BS ISO 3468:2014

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# Passenger cars — Windscreen defrosting and demisting systems — Test method

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INTERNATIONAL STANDARD

**ISO 3468**

Third edition
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# Passenger cars — Windscreen defrosting and demisting systems — Test method

*Voitures particulières — Dispositif de dégivrage et de désembuage du pare-brise — Méthode d'essai*

Reference number
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# Contents

Page

# Foreword

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 17, *Visibility*.

This third edition cancels and replaces ISO 3468:1989 and ISO 3470:1989, which have been technically revised.

# Introduction

It is not necessary for the tests specified in Clauses 4 and 5 to be repeated on types of power-driven vehicles which do not differ from one another in respect of the following essential features, which affect defrosting/demisting performance:

a) shape, size, and surface characteristics of the windscreen;

b) characteristics of each system designated by the vehicle manufacturer as contributing to windscreen defrosting/demisting;

c) number of seats as designated by the vehicle manufacturer.

It can be possible to carry out tests of a similar nature on front windscreens and rear-windows simultaneously.

INTERNATIONAL STANDARD ISO 3468:2014(E)

# Passenger cars — Windscreen defrosting and demisting systems — Test method

## 1 Scope

This International Standard specifies the test method for passenger car (ISO 3833:1977, 3.1.1) windscreen defrosting and demisting systems, when these are fitted.

This International Standard does not specify reference areas or levels of performance.

The test condition of −18 °C ± 3 °C specified for defrosting systems will meet the majority of cold climatic requirements.

The tests for demisting systems are conducted at a temperature of −3°C ± 1°C, since this is the practical minimum temperature at which mist, as defined in 3.7, can normally occur.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1176:1990, *Road vehicles — Masses — Vocabulary and codes*

ISO 3833:1977, *Road vehicles — Types — Terms and definitions*

ISO 6549:1980, *Road vehicles — Procedure for H-point determination*[1)]

## 3 Terms and definitions

For the purposes of this document, the following definitions apply.

**3.1**
**defrosted area**
area of the outer glazed surface of the windscreen having a dry surface or covered with melted or partially melted (wet) frost, excluding any area of the windscreen covered with dry frost

**3.2**
**defrosting**
elimination of frost and/or ice covering the outer glazed surface of the windscreen by the operation of the windscreen defrosting and/or windscreen wiping and washing systems

**3.3**
**windscreen defrosting system**
device, or combination of devices, intended by the vehicle manufacturer to eliminate frost or ice from the glazed surfaces of the windscreen and thus restore visibility, together with the necessary accessories and controls

**3.4**
**windscreen wiping system**
device for wiping the windscreen outer glazed surface, together with the necessary accessories and controls

1) From 2021-06-01, ISO 20176 will cancel and replace ISO 6549:1999.

**3.5**
**windscreen washing system**
device for storing washer solution and applying it to the windscreen outer glazed surface together with the necessary controls

**3.6**
**road load**
power output, as indicated by the vehicle manufacturer, required to move the vehicle on a flat road at a specified speed through still air at 20 °C, with a standard barometric pressure of 1 013 mbar; the mass of the vehicle being equal to the complete vehicle kerb mass, in accordance with ISO 1176 (ISO-M06) plus 150 kg, i.e. representing the driver and passenger on the front seats

Note 1 to entry: Road load takes account of transmission friction, rolling friction, and air resistance.

**3.7**
**mist**
film of condensate on interior glazed surface

**3.8**
**demisting**
elimination of mist from the windscreen by the operation of the windscreen demisting system

**3.9**
**windscreen demisting system**
device, or combination of devices, intended by the vehicle manufacturer to remove mist from the windscreen and thus restore visibility, together with the necessary accessories and controls

# 4 Test method for defrosting systems

## 4.1 Performance requirements

When tested in accordance with the following procedure, and at the temperature specified, the defrosting system shall be capable of defrosting specified percentages of specified areas after stated time intervals from the start of the test.

## 4.2 Test equipment

**4.2.1** Cold chamber, large enough to contain the complete vehicle and capable of ensuring that temperatures of either −8 °C ± 2 °C or −18 °C ± 3 °C can be maintained throughout the test.

**4.2.2** Spray gun, capable of applying liquid to the outer glazed surface of the windscreen and having the following characteristics:

— nozzle diameter: 1,7 mm;

— operating pressure: 350 kPa ± 20 kPa;[2)]

— nominal flow rate: 395 ml/min;

— projection cone diameter at 200 mm from nozzle: 300 mm.

## 4.3 Test preparation

**4.3.1** Carry out all necessary vehicle preparation, e.g. cleaning and marking (if required) of the windscreen and installation of necessary instrumentation to ensure a satisfactory test and to record the test conditions, prior to the temperature stabilization in 4.3.4.

2) 1 kPa = $10^{-2}$ bar

**4.3.2** Thoroughly degrease the outer and inner glazed surfaces using an appropriate degreasing agent. When dry, apply a 3 % to 10 % solution of ammonia in water, allow to dry, and, finally, wipe with a dry cotton cloth or paper towel that contains no additives.

**4.3.3** Ensure that the chamber (4.2.1) is at or below the specified test temperature before the start of the stabilizing period.

**4.3.4** In the case of an electric vehicle or a plug-in hybrid electric vehicle, the high voltage battery should be fully charged prior to soaking.

**4.3.5** Place the vehicle in the chamber (4.2.1). Maintain the temperature in the chamber throughout the soak and test periods at either

a) −18 °C ± 3 °C, full temperature range, or

b) −8 °C ± 2 °C, restricted temperature range.

**4.3.6** Keep the vehicle, with the engine stopped, at the specified test temperature for a period of 10 h. This period can be shortened if instruments are available to check that the engine coolant, lubricant, and vehicle internal air have stabilized at the specified test temperature.

## 4.4 Test condition

**4.4.1** Measure the chamber temperature at the same height as the middle of the windscreen at a location, such that the temperature is not significantly affected by heat from the vehicle under test or by cold air entering the chamber.

**4.4.2** Measure the horizontal component of the air velocity; cooling the chamber immediately prior to the test, at a point located on the longitudinal centreline of the vehicle, 300 mm ahead of the base of the windscreen, at a level half-way between the windscreen top and bottom. The velocity of this component shall be as low as possible and in any case less than 8 km/h.

## 4.5 Test procedure

**4.5.1** Set the vehicle defrosting system controls (see 3.3) for maximum defrost as recommended by the vehicle manufacturer.

**4.5.2** After the temperature stabilization in 4.3.5, create an even coating of frost of 0,044 g/cm$^2$ over the entire outer glazing surface of the windscreen by means of the spray gun (4.2.2).

**4.5.3** The engine bonnet (hood), doors, windows, and vents, except the air intakes and outlets of the defrosting and ventilating system, shall be closed, except that one or two windows can be open with a total distance of 25 mm depending on the mode of operation as indicated by the vehicle manufacturer.

**4.5.4** After the frost coating has been formed, an additional period of between 30 min and 40 min shall elapse before the start of the recorded test period.

**4.5.5** After the period specified in 4.5.4 has elapsed, one or two observers can enter the vehicle; start the engine. An external power source can be used to start it but shall then be disconnected. The test period commences when the engine has been started and is running under its own power. Bring the defrosting system into operation as prescribed by the vehicle manufacturer, with the vehicle in the condition specified by the manufacturer for satisfactory operation at low temperature. The defroster blower can be turned on at any time.

**4.5.6** The total duration of the test is 40 min. Depending on the vehicle powertrain type, the powertrain load, and speed through the test, the conditions specified in 4.5.6.1 to 4.5.6.3 shall apply.

**4.5.6.1** For vehicles equipped with a conventional mechanical powertrain during the first 5 min of the test period, the engine speed can be adjusted according to manufacturer's specification, recommended for warming up when starting in cold weather. For the remaining 35 min of the test, the engine shall be run at either

a) speed as indicated by the vehicle manufacturer, but in no case exceeding 50% of the speed at which it develops maximum power, or

b) if the vehicle manufacturer desires, on a chassis dynamometer, the engine speed and load shall not exceed the speed and equivalent road load at 40 km/h in the gear and with the tyre inflation pressures recommended by the vehicle manufacturer for the road load.

**4.5.6.2** For electric vehicles and plug-in hybrid vehicles, or any vehicle equipped with a powertrain with a specified pure electric range, the powertrain load shall not exceed 50 % of the maximum pure electric load at either −8 °C or −18 °C, according to the manufacturer's powertrain calibration specification.

**4.5.6.3** For hybrid electric vehicles, the test shall be run as described in 4.5.6.1, with the powertrain control logic according to the manufacturer's specification at either −8 °C or −18 °C.

**4.5.7** The windscreen wipers can be used during the test in accordance with the instructions of the vehicle manufacturer if they can commence operation without manual assistance.

**4.5.8** If the vehicle battery is used, it shall be fully charged; an external power source can supplement or replace the battery to meet the requirement of 4.5.9.

**4.5.9** The voltage measured between the earth and the point in the common live line that can be identified and contacted nearest to the windscreen defrosting system shall be the system's rated voltage (if it differs from the vehicle's rated voltage) or 1,15 × the rated voltage specified for the vehicle ±5 %.

**4.5.10** If standard equipment on the vehicle model is under test, the following devices can be activated: rear window defrost device, heated seats, supplemental heat source such as Positive Temperature Coefficient (PTC) heaters or fuel operated heater. Dipped beam headlamps can also be switched on for the duration of the test.

**4.5.11** If the vehicle is equipped with a heat storage device, it shall be fully charged prior to the test and set to discharge according to the vehicle specification.

**4.5.12** If the vehicle is equipped with a supplemental water pump, it shall be set to operate as it would normally operate at speed less than 40 km/h.

**4.5.13** At the start of the test, and thereafter at stated intervals, record the defrosting pattern. A method of recording is given in Annex A but an equivalent method can be used.

## 5 Test method for demisting systems

### 5.1 Performance requirements

When tested in accordance with the following procedure, the demisting system shall be capable of demisting specified percentages of specified areas after stated time intervals from the start of the test.

## 5.2 Test equipment

**5.2.1** Cold chamber, large enough to contain the complete vehicle and capable of ensuring that temperatures of −3 °C ± 1°C can be maintained throughout the test.

**5.2.2** Steam generator (see Figure 1) with the following characteristics:

a) the water container shall have a capacity of at least 2,25 l;

b) the heat loss at boiling point shall not exceed 75 W at an ambient temperature of −3 °C ± 1 °C;

c) the fan shall operate at capacity of 0,07 $m^3$/min to 0,1 $m^3$/min at 50 Pa static pressure;

d) a device to regulate the steam output by controlling the input wattage to the heating element.

The steam generator shall also meet the requirements of Table 1.

The generator shall be calibrated at −3 °C ± 1 °C to give readings for each 70 g/h ± 5 g/h output up to a maximum of *n* times this figure, where *n* is the number of seating positions designated by the vehicle manufacturer.

The generator is calibrated by weighing with water before and after 1 h of operation at the prescribed ambient temperature. A minimum of four points covering the range of seating positions shall be obtained. The heat input to achieve the above shall be made by using a regulating device as indicated in 5.2.2 item d). The calibration shall be presented in the form of a graph or table of steam output against input wattage.

## 5.3 Test preparation

**5.3.1** Carry out all necessary vehicle preparation, e.g. cleaning and marking (if required) of the windscreen and installation of necessary instrumentation to ensure a satisfactory test and to record the test conditions, prior to the temperature stabilization in 5.3.6.

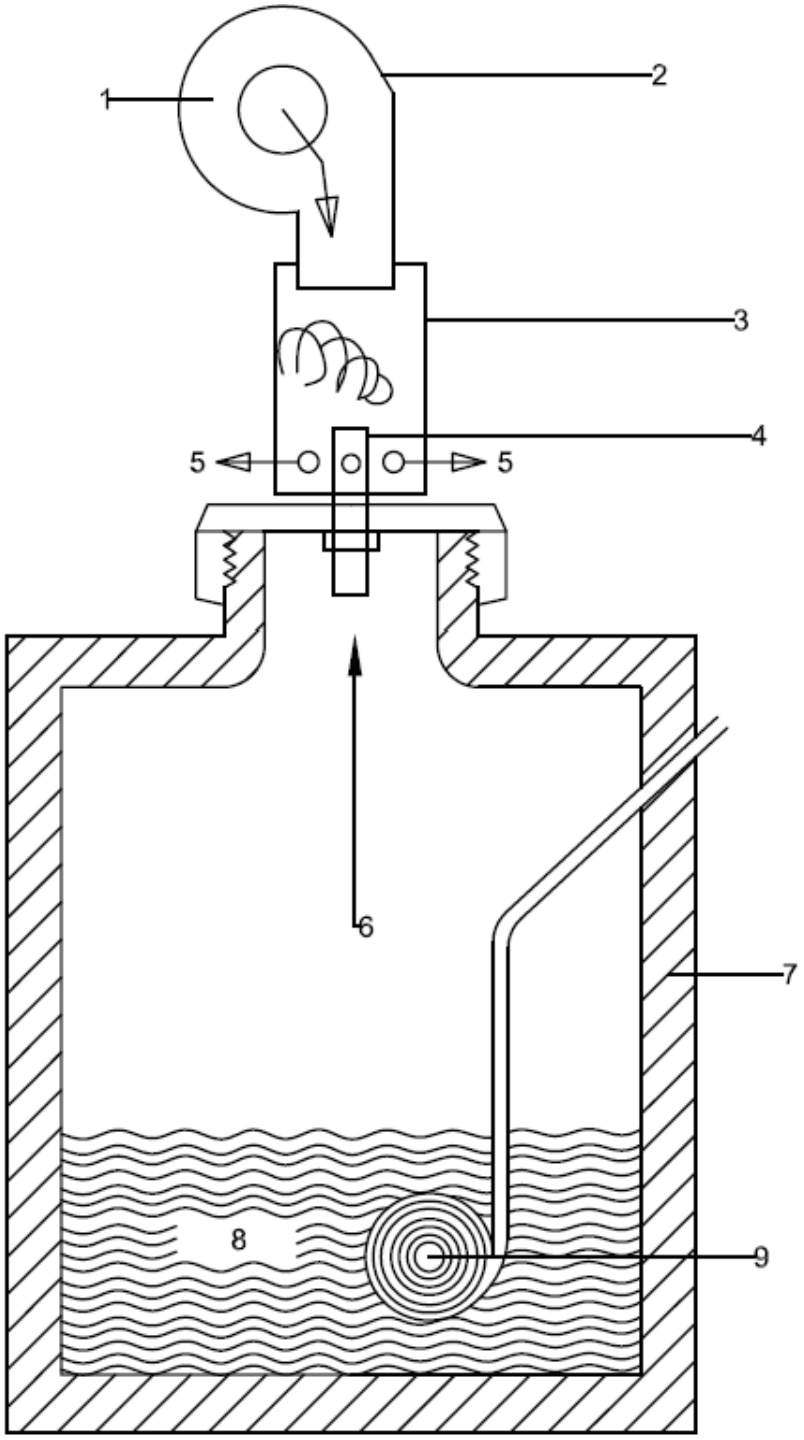
**5.3.2** Thoroughly degrease the outer and inner glazed surfaces using an appropriate degreasing agent. When dry, apply a 3 % to 10 % solution of ammonia in water, allow to dry, and, finally, wipe with a dry cotton cloth or paper towel that contains no additives.

**5.3.3** Ensure that the chamber (5.2.1) is at or below the specified test temperature before the start of the stabilizing period.

**Table 1 — Dimensions and characteristics of steam generator**

Dimensions in millimetres

| Component | Dimensions | Material |
|---|---|---|
| Nozzle | length: 100<br>inside diameter: 15 | Brass |
| Dispersion chamber | length: 115<br>inside diameter: 75<br>six holes of a Ø 6,3 evenly spaced at 25 mm above the bottom of the dispersion chamber interior | Brass tube of 0,38 wall thickness |




**Key**

| | | | |
|---|---|---|---|
| 1 | air | 6 | steam |
| 2 | centrifugal fan | 7 | insulated container |
| 3 | dispersion chamber | 8 | water |
| 4 | nozzle | 9 | heating element |
| 5 | air and steam | | |

**Figure 1 — Typical steam generator**

**5.3.4** In the case of an electric vehicle or a plug-in hybrid electric vehicle, the high voltage battery should be fully charged prior to soaking.

**5.3.5** Place the vehicle in the chamber (5.2.1). Maintain the temperature in the chamber at −3 °C ± 1 °C throughout the preparation and soak period.

**5.3.6** Keep the vehicle, with the engine stopped, at the specified test temperature for a stabilizing period of 10 h. This period can be shortened if instruments are available to check that the engine coolant, lubricant, and internal vehicle air have stabilized at the specified test temperature.

## 5.4 Test conditions

**5.4.1** Measure the chamber temperature at the same height as the middle of the windscreen at a location such that the temperature is not significantly affected by heat from the vehicle under test or by cold air entering the chamber.

**5.4.2** Measure the horizontal component of the air velocity cooling the chamber immediately prior to the test, at a point located on the longitudinal centreline of the vehicle, 300 mm ahead of the base of the windscreen, at a level half-way between the windscreen top and bottom. The velocity of this component shall be as low as possible and in any case less than 8 km/h.

**5.4.3** The engine bonnet (hood), doors, windows, and vents, except the air intakes and outlets of the heating and ventilating system, shall be closed during the misting period.

**5.4.4** The mist shall be produced by means of the steam generator in 5.2.2 or by any other means giving an equivalent result.

**5.4.5** The steam generator shall be located with its outlets in the median plane of the vehicle at a height of 580 mm ± 80 mm above the R-point of the driver's seat as defined in ISO 6549. It shall normally be placed immediately behind the front seat backrest, with the seatback, if adjustable, set at the angle specified by the vehicle manufacturer. Where the design of the vehicle precludes this location, the generator can be placed in the nearest convenient position to that described above.

## 5.5 Test procedure

**5.5.1** Fill the container of the steam generator (5.2.2) with water. Start the steam generator outside the vehicle, bringing up to boiling as soon as possible. The steam generator, containing at least 1,7 l of water, shall be stabilized to generate 70 g/h ± 5 g/h of steam for each seating position designated by the vehicle manufacturer.

**5.5.2** Install the generator (5.2.2) in the vehicle; then set and maintain the level with the power setting reduced to maintain incipient boil. Increase the wattage setting to that determined in 5.5.1 and allow to steam for 5 min, after which time, one or two observers shall enter the vehicle. Reduce the generator output by 70 g/h ± 5 g/h for each observer.

**5.5.3** Set the vehicle demisting system controls (see 3.9) for maximum demist as indicated by the vehicle manufacturer.

**5.5.4** One minute after the observer(s) has (have) entered the vehicle, start the engine in the manner indicated by the vehicle manufacturer. The test period commences when the engine has been started and is running under its own power.

At the discretion of the vehicle manufacturer, one or two windows can be left open with a total distance of 25 mm during the demisting period, depending on the mode of operation as indicated by the vehicle manufacturer.

**5.5.5** Depending on the vehicle powertrain type, the powertrain load, and speed throughout the test, the conditions specified in 5.5.5.1 to 5.5.5.3 shall apply:

**5.5.5.1** For vehicles equipped with a conventional mechanical powertrain, the engine shall be run at either

a) speed as indicated by the vehicle manufacturer, but in no case exceeding 50 % of the speed at which it develops maximum power, or

b) if the vehicle manufacturer desires, on a chassis dynamometer, the engine speed and load shall not exceed the speed and equivalent road load at 40 km/h in the gear and with the tyre inflation pressures recommended by the vehicle manufacturer for the road load.

**5.5.5.2** For electric vehicles and plug-in hybrid vehicles or any vehicle equipped with a powertrain with a specified pure electric range, the powertrain load shall not be exceeding 50 % of the maximum pure electric load at −3 °C, according to the manufacturer's powertrain calibration specification.

**5.5.5.3** For hybrid electric vehicles, the test shall be run per 5.5.5.1, with the powertrain control logic according to the manufacturer's specification at −3 °C.

**5.5.6** If the vehicle battery is used, it shall be fully charged; an external power source can supplement or replace the battery to meet the requirements of 5.5.7.

**5.5.7** The voltage measured between the earth and the point in the common live line that can be identified and contacted nearest to the windscreen demisting system shall be the system's rated voltage (if it differs from the vehicle's rated voltage) or 1,15 × the rated voltage specified for the vehicle ± 5 %.

**5.5.8** If standard equipment on the vehicle model is under test, the following devices can be activated: rear window defrost device, heated seats, supplemental heat source such as Positive Temperature Coefficient (PTC) heaters or fuel operated heater. Dipped beam headlamps can also be switched on for the duration of the test.

**5.5.9** If the vehicle is equipped with an heat storage device, it shall be fully charged prior to the test and set to discharge according to the vehicle specification.

**5.5.10** If the vehicle is equipped with a supplemental water pump, it shall be set to operate as it would normally operate at speed less than 40 km/h.

**5.5.11** At the start of the test, demisting pattern shall be recorded (see 5.1).

# Annex A
(informative)

# Recommended method of recording cleared area

## A.1 Test preparation

The area to be assessed should be accurately located and clearly marked on the inside of the windscreen.

## A.2 Recording cleared area

On the inside of the windscreen, the observer(s) should outline the defrosted area at 5 min intervals from the start of the test period using, for example, a wax pencil for this purpose.

On completion of every test, a tracing should be taken of the defrosting pattern. The tracing should be marked to identify the driver's side.

Other methods are permitted providing they give a comparable result; for example, see ISO 5898.

# Bibliography

[1] ISO 3469, *Passenger cars — Windscreen washing systems — Test methods*

[2] ISO 5898, *Passenger cars — Rear-window defrosting system — Test method*

[3] ISO 6255, *Passenger cars — Rear-window washing and wiping systems — Test methods*

[4] ISO 9619, *Passenger cars — Windscreen wiping systems — Test method*

[5] ISO 20176, *Road vehicles — H-point machine (HPM-II) — Specifications and procedure for H-point determination*

[6] Regulation No EC 672/2010 on windscreen defrosting and demisting systems

[7] SAE J902*Passenger Car Windshield Demisting and Defrosting Systems*

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