INTERNATIONAL STANDARD

ISO 19921

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Ships and marine technology — Fire resistance of metallic pipe components with resilient and elastomeric seals — Test methods

Navires et technologie maritime — Résistance au feu des composants de tuyaux métalliques avec joints élastiques ou élastomères — Méthodes d'essai

Reference number
ISO 19921:2005(E)

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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.

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 19921 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 3, *Piping and machinery*.

Introduction

The purpose of this International Standard is to establish whether a metallic valve, fitting, coupling or similar piping component that contains a resilient or elastomeric seal can be exposed to fire without losing its function, i.e. without leaking when exposed to normal operating pressure.

Only water is permitted as the test medium. The use of combustible test media is prohibited in order to ensure the safety of operators and the test bench.

The test method in this International Standard is intended to provide reproducible results when combined with the test bench in accordance with ISO 19922.

In case of a request for a flame test under different test conditions, e.g. flame temperature, working pressure or duration of flame application, the test is carried out in accordance with this International Standard with the test bench in accordance with ISO 19922, but under the specific conditions requested.

Ships and marine technology — Fire resistance of metallic pipe components with resilient and elastomeric seals — Test methods

1 Scope

This International Standard specifies test procedures for determining the fire resistance of metallic valves, pipe couplings, and similar pipe components which contain a resilient or elastomeric seal and which are used in ship engineering systems.

The purpose of this International Standard is to determine whether, after the period of fire testing on a test bench which fulfils the requirements of ISO 19922, pipeline components remain tight, and without any failure which could affect their function, even when subjected to proof pressure.

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 19922, *Ships and marine technology — Fire resistance of metallic pipe components with resilient and elastomeric seals — Requirements imposed on the test bench*

3 Designation

The designation of the test for determining the fire resistance is composed of the elements quoted in the example below:

Test ISO 19921 — 30 — 5 — 24 — F

In this designation the elements have the following meaning:

Test: designation.
ISO 19921: number of this International Standard.
30: test duration in minutes.
5: working pressure during flame application, in bar.
24: proof pressure following flame application, in bar.
F: test piece with fire sleeve.

4 Test pieces and preparation

The pipeline components to be tested shall be of a size that allows the flames to completely enclose the test pieces, as required in 7.1.

It shall be agreed between the client and the operator of the test bench how the test pieces are to be attached.

The test pieces may be tested either with or without fire protection coating, subject to agreement. Identification letter B is used for tests without fire sleeve, identification letter F for tests with fire sleeve.

Prior to the test, the test pieces shall be stored at ambient temperature for 24 h.

5 Number of test pieces

The number and size of the test pieces shall be agreed between the client and the operator of the test bench. However, the tests shall be carried out on a minimum of three test pieces of different sizes. The minimum and maximum sizes of the series of components to be qualified shall be tested in all cases.

6 Test bench

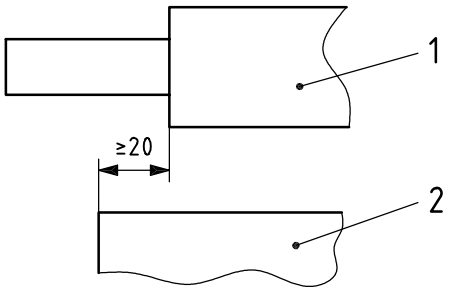
The tests shall be carried out on a test bench which fulfils the requirements of ISO 19922.

7 Test performance

7.1 Installation of test pieces

The test piece shall be installed on the test bench such that the burner extends beyond the test piece by at least 20 mm on all sides (see Figure 1) and that the test piece is completely enclosed by the flames.

Dimensions in millimetres



Key

1 test piece

2 burner

Figure 1 — Installation of test piece

7.2 Preparation

After installation, the test piece shall be rinsed with the test medium (water) for at least 1 min, in order to evacuate as far as possible the air contained in the test piece.

7.3 Measured values and measuring points

The following values shall be measured at the points indicated (see Figure 2):

— water temperature at measuring points a and b;

— flame temperature at measuring point c;

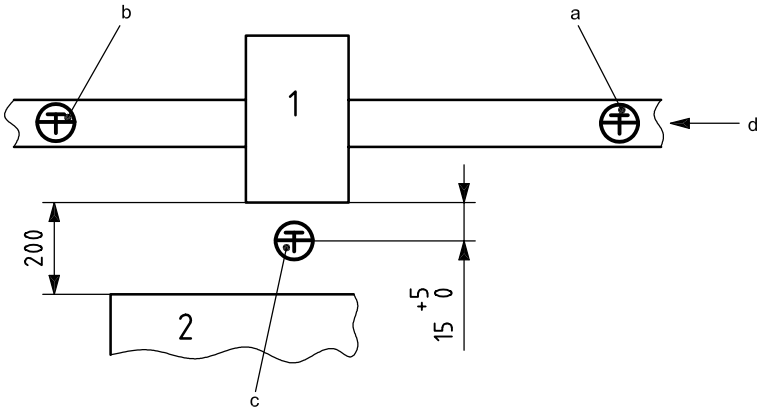
— flow rate of water;

— pressure inside test piece during flame application;

— gas consumption.

All values shall be recorded in intervals of not longer than 2 min.

Dimensions in millimetres



Key

1 test piece

2 burner

a Water temperature at test piece (inlet).

b Water temperature at test piece (outlet).

c Flame temperature below centre of test piece.

d Flow direction.

Figure 2 — Temperature measuring points

7.4 Commencement of test

The test duration starts at the moment the test piece is exposed to the specified test temperatures (flame temperature and flowing water temperature), which shall be reached at the measuring points.

7.5 Test temperatures

The temperatures according to Table 1 shall be adhered to throughout the test. To ensure the water temperatures are maintained as indicated, the velocity of flow shall be controlled accordingly.

Table 1 — Temperatures

Temperature of flowing water at	**temperature measuring point a**	80 °C ± 2 °C
	temperature measuring point b	max. 85 °C
Temperature of flame at temperature measuring point c during test		800 °C ± 50 °C
NOTE Temperature measuring points are shown in Figure 2.		

7.6 Test pressures

The test piece shall be subjected to a working pressure of at least 500 kPa ± 20 kPa (5 bar ± 0,2 bar) for the test.

Alternative working pressures shall be agreed upon.

At the end of flame application, the test piece shall be subjected to proof pressure at ambient temperature for 5 min. The proof pressure shall be at least 1,5 times the nominal or working pressure.

7.7 Test duration

The duration of the test shall be 30 min.

7.8 Heat flux

The heat flux shall correspond to a pre-mix flame of propane with a fuel flow rate of 5 kg/h for a total heat release rate of 65 kW. The gas consumption shall be measured with an accuracy of ± 3 % in order to maintain a constant heat flux. Propane with a minimum purity of 95 % shall be used.

For piping greater than 152 mm in diameter, one additional row of burners shall be included for each 51 mm increase in pipe diameter. A constant heat flux averaging 113,6 kW/m^2 (± 10 %) shall still be maintained at the 12,5 cm ± 1 cm height above the centreline of the burner array. The fuel flow shall be regulated to maintain the designated heat flux, and the specimen shall be completely engulfed in the flame envelope.

8 Assessment

The test piece is considered to have passed the test when it remains tight during the flame test and when subjected to proof pressure after flame application.

In the event of a test piece failing, the test shall be repeated for two test pieces of the nominal diameter having failed. If during the repeat test one test piece fails, the pipeline component of the design presented for testing is regarded as having failed.

If the test pieces pass the test, the pipeline components of the nominal diameters tested, as well as the further sizes in the series according to Table B.1, are approved. See also Clause 5.

NOTE For services other than flammable fluids, a leakage rate of not more than 0,2 l/min is considered acceptable.

9 Test certificate

The test results shall be certified in a test certificate as shown in Annex A.

Annex A
(normative)

Test certificate

Test Certificate **Fire resistance of pipeline components subject to ISO 19921**	**No.**

Details on test piece

Component: Type: ..... According to specification: .....

Nominal diameter: ..... Allowable working pressure: ..... [bar] Proof pressure: ..... [bar]

Manufacturer: Name: .....

Information on installation of test piece on the test bench:

Fire sleeve: .....
Type: .....

Test conditions

Working pressure during the test: ..... [bar] Static test pressure following flame application: ..... [bar]

Duration of flame application: ..... [min] Duration of static pressure load following flame application: ..... [min]

Test results

Water temperature: at test piece inlet: ..... [°C] at test piece outlet: ..... [°C]

Flame temperature: below centre of test pieces: ..... [°C]

Actual test duration: [min] (if different from the duration of flame application as stipulated under test condition)

Tight at test pressure after flame application? □ yes □ no

Measurement records (see Annex) No.: .....

Description of failure

Remarks (e.g. on behaviour in fire)

Assessment: Test passed: □ yes □ no

The test was carried out at: Name of test facility:
Address of test facility:

Inspector (Name): Inspector organization Date of testing:

Annex B
(informative)

Evidence of suitability of other pipeline components via representative nominal bores

A selection of representative nominal bores may be tested in order to evaluate the fire resistance of a series or range of pipeline components, if applicable. The nominal bores to be tested should be agreed upon. Depending on the design of the pipeline components, different nominal bores may be necessary in each case.

If there is no agreement on nominal bores, the stipulations in Table B.1 are applicable.

Table B.1 — Evidence of suitability of other pipeline components on the basis of the nominal bore D_N

Nominal bore of the pipeline component tested D_N	Other nominal bores, the suitability of which is deemed to have been proven D_N
8	8, 10, 15
10	10, 15, 20
15	15, 20, 25
20	20, 25, 32, 40
25	25, 32, 40, 50
32	32, 40, 50, 65
40	40, 50, 65, 80
50	50, 65, 80, 100
65	65, 80, 100, 125
80	80, 100, 125, 150
100	100, 125, 150, 200
125	125, 150, 200, 250
150	150, 200, 250, 300
200	200, 250, 300, 350, 400
250	250, 300, 350, 400, 450, 500
300	300, 350, 400, 450, 500, 600

Annex C
(informative)

Pipeline components that can be fire-test qualified using this International Standard

The following are examples of metallic piping components that can contain elastomeric seals and can be tested according to this International Standard on a test bench fulfilling the requirements of ISO 19922:

- pipe fittings such as
  - couplings designed to ISO 15837,
  - compression fittings,
  - flanges,
  - gate valves,
  - butterfly valves,
  - cocks,
  - all kinds of filters including spin on filters;
- metallic expansion joints and other flexible parts, excluding hoses and hose assemblies.

Bibliography

[1] ISO 15837, *Ships and marine technology — Gasketed mechanical couplings for use in piping systems — Performance specification*

ICS 47.020.30; 47.020.99

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