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**Petroleum and natural gas  
industries — Downhole equipment —  
Completion accessories**

*Industries du pétrole et du gaz naturel — Équipement de fond de trou  
— Accessoires de complétion*

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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)

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

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is 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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## Introduction

This International Standard has been developed by users/purchasers and suppliers/manufacturers completion accessories 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 completion accessories. Further, this International Standard addresses supplier/manufacturer requirements which set the minimum requirements with which suppliers/manufacturers shall 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 for a chosen accessory.

The three quality grades provide the user/purchaser the 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 may be specified by the user/purchaser as supplemental requirements.

Seven standard design validation grades (V0 to V6) 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.

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.

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# Petroleum and natural gas industries — Downhole equipment — Completion accessories

## 1 Scope

This International Standard provides requirements and guidelines for completion accessories, as defined herein for use in the petroleum and natural gas industry. This International Standard provides requirements for the functional specification and technical specifications including: design, design verification and validation, materials, documentation and data control, redress, repair, shipment, and storage. This International Standard covers the pressure containing, load bearing, disconnect/reconnect, tubing movement, and opening a port functionalities of completion accessories.

Products covered under ISO 11960, ISO 10432, ISO 10423, ISO 14310, ISO 16070, ISO 28781, ISO 10407-2, ISO 17824, and ISO 17078-1 are not included. Also not included are other products such as: liner/tubing hangers, down-hole well test tools, inflow control devices, surface controlled sliding sleeves and chokes, down-hole artificial lift equipment, and all functionalities relating to electronics. This International Standard does not cover the connections to the well conduit. Installation of these products is outside the scope of this International Standard.

## 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 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 NDT 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

#### **anchor**

completion accessory designed to disconnect or reconnect the tubing by attaching to a designed receptacle

### 3.2

#### **assembly**

product comprised of more than one component

3.3

**blast joint**

completion accessory with anti-erosion provision on the OD

3.4

**casing**

conduit that is an integral lining of a drilled well typically from the surface downward which is not used for a production conduit

3.5

**chemical injection mandrel**

completion accessory with provision to attach conduit(s) for injection of chemicals

3.6

**component**

individual part of an assembly

3.7

**completion accessory**

equipment that forms an integral part of the tubing (3.70) and is not covered by any other ISO downhole equipment standards

Note 1 to entry: See 5.2.

3.8

**conduit**

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

3.9

**cross-over**

(see tubing adapter)

3.10

**design validation**

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

[SOURCE: ISO/TS 29001:2010, 3.1.7]

3.11

**design verification**

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

[SOURCE: ISO/TS 29001:2010, 3.1.8]

3.12

**disconnect load**

load at which a completion accessory is designed to disconnect

3.13

**drift diameter**

minimum ID of a completion accessory, expressed as the OD of the drift bar utilized during assembly inspection, as outlined in 7.4.11

3.14

**down-hole well test tools**

down-hole tools temporarily set in place for the purpose of evaluating the production potential of the chosen formation

3.15

**down-hole artificial lift equipment**

equipment integral to the conduit that provides additional energy to the production fluids

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**3.16****end connection**

thread or other mechanism connecting the completion accessory to the conduit

**3.17****expansion [travel] joint**

completion accessory that facilitates tubing movement

**3.18****exposed component**

flow-wetted component, internally wetted component, and/or component contacted by well fluid in the annulus

**3.19****fill valve**

completion accessory with provision to open and/or close a port in the tubing to allow passage of fluids between the ID of the tubing and the annulus, or vice versa

**3.20****flow coupling**

completion accessory with anti-erosion provision on the ID

**3.21****flow-wetted component**

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

**3.22****free-passage**

passing a tool or component over or through another tool or component with un-restricted movement

**3.23****gauge OD**

maximum specified product OD

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**3.24****gauge mandrel**

completion accessory with provision to attach permanent monitoring devices

**3.25****grade**

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

**3.26****heat traceable**

traceable back to a unique heat and heat treatment of material

**3.27****inflow control device**

device incorporated into a sand control screen that regulates the flow into the production conduit

**3.28****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

**3.29****job lot**

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

**3.30**

**job lot traceable**

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

**3.31**

**liner**

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

**3.32**

**liner [tubing] hanger**

mechanical device used for transferring the load of an inner liner [tubing] to the casing below the wellhead

**3.33**

**locator**

completion accessory with provision to disconnect or reconnect the tubing to a designed receptacle

**3.34**

**mandrel**

component, or components, of a completion accessory that contains the end connections and provides a conduit through the completion accessory

**3.35**

**manufacturing**

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

Note 1 to entry: 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.

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**3.36**

**mill-out extension**

completion accessory used below a packer to facilitate removal by milling

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**3.37**

**non-conformance**

non-fulfillment of a specified requirement

**3.38**

**non-sealing space out joint**

completion accessory with provision to accommodate tubing movement used to adjust tubing lengths but without provision to hold pressure

**3.39**

**number of disconnects [reconnects]**

number of times a completion accessory can be disconnected [reconnected] and perform its intended function

**3.40**

**number of strokes**

maximum number of times a completion accessory can be moved through its stroke length and perform its intended function

**3.41**

**on-off tool**

completion accessory with provision to disconnect or reconnect the tubing

**3.42**

**open/close cycle**

opening then closing a port

**3.43****packer**

mechanical device with a packing element, 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

**3.44****perforated sub**

completion accessory that contains flow ports for the passage of fluids from the ID of the tubing to the annulus, or vice versa

**3.45****performance envelope**

graph that illustrates the combined ratings of differential pressure and axial loads

**3.46****polished bore receptacle**

completion accessory with designed receptacle used to disconnect or reconnect the tubing by accepting a locator, seal assembly, or similar device

**3.47****port flow area**

area for the passage of fluids from the ID of the tubing to the annulus, or vice versa

**3.48****pressure reversal**

change in the pressure differential from internal to external of the product, or vice versa

**3.49****qualified person**

individual with documented 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

**3.50****reconnect temperature**

temperature at which the completion accessory can be reconnected and performs its intended function

**3.51****redress**

replacement of components on a completion accessory

**3.52****repair**

redress and/or re-manufacture of the completion accessory to restore it to the original functionality

**3.53****seal assembly**

completion accessory that seals in a designed receptacle

**3.54****sealing device**

device providing a barrier to the passage of liquid and/or gas across the interface between two components

**3.55****sealbore extension**

completion accessory with designed receptacle used to disconnect or reconnect the tubing by accepting a locator, seal assembly, or similar device

**3.56**

**shear device**

component designed to disconnect one time at a predetermined load

**3.57**

**shear-out safety joint**

completion accessory with provision to disconnect the tubing at a pre-determined load through use of a shear device

**3.58**

**sliding sleeve**

completion accessory that is activated to open or close communication between the tubing and casing annulus by moving a sleeve

**3.59**

**sour service**

completion accessories whose Type 1 components are manufactured from materials that comply with ISO 15156 (all parts)

**3.60**

**standard service**

completion accessories whose components may or may not be manufactured from materials that comply with ISO 15156 (all parts)

**3.61**

**stroke**

movement from one end of the stroke length to the other end

**3.62**

**stroke distance**

cumulative distance determined by the number of rated strokes multiplied by the stroke length

**3.63**

**stroke length**

distance between the fully collapsed position and fully expanded position for a completion accessory with provision to accommodate tubing movement

**3.64**

**substantive design change**

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

**3.65**

**surface controlled down-hole choke**

down-hole device used to restrict flow rates through its ID, not intended to seal as a barrier controlled without thru-tubing intervention

**3.66**

**surface controlled sliding sleeve**

tubing mounted device that is activated to open or close communication between the tubing and casing annulus by moving a sleeve without thru-tubing intervention

**3.67**

**telescoping swivel sub**

completion accessory with provision to rotate and accommodate tubing movement

**3.68**

**temperature cycle range**

temperature fluctuation within which the product is designed to operate

Note 1 to entry: The temperature cycle range is applicable anywhere within the product's temperature range.

**3.69****temperature range**

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

**3.70****tubing**

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

**3.71****tubing adapter**

completion accessory that connects two different end connections

**3.72****tubing seal receptacle**

completion accessory with designed receptacle used to disconnect or reconnect the tubing by accepting a locator, seal assembly, or similar device

**3.73****tubing size**

nominal tubing OD as specified in ISO 11960

**3.74****Type 1 component**

(weld) component that isolates pressure and/or may be loaded in tension as the result of axial loads on the completion accessory during run-in, activation, *in-situ*, or retrieval

**3.75****Type 2 component**

(weld) component that does not meet the criteria of a Type 1 component

**3.76****unloader sub**

completion accessory with provision to open and/or close a port in the tubing to allow passage of fluids between the ID of the tubing and the annulus, or vice versa

**3.77****unloading pressure**

maximum differential pressure across a completion accessory at the time of disconnect, or port opening, at which the completion accessory can perform its intended function

**3.78****wireline entry guide**

completion accessory used at the end of tubing to facilitate re-entry into the tubing

**3.79****y-block**

completion accessory that connects one tubing string from above to two tubing strings below, or vice versa

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## 4 Symbols and abbreviated terms

AQL	Acceptance quality limit
COC	Certificate of compliance
ID	Inside diameter
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 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 type description

The user/purchaser shall specify, as applicable, the following functional type based on the products primary function. Secondary functions and their interactions with the primary functions shall also be identified in detail as required by the operational needs:

- Non-pressure containing, such as:
  - non-sealing space out joint (3.38);
  - perforated sub (3.44);
  - wireline entry guide (3.78).
- Pressure containing, such as:
  - blast joint (3.3);
  - chemical injection mandrel (3.5);
  - cross-over (3.9) or tubing adapter (3.71);
  - flow coupling (3.20);
  - gauge mandrel (3.24);
  - mill-out extension (3.36);
  - sealbore extension (3.55);
  - y-block (3.79).
- Disconnect or reconnect, such as:
  - anchor (3.1);

- locator (3.33);
- on-off tool (3.41);
- polished bore receptacle (3.46);
- seal assembly (3.53);
- shear-out safety joint (3.57);
- tubing seal receptacle (3.72).
- Tubing movement, such as:
  - expansion joint (3.17);
  - telescoping swivel sub (3.67);
  - travel joint (3.17).
- Open a port in the conduit; such as:
  - fill valve (3.19);
  - sliding sleeve (3.58);
  - unloader sub (3.76).

NOTE This is a representative sample of completion accessories and is not meant to be all inclusive of products covered in this International Standard. Completion accessories may have multiple functionalities, they have been listed here only as examples of products that have the listed functionality.

### 5.3 Well parameters

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

- dimensions, material, grade of the casing and tubing;
- end connections;
- well angle from the vertical;
- deviations and restrictions product must pass through;
- configuration of tubing (single or multiple strings) and other lines (electrical/hydraulic) that must pass through or by-pass the completion accessory;
- relationship of the completion accessory 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;
- activation method and number of times activated or manipulated;
- setting depth;