INTERNATIONAL STANDARD

ISO 24569

First edition
2023-06

Ships and marine technology — External firefighting system test methods

Navires et technologie maritime — Méthodes d'essai des systèmes de lutte contre les incendies extérieurs

Reference number
ISO 24569:2023(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Maritime safety*.

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.

Introduction

The purpose of this document is to provide a standard for test methods, relevant procedures, and the inspection process of marine external firefighting systems. Moreover, it includes procedures to comprehensively verify the correctness of the installations and the integrity of the external firefighting systems, in order to ensure that the main functions and performance indices of the system meet the specified requirements.

Ships and marine technology — External firefighting system test methods

1 Scope

This document specifies the test methods for marine external firefighting systems after installation aboard, mainly including test preparation, test conditions, test apparatus and procedures. This document excludes the performance requirements of the equipment.

This document is applicable to the testing of external firefighting systems installed on ships for the purpose of extinguishing fires occurring on other vessels, offshore structures or quayside structures.

This document applies to marine external firefighting system with water or foam as the medium.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
external firefighting system
system installed on ships for the purpose of extinguishing fires occurring on other vessels, offshore installation or quayside structures

Note 1 to entry: In general, the system consists of a fire pump, foam pump, fire monitor, foam proportioner, *power source* (3.2), *telescopic mast* (3.5) (if configured), control console, valve accessories and pipeline.

3.2
power source
prime mover which provides driving power for the fire pump

3.3
water curtain system
fixed system that provides protection of the ship on which the system is installed against external heat radiation by water spray

3.4
fire monitor
device for continuously spraying a fire extinguishing agent, where water or foam mixture is greater than 16 l/s, and which is provided by fire pumps and *foam pumps* (3.9) to supply a fire extinguishing agent

3.5
telescopic mast
fixed platform for a *fire monitor* (3.4) installation, driven by power, and which can position the *fire monitor* (3.4) to a certain height

3.6
foam concentrate
foam liquid that, when mixed with water in the appropriate concentration, gives a *foam solution* (3.7)

[SOURCE: ISO 7203-1:2019, 3.8, modified — "foam" added before "concentrate" in the term, and before "liquid" in the definition.]

3.7
foam solution
solution of *foam concentrate* (3.6) and water

[SOURCE: ISO 7203-1:2019, 3.15]

3.8
foam proportioner
device which can automatically control the mixing ratio within a certain range of water pressure and flow

3.9
foam pump
pump that supplies *foam concentrate* (3.6) to a foam system

3.10
length of throw of the fire monitor
distance measured horizontally from the monitor outlet to the mean impact area of water spray

Note 1 to entry: The mean impact area of water spray is measured for not less than 10 s. The *fire monitor* (3.4) outlet end face is measured when the *fire monitor* (3.4) is spraying under specified conditions.

4 Test preparation

4.1 Documents used in the test

The documents required to conduct the test are as follows:

a) schematic diagram of the external firefighting system;

b) layout of the external firefighting system;

c) layout of the water curtain system;

d) installation drawing and related technical documents of the external firefighting system equipment;

e) electrical control schematic diagram of the external firefighting system;

f) layout of the external firefighting system electrical equipment;

g) system operation instructions, ex-factory test documents;

h) system equipment test programme.

4.2 Instruments and tools for the test

The instruments and tools required to conduct the test are as follows:

a) anemometer having an accuracy of 0,5 m/s;

NOTE See ISO 10596:2009, 7.2.

b) pressure gauge;

c) vacuum gauge;

d) megohmmeter;

e) ammeter;

f) voltmeter;

g) range finder;

h) stopwatch having an accuracy of 0,1 s;

i) thermometer having an accuracy of 1 °C;

j) goniometer having an accuracy of 1 degree.

Other instrumentation shall be accurate to within the limits as follows:

k) pressure: ±1 % of the value to measure;

l) length: ±1 % of the value to measure;

m) electrical resistance: ±1,5 % of the actual measurement;

n) voltage: ±1,5 % of the actual measurement;

o) electric current: ±1,5 % of the actual measurement.

5 Test conditions

5.1 The external firefighting system shall be installed on board a ship and shall be in fully operating conditions.

5.2 When measuring the length of throw of the fire monitor, the wind speed shall not be greater than 3 m/s and the fire monitor spray should be along the wind direction.

5.3 There shall be enough operation space around the fire monitor. There shall be no obstacles in the hull that affect the spray range of the fire monitor.

5.4 There shall be no vessels within the range of the fire monitor.

6 Test items and procedures

6.1 Test items

The following tests shall be conducted:

a) insulation resistance test of electrical equipment;

b) operation test of electric valve;

c) operation test of fire monitor;

d) test of control and alarm system;

e) test of fire pump;

f) test of fire monitor;

g) test of foam fire extinguishing system;

h) test of telescopic mast;

i) test of water curtain system and fire hydrant.

6.2 Insulation resistance test of electrical equipment

Measure the insulation resistance of each electrical equipment of the system before and after the test. The minimum value of the insulation resistance shall not be less than 1 MΩ.

6.3 Operation test of electric valve

6.3.1 Electric valves shall be opened and closed by manual and remote control, respectively. The valve movements shall be smooth and free of jamming, the valve open/close position shall be indicated correctly. The operating current and voltage of each electric valve shall be measured. The test shall be conducted while the fire pump is stopped.

6.3.2 Combined with other tests of the external firefighting system, while the fire pump is running, the electric valve shall be opened and closed by remote control. The valve movements shall be smooth and free of jamming, the valve open/close position shall be indicated correctly.

6.4 Operation test of fire monitor

6.4.1 Static control test of fire monitor

6.4.1.1 The test shall be conducted while the fire pump is stopped.

6.4.1.2 Each fire monitor shall be respectively operated by console, portable controller and local manual control mode. The pitching rotation mechanism, horizontal rotation mechanism and the local control hand wheel of each fire monitor shall be operated smoothly without jamming, and the transmission mechanism shall be safe and reliable. The fire monitor shall be able to be fixed in any specified position.

6.4.1.3 Measure the pitching rotating angle and horizontal rotating angle of fire monitor with the goniometer and check if the fire monitor can be fixed in any specified angle.

6.4.1.4 Check whether the function of the limit device of each fire monitor is normal, and whether each fire monitor can stop automatically when it turns to the limit position.

6.4.2 Dynamic operation test of fire monitor

6.4.2.1 The test shall be conducted when the fire pump is started and the fire monitor is working at the rated injection pressure.

6.4.2.2 Check the operation performance of the fire monitor in accordance with 6.4.1.2.

6.4.2.3 Measure the rotation angle of the fire monitor in accordance with 6.4.1.3.

6.4.2.4 Measure the limit device of fire monitor in accordance with 6.4.1.4.

6.5 Test of control and alarm system

6.5.1 Check each alarm indication and buzzer on the fire control console. The display or alarm indicator shall be visual, and the buzzer shall be audible.

6.5.2 The methods of simulating failure or utility test shall be adopted to check various alarm functions of the external firefighting system. When a fault occurs, the corresponding alarm signal shall be sent out at the relevant console.

6.6 Test of fire pump

6.6.1 The function of the start and stop of the fire pump shall be tested. The start and stop shall be smooth and free of abnormalities. The test shall be conducted at least three times.

6.6.2 The function of the starting interlock of the fire pump shall be tested. When the inlet valve of the fire pump is closed, the fire pump shall not be started.

6.6.3 In idle or low speed conditions, the fire pump shall be stopped in an emergency, and the emergency stop function shall be normal and effective.

6.6.4 Each fire pump shall be started and kept running at idle for 10 min. The pump, piping and instrument shall have no abnormal vibration, noise, leakage and other phenomena such a overheating.

6.6.5 The fire pump shall be kept running at normal working conditions for 10 min. The pump, piping, fire monitor and instrument shall have no abnormal vibration, noise, leakage and other phenomena such as overheating. The bearing shell temperature of the fire pump shall be less than 75 °C, and the temperature rise of the bearing shell of the fire pump shall not be more than 35 °C. The lubricating oil temperature, cooling water temperature and other technical parameters of the power source equipment shall be within the range specified in the technical documents of the equipment.

6.6.6 Under normal working conditions, the inlet and outlet pressure of fire pumps shall be measured through the pump inlet and outlet pressure gauge. The measured value shall meet the specified standard of the equipment set by the manufacturer.

6.7 Test of fire monitor

6.7.1 Under the rated working conditions, the jet or fog mode of fire monitor shall be switched, and the switching function shall be normal. The switching time shall be within the specified value of the equipment. The spray angle of the fire monitor shall be measured by a goniometer in the fog mode of the fire monitor, and the spray angle shall meet the specified value of the equipment.

6.7.2 For the fire monitor with dual flow injection function, the flow switching function test shall be conducted under the rated working state, and the switching function shall be normal. The switching time shall be within the specified value of the equipment.

6.7.3 Under normal working conditions while the fire monitor is working on jet mode, the inlet pressure of each fire monitor shall be measured by the inlet pressure gauge of the fire monitor. The measured value shall meet the specified standard of the equipment set by the manufacturer.

6.7.4 Measure the length of throw of the fire monitor by following procedures.

a) The test shall be carried out under calm wind or downwind state where the wind speed is not greater than 3 m/s, and the best angle of the fire monitor shall be adjusted. The length of throw shall be measured along the downwind direction. The test shall be carried out in open water area. During the test, there shall be no ships within the length of throw of the fire monitor.

b) Make the fire monitor spray along the wind direction in the jet mode, observe the pressure gauge installed at the inlet of the fire monitor. When the inlet pressure of the fire monitor reaches the normal working pressure and is stable, measure the length of throw of the fire monitor through the existing radar or range finder on the ship. Other alternative methods approved by the ship owner,

shipyard, manufacturer and other stakeholders may also be used for the measurement of length. The length of throw of the fire monitor shall meet the specified value of the equipment.

Examples of alternative methods:

c) Send a small boat to the mean impact area of water spray of the fire monitor, tie a rope between the small boat and the tested ship, and measure the length of throw by measuring the length of the rope between the boat and the ship.

d) The tested ship is anchored near the dock, and the fire monitor throw water toward the open area of the dock. The length of throw is recorded by measuring the distance between the mean impact area of water spray on the dock and the fire monitor.

6.8 Test of foam fire extinguishing system

6.8.1 When foam extinguishing system is tested, seawater or fresh water shall be used instead of foam concentrate. Foam tanks shall be filled with seawater or fresh water before testing.

6.8.2 Under the normal working conditions, start the foam pump and carry out the utility test. The time shall be not less than 30 min. The test time shall also be determined by considering the volume of the foam tank. The starting current, working current, working voltage, inlet and outlet pressure shall be measured. The measured value shall meet the specified standard of the equipment set by the manufacturer. Foam pump shall have no abnormal vibration and no leakage.

6.8.3 During the foam pump function test, all fire monitors are sprayed with or without foam solution, and the inlet pressure of each fire monitor shall be measured by the inlet pressure gauge of the fire monitor. The measured value shall meet the specified standard of the equipment set by the manufacturer.

6.8.4 In the process of the foam pump utility test, according to the methods specified in 6.7.4, measure the length of throw of the fire monitor. The measuring result shall be no less than the specified value.

6.8.5 Combined with the foam test of the fire monitor, check the working of the foam proportioner, and correct the direction of the flow. The rotation of the adjusting handle shall be smooth without jamming and abnormality. Foam proportioner shall be free of leakage.

6.8.6 Start the mobile foam generator utility test, connected with the water supply pipe and the foam concentrate supply pipe of the mobile foam generator respectively, and open the mobile foam generator. Check the inlet water pressure and the effect making by the mobile foam generator. During the test, check that there is no leakage on the mobile foam generator.

6.9 Test of telescopic mast (if applicable)

6.9.1 Start the hydraulic pump set, raise the telescopic mast to the specified working position and hold on. Then start the fire monitor installed on the telescopic mast and spray for no less than 5 min at the rated flow rate, and then drop to the original position. The lifting test shall be conducted at least three times. The telescopic mast shall be stable in the process of working without abnormal sound, shaking and leakage.

6.9.2 Start the hydraulic pump set, raise the telescopic mast to the specified working position and hold on, then turn off the power and use the emergency auxiliary equipment to lower it. The lifting test shall be conducted at least three times. The emergency auxiliary equipment shall be able to make the telescopic mast fall smoothly and safely homing.