SLOVENSKI STANDARD

oSIST prEN ISO 14692-1:2015

01-oktober-2015

Industrija za predelavo nafte in zemeljskega plina - S steklenimi vlakni ojačeni polimerni cevovodi (GRP) - 1. del: Slovar, simboli, uporaba in materiali (ISO/DIS 14692-1:2015)

Petroleum and natural gas industries - Glass-reinforced plastics (GRP) piping - Part 1: Vocabulary, symbols, applications and materials (ISO/DIS 14692-1:2015)

Erdöl- und Erdgasindustrie - Glasfaserverstärkte Kunststoffrohrleitungen (GFK) - Teil 1: Anwendungsbereiche und Werkstoffe (ISO/DIS 14692-1:2015)

Industries du pétrole et du gaz naturel - Canalisations en plastique renforcé de verre (PRV) - Partie 1: Vocabulaire, symboles, applications et matériaux (ISO/DIS 14692-1:2015)

Ta slovenski standard je istoveten z: **prEN ISO 14692-1**

ICS:

01.040.75	Naftna in sorodna tehnologija (Slovarji)	Petroleum and related technologies (Vocabularies)
75.200	Oprema za skladiščenje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment
83.140.30	Cevi, fitingi in ventili iz polimernih materialov	Plastics pipes, fittings and valves

oSIST prEN ISO 14692-1:2015 **en,fr,de**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 14692-1

ISO/TC **67**/SC **6**

Secretariat: **AFNOR**

Voting begins on:
2015-08-06

Voting terminates on:
2015-11-06

Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping —

Part 1:
Vocabulary, symbols, applications and materials

Industries du pétrole et du gaz naturel — Canalisations en plastique renforcé de verre (PRV) —

Partie 1: Vocabulaire, symboles, applications et matériaux

ICS: 75.200; 83.140.30

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 14692-1:2015(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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 14692-1 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/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 14692 consists of the following parts, under the general title *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping*:

— *Part 1: Vocabulary, symbols, applications and materials*

— *Part [n]:*

— *Part [n+1]:*

— *Part 1: Vocabulary, symbols, applications and materials*

— *Part 2: Qualification and manufacture*

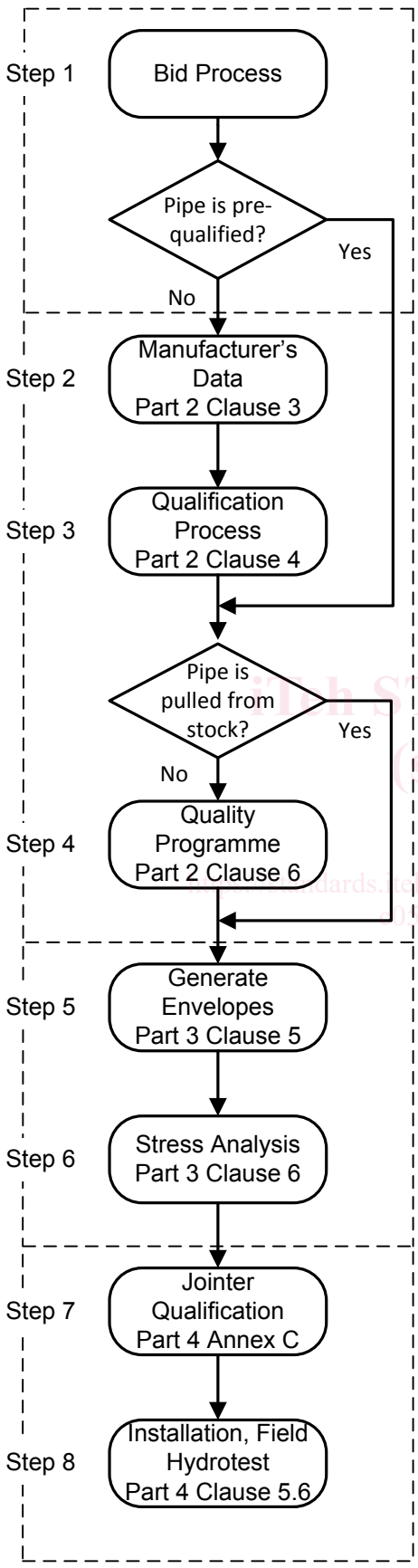
— *Part 3: System design*

— *Part 4: Fabrication, installation, inspection and maintenance*

Introduction

The objective of ISO 14692 (all parts) is to provide the oil and gas industry, and the supporting engineering and manufacturing industry, with mutually agreed specifications and recommended practices for the purchase, qualification, manufacturing, design, handling, storage, installation, commissioning and operation of GRP piping systems.

This part, Part 1, provides guidance in the use and interpretation of the other Parts of ISO 14692, namely Parts 2, 3 and 4. Refer to Figure 1. It identifies the 8 basic steps involved:



Concepts

Enquiry sheet (Part 1 Annex D)
Estimated f_3 (Part 1 Annex F)
Scope limits (Part 1 Annex C)
A_0, A_2, A_3, MPRxx (Part 1, 3.1 and 3.2; Part 2, 3.3 and 3.4)

Pipe, fittings and joints that have already been qualified per ISO 14692-2 would not need to repeat steps 2 and 3. Manufacturer would select a product with an MPR_{xx} to meet the requirements in the Enquiry sheet.

Long term envelopes (Part 2, 3.5 and Annex D)
Gradients and $rd_{1000,xx}$ (Part 2, 3.2 and Annexes B and C)
$D_{r,min}$, $t_{r,min}$, SIFs (Part 2, 3.6, 3.8)
Production processes and jointing instructions (Part 2, 3.9)

Scaling rules (Part 2, 4.2)
Product qualification (Part 2, 4.3)
Elastic properties (Part 2, 4.4)
Fire performance, electrical conductivity, other (Part 2, 4.5)

Pipe, fittings and joints that have already been inspected per ISO 14692-2 would not need to repeat step 4.

Mill hydrostatic test, degree of cure, glass content, visual inspection and key component dimensions (Part 2, 6.1 and 6.2)

Combinations of partial factors and the f_2 part factor (Part 3, 5.1 thru 5.3)
Generate design envelope(s) (Part 3, 5.4)

Flexibility factors and SIFs (Part 3, 6.3 thru 6.5 and Annex A)
Allowable deflections and stresses (Part 3, 6.7 and 6.8)
External pressure / vacuum rating (Part 3, 6.9)

Based on manufacturer's jointing procedures
Theoretical and practical exam terms (Part 4, Annex C)
Jointer qualification on representative joint types and sizes (Part 4, Annex C)

System design output (Part 3, clause 8)
Field hydrotest (Part 4, 5.6)
Manufacturer's jointing instructions (Part 2, 3.9)
Installation instructions (Part 4, 5.5)
Jointer certificates (Part 4, Annex C)

Figure 1 – Guidance on the use of ISO 14692 (all parts)

Step 1: The Bid Process. Here, the principal completes an enquiry sheet (refer to Annex D) that defines the design pressures and temperatures of the piping system as well as the application, required pipe sizes and required components (bends, tees, reducers, flanges, etc.). The principal also verifies that the scope of the application is within the limits of ISO 14692 (refer to Annex C). The principal and manufacturer shall also come to an agreement on the value of the estimated value of the part factor $f_{3,est}$ (refer to Annex F).

In some cases, the manufacturer may wish to offer a product that 1) meets or exceeds the requirements in the Enquiry sheet and 2) has already been manufactured, qualified and inspected per ISO 14692-2. In this case, steps 2 thru 4 would not need to be repeated.

Step 2: Manufacturer's Data. Recognizing that long term regression testing can easily take 2 or more years to complete, the manufacturer will most likely have already selected target values for MPR_{xx}, the long term envelope(s) and the minimum reinforced wall thicknesses. The manufacturer shall determine the appropriate gradient and $rd_{1\ 000,xx}$ can then be calculated to suit the survival test duration. Additional basic data such as pipe sizes, wall thicknesses, SIFs, production processes and jointing instructions shall also be provided.

Step 3: Qualification Process. Here, the manufacturer conducts survival tests to qualify the pressure and temperature. If applicable, the manufacturer shall also qualify fire performance and electrical conductivity properties. Elastic properties, potable water certification, impact and low temperature performance are also addressed in this step. Just as with Step 2, the manufacturer may have already completed part or all of the qualification process prior to Step 1, the bid process.

Step 4: Quality Programme. Step 4 defines the basic requirements for the manufacturer's quality management system.

Step 5: Generate Envelopes. Step 5 is the first major step in Part 3. Here, partial factors and part factors are identified and combinations of these factors are determined. Formulae are then provided to calculate the design envelope(s).

Step 6: Stress Analysis. Step 6 identifies the flexibility factors and SIFs to be used in the stress analysis. It also defines the allowable values for vertical deflection, stresses and buckling. An analytical formula for external pressure is provided.

Step 7: Bonder Qualification. Step 7 is the first major step in Part 4 where the bonder qualification process is defined.

Step 8: Installation, Field Hydrotest. Step 8 is the last major step where installation issues are addressed.

Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 1: Vocabulary, symbols, applications and materials

1 Terms, definitions, symbols and abbreviated terms

For terms, definitions, symbols and abbreviated terms, refer to Annex A.

2 Scope, applications and document structure

2.1 Scope

This part, Part 1 of ISO 14692, defines the applications, pressure rating methodology, the classification of the products according to application, type of joint and resin matrix and the limitations to both the materials of construction and the dimensions. It also lists the terms, definitions and symbols used and provides guidance in the use and interpretation of the other Parts of ISO 14692, namely Parts 2, 3 and 4.

ISO 14692 (all parts) is applicable to GRP piping systems that 1) utilize joints that are capable of restraining axial thrust from internal pressure, temperature change and fluid hydrodynamic forces and 2) have a trapezoidal shape for its design envelope. It is primarily intended for offshore applications on both fixed and floating topsides facilities, but it may also be used for the specification, manufacture, testing and installation of GRP piping systems in other similar applications found onshore, e.g. produced-water, firewater systems and general industrial use.

2.2 Applications

ISO 14692 (all parts) applies to the specification, manufacture, testing and installation of GRP piping and pipeline systems associated with oil and gas industry production, processing and utility service applications. It is intended for offshore applications on both fixed and floating topsides facilities, but it may also be used as guidance for GRP piping and pipeline systems in oil and gas industry applications found onshore.

For floating installations, reference should be made to the design, construction and certification standards for the hull or vessel, since these may allow alternative codes and standards for GRP piping associated with marine and/or ballast systems. However, it is recommended that ISO 14692 (all parts) be used for such applications to the maximum degree attainable.

ISO 14692 (all parts) may also be used as the general basis for specification of pipe used for pump caissons, stilling tubes, I-tubes, seawater lift risers and other similar items.

Typical oil and gas industry applications for the use of GRP pipe include those listed in Table 1.

Table 1 – Typical current and potential GRP piping oil and gas applications

Ballast water	Hydrochloric acid
Boiler feed water	Inert gas
Brine	Jet-A fuel
Carbon Dioxide (CO_2)	Natural gas
Chlorine, gas, wet	Oil
Condensate (water and gas)	(Sour) Oil plus associated gas
Cooling water, sweet, brackish, seawater	Potable water
Demineralised water	Process water
Diesel fuel	Produced water
Drains	Seawater
Emulsions (water-oil-gas mixtures)	Service water
Fire water (ring main and wet or dry deluge)	Sewer (grey and red)
Formation water	Sodium hydroxide
Fresh water	Sodium hypochlorite
Fuel	Sour water
Gas (methane, etc.)	Unstabilized oil
Glycol	Vents
Hydrocarbon (with or without associated gas)	Wastewater
Hydrogen chloride gas (HCl)	Water disposal
Injection water	
NOTE 1 Some applications, such as wet chlorine gas, hydrogen chloride gas, hydrochloric acid, sodium hydroxide and sodium hypochlorite, require a barrier liner and may require specific corrosion resistant resins. Consult manufacturer for recommendations.	

2.2.1 Other Standards

GRP piping products are used in a wide variety of applications in both industrial and municipal service. For some applications, ISO14692 (all parts) may be properly considered as the basis for piping and pipeline selection and design. In all applications, the selection of the appropriate standard for any particular application must take into consideration the design life of the project, the service temperature, the corrosive nature of the fluid, whether the intended installation is above ground or buried and what type of joining system is to be used. Depending on the service conditions, other GRP piping standards may be more appropriate and better suited than ISO 14692 (all parts) for all or part of the system. This is particularly the case for aqueous applications of both a municipal and industrial nature where the pipelines are generally buried and axial tensile loads are minimal. Other widely used GRP piping standards include:

- ISO 10639:2004, Plastics piping systems for pressure and non-pressure water supply – Glass reinforced thermosetting plastics (GRP) systems based on unsatured polyester (UP) resin
- ISO 10467:2004, Plastics piping systems for drainage and sewerage – Glass reinforced thermosetting plastics (GRP) systems based on unsatured polyester (UP) resin
- API 15 HR (R2010), Specification for high pressure fiberglass line pipe
- ASTM D3262-11, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
- ASTM D3517-14, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe
- ASTM D3754-14, Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe
- AWWA C950-07, Fiberglass Pressure Pipe
- EN 1796:2006, Plastics piping systems for water supply with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP)
- EN 14364:2006, Plastic piping systems for drainage and sewerage with or without pressure – Glass reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) – Specifications for pipes, fittings and joints

ISO 14692 is not intended to be applied to sewerage and drainage applications though it may provide useful guidance in specific areas not addressed in alternative standards. ISO 14692 is also not specifically intended for non-structural applications such as open drain systems and other low pressure piping applications.

ISO 14692 (all parts) covers all the main components that form part of a GRP pipeline and piping system (pipe, bends, reducers, tees, supports, flanged joints) with the exception of valves and instrumentation.

2.3 Document structure

ISO 14692-2, ISO 14692-3 and ISO 14692-4 follow the individual phases in the life cycle of a GRP piping system, i.e. from qualification and manufacture through design to fabrication, installation, operation and decommissioning.

Each part is therefore aimed at the relevant parties involved in that particular phase.

— *Part 1: Vocabulary, symbols, applications and materials*. It provides guidance in the use of the other 3 parts of ISO 14692, namely Parts 2, 3 and 4. It defines the applications, pressure rating methodology, the classification of the products according to application, type of joint and resin matrix and the limitations to both the materials of construction and the dimensions. It also lists the terms, definitions and symbols used. Main users are envisaged to include all parties in the life cycle of a typical GRP piping system. ISO 14692-1 should be used in conjunction with the part of specific relevance.

— *Part 2: Qualification and manufacture.* Its objective is to enable the supply of GRP components with known and consistent properties from any source. Main users of the document are envisaged to be the principal, the manufacturer, certifying authorities and government agencies.

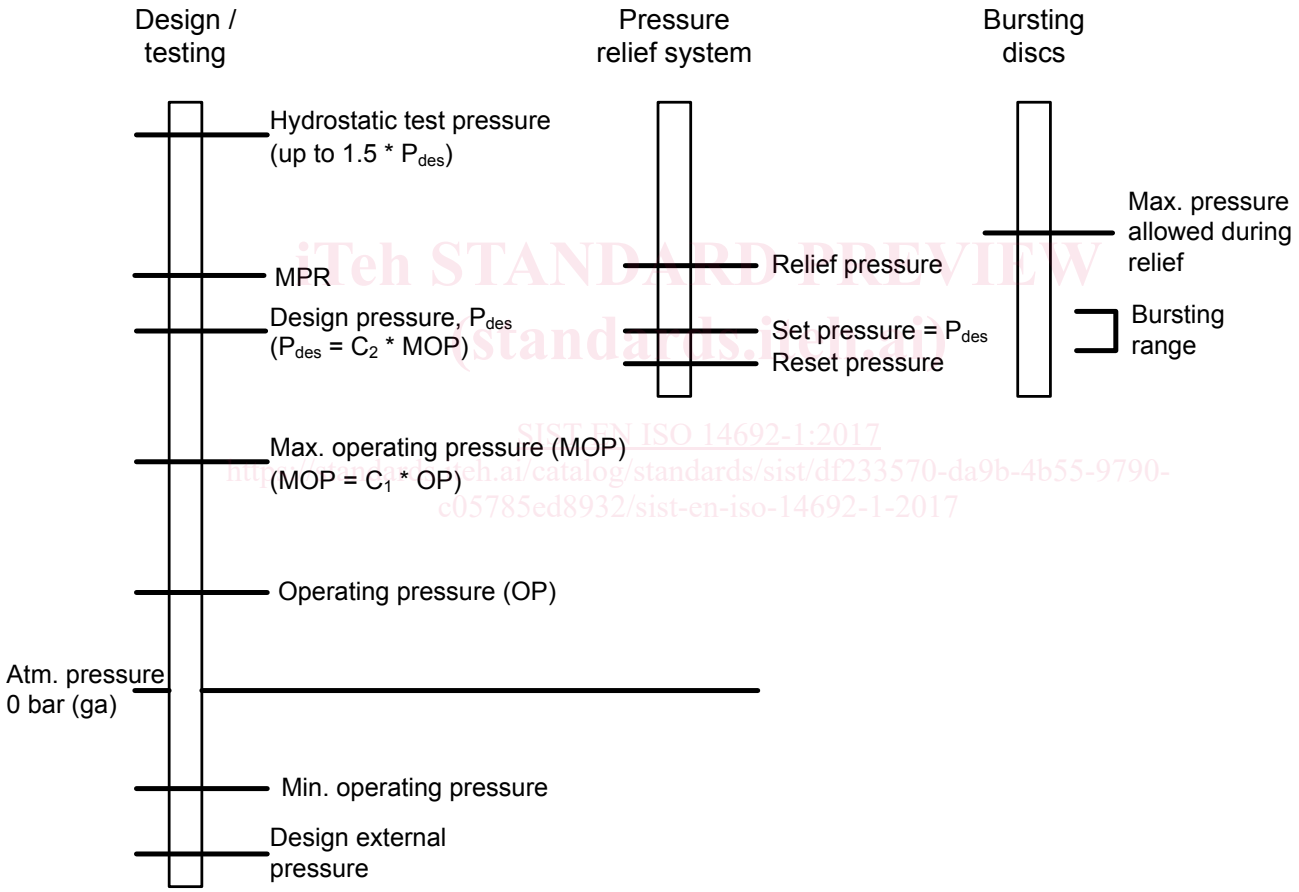
— *Part 3: System design.* Its objective is to ensure that piping systems, when designed using the components qualified in ISO 14692-2, meet the specified performance requirements. Main users of the document are envisaged to be the principal, the manufacturer, design contractors, certifying authorities and government agencies.

— *Part 4:* Fabrication, installation, inspection and maintenance. Its objective is to ensure that installed piping systems meet the specified performance requirements throughout their service life. Main users of the document are envisaged to be the principal, the manufacturer, fabrication/installation contractors, repair and maintenance contractors, certifying authorities and government agencies.

3 Pressure rating

3.1 MPR_{xx}

MPR_{xx} is the maximum pressure rating at sustained conditions for a 20 year design life at the temperature of xx ^{o}C. MPR_{xx} shall be the maximum catalogue value published by the manufacturer. MPR_{xx} shall be defined at 65 ^{o}C for GRE (MPR_{65}) and 21 ^{o}C for GRUP and GRVE (MPR_{21}). The manufacturer shall also publish MPR_{xx} at other temperatures if these are required. Refer to clause 3.3 of Part 2.



NOTE C_1 may vary from 1,05 to 1,25 depending on the application. C_2 may range from 1,10 to 1,25. Values outside of these ranges are also possible. The intention of this figure is not to specify C_1 and C_2, but rather to show the relationship between OP, MOP, P_{des} and MPR_{xx}. C_1 is system dependant based on many design parameters (e.g. pump type, elevation changes, flow velocity). C_2 is typically a margin included by the client's process engineer and can vary widely (e.g. the engineer may set this to a flange rating limit or the rating of adjacent equipment not related to the operating pressure or to provide a margin to prevent early triggering of safety relief devices).

Figure 2 – Pressure terminology

For GRE, MPR_{65} can be determined with the following equation:

$$MPR_{65} \leq \frac{0{,}67 \times 2 \times t_{r,\min} \times \sigma_{h,LT,2:1,65}}{D_{r,\min}} \quad (1)$$

For GRUP and GRVE, MPR_{21} can be determined with the following equation:

$$MPR_{21} \leq \frac{0{,}67 \times 2 \times t_{r,\min} \times \sigma_{h,LT,2:1,21}}{D_{r,\min}} \quad (2)$$

where

MPR_{65} maximum pressure rating at 65° C, expressed in MPa

MPR_{21} maximum pressure rating at 21° C, expressed in MPa

$t_{r,min}$ minimum reinforced pipe wall thickness, expressed in millimetres

$\sigma_{h,LT,2:1,xx}$ long term envelope hoop stress for an unrestrained, hydraulic (2:1) condition at xx° C, expressed in MPa

$D_{r,min}$ mean diameter of the minimum reinforced pipe wall, expressed in millimetres

At the bid stage, an estimated value of MPR_{xx} can be determined with the following equation:

$$MPR_{xx}(estimated) = \frac{P_{des}}{f_{3,est} \times A_0 \times A_2 \times A_3} \quad (3)$$

where

MPR_{xx} (est) maximum pressure rating at T_{des}, expressed in MPa