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Earth-moving machinery — Operator enclosure environment —

Part 5: Windscreen defrosting system test method

Engins de terrassement — Environnement de l'enceinte de l'opérateur —
Partie 5: Méthode d'essai du système de dégivrage du pare-brise

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10263-5 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*.

This second edition cancels and replaces the first edition (ISO 10263-5:1994), which has been technically revised.

ISO 10263 consists of the following parts, under the general title *Earth-moving machinery — Operator enclosure environment*:

— *Part 1: Terms and definitions*

— *Part 2: Air filter element test method*

— *Part 3: Pressurization test method*

— *Part 4: Heating, ventilating and air conditioning (HVAC) test method and performance*

— *Part 5: Windscreen defrosting system test method*

— *Part 6: Determination of effect of solar heating*

Earth-moving machinery — Operator enclosure environment —

Part 5:
Windscreen defrosting system test method

1 Scope

This part of ISO 10263 specifies a test method to determine the performance of windscreen defrosting systems of earth-moving machinery, fitted with an operator enclosure and a device for defrosting the windscreen. It includes tests that can be conducted with test equipment in commercially available laboratory facilities, as well as in an appropriate outdoor environment.

2 Normative references

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

ISO 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

ISO 9249, *Earth-moving machinery — Engine test code — Net power*

ISO 10263-1, *Earth-moving machinery — Operator enclosure environment — Part 1: Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10263-1 and the following apply.

3.1
windscreen defrosting system
means intended to defrost the windscreen

3.2
daylight opening
DLO
maximum unobstructed opening through any glazed aperture, with trim mouldings and mounting seals adjoining the glazed surface

3.3
defrosted area
area of the windscreen consisting of dry cleared surface and melted or partially melted (wet) test coating, and excluding that area of the windscreen covered with dry test coating of ice

NOTE For further explanation of defrosted areas, see Figure 1.

3.4
heat transfer medium
HTM
means through which defroster system heating is achieved

3.5
defrosting
removal and maintenance of an ice/frost-free window area for visibility

3.6
seat index point
SIP
point in the central, vertical and longitudinal plane of the SIP measuring device

NOTE Adapted from ISO 5353:1995, definition 3.1.

4 Test equipment

4.1 Environmental chamber sufficiently large to contain the base machine or machine operator enclosure with provision for circulating air.

NOTE In lieu of an environmental chamber, the test may be conducted outside under test conditions similar to those in an environmental chamber (see 5.2).

4.2 Means of recording boundaries of windscreen areas defrosted.

4.3 Device to measure rotational frequency (rpm) with a measuring accuracy of 2 % of observed value.

4.4 Stopwatch or other timing device.

4.5 Thermometers or other temperature measuring devices, with a measuring accuracy of ± 0,5 °C.

4.6 Throttle control device (remote or auxiliary, if desired).

4.7 Spray device, to apply mist to the windscreen, with the following characteristics:

a) fluid: distilled water;

b) liquid nozzle size diameter: 1,7 mm;

c) recommended operating gauge pressure: (345 ± 20) kPa;

d) spray pattern at 200 mm from spray nozzle: (300 ± 50) mm wide.

4.8 Device to measure quantity of water provided by the spray device ± 2,5 %.

4.9 Auxiliary power supply for heater blower motor when bench-testing operator enclosure only.

4.10 Anemometer to measure wind speed, within a measuring accuracy of 0,5 m/s.

5 Test conditions

5.1 The maximum ambient temperature for the heating system test shall be −15 °C at a maximum ambient wind speed of 5 m/s.

5.2 If it is not practical to test the base machine due to physical size limitations, the operator's enclosure may be bench-tested, simulating the heat loads and system parameters imposed by the base machine on the enclosure. If this laboratory procedure is used, supplementary field testing should be carried out to confirm the test results.

5.3 The machine shall be operated in accordance with the manufacturer's recommended warm-up procedure, and then at rated speed under a maximum load of no more than 20 % of the maximum rated net engine power, determined in accordance with ISO 9249.

5.4 The HTM flow shall come from engine operation or from an independent HTM flow.

The HTM flow shall result from engine operation as specified in 5.3. The independent HTM flow and temperature shall be the same as that resulting from operation of the machine engine, in accordance with the requirement of 5.3.

Following are three typical examples of HTM:

— liquid engine coolant;

— hydraulic oil;

— air/liquid obtained from an auxiliary heat source, i.e., gas-fired heater or oil-fired heater.

5.5 The HTM temperature shall be measured as close as possible to the inlet pipe of the heating unit. For those systems using more than one heater, it shall be measured at the inlet pipe of the heating unit receiving the first coolant flow.

The HTM flow may be measured at any suitable point.

The ambient outside air temperature and wind speed shall be measured at a location where it is not affected by the machine, and at a height equivalent to the air intake height on the operator enclosure, but no further than 10 m away.

At the beginning of the test, the HTM shall be at ambient temperature.

5.6 Windscreen wiper blades and arms shall not come into contact with the windscreen glazed surface during ice application. Windscreen wipers may be used during the test. If windscreen wipers are used, the number of swipes and times are to be listed in the report.

5.7 Defroster and/or heating system blower(s) shall be on and at maximum speed.

5.8 The voltage at the terminals of the blower motor shall be no more than 15 % above the nominal rating of the system (for example 13,8 V for a 12 V system or 27,6 V for a 24 V system).

5.9 The temperature controls shall be at maximum heat position.

5.10 All engine, heating and defroster units shall be standard production parts or equivalent, adjusted within specified limits.

5.11 The engine bonnet (hood), doors and windows shall be closed.

5.12 If an auxiliary heater(s) is part of the standard heating and defroster system, it may be operated.

5.13 Auxiliary means of preheating the engine, etc. are permissible, providing they do not heat the HTM. Similarly, no simulated or actual solar heat load shall be allowed to strike the windscreen.

5.14 An operator may be in the enclosure throughout the duration of the test.

6 Test procedure

6.1 Thermally soak the machine until instrumentation can confirm that the HTM, windshield, HVAC system, duct work and enclosure temperatures are −15 °C or below.

6.2 Following the machine soak period, form a coating of ice on the windscreen(s) by spraying (0,050 ± 0,005) ml of water per square centimetre of glazed surface with a spray device. Apply coating in even, horizontal overlapping layers (to the outside surface) until the specified quantity of liquid has been applied. Upon completion of the icing process, allow an additional soak period of 30 min to 40 min.

NOTE Measuring and applying spray to multiple piece windshields as distinct separate steps will better ensure the correct ice thickness for each section.

6.3 Start the engine or heat source. Put the defrosting system into action, maintaining the test conditions specified in Clause 5 throughout the test period. Every 5 min for 1 h, outline the defrosted areas on the inside surface of the windscreen. See also 8 d).

7 Minimum performance requirements

The windscreen areas that shall be defrosted are defined in Table 1 for various families of earth-moving machines. Each area is defined by angles from the operator's eye point 660 mm above and 20 mm in front of the SIP as defined in ISO 5353.

In the side view, the upper and lower boundaries of the areas are established by the intersection of two planes and the windshield glazing surface; the two planes being seen as lines converging at the eye point. The planes are fixed by angles above and below the X–X line.

In the plane (top) view, the left and right boundaries of the areas are established by the intersection of two vertical planes and the windshield glazing surface; the two planes being seen as lines converging at the eye point. The planes are fixed by angles to the left and right of the X–X line. See Figure 2.

If any of the four planes, or portions of them established by the angles in Table 1, do not intersect the windscreen glazed surface but fall outside of the DLO, then relocate that part of the plane until it just intersects the windscreen glazed surface along a line which lies entirely on the DLO and touches the moulding or frame. The areas used in determining the percentage of defrosted area are those areas on the outside glazed surface which are not within 25 mm of the edge of the DLO (pillars, division bar, header, etc.). The percentage is the ratio of defrosted area to the defined area. Figure 2 illustrates all of these areas on a typical windscreen.

After 60 min of testing, the percentage of defrosted area shall meet the minimum requirements specified in Table 2. The non-defrosted portions shall be located only along the windscreen frame or moulding.

8 Test report

The test report shall contain the following information:

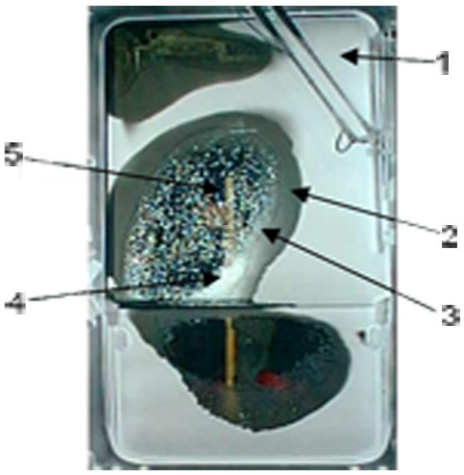
a) model and product identification number of the machine tested;

b) ambient conditions outside the operator enclosure [i.e. dry bulb temperature, moisture content (kg H_2O/kg dry air), and wind speed];

c) time necessary at the specified ambient temperature to defrost the minimum requirement area given in Table 2 for each area;

d) the pattern of the defrosted area transferred to a transparent material by tracing, marked to identify the driver's side if it is not centred in relation to the windscreen. If preferred, a digital camera may be used to electronically record the results at 5 min intervals (see the example in Figure 1).

e) an example of a suitable test report form is given in Annex A.



Key

1 white ice
2 edge of white ice
3 grey ice
4 wet ice
5 defrosted area

Figure 1 — Digital picture of defrosting window