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**Petroleum and natural gas industries —  
Downhole equipment — Packers and  
bridge plugs**

*Industries du pétrole et du gaz naturel — Équipement de fond de  
trou — Garnitures d'étanchéité (packers) et bouchons mécaniques  
d'isolation de fond*

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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.

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 14310 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

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This second edition cancels and replaces the first edition (ISO 14310:2001), which has been technically revised.

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## Introduction

This International Standard has been developed by users/purchasers and suppliers/manufacturers of packers and bridge plugs and is intended for use in the petroleum and natural gas industry worldwide. This International Standard is intended to give requirements and information to both parties in the selection, manufacture, testing and use of packers and bridge plugs. Further, this International Standard addresses supplier/manufacturer requirements that set the minimum requirements with which it is necessary that suppliers/manufacturers comply to claim conformity with this International Standard.

This International Standard has been structured to allow for grades of increased requirements both in quality control and design validation. These variations allow the user/purchaser to select the grade required for a specific application.

The three quality grades provide the user/purchaser with a choice of requirements to meet a specific preference or application. Quality grade Q3 is the minimum grade of quality offered by this product standard. Quality grade Q2 provides additional inspection and verification steps, and quality grade Q1 is the highest grade provided. Additional quality requirements can be specified by the user/purchaser as supplemental requirements.

Seven standard design-validation grades (V0 to V6) provide the user/purchaser with a choice of requirements to meet a specific preference or application. Design validation grade V6 is the minimum grade and represents equipment where the validation method has been defined by the supplier/manufacturer. The complexity and severity of the validation testing increases as the grade number decreases.

It is necessary that users of this International Standard be aware that requirements above those outlined in this International Standard can be needed for individual applications. This International Standard is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is necessary that the supplier/manufacturer identify any variations from this International Standard.

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# Petroleum and natural gas industries — Downhole equipment — Packers and bridge plugs

## 1 Scope

This International Standard provides requirements and guidelines for packers and bridge plugs as defined herein for use in the petroleum and natural gas industry. This International Standard provides requirements for the functional specification and technical specification, including design, design verification and validation, materials, documentation and data control, repair, shipment, and storage. In addition, products covered by this International Standard apply only to applications within a conduit. Installation and maintenance of these products are outside the scope of this International Standard.

## 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 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3601-1, *Fluid power systems — O-rings — Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 3601-3, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

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

ISO 9712, *Non-destructive testing — Qualification and certification of personnel*

ISO 11960, *Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells*

ISO 15156, (all parts), *Petroleum and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production*

## 3 Terms and definitions

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

### 3.1

#### **assembly**

product comprised of more than one component

### 3.2

#### **bridge plug**

mechanical device installed in, and used for blocking fluid (liquid or gas) communication in, the conduit and not installed in a designed receptacle

3.3

**casing**

pipe extending from the surface and intended to line the walls of a drilled well

3.4

**casing size**

nominal casing outside diameter (OD) as specified in ISO 11960

3.5

**component**

individual part of an assembly

3.6

**conduit**

casing, tubing or liner, either metallic or non-metallic

3.7

**design validation**

process of proving a design by testing to demonstrate conformity of the product to design requirements

NOTE Seven standard design validation grades (V6 to V0) are specified in 6.5.

[ISO/TS 29001]

3.8

**design verification**

process of examining the result of a given design or development activity to determine conformity with specified requirements

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NOTE These activities are described in 6.4.

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3.9

**drift diameter**

minimum inside diameter (ID) of a packer, expressed as the OD of the drift bar utilized during assembly inspection, as outlined in 7.4.11

3.10

**end connection**

thread or other mechanism connecting the packer or bridge plug to the conduit

3.11

**exposed component**

**flow-wetted component** (3.13), **internally wetted component** (3.18), and/or component contacted by well fluid below the packing element

3.12

**extrusion gap**

radial gap between the maximum rated casing ID and the minimum OD immediately adjacent to the packing element

3.13

**flow-wetted component**

**component** (3.5) that comes in direct contact with the dynamic movement of well fluids in the flow stream

3.14

**gauge OD**

maximum specified product OD



**3.15****grade**

category or rank given to different requirements for quality or design validation

**3.16****heat-traceable**

traceable to a unique heat treatment (heat) of material

**3.17****inflatable packing element**

packer or bridge plug packing element energized to form a seal by applying fluid pressure directly to the element

**3.18****internally wetted component**

**flow-wetted component** (3.13) and any component out of the flow stream, but contacted by well fluids through a port or other passage to the flow-wetted area

**3.19****job lot**

batch of material or components that have undergone the same process or series of processes

**3.20****job-lot traceable**

⟨parts⟩ identifiable as originating from a job lot that designates the included heat(s)

**3.21****liner**

pipe that does not extend from the surface and is intended to line the walls of a drilled well

**3.22****mandrel**

component(s) of a packer that contain(s) the end connections and provide(s) a conduit through the packer

**3.23****manufacturing**

process and actions performed by an equipment supplier/manufacturer that are necessary to provide finished component(s), assemblies and related documentation that fulfil the requests of the user/purchaser and meet the standards of the supplier/manufacturer

## NOTE

Manufacturing begins when the supplier/manufacturer receives the order and is completed at the moment the component(s), assemblies and related documentation are surrendered to a transportation provider.

**3.24****NACE service**

packers or bridge plugs whose **type 1 components** (3.41) are manufactured from materials that comply with ISO 15156 (all parts)

**3.25****non-conformance**

non-fulfilment of a specified requirement

**3.26****packer**

mechanical device with a **packing element** (3.27), not installed in a designed receptacle, used for blocking fluid (liquid or gas) communication through the annular space between conduits by sealing off the space between them

**3.27**

**packing element**

seal on a **packer** (3.26) or **bridge plug** (3.2) that blocks fluid communication by sealing on the ID of the conduit

**3.28**

**performance envelope**

graph that illustrates the combined effects of differential pressure and axial loads on a packer or bridge plug at the rated temperature

**3.29**

**permanent packer**

**permanent bridge plug**

**bridge plug** (3.2) or **packer** (3.26) that has no design feature for intact removal from the conduit, necessitating substantial destruction for its removal

**3.30**

**pressure reversal**

change in the direction of the pressure differential across the packing element from above to below or vice versa

**3.31**

**qualified person**

individual with characteristics or abilities gained through training or experience, or both, as measured against established requirements, such as standards or tests that enable the individual to perform a required function effectively

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**3.32**

**repositionable packer**

**repositionable bridge plug**

**bridge plug** (3.2) or **packer** (3.26) that meets the definition of **retrievable packer (retrievable bridge plug)** (3.33) and has a design feature facilitating its relocation inside the conduit (without removal) while re-establishing its intended function

**3.33**

**retrievable packer**

**retrievable bridge plug**

**bridge plug** (3.2) or **packer** (3.26) that has a design feature facilitating its removal from the conduit substantially intact

**3.34**

**seal**

device providing a barrier to the passage of liquid and/or gas

**3.35**

**shear device**

component designed to disconnect under a predetermined load

**3.36**

**standard service**

**packer** (3.26) or **bridge plug** (3.2) whose components might or might not be manufactured from materials that comply with ISO 15156 (all parts)

**3.37**

**substantive design change**

change to the design, identified by the supplier/manufacturer, that affects the performance of the product in the intended service condition

**3.38****temperature-cycle range**

specified range of temperature fluctuation over which the product is designed to operate

NOTE The temperature-cycle range is applicable anywhere within the product's temperature range.

**3.39****temperature range**

specified range of temperature over which the product is designed to operate

**3.40****tubing**

pipe placed within a well to serve as a production or injection conduit

**3.41****type 1 component**

⟨weld⟩ component that isolates pressure and/or may be loaded in tension as the result of axial loads on the packer or bridge plug during run-in, setting, *in situ*, or retrieval

**3.42****type 2 component**

⟨weld⟩ component that does not meet the criteria of a **type 1 component** (3.41)

**4 Symbols and abbreviated terms**

AQL Acceptance quality limit

COC Certificate of compliance

ID Inside diameter  
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MTR Material test report

NDE Non-destructive examination

OD Outside diameter

QC Quality control

**5 Functional specification****5.1 General**

The user/purchaser shall prepare a functional specification for ordering products that conform to this International Standard and specify the following requirements and operating conditions, as applicable, and/or identify the supplier's/manufacturer's specific product. These requirements and operating conditions may be conveyed by means of a dimensional drawing, data sheet or other suitable documentation.

**5.2 Type description**

The user/purchaser shall specify, as applicable, the following type:

- packer or bridge plug;
- permanent, retrievable or repositionable.

### 5.3 Well parameters

The user/purchaser shall specify, as applicable, the following well parameters:

- dimensions, material, grade of the casing and tubing;
- end connections above/below the packer or bridge plug;
- well angle from the vertical at the setting position of the packer or bridge plug;
- deviations and restrictions through which the packer or bridge plug is required to pass;
- configuration of tubing (single or multiple strings) and other lines (electrical/hydraulic) that are required to pass through or by-pass the packer;
- relationship of packer or bridge plug with other well devices/tubing/casing by means of a well schematic drawing, if applicable;
- expected minimum and maximum values of production/injection pressures, pressure differentials, temperatures, changes in temperatures and flow rates;
- any other relevant well parameter(s).

### 5.4 Operational parameters

The user/purchaser shall specify, as applicable, any of the following operational parameters:

- installation method, including conveyance method and setting method;
- setting depth; <https://standards.iteh.ai/catalog/standards/sist/4fbf3729-0e5f-4128-8ace-5fd2f7e0ee3/iso-14310-2008>
- retrieving or repositioning method and number of repositionings, if applicable;
- anticipated loading conditions, including combined loading (pressure, tension/compression) and torque, applied to the packer or bridge plug prior to and during setting, during use and during retrieving;
- expected setting temperature and anticipated temperature cycle during well operations;
- size, type and configuration of devices that will be run through the packer, if applicable;
- any other relevant operational parameters.

### 5.5 Environmental compatibility

#### 5.5.1 General

If the user/purchaser has access to the corrosion property data of the operating environment based on historical data and/or research, he shall state to the supplier/manufacturer which material(s) has/have the ability to perform as required within the corrosion environment per the requirements of 5.5.3, as applicable. Otherwise, material compatibility shall be specified according to 5.5.2.

#### 5.5.2 Well environment

The user/purchaser shall identify the density, chemical/physical composition, and the condition of the fluid and/or its components, including solid (sand production, scale, etc.), liquid and/or gaseous, to which the packer or bridge plug is exposed during its expected life cycle.