
**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 3.

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 International Standard 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 and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

Annex A forms a normative part of this International Standard.

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Introduction

This International Standard has been developed by users/purchasers and suppliers/manufacturers of packers and bridge plugs 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 which set the minimum parameters with which suppliers/manufacturers shall comply to claim conformity with this International Standard.

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

Six standard design validation grades (V1 to V6) and one special design validation grade (V0) provide the user/purchaser the 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.

Design validation grade V6 and quality control grade Q3 represent equipment designed and manufactured consistent with minimum industry practice. These grades are sufficient for a number of applications; however, some applications could require and justify the higher grades of quality control and design validation defined by this International Standard. <https://standards.iteh.ai/catalog/standards/sist/83a37766-3d44-4fa0-9caf-a5e948e8cb07/iso-14310-2001>

Users of this International Standard should be aware that requirements above those outlined in this International Standard may 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 may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this International Standard and provide details.

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

1 Scope

This International Standard provides requirements for packers and bridge plugs for use in the petroleum and natural gas industry. Application of this International Standard is limited to those products meeting the definition of a packer or bridge plug intended for petroleum and natural gas industry subsurface operations.

This International Standard applies only to product applications within a conduit. Installation and maintenance of these products is outside the scope of this International Standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality limit (AQL) for lot-by-lot inspection*

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

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

ISO 9000:2000, *Quality management systems — Fundamentals and vocabulary*

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

NACE MR0175, *Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply. Quality control terms not defined herein are defined in ISO 9000.

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

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3.4

casing size

nominal casing 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 the packer or bridge plug design by a test to demonstrate conformance of the product to one of the design validation grades.

NOTE Six standard design validation grades (V6 to V1) are specified in 6.5 and one special design validation grade (V0) specified in annex A.

3.8

design verification

activities performed at appropriate stages of process output which ensure that the end product conforms to the supplier's/manufacturer's technical specification

NOTE These activities are described in 6.4.

3.9

drift diameter

minimum ID of a packer, expressed as the OD of the drift bar utilized during assembly verification, as outlined in 7.4.11

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3.10

end connection

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

3.11

exposed component

flow-wetted component, internally wetted component and/or component contacted by well fluid below the packing element

cf. **flow-wetted component** (3.13), **internally wetted component** (3.18)

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 that comes in direct contact with the dynamic movement of well fluids in the flow stream

cf. **exposed component** (3.11), **internally wetted component** (3.18)

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

cf. **exposed component** (3.11), **flow-wetted component** (3.13)

3.19**job lot**

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

3.20**job lot traceable**

the ability for parts to be identified as originating from a job lot which identifies the included heat(s)

3.21**liner**

pipe not extending from the surface and intended to line the walls of a drilled well

3.22**mandrel**

component, or components, of a packer that contains the end connections and provides 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 are manufactured from materials that comply with NACE MR0175

cf. **Type 1 component** (3.39), **standard service** (3.34)

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

non-fulfilment of a specified requirement

3.26

packer

mechanical device, 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 or bridge plug that blocks fluid communication by sealing on the ID of the conduit

cf. **bridge plug** (3.2), **packer** (3.26)

3.28

permanent packer [bridge plug]

packer [bridge plug] that has no design feature for intact removal from the conduit, necessitating substantial destruction for its removal

3.29

pressure reversal

changing the pressure differential from above to below the product or vice versa

3.30

repositionable packer [bridge plug]

packer [bridge plug] that meets the definition of **retrievable packer [bridge plug]** (3.31) and has a design feature facilitating relocation inside the conduit (without removal) while re-establishing its intended function

3.31

retrievable packer [bridge plug]

packer [bridge plug] that has a design feature facilitating removal from the conduit substantially intact

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3.32

seal

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

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3.33

shear device

component designed to disconnect under a predetermined load

3.34

standard service

packer or bridge plug whose components may or may not be manufactured from materials that comply with NACE MR0175

3.35

substantive design change

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

3.36

temperature cycle range

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

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

3.37

temperature range

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

3.38**tubing**

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

3.39**Type 1 component [weld]**

component [weld] that isolates pressure and/or may be loaded in tension

NOTE The tension may be the result of axial loads on the packer or bridge plug during run-in, setting, *in situ*, retrieval, or any other source.

3.40**Type 2 component [weld]**

component [weld] that does not meet the criteria of a Type 1 component [weld]

4 Abbreviated terms

AQL Acceptance quality limit

COC Certificate of compliance

EDS Equipment data sheet

ID Inside diameter

MTR Material test report

NDE Non-destructive examination

OD Outside diameter

QC Quality control

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5 Functional specification**5.1 General**

The user/purchaser shall prepare a functional specification to order products which conform with 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 Functional characteristics

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

- 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;

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- well angle from the vertical at the setting position of the packer or bridge plug;
- deviations and restrictions that packer or bridge plug must pass through;
- configuration of tubing (single or multiple strings) and other lines (electrical/hydraulic) that must 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;
- the expected minimum and maximum values of production/injection pressures, pressure differentials, 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;
- retrieving or repositioning method, if applicable;
- the 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;
- size, type and configuration of devices to be run through the packer, if applicable;
- any other relevant operational parameters.

5.5 Environmental compatibility

5.5.1 General

Material compatibility shall be specified according to 5.5.2 and/or 5.5.3.

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 full life cycle.

5.5.3 Product materials requirements

5.5.3.1 Materials for metallic and non-metallic components shall be designated for standard service (3.34) or NACE service (3.24).

5.5.3.2 Components may be grouped as flow-wetted components (3.13), internally wetted components (3.18), exposed components (3.11), and other components.

5.6 Well equipment compatibility

The user/purchaser shall identify, as applicable, the following:

- top and bottom tubular connection(s), the material and dimensions of the connections to the conduit(s);