INTERNATIONAL STANDARD

ISO 3434

Third edition
2012-09-01

Ships and marine technology — Heated glass panes for ships' rectangular windows

Navires et technologie maritime — Vitrages chauffants pour fenêtres rectangulaires de navires

Reference number
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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 3434 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 8, *Ship design*.

This third edition cancels and replaces the second edition (ISO 3434:1992), which has been technically revised. It also incorporates the Amendment ISO 3434:1992/Amd.1:2004.

Ships and marine technology — Heated glass panes for ships' rectangular windows

1 Scope

This International Standard specifies construction characteristics, optical qualities and heat current circuit, as well as the tolerances, tests, marking and designation of heated glass panes for ships' rectangular windows of the heated series according to ISO 3903.

It includes the conditions to comply with the safety of ships in times of frost and/or snow, particularly during manoeuvres in port.

Heated glass panes are used on ships principally for the windows of wheel-houses and bridges, as well as in enclosed locations used for look-out and manoeuvring purposes. This International Standard specifies heated glass panes which are intended for use at temperatures down to −40 °C.

2 Normative references

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

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 614, *Shipbuilding and marine technology — Toughened safety glass panes for rectangular windows and side scuttles — Punch method of non-destructive strength testing*

ISO 3903, *Ships and marine technology — Ships' ordinary rectangular windows*

ISO 5779:1987, *Shipbuilding — Ordinary rectangular windows — Positioning*

ISO 21005, *Ships and marine technology — Thermally toughened safety-glass panes for windows and side scuttles*

IEC 60092-101, *Electrical installations in ships — Part 101: Definitions and general requirements*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

3 Optical requirements

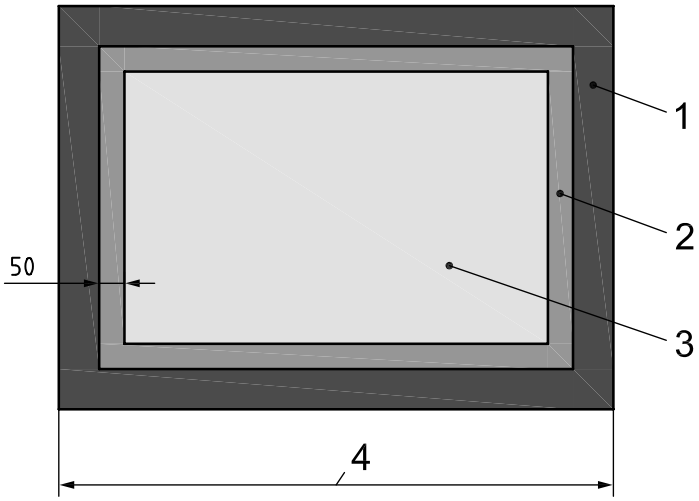
3.1 Requirements

When heated glass panes are installed in windows, they shall comply with the requirements in 3.2 and 3.3.

All the optical requirements shall apply independent of the kind of temperature control (for example, a thermostat).

However, these optical qualities are not required at the periphery of the glass pane within a distance of 50 mm width, see Figure 1.

Dimensions in millimetres



Key

1 edge cover, variable width
2 edge zone
3 main clear vision area
4 pane size (w/h)

Figure 1 — Main clear vision area

3.2 Visibility

Heated glass panes shall ensure perfect visibility in all weather, avoiding the formation of mist or frost, in relation to the heat output, see Table 3. In addition, they shall ensure maximum efficiency of the windscreen wipers when operating in conditions of frost and/or snow. They shall not cause any significant reduction in the ability of a person to see with the naked eye or binoculars when a distant object is observed at normal line of vision through the glass. National and international regulations must be considered.

Tinted glass shall not be used.

3.3 Discoloration

Heated glass panes shall not cause any deterioration in perception of colour, or perceivable discoloration of objects, in particular colours of signal lights and lights on buoys.

4 Construction of glass pane

4.1 General

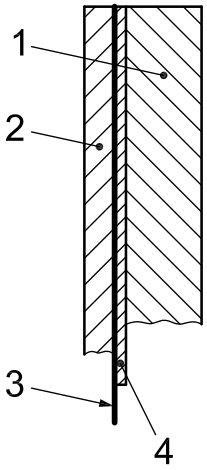
A complete mountable heated glass pane that meets the requirements of this International Standard is an assembly consisting of laminated glass panes and a durable mounted device for the electrical connection.

4.2 Composition and materials

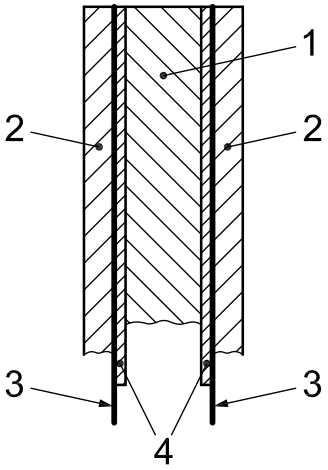
Samples of the composition of the laminated glass panes are shown in Table 1 and Figure 2.

Table 1 — Components of heated glass panes

Item reference (see Figure 1)	Term
1	carrier pane
2	cover pane
3	heating element
4	interlayer



a) Type A, with two laminated glass panes



b) Type B, with three laminated glass panes

Item references are given in Table 1.

Figure 2 — Samples of cross-sections of heated glass panes (not to scale)

4.2.1 Carrier pane

The carrier pane shall be clear single thermally toughened safety glass according to ISO 21005 or equivalent.

The configuration of the window in the ship is specified in ISO 5779:1987.

4.2.2 Cover pane

The cover pane protects the heating element. The material shall be a clear single safety glass pane, toughened or semi-toughened.

4.2.3 Heater element

The heating element consists of a thin wire, a conductive film or a conductive coating ensuring the requirements of 3.3.

4.2.4 Interlayer

The interlayer consists of a thin polymer material, e.g. polyvinyl butyral (PVB) foil.

4.3 Protection of edges

The glass panes shall have edge sealing all around to avoid any penetration of humidity or any other form of chemical attack between the layers of the lamination, and to protect the edges against impact as well as to ensure durable electrical insulation. Materials such as silicone, rubbers, polysulfides or similar shall be used, compatible with the plastic interlayers of the lamination.

This edge protection shall be bonded to the edge not thicker than 3 mm (see Figure 3).

Dimensions in millimetres

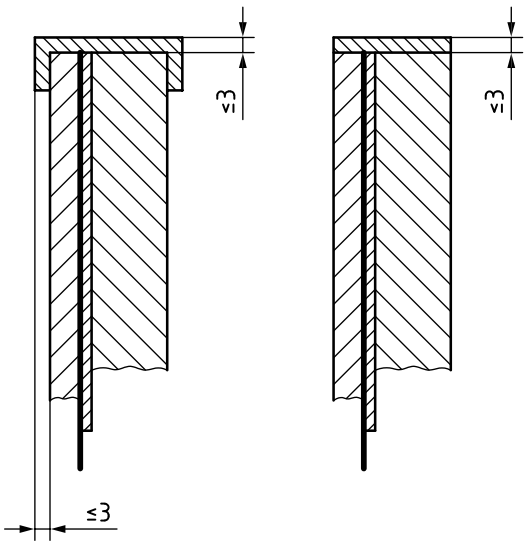


Figure 3 — Protection of edges

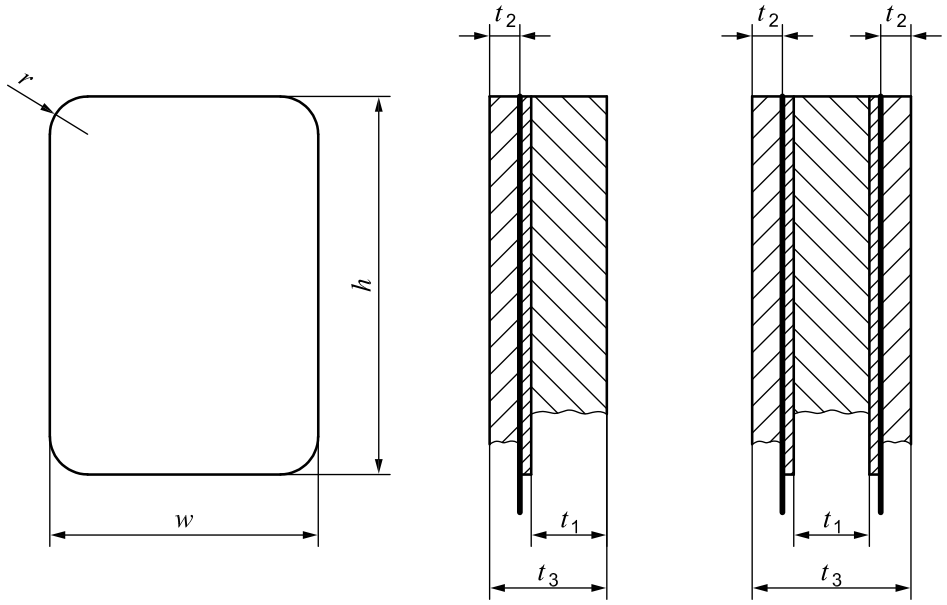
4.4 Dimensions

4.4.1 Dimensioning and glass thickness

The main dimensions of a heated glass pane shall be produced as shown in Figure 4. The dimension t_1 in Figure 4 is in accordance with ISO 21005. Carrier panes shall have thickness t_1. Glass panes in accordance with or equivalent to ISO 21005 shall be used.

NOTE 1 Thickness t_1 is the designating thickness for heated glass panes.

NOTE 2 The nominal sizes of windows are the dimensions of the clear parts allowing the passage of light, including the 50 mm edge zone shown in Figure 1. The sizes are given in accordance with ISO 3903:1993, Table 2. Other sizes that are not listed may be agreed on between the parties concerned.



t_1 nominal thickness of carrier glass pane

t_2 nominal thickness of cover glass pane

Figure 4 — Dimensions of heated glass pane

4.4.2 Tolerances on thicknesses

Tolerances on thicknesses of heated glass panes shall be as given in Table 2.

Table 2 — Tolerances on thicknesses

Dimensions in millimetres

Thickness		Tolerance	
Total, t_3		±1,5	
carrier pane, t_1	8	±0,3	in accordance with ISO 21005
	10		
	12		
	15	±0,5	
	19	±1	
	25	±1	
Cover pane, t_2		±0,3	

4.5 Parallelism

The tolerance on parallelism between the two surfaces of the glass pane shall not exceed 1 mm/1 000 mm, see Figure 5.

Dimensions in millimetres

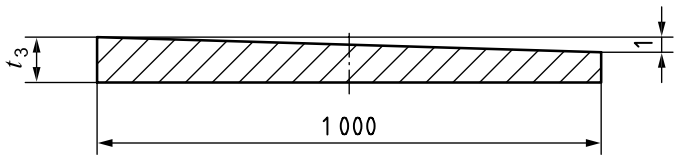


Figure 5 — Parallelism

4.6 Admissible distortion

The tolerance on flatness shall not exceed 3 mm/1 000 mm, see Figure 6.

Dimensions in millimetres

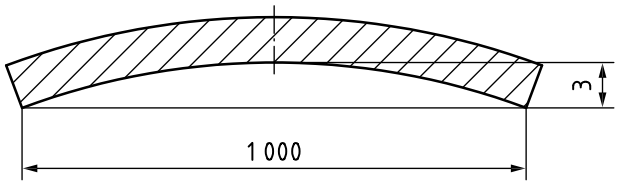


Figure 6 — Flatness

5 Heating circuit

5.1 Heat output

The heat output given in Table 3 is specified for heated panes used for de-misting and de-frosting of the glass at a medium wind velocity and a standard atmosphere 20 °C and 65 % relative humidity as specified in ISO 554:1976, outside the polar regions.

Higher heat output is required for navigation in polar regions; in such a case the manufacturers of heated glass panes shall be consulted

Table 3 — Heat output

Heat output W/dm^2		Outdoor temperatures
min.	max.	
7	9	down to −12 °C
12	15	down to −28 °C
17	21	down to −40 °C

5.2 Electrical power supply

The power supply circuit of the heating for the glass pane shall be aligned with the supply voltage for continuous power supply customary on board of ships, as fixed in IEC 60092-101. The voltage in d.c. or a.c. may be used. For power supply identification systems, see Table 4.

Table 4 — Electrical power supply identification system

Supply	Voltage V	Frequency Hz	Identification no.
d.c.	24	–	01
	110	–	02
	220	–	03
a.c. single phase	115	50	11
		60	12
	230	50	13
		60	14
a.c. three phase	115	50	31
		60	32
	230	50	33
		60	34
	230/400	50	35
		60	36
	440	50	37
		60	38

5.3 Electrical connections

Moisture-proofed connection boxes, with a degree of protection of at least IP22 in accordance with IEC 60529, shall be installed between the heating circuit and the feed cable. These boxes shall be bonded to the inner side of the heated glass pane.

All necessary precautions concerning insulation and earthing of the installation to protect against electrical shock shall be taken. For requirements, see IEC 60092-101.

If in special cases the connection box has to be installed on the glassframe or main frame of the windows, this shall be especially agreed between supplier and customer. In such cases, the glass pane will need to be equipped with suitable cables.

5.4 Overheating protection

Heated glass panes shall be equipped with temperature-limitation devices (regulators) to ensure the heated glass pane does not overheat. Electric power to the heated glass pane must be switched off to ensure the temperature of the glass pane surface does not exceed 50 °C. Two types of such a regulator are specified:

— **Single regulation (S):** the regulator (e.g. a temperature sensor) is mounted directly on the glass pane (interior-side). It affects only the relevant glass pane and is part of original equipment.

— **Group regulation (G):** a separate regulation device — not mounted directly at the window — to which several glass panes are connected appropriately. Relevant information on type and number of these regulation devices is necessary at the time of ordering.

6 Tests

Tests shall be carried out by the heated glass manufacturer.

6.1 Electrical tests

A voltage test shall be carried out on each finished heated glass pane. The test voltage shall be an a.c. voltage of 1 000 V plus twice the rated voltage, with a minimum of 1 500 V. The test frequency shall be 25 Hz to 100 Hz.

The test duration shall be 1 min, and shall cover the electrical circuit from the connection for the heating area to the edge of the glass pane all around.

6.2 Mechanical tests

The carrier pane of the heated glass pane shall be tested in accordance with ISO 614.

6.3 Test certification

The tests in 6.1 and 6.2 should be performed in a laboratory that complies with ISO/IEC 17025 and, where appropriate, a certificate issued. A model test certificate is given in Annex A.

7 Marking

Heated glass panes which meet the requirements of this International Standard shall be marked with a single equilateral triangle in accordance with ISO 614. Examples are given in Figure 7 and Figure 8.

In addition, the following indications shall be added:

a) within the triangle: the total nominal thickness t_3 of the heated glass pane, in millimetres;

b) above the triangle: the heat output per square decimetre;

c) the left side: the voltage and the identification number;

d) the right side: type of glass pane, Type A or Type B.

The marking shall be readable form the interior and shall be situated in a bottom corner of the glass pane.

EXAMPLE 1 A glass pane of Type A (two laminated panes) with a total thickness $t_3 = 15$ mm, a heat output of 7 W/dm^2 to 9 W/dm^2, and an electrical supply of 230 V, 50 Hz, single-phase (identification number 13) shall be marked in accordance with Figure 7.

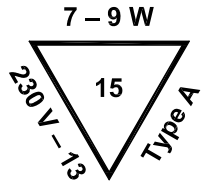


Figure 7 — Marking glass pane Type A

EXAMPLE 2 A glass pane of Type B (three laminated panes) with a total thickness $t_3 = 22$ mm, a power output for two heating elements of 12 W/dm^2 to 15 W/dm^2, and an electrical supply of 440 V, 60 Hz, three-phase (identification number 38) shall be marked in accordance with Figure 8.

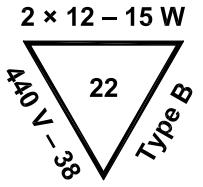


Figure 8 — Marking glass pane Type B

8 Designation

For reference and ordering purposes, heated glass panes conforming to this International Standard shall be designated by indicating the following elements in the order given:

a) denomination (abbreviated): glass pane;

b) number of this International Standard: ISO 3434;

c) type of glass composition: code-letter A or B, see 4.2;

d) minimum power loading, in watts per square decimetre, as specified in Table 3;

e) overheating protection device: code-letter S or G;

f) current rating given by the identification number, as specified in Table 4.

EXAMPLE A heated glass pane, which meets the requirements of this International Standard, composed of two glass panes (Type A), with a carrier pane of glass thickness $t_1 = 15$ mm, minimum heat output 12 W/dm^2 (12 W), with overheating protection device for single-regulation (S), for a.c. single phase supply, voltage 230 V with a frequency of 60 Hz (identification no. 14), is designated as follows:

Glass pane ISO 3434 — A × 15 — 12WS — 14

Annex A
(informative)

Model for test certificate

Manufacturer	Electrically heated bridge windows	Inspection		
			Date	**Name**
TEST CERTIFICATE				
Customer:		Agent:		
Contract number: Order number: Drawing number: Date of manufacture: Standard: ISO 3434 Specification: Laminated toughened glass				
			Specified	**Actual**
Mechanical				
Size of window				
Thickness				
Corner radius				
Number of panes				
Electrical				
Voltage				
Heat output				
Size of heated area				
Resistance of sensing elements at 20 °C				
Resistance of heating element				
Insulation between heating and sensing elements				
Optical tests				
Freedom from scratches				
Clear undistorted vision				
Interlayer defects				
OBSERVATIONS:				

ICS 47.020.10; 47.020.90

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