text{m}^3/\text{min}$  at a static pressure of 50 Pa.
- (5) Six steam outlet holes, each measuring 6.0 to 6.5 mm in diameter, shall be provided around the top of the steam generator.
- (6) When filled with 1.5 liters or more of water, the steam generator shall be capable of generating steam in a stable manner at a rate of  $\{(70 \pm 5) \times (\text{Riding capacity})\}$  g per hour.

Fig. Outline of Steam Generator

