

# **SLOVENSKI STANDARD**

## **oSIST prEN ISO 17782:2016**

**01-november-2016**

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**Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina -  
Proizvajalčeva kvalifikacija posebnih materialov (ISO/DIS 17782:2016)**

Petroleum, petrochemical and natural gas industries - Qualification of manufacturers of special materials (ISO/DIS 17782:2016)

Erdöl-, petrochemische und Erdgasindustrie - Herstellerqualifizierung von Sonderwerkstoffen (ISO/DIS 17782:2016)

Industries du pétrole, de la pétrochimie et du gaz naturel - Qualification des fabricants de matériaux spéciaux (ISO/DIS 17782:2016)

**Ta slovenski standard je istoveten z: prEN ISO 17782**

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### Petroleum, petrochemical and natural gas industries — Qualification of manufacturers of special materials

*Industries pétrolière, pétrochimique et du gaz naturel — Qualification des fabricants de matériaux spéciaux*

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

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ISO 17782 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Working Group 8.

## Introduction

This International Standard is based on NORSOK M-650, 4<sup>th</sup> edition, which was developed by the Norwegian petroleum industry to ensure adequate safety, value added and cost effectiveness for petroleum industry developments and operations.

The qualification requirements provide a scheme for manufacturers to demonstrate their competence and experience to manufacture the relevant material grades and product forms. The intention is that a manufacturing procedure qualification record (MPQR) accepted by one customer should also be acceptable for other customers, within the essential variables of this International Standard.

To achieve qualification, a Qualifying Company would need to be engaged. For specific orders, a Qualifying Company can be engaged through projects by Companies or Main Contractors. Manufacturers who wish to qualify without having a specific order for a project can in such cases contact a Qualifying Company known in the market. There is no established list of Qualifying Companies within the petroleum, petrochemical and natural gas industries.

This International Standard includes the following annexes that are either normative or informative:

- Annex A provides the Manufacturing Procedure Summary front page and examples (informative);
- Annex B contains the Temperature Uniformity Survey with additional requirements to Annex M of ISO 10423:2009 and ASTM A991-10 (normative);
- Annex C provides an example of verification of the heat treatment procedure (informative);
- Annex D contains requirements related to fasteners (normative);
- Annex E contains requirements related to induction bending in the case of testing for qualification of bends without post-bend heat treatment (normative);
- Annex F contains requirements for the assessment of testing laboratories (normative);
- Annex G provides the Manufacturing Procedure Qualification Record front page (normative).

# Petroleum, petrochemical and natural gas industries — Qualification of manufacturers of special materials

## 1 Scope

This International Standard establishes a set of qualification requirements to verify that the Manufacturer of special materials for the petroleum, petrochemical and natural gas industries has sufficient competence and experience of the relevant material grades of metal, and the necessary facilities and equipment, to manufacture these materials in the required shapes and sizes with acceptable properties according to the applicable standard, material specification and/or material data sheet specified by the Purchaser.

This International Standard is applicable to the qualification of Manufacturers of various materials, product forms and manufacturing processes when specified by the Purchaser. This International Standard has been established considering especially, but not exclusively:

- a) duplex stainless steel;
- b) high alloyed austenitic stainless steel;
- c) nickel-based alloys;
- d) titanium and its alloys.

This International Standard also is applicable to the special processes of induction bending, cold bending of tubes and strain-hardened products.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3834-2, *Quality requirements for fusion welding of metallic materials — Part 2: Comprehensive quality requirements*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ISO 10423:2009, *Petroleum and natural gas industries — Drilling and production equipment — Wellhead and christmas tree equipment*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 14343, *Welding consumables — Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels — Classification*

ISO 15590-1, *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems — Part 1: Induction bends*

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ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ASME Boiler and Pressure Vessel Code, Section II, Materials, Part C, *Specifications for welding rods, electrodes, and filler metals* (also referred to ASME II Part C)

ASME Boiler and Pressure Vessel Code, Section IX: *Welding and Brazing Qualifications* (also referred to ASME IX)

ASTM A370-14, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A991-10, *Standard Test Method for Conducting Temperature Uniformity Surveys of Furnaces Used to Heat Treat Steel Products*

ASTM E407, *Standard Practice for Microetching Metals and Alloys*

EN 10204, *Metallic products — Types of inspection documents*

### 3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO 9000 and the following apply.

#### 3.1 Terms and definitions

##### 3.1.1

##### **continuous furnace**

furnace in which the item/product to be heat treated is loaded and heat-treated in a continuous cycle

##### 3.1.2

##### **company**

owner or organization that is responsible for development of and/or operation of an installation/facility

Note 1 to entry: For the purposes of this International Standard, the company is normally an oil company.

##### 3.1.3

##### **equalization time**

time used to ensure a uniform pre-set temperature throughout a heat treatment load and/or throughout all section thicknesses of a component

##### 3.1.4

##### **heat sink**

separate block used to monitor temperature during heat treatment and made from the same generic type of material as the parts being heat-treated

##### 3.1.5

##### **high alloyed austenitic stainless steel (SS)**

austenitic stainless steel typically having  $PREN \geq 40$  or  $[\%Ni + 2(\%Mo)] > 30$  where  $\%Mo > 2$ , all mass fractions expressed as percent

EXAMPLES SS type 6 Mo, UNS S31266, UNS S32654, UNS S34565, UNS J95370.

##### 3.1.6

##### **holding time**

time from when the controlling thermocouple(s) (normally the furnace thermocouple(s)) has reached set temperature until the specified soaking time is completed

Note 1 to entry: See also Annex C.

Note 2 to entry: Holding time consists of equalization time + soaking time. Holding time is not applicable to continuous and semi-continuous furnaces.

### 3.1.7

#### **main contractor**

party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation or maintenance of a facility, on a contract awarded by the company

### 3.1.8

#### **manufacturer**

party, including subcontractors, which carries out operations which affect the material properties of the finished product

Note 1 to entry: These operations can include forming, heat treatment, etc.

### 3.1.9

#### **pitting resistance equivalent number**

##### **PREN**

number indicating the resistance of stainless steel to pitting corrosion and related to chemical composition

Note 1 to entry: PREN is calculated from one of the following equations:

- a)  $\text{PREN} = \% \text{Cr} + 3,3 \% \text{Mo} + 16 \% \text{N}$
- b)  $\text{PREN} = \% \text{Cr} + 3,3 \% (\text{Mo} + 0,5 \text{W}) + 16 \% \text{N}$

where all mass fractions are expressed as percent.

Note 2 to entry: The requirement for the minimum PREN value applies to the applicable material specification, MDS and/or material standard as specified by Purchaser.

### 3.1.10

#### **Purchaser**

party which purchases a product from a Manufacturer

Note 1 to entry: Company (end user), main contractor and buyer are Purchasers in the context used in this International Standard.

### 3.1.11

#### **Qualifying Company**

Company, the main contractor, the Purchaser or a party authorised to act on its behalf, which monitors the qualification exercise and in the end approves the resulting manufacturing procedure qualification record (MPQR) by signing and stamping the MPQR front page

Note 1 to entry: See Annex G for MPQR front page.

### 3.1.12

#### **semi-continuous furnace**

furnace for which the load to be heat-treated is prepared as a batch in front of the furnace and then passed in a continuous way through the furnace

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**3.1.13****soaking time**

batch processes: time that the entire part being heat-treated (throughout its cross-sections) remains at the specified set temperature

continuous and semi-continuous processes: time that the section being heat-treated (throughout its cross-sections) remains within the specified soaking temperature range

Note 1 to entry: See also Annex C.

**3.1.14****soaking zone**

final zone in a continuous/semi-continuous heat treatment furnace within which the material is maintained within the specified soaking temperature range

**3.1.15****test direction**

direction in which testing is carried out as defined relative to the geometry of the component to be tested

Note 1 to entry: For the purposes of this International Standard, the definitions given in ASTM A370-14, section 5, apply, with axial defined as the longitudinal axis of the test specimen located parallel to the main axis of the component.

**3.1.16****SS type 22Cr duplex**

ferritic/austenitic stainless steel alloys with  $30,0 < \text{PREN} < 40,0$  and  $\text{Cr} \geq 19 \%$  (mass fraction)

**EXAMPLES**

UNS S31803 and UNS S32205.

**3.1.17****SS type 25Cr duplex**

ferritic/austenitic stainless steel alloys with  $40,0 \leq \text{PREN} < 48,0$  (mass fraction)

Note 1 to entry: This alloy is often referred to as “super duplex”.

**EXAMPLES**

UNS S32505, UNS S32550, UNS S32750, UNS S32760 and UNS S39274.

**3.1.18****SS type 6Mo**

austenitic stainless steel alloy having 6 % Mo by mass fraction expressed as percent and typically  $\text{PREN} \geq 40$

**EXAMPLES**

UNS S31254, UNS N08367 and UNS N08926.

**3.2 Abbreviated terms**

AOD	argon oxygen decarburization
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
EN	European Standard

HIP	hot isostatic pressed
HV	Vickers hardness
MDS	material data sheet
MOM	minutes of meeting
MPQR	manufacturing procedure qualification record
MPS	manufacturing procedure summary
NDE	non-destructive examination
NORSOK	standards developed by the Norwegian Technology Centre
PED	Pressure Equipment Directive
PREN	pitting resistance equivalent number
PWHT	post-weld heat treatment
SS	stainless steel
UNS	unified numbering system
VOD	vacuum oxygen decarburization
WPQR	welding procedure qualification record
WPS	welding procedure specification

## 4 Responsibilities

### 4.1 Purchaser's responsibilities

The Purchaser is responsible for ensuring that the Manufacturers engaged for a project are qualified within the essential variables of this International Standard. Existing manufacturer's procedure qualification records (MPQRs) shall be reviewed for compliance with this International Standard. Manufacturers unknown to the Purchaser should in addition be visited.

Acceptance of an MPQR and the Manufacturer chosen are at the discretion and determination of the Purchaser.

The Purchaser is not exempted from his responsibility for quality surveillance of his subcontractors, even if these fulfil the requirements of this International Standard.

### 4.2 Manufacturer's responsibilities

The Manufacturer is responsible for establishing and maintaining required documentation and carrying out verification and testing in accordance with this International Standard.

A Manufacturer complying with this International Standard assumes the obligation to carry out manufacturing and certification of products in accordance with the qualified Manufacturing Procedure

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Summary (MPS), including all referenced procedures. If an order requiring compliance with this International Standard is outside the qualified range as defined in 10.2, the Purchaser shall be informed.

### 4.3 Qualifying Company's responsibilities

The qualification exercise itself shall be carried out in cooperation with and verified by a Qualifying Company.

The Qualifying Company shall monitor the qualification exercise, review and finally approve the resulting MPQR by signing and stamping the MPQR front page (see Annex G). Qualifying Company personnel shall have knowledge of metallurgical aspects of the applicable alloys, including phase and transformation diagrams, effects of hot forming, welding, heat treatment, testing, etc., and have relevant knowledge for the manufacturing process to be evaluated.

Qualifying Company personnel shall either have previous qualification experience with this International Standard or receive guidance/supervision from a person with previous qualification experience with this International Standard.

Qualifying Company shall be independent of the Manufacturer.

NOTE Qualification experience with NORSOK M650 Ed. 4 is considered equal to qualification experience with this international standard.

## 5 Qualification of manufacturers

### 5.1 Basis for qualification of manufacturers

As a basis for qualification as a Manufacturer, including any nominated subcontractors, the Manufacturer shall have:

- a) knowledge and relevant manufacturing experience with the type of material to be qualified (see Clause 7);
- b) acceptable manufacturing facilities and equipment (see Clauses 7 and 9);
- c) an established MPS (procedure) covering all manufacturing steps from melting or semi-finished product to finished product (see Clause 8);
- d) an established heat-treatment procedure (see Clause 9);
- e) a quality management system;

NOTE It is common that the Manufacturer has a contractual obligation to have a quality management system that complies with the requirements of ISO 9001;

- f) documented qualification records in compliance with this International Standard (see Clause 10).

### 5.2 Evaluation for acceptance

The Qualifying Company shall carry out a review of the manufacturing facilities, equipment, implementation of procedures and documentation, as required by this International Standard, on the premises of the Manufacturer and his subcontractors.

The results of the evaluation shall be documented in an evaluation report or minutes of meeting (MOM).

### 5.3 Acceptance of qualification

A complete MPQR with content in accordance with Clause 11 shall be established for evaluation for acceptance.

The only way to qualify a manufacturing procedure is to fulfil all the requirements of this International Standard. It is not possible to deviate from this International Standard with respect to being qualified. When all requirements in this International Standard are fulfilled, the MPQR front page (see Annex G) shall be signed off and stamped by the Qualifying Company.

### 5.4 Proof of acceptance

The original MPQR front page (see Annex G), completed with all data indicated in Annex G and signed by the Qualifying Company, is the only valid proof of acceptance in accordance with this International Standard.

Where a party authorized by the Company, main contractor or purchaser is used as the Qualifying Company, the Company, main contractor or Purchaser who has given the authorization shall co-sign the MPQR front page to confirm their acceptance of the MPQR.

NOTE ISO does not keep any listing of qualified manufacturers who are accepted in accordance with this International Standard.

## 6 Validity of qualification

### 6.1 Term of validity

The Manufacturer's qualification is valid for maximum 5 years starting from the date of signing and stamping of the MPQR front page. For new Manufacturers, see 7.1.2.

For renewal of an existing qualification according to 6.2, the renewal is valid for maximum 5 years starting from the expiry date of the original qualification.

The qualification is valid within the parameters specified in 10.2.

### 6.2 Renewal of qualification

A Manufacturer with regular production of the originally qualified products and alloys to a valid MPS is considered re-qualified, and additional testing is normally not required provided that production testing records are retained that demonstrate continued compliance with the specifications employed for the original qualification. It is a prerequisite that all requirements of this International Standard are complied with.

A renewal shall be initiated prior to the expiry date of the existing MPQR. If this is not the case, a complete new qualification shall be carried out.

The following actions shall be executed for a qualification renewal:

- a) evaluating and reviewing the Manufacturer's and subcontractors' premises according to 5.2 by the Qualifying Company;
- b) reviewing and updating the MPS and referred procedures and making a decision whether retesting is required;