INTERNATIONAL STANDARD

ISO 22419

First edition
2019-04

Ships and marine technology — Testing specification for handrails using electrical resistance trace heating

Reference number
ISO 22419:2019(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Ships and marine technology — Testing specification for handrails using electrical resistance trace heating

1 Scope

This document specifies a test method to assess the performance of handrails using electrical resistance trace heating to provide anti-icing in low temperature environments, when installed for exterior applications. It includes requirements for the test facility, the test conditions, the test specimens, the test procedures and the test report.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC/IEEE 60079-30-1, *Explosive atmospheres — Part 30-1: Electrical resistance trace heating — General and testing requirements*

IEC/IEEE 60079-30-2, *Explosive atmospheres — Part 30-2: Application guide for design, installation and maintenance*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
heated handrail
handrail that can be heated through a heating device on the handrail to prevent falling accidents

3.2
anti-icing
prevention of ice formation on protected surfaces

3.3
ambient temperature
temperature of the air in the test chamber

4 Construction and materials

Handrails should be designed and constructed using materials that withstand the foreseeable conditions of use. In particular, at least the following details shall be considered:

a) dimensioning and selection of components shall ensure sufficient rigidity and stability;

b) all parts shall be resistant to environmental effects (such as due to climate, chemical agents, corrosive gases) e.g. by the use of a corrosion resistant material or with the aid of a suitable protective coating;

c) heated handrails that contain heat tracing and are installed in hazardous areas shall comply with IEC/IEEE 60079-30-1 and IEC/IEEE 60079-30-2.

NOTE Material selection can be covered in statutory requirements of national/local authorities and/or in IACS requirements for the intended applications.

5 Test method

5.1 Test purpose

The purpose of the test is to evaluate whether or not the heated equipment is capable of preventing the formation of ice and can operate (function) properly when subjected to low temperature operating conditions.

5.2 Test facility requirements

a) The test facility shall have the ability to maintain the specified temperature within the permissible range indicated in 5.3.2, in the available volume.

b) The wind generated by the refrigerating machine installed inside the cold chamber shall not affect the specimen.

c) A wind-speed control system installed inside the cold chamber shall allow to generate a wind at constant speed.

d) All sensors shall be calibrated according to manufacturer directions for the planned test conditions.

5.3 Test conditions

5.3.1 General

The ambient temperature, wind speed, heating media and the test-specimen temperature shall be recorded during the test. The test conditions shall be selected based upon the desired performance of the equipment.

5.3.2 Test temperature

5.3.2.1 General

The equipment shall be tested at the temperature agreed upon between the manufacturer and the purchaser. The test temperature shall be observed after the test-specimen temperature is stabilized according to 5.3.2.2.

The temperature of the wind delivered to the test specimen shall be within ±2 °C of the test condition temperature during the steady state. Where, due to the size of the test chamber, it is not feasible to maintain these tolerances, the tolerances may be widened to ±3 °C down to −25 °C.

A temperature sensor shall be installed between the wind generator and the test specimen to measure the ambient temperature.

5.3.2.2 Temperature stabilization

a) Ambient temperature: once the ambient temperature does not change by ±2 °C over a period of 30 min, it shall be considered as stabilized.

b) Specimen temperature: once the specimen temperature does not change by ±2 °C over a period of 60 min, it shall be considered as stabilized.

5.3.2.3 Temperature sensors

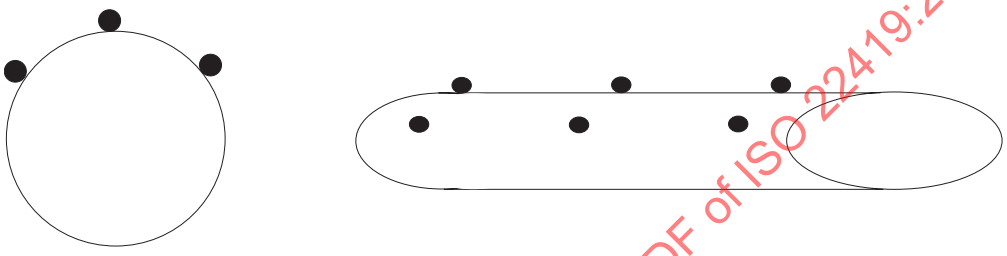
The temperature sensors shall be installed as follows.

a) No less than 9 sample points shall be used.

b) 3 sample points shall be evenly distributed on each of the sides and on top of the specimen (see Figure 1).

c) The temperature sensors used in the testing shall be calibrated according to its manufactures directions for the planned test conditions.

d) Temperature sensors (e.g. thermal imagery or thermo couples) shall be properly adjusted for the emissivity of the material, if applicable, and verified with a secondary measurement.



Front view **Side view (general)**

Figure 1 — Location of the 9 sample points (example)

5.3.3 Test wind

The equipment shall be tested at each wind speed, as agreed upon between the manufacturer and the purchaser.

Wind sensors shall be installed within 10 cm in front of the specimen and within 10 cm above and below, as applicable.

NOTE Depending on the type of wind tunnel used, a lower sensor may not be required.

Wind speed control should maintain the flow rate within 10 %. The wind speed sensor shall be calibrated by the certificate authority.

5.4 Test specimen requirements

5.4.1 General requirement

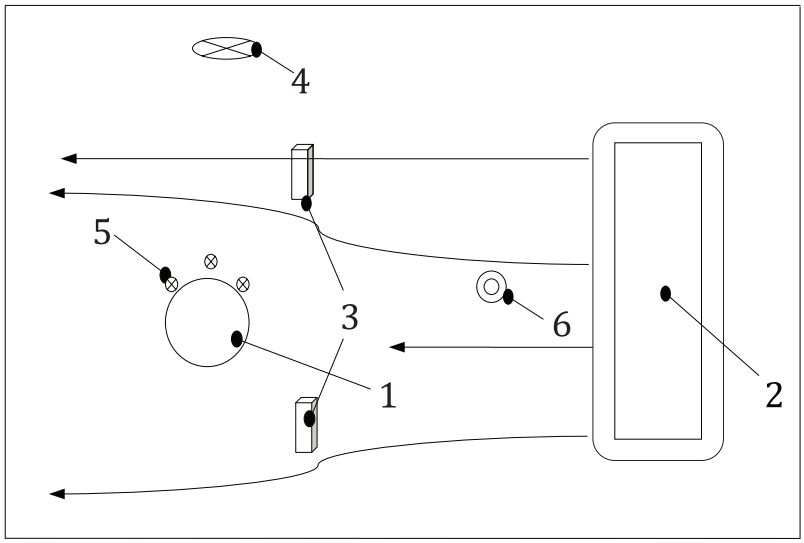
The test specimen shall be installed inside the test facility as specified in Figure 2, in a manner that does not aid the performance of the specimen.

5.4.2 Dimension

The test specimen length should be 1 000 mm.

5.4.3 Installation method

The handrail shall be positioned perpendicular to the wind direction.



Key

1 heated handrail
2 wind generator
3 wind sensor
4 remote sensor
5 contact sensor
6 ambient temperature sensor

Figure 2 — Heated handrail specimen installation

5.5 Test procedures

5.5.1 General

The heated handrail specimen shall be tested using the test procedure specified in 5.5.2 (Option 1). However, the test procedure given in 5.5.3 (Option 2) shall be used when taking into consideration a special event or accident (e.g. blackout or low temperature operating procedures of anti-icing equipment as per the requirements agreed upon by the parties). See Figure 3.

5.5.2 Test procedure — Option 1

a) The test specimen shall be installed per 5.4.3 requirements.

b) The test specimen shall be visually inspected and electrically and mechanically checked.

c) Good workmanship of the test specimen and conformity with the manufacturer's drawings and specifications can be assessed by visual inspection can be assessed by visual inspection.

d) Check the conditions of the measuring equipment and install it according to the test condition given in 5.3.

e) Calibration and functionality of all measuring equipment shall be verified before the test begins.

f) Lower the ambient temperature of the test chamber to 5 °C/0 °C. Once temperature stabilization has been achieved for both the chamber and the test specimen, turn on the electric power of the heating media.

g) Turn on the wind generator as required to meet the test conditions (see 5.3.3). The wind speed to the specimen shall be maintained throughout the test.

h) The wind generator should start operating before lowering the ambient temperature of the cold room to the target temperature, because it may not start operating unless warmed up in low temperature.

i) Set the ambient temperature of the cold room to the specified temperature(s).

j) Once the temperature stabilization has been achieved at the specified testing temperature, record the ambient temperature of the cold chamber and the specimen surface temperature per 5.3.2.3, at 1 min intervals until stabilization is achieved, thermal images and the wind speed as required (refer to Figure 3).

k) For additional testing temperatures repeat steps i) and j).

5.5.3 Test procedure — Option 2

a) The test specimen shall be installed per 5.4.3 requirements.

b) The test specimen shall be visually inspected and electrically and mechanically checked.

NOTE 1 Good workmanship and conformity with the manufacturer's drawings and specifications can be assessed by visual inspection.

c) Check the conditions of the measuring equipment and install it according to the test conditions given in 5.3.

d) The calibration and functionality of all measuring equipment shall be verified before the test begins.

e) Turn on the wind generator as required to meet the test conditions (see 5.3.3). The wind speed to the specimen shall be maintained throughout the test.

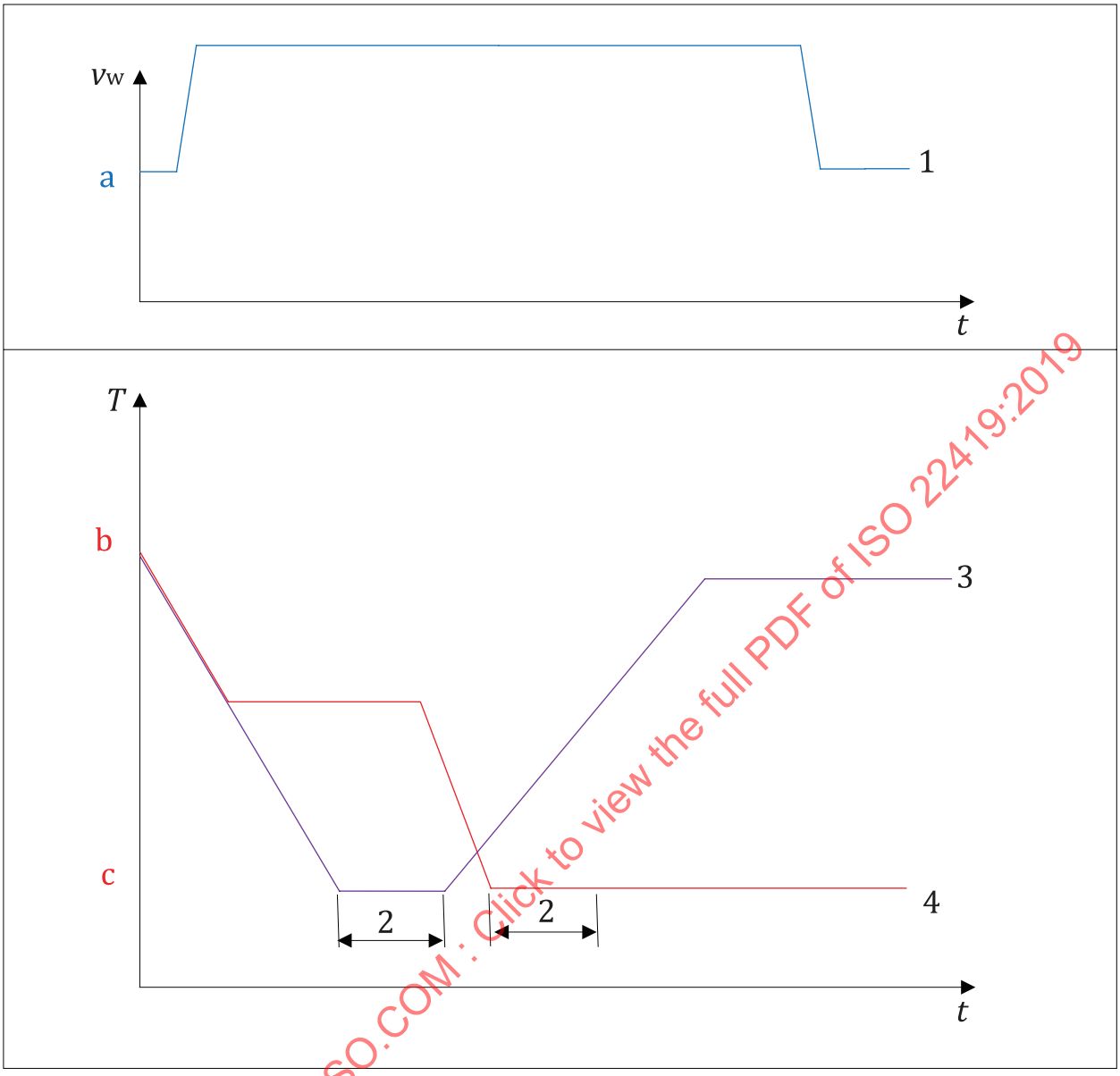
f) The wind generator should start operating before lowering the ambient temperature of the cold room to the target temperature, because it may not start operating unless warmed up in low temperature.

g) Set the ambient temperature of the cold room at the specified testing temperature(s).

h) Once the temperature stabilization has been achieved at the specified testing temperature, the heating media shall be energized.

i) Record the ambient temperature of the cold chamber and the test-specimen surface temperature per 5.3.2.3, at 1 min intervals until stabilization has been achieved.

j) Once stabilization has been achieved, record the ambient temperature of the cold chamber, the test-specimen surface temperature per 5.3.2.3, thermal images and the wind speed.



Key

v_w	wind speed (m/s)	1	stabilized time
t	time (min)	2	wind speed graph
T	test temperature (°C)	3	temperature graph (Option 2)
a	wind speed condition	4	temperature graph (Option 1)
b	ambient room temperature		Curve 4: the plateau portion should be aligned to 5 °C.
c	temperature condition		

Figure 3 — Schematic testing procedures

5.6 Pass/fail criteria

a) The stabilized value of the test-specimen temperature from the 9 sample points shall be constantly stable above 0 °C.

b) The temperatures recorded at each individual sample point shall not be below 0 °C.

6 Test report

The test report shall include the following information:

a) test description:

   — the name of the testing laboratory, the date of the test, a unique test reference and report identification number;

b) the names of the sponsor/customer, the manufacturer:

c) a record of the test details:

   — specimen temperature, ambient temperature, wind speed;

d) manufacture's product description:

   — details of any component (as applicable) e.g. material type, size, material thickness, heating element type, coating type,

   — test specimen serial number (if applicable);

e) report:

   — thermographic report (Remote sensor), temperature graph (contact sensor);

f) images:

   — thermal image, Still (optical) image;

g) list of measuring devices, with types and model:

   — temperature sensor, thermal camera, anemometer, data logger;

h) other:

   — rated voltage,

   — specimen temperature.