

# SLOVENSKI STANDARD

## SIST EN ISO 24817:2017

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Nadomešča:

SIST EN ISO 24817:2015

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**Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Popravila cevovodov s kompozitnimi materiali - Ocenitev in načrtovanje, montaža, preskušanje in nadzor (ISO 24817:2017, popravljena različica 2018-01-01)**

Petroleum, petrochemical and natural gas industries - Composite repairs for pipework - Qualification and design, installation, testing and inspection (ISO 24817:2017, Corrected version 2018-01-01)

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Erdöl-, petrochemische und Erdgasindustrie - Reparatur von Rohrleitungen mit Verbundwerkstoffen - Bewertung und Ausführung, Montage, Test und Inspektion (ISO 24817:2017, korrigierte Fassung 2018-01-01)

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Industries du pétrole, de la pétrochimie et du gaz naturel - Réparations en matériau composite pour canalisations - Qualification et conception, installation, essai et inspection (ISO 24817:2017, Version corrigée 2018-01-01)

**Ta slovenski standard je istoveten z: EN ISO 24817:2017**

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**ICS:**

75.180.20      Predelovalna oprema      Processing equipment

**SIST EN ISO 24817:2017**

**en,fr,de**

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EUROPEAN STANDARD

**EN ISO 24817**

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2017

ICS 75.180.20

Supersedes EN ISO 24817:2015

English Version

**Petroleum, petrochemical and natural gas industries -  
Composite repairs for pipework - Qualification and design,  
installation, testing and inspection (ISO 24817:2017,  
Corrected version 2018-01-01)**

Industries du pétrole, de la pétrochimie et du gaz naturel - Réparations en matériau composite pour canalisations - Conformité aux exigences de performance et conception, installation, essai et inspection (ISO 24817:2017, Version corrigée 2018-01-01)

Erdöl-, petrochemische und Erdgasindustrie - Reparatur von Rohrleitungen mit Verbundwerkstoffen - Bewertung und Ausführung, Montage, Test und Inspektion (ISO 24817:2017, korrigierte Fassung 2018-01-01)

This European Standard was approved by CEN on 5 September 2017.

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SIST EN ISO 24817:2017

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## European Foreword

This document (EN ISO 24817:2017) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" the secretariat of which is held by NEN.

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INTERNATIONAL  
STANDARD

ISO  
24817

Second edition  
2017-08

Corrected version  
2018-01

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**Petroleum, petrochemical and natural  
gas industries — Composite repairs  
for pipework — Qualification and  
design, installation, testing and  
inspection**

*Industries du pétrole, de la pétrochimie et du gaz naturel —  
Réparations en matériau composite pour canalisations — Conformité  
aux exigences de performance et conception, installation, essai et  
inspection*

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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.

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 (see [www.iso.org/directives](http://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 (see [www.iso.org/patents](http://www.iso.org/patents)).

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For an explanation on 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document 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*.

This second edition cancels and replaces the first edition (ISO 24817:2015), which has been technically revised.

This corrected version of ISO 24817:2017 incorporates the following correction:

- in [7.5.7, Formula \(15\)](#), “D4” has been replaced by “D<sup>4</sup>”.

**ISO 24817:2017(E)****Introduction**

The objective of this document is to ensure that pipework, pipelines, tanks and vessels repaired using composite systems that are qualified, designed, installed and inspected using this document will meet the specified performance requirements. Repair systems are designed for use within the petroleum, petrochemical and natural gas industries, and also within utility service applications. The main users of this document will be plant and equipment owners of the pipework and vessels, design contractors, suppliers contracted to provide the repair system, certifying authorities, installation, maintenance and inspection contractors.

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# Petroleum, petrochemical and natural gas industries — Composite repairs for pipework — Qualification and design, installation, testing and inspection

## 1 Scope

This document gives requirements and recommendations for the qualification and design, installation, testing and inspection for the external application of composite repair systems to corroded or damaged pipework, pipelines, tanks and vessels used in the petroleum, petrochemical and natural gas industries.

## 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 75-3, *Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 527-4, *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*

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

ISO 10952, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Determination of the resistance to chemical attack for the inside of a section in a deflected condition*

ISO 11357-2, *Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature and glass transition step height*

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

ISO 14692, *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping*

ASTM C581, *Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Reinforced Structures Intended for Liquid Service*

ASTM D543, *Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents*

ASTM D696, *Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between Minus 30°C and 30°C with a Vitreous Silica Dilatometer*

ASTM D1598, *Standard Test Method for Time-to-Failure of Plastic Pipe under Constant Internal Pressure*

ASTM D1599, *Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings*

ASTM D2583, *Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor*

ASTM D2992, *Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings*

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ASTM D3039, *Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials*

ASTM D3165, *Standard Test Method for Strength Properties of Adhesives in Shear by Tension Loading of Single-Lap-Joint Laminated Assemblies*

ASTM D3681, *Standard Test Method for Chemical Resistance of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe in a Deflected Condition*

ASTM D5379, *Standard Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method*

ASTM D6604, *Standard Practice for Glass Transition Temperatures of Hydrocarbon Resins by Differential Scanning Calorimetry*

ASTM E831, *Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis*

ASTM E1640, *Standard Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis*

ASTM E2092, *Standard Test Method for Distortion Temperature in Three-Point Bending by Thermomechanical Analysis*

ASTM G8, *Standard Test Methods for Cathodic Disbonding of Pipeline Coatings*

BS 7910, *Guide to methods for assessing the acceptability of flaws in metallic structures*

EN 59, *Methods of testing plastics — Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor (BS 2782-10, Method 1001; Measurement of hardness by means of a Barcol impressor)*

EN 1465, *Adhesives — Determination of tensile lap shear strength of rigid-to-rigid bonded assemblies*

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**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 <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

**3.1****anisotropic**

exhibiting different physical properties in different directions

**3.2****Barcol hardness**

measure of surface hardness using a surface impresser

**3.3****blister**

air void between layers within the laminate visible on the surface as a raised area

**3.4****composite**

thermoset resin system that is reinforced by fibres

**3.5****crack**

split in the laminate extending through the wall (perpendicular to the surface) such that there is actual separation with opposite surfaces visible

**3.6****cure  
curing**

setting of a thermosetting resin system, such as polyester or epoxy, by an irreversible chemical reaction

**3.7****cure schedule**

time-temperature profile qualified to generate a specified  $T_g$  or HDT

**3.8****defect type A**

defect within the substrate, not through-wall and not expected to become through-wall within the repair design lifetime of the repair system

**3.9****defect type B**

through-wall defect or a defect within the substrate where at the end of service life the remaining wall thickness is less than 1 mm

**3.10****defined lifetime**

actual application or service lifetime of the repair

**3.11****delamination**

area between the repair laminate and the substrate which should be bonded together but where no bond exists, or an area of separation between layers in the repair laminate

**3.12****design lifetime**

maximum application lifetime of the repair

**3.13****differential scanning calorimetry****DSC**

method of determining the glass transition temperature of a thermosetting resin

**3.14****dry spot or un-impregnated/dry fibre**

area of fibre not impregnated with resin, with bare, exposed fibre visible

**3.15****engineered repair**

repair which has been designed and applied under a specified, controlled process so that under the design conditions, there is a high degree of confidence that the repair will maintain its integrity over the design lifetime

**3.16****exposed fibre**

area of fibre not impregnated with resin that projects from the body of the repair

**3.17****foreign matter**

any substance other than the reinforcing fibre or other materials that form part of the repair system

**3.18****finishing materials**

final layer of material to help compact the repair laminate, typically a polymeric film or a fabric

Note 1 to entry: They should be fully removed after the repair has hardened and before the repair is inspected or painted.