

ISO/FDIS 12736-1:2023 (E)

ISO/TC 67/SC 2

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**Petroleum**Oil and **natural**gas industries **including lower carbon energy** — Wet thermal insulation systems for pipelines and subsea equipment — Part 1: Validation of materials and insulation systems

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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.

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This first edition of ISO 12736-1, together with ISO 12736-2 and ISO 12736-3, cancels and replaces ISO ISO 12736:2014.

The main changes are as follows:

- clearer delineation between validation and projects;
— introduction of material classes;
— modification of material property testing requirements, including detailed thermal conductivity testing requirements;
— introduction of additional long-term testing requirements;

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- introduction of additional system testing requirements, including system interfaces;
- removal of project specific testing requirements;
- addition of requirement for risk-based analysis of the system long-term performance;
- modifications of the format and content requirements of the final validation dossier;
- addition of Annex A with guidelines guidance for using this document.

A list of all parts in the ISO 12736 series can be found on the ISO website.

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](http://www.iso.org/members.html).

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**Introduction**

~~Annex A further clarifies the intended use of this document.~~

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# Oil and natural gas industries including lower carbon energy — Wet thermal insulation systems for pipelines and subsea equipment — Part 1: Validation of materials and insulation systems

## 1 Scope

This document specifies requirements for the validation of wet thermal insulation systems applied to pipelines and subsea equipment in the petroleum oil and natural gas industries industry.

This document is applicable to wet thermal insulation systems submerged in seawater.

This document does not apply to:

- maintenance works on existing installed wet thermal insulation systems;
- qualification for anti-corrosion coating;
- thermal insulation in the annulus of a steel pipe-in-pipe system.

## 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.

ISO 34-1, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces*

ISO 34-2, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 2: Small (Delft) test pieces*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 178, *Plastics — Determination of flexural properties*

ISO 179-1, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test*

ISO 527 (all parts), *Plastics — Determination of tensile properties*

ISO 604, *Plastics — Determination of compressive properties*

ISO 844, *Rigid cellular plastics — Determination of compression properties*

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ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

ISO 1183 (all parts), *Plastics — Methods for determining the density of non-cellular plastics*

ISO 6721-1, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles*

ISO 8301, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Heat flow meter apparatus*

ISO 8302, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus*

ISO 11357-1, *Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles*

ISO 11357-4, *Plastics — Differential scanning calorimetry (DSC) — Part 4: Determination of specific heat capacity*

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 12736-2, *PetroleumOil and natural-gas industries including lower carbon energy — Wet thermal insulation systems for pipelines and subsea equipment — Part 2: Qualification processes for production and application procedures*

ISO 12736-3, *PetroleumOil and natural-gas industries including lower carbon energy — Wet thermal insulation systems for pipelines and subsea equipment — Part 3: Interfaces between systems, field joint systems, field repairs, and pre-fabricated insulation*

ISO 15711, *Paints and varnishes — Determination of resistance to cathodic disbonding of coatings exposed to sea water*

ISO 80000-1, *Quantities and units — Part 1: General*

ASTM D575, *Standard Test Methods for Rubber Properties in Compression*

[ISO 80000-1, Quantities and units — Part 1: General](#)

### 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

##### agreed

specified in the purchase order

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Note 1 to entry: To be discussed by the *system provider* (3.3837) and *system purchaser* (3.3938) with input from end user (3.8) as required.

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**3.2 application procedure specification**  
**APS**

quality specification document, or group of specifications, describing procedures, method, equipment, tools, etc. used for *system* (3.3635) application

**3.3 batch**

quantity of *material* (3.1918) produced in a continuous manufacturing operation using raw materials of the same source or grade

**3.4 blown foam**

insulation *material* (3.1918) formed by incorporating a gas phase into a polymer matrix

**3.5 certificate of analysis**

document provided by the manufacturer that indicates results of specific tests or analysis, including test methodology, performed on a specified lot of the manufacturer's product and corresponding conformity ranges

**3.6 construction joint**

*interface* (3.1413) where both *systems* (3.3635) are identical

**3.7 cutback**

length of item left uncoated at each end for joining purposes

Note 1 to entry: Welding is an example of joining purposes.

**3.8 end user**

*company that owns and/or operates the pipeline* (3.23) or *subsea equipment* (3.34)

**3.9 field joint**

uncoated area that results when two pipe sections, or a pipe section and a *fitting* (3.109), with *cutbacks* (3.7) are assembled by welding or other methods

**3.109 fitting**

receptacle on a piece of *subsea equipment* (3.3433), which interfaces to a *pipeline* (3.2322)

**3.110 high molecular weight precursor thermoset**

*material* (3.1918), which is a polymeric compound that remains malleable until application of sufficient heat to cause network formation and then does not flow upon reheating

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EXAMPLE Butyl rubber.

### 3.1211

#### inorganic syntactic foam

insulation material (3.1918) formed by dispersing inorganic hollow particles within a polymer matrix

### 3.1312

#### inspection and test plan

##### ITP

document providing an overview of the sequence of inspections and tests, including appropriate resources and procedures

### 3.1413

#### interface

location where two *systems* (3.3635) meet and affect each other

Note 1 to entry: A *field joint* (3.98) *system* (3.3635) has two interfaces.

Note 2 to entry: In the case of multilayer *systems* (3.3635), interfaces can be made up of multiple sub-interfaces.

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### 3.1514

#### jumper

short section of *pipeline* (3.2322) that transfers fluid between two pieces of *subsea equipment* (3.3433)

### 3.1615

#### liquid precursor elastomeric thermoset

*material* (3.1918), which is a polymeric compound with its glass transition below ambient temperature, that is produced via the combination of one or more components that can be pumped and flow as liquids and ~~which~~that react to create a crosslinked polymer that does not flow upon reheating

EXAMPLE Liquid precursor silicone rubber.

### 3.1716

#### liquid precursor non-elastomeric thermoset

*material* (3.1918), which is a polymeric compound with its glass transition above ambient temperature, that is produced via the combination of one or more components that can be pumped and flow as liquids and ~~which~~that react to create a crosslinked polymer that does not flow upon reheating

EXAMPLE Liquid epoxy.

### 3.1817

#### mainline

portion of a *pipeline* (3.2322) that is not a *field joint* (3.98)

### 3.1918

#### material

polymeric compound applied to the *substrate* (3.35) ~~to be~~34) protected ~~or~~ insulated in units of discrete thickness (layers) to build up a *system* (3.3635)

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### 3.2019

#### material manufacturer

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~~legal~~ entity responsible for the manufacture of one or more *materials* (3.4918) utilized in a *system* (3.3635)

**3.2420**

**material maximum and minimum rated temperature**

maximum and minimum temperature to which a particular *material* (3.4918) can be continuously exposed, as per *system provider* (3.3837) recommendation, during storage or in service as part of a *system* (3.3635)

Note 1 to entry: For multi-layer systems, the material maximum rated temperature can be less than the *system maximum rated temperature* (3.3736).

**3.2221**

**maximum rated pressure**

maximum hydrostatic pressure to which the *system* (3.3635) can be exposed, according to the *system provider* (3.3837)

**3.2322**

**pipeline**

**flowline**

tubular piping used to convey fluids

Note 1 to entry: Pipeline includes *jumpers* (3.4514), *risers* (3.2928) and *field joints* (3.98).

**3.2423**

**pre-fabricated insulation**

section of stand-alone insulation, which is factory manufactured into its final form and then installed in the field by mechanically fastening or bonding to a corrosion protected structure

**3.2524**

**pre-production trial**

**PPT**

series of tests performed immediately before the start of production, designed to demonstrate that the requirements of the *validated* (3.4443) *system* (3.36) ~~and/or~~ (35), ~~the procedure qualification trial~~ (3.2625) ~~or both~~ are achieved

Note 1 to entry: Requirements for PPT ~~are~~ shall be as outlined in ISO 12736-2 or ISO 12736-3 and as *agreed* (3.1).

**3.2625**

**procedure qualification trial**

**PQT**

series of tests designed to demonstrate that the *materials* (3.4918), *system provider* (3.3837), equipment and procedures can produce ~~the~~ *system* (3.3635) in accordance with the *validation dossier* (3.4544) and meet specific *project* (3.2726) requirements

Note 1 to entry: Requirements for PQT ~~are~~ shall be as outlined in ISO 12736-2 or ISO 12736-3 and as *agreed* (3.1).

**3.2726**

**project**

scope of work *agreed* (3.1) upon contractually between *system purchaser* (3.3938) and *system provider* (3.3837)

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