TECHNICAL SPECIFICATION

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Petroleum, petrochemical and natural gas industries — Method of test for fire dampers

Industries du pétrole, de la pétrochimie et du gaz naturel — Méthode d'essai des clapets coupe-feu

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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 27469 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

Introduction

The purpose of this International Technical Specification is to enable evaluation of the ability of a fire damper installation to maintain the integrity of fire rated barriers. Typical fire barrier ratings are given in ISO 13702:1999, Table C.5.

The following performance criteria are evaluated by this Technical Specification:

a) fire integrity and insulation: to limit/control the spread of radiated and conducted heat at the protected side of a fire damper installation; it is necessary to determine the distance from the damper's blades, in free air or along a duct, where temperatures do not exceed requirements;

b) ability to provide protection from both hydrocarbon pool fires and jet fires;

c) leakage past closed blades;

d) ability to withstand overpressure that can arise from an explosion.

This Technical Specification is based on the use of existing approved fire research and testing facilities. Specially constructed facilities can be required for testing blast pressure withstand capability. It is important that test dampers be installed in a manner that represents their design installation.

In carrying out the tests described in this Technical Specification, it is necessary to refer to other standards connected with the fire-testing of materials and application in the petroleum and natural gas industries. The test methods simulate thermal and overpressure conditions that can result from fire and explosion. The conditions in a real incident can be different, so the test results and resultant damper designations do not guarantee safety but can be used as elements of a fire and explosion risk assessment that takes into account all other pertinent factors.

NOTE It is planned to determine some aspects of this Technical Specification during the development and testing stage.

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CAUTION - Attention is drawn to the fact that fire testing is hazardous and that there is a possibility that toxic fumes, smoke and/or gases can be evolved during tests. Mechanical and operational hazards can also occur during construction of the test elements or structures, their testing and disposal of test residues.

It is essential that an assessment of all potential hazards and risks to health be made and safety precautions identified and provided, including appropriate training to relevant personnel.

1 Scope

This Technical Specification specifies a method for determining the following:

a) ability of fire dampers installed in ventilation systems to prevent the spread of fire and heat through designated fire divisions; typical ratings are given in ISO 13702:1999, Table C.5.

b) fire damper operational reliability in the petroleum, petrochemical and natural gas industries, particularly offshore installations;

NOTE It is planned to determine the methodology during the testing and development phase.

c) ability of fire dampers installed in ventilation systems to withstand blast overpressures that may result from the explosion of a flammable gas.

This Technical Specification applies to different start-up operations for different types of furnace and, therefore, tolerances in test conditions at the beginning of the test are not described in detail. The fire test enables only a limited assessment of the actuating mechanism being carried out and additional tests can be necessary to fully evaluate its operational reliability.

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 834-1, *Fire-resistance tests — Elements of building construction — Part 1: General requirements*

ISO 13702:1999, *Petroleum and natural gas industries — Control and mitigation of fires and explosions on offshore production installations — Requirements and guidelines*

ISO 15138, *Petroleum and natural gas industries — Offshore production installations — Heating, ventilation and air-conditioning*

ISO 22899-1:2007, *Determination of the resistance to jet fires of passive fire protection materials — Part 1: General requirements*

EN 1363-1, *Fire resistance tests — Part 1: General requirements*

EN 1363-2:1999, *Fire resistance tests — Part 2: Alternative and additional procedures*

3 Terms and definitions

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

3.1
fire damper
mechanical device designed to close off an air duct or aperture and prevent the passage of fire

3.2
connecting duct
duct section between the fire damper and supporting construction

3.3
extension duct
duct section on the unexposed side of the fire damper and on which the test temperature sensors are located

3.4
test specimen
fire damper, connecting duct, extension duct, insulation and (as applicable) the perimeter penetration sealing system

3.5
test construction
complete assembly of the test specimen and the supporting construction

3.6
fire-damper actuating mechanism
mechanism, integral or directly associated with the fire damper that when initiated by the thermal release device, causes the movable components of the damper to change from the “open” to the “closed” position

3.7
thermal release mechanism
thermally actuated device designed to respond to a rise in temperature and release the fire-damper actuating mechanism/blades at a predetermined temperature

NOTE It can interface with mechanically, electrically, electronically, or pneumatically operated mechanisms that are positioned integrally or remotely from the device

3.8
pool fire
combustion of flammable or combustible hydrocarbon liquid spilled and retained on the surface

3.9
jet fire
ignited discharge of flammable material under pressure

3.10
exposed
facing the fire

3.11
unexposed
facing away from the fire

4 Testing

4.1 Test types

The following different types of test shall be required:

a) hydrocarbon pool fire;

b) jet fire;

NOTE Procedure details will be defined during the development and testing stage.

c) blast pressure.

4.2 Hydrocarbon pool fire test

4.2.1 General test procedure

The test shall be carried out in accordance with ISO 834-1, except where amended by this Technical Specification. The time-temperature curve shall be in accordance with EN 1363-2:1999, 4.1 and Figure 1.

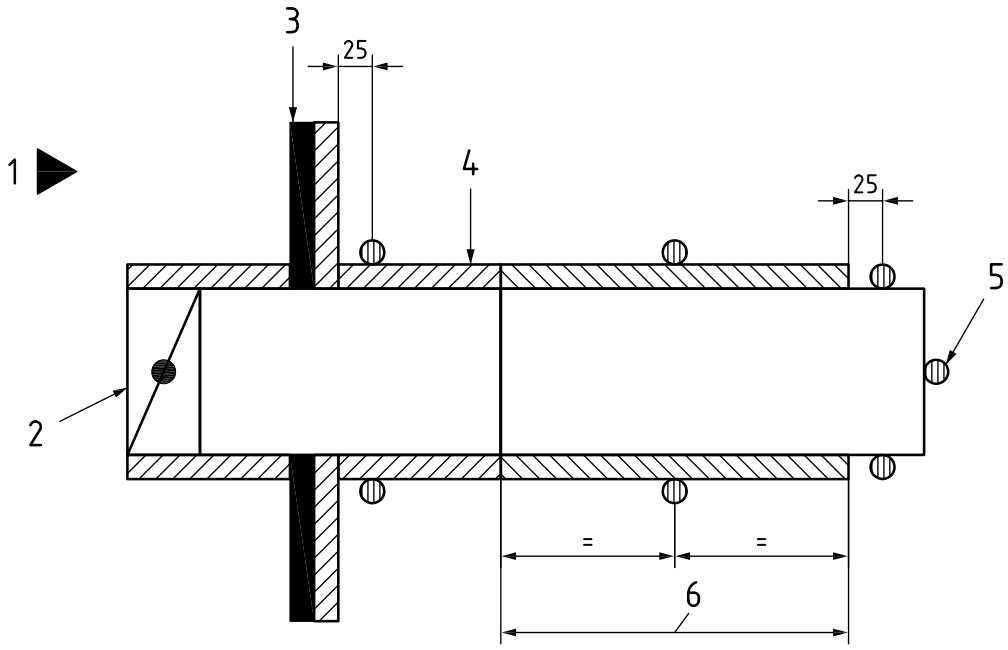
4.2.2 Test environment

The test shall be carried out in an environment in which the effects of weather do not significantly affect the test. The test specimen should be shielded from the effects of a high wind and testing should not be carried out if wind speed in the immediate vicinity exceeds 3 m/s. The ambient temperature range for the test is −10 °C to +40 °C.

4.2.3 Specimen mounting

The test specimen comprised of the damper assembly, ducting sections and supporting structure shall be constructed in accordance with an approved “H” rating design and insulated to a H120 rating on the stiffened external face of the furnace. Vertical and horizontal arrangements should be of similar construction. The fire damper should be fixed in position in the same manner as intended for a design installation and should be as close to the fire barrier division as possible. Extension ducts and insulation shall be provided as required to meet thermal performance criteria and to enable measurement of temperatures arising from radiated, conducted and convected heat on the unexposed side of the fire damper. Typical arrangements are shown in Figures 1, 2, 3 and 4.

Dimensions in millimetres



Key

1 furnace
2 fire damper
3 structural steel core
4 insulation material
5 temperature sensing device
6 define by testing

Figure 1 — Fire damper installed inside the furnace

Dimensions in millimetres

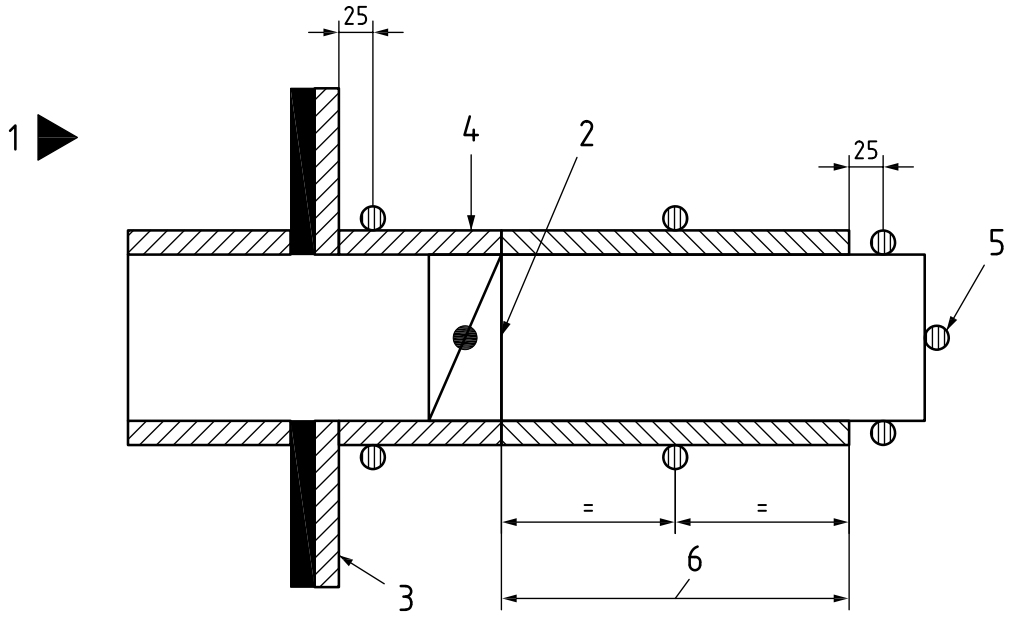


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Figure 2 — Fire damper installed outside the furnace