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**Petroleum and natural gas industries —  
Design and operation of subsea production  
systems —**

**Part 4:  
Subsea wellhead and tree equipment**

iTeh STANDARD PREVIEW

*Industries du pétrole et du gaz naturel — Conception et fonctionnement des  
systèmes de production immergés*

*Partie 4: Équipements immergés de tête de puits et tête de production*

ISO 13628-4:1999

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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.

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.

International Standard ISO 13628-4 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*.

ISO 13628 consists of the following parts, under the general title *Petroleum and natural gas industries — Design and operation of subsea production systems*:

- Part 1: *General requirements and recommendations*
- Part 2: *Flexible pipe systems for subsea and marine applications*
- Part 3: *Through Flowline (TFL) systems* [ISO 13628-4:1999](https://standards.iteh.ai/catalog/standards/sist/c6913c94-ac36-46cd-8d76-7072ac8aa0d/iso-13628-4-1999)
- Part 4: *Subsea wellhead and tree equipment* <https://standards.iteh.ai/catalog/standards/sist/c6913c94-ac36-46cd-8d76-7072ac8aa0d/iso-13628-4-1999>
- Part 5: *Subsea control umbilicals*
- Part 6: *Subsea production control systems*
- Part 7: *Workover/completion riser systems*
- Part 8: *Remotely Operated Vehicles (ROV) interfaces on subsea production systems*
- Part 9: *Remotely Operated Tools (ROT) intervention systems*

Annexes E, G and H form a normative part of this part of ISO 13628. Annexes A, B, C, D, F and I are for information only.

## Introduction

This part of ISO 13628 is not intended to obviate the need for sound engineering judgement as to when and where this part of ISO 13628 should be utilized, and the users of this part of ISO 13628 should be aware that additional or differing requirements may be needed to meet the needs for the particular service intended or to meet local legislation.

The objective of this part of ISO 13628 is to define clear and unambiguous requirements which will facilitate international standardization in order to enable safe and economic development of offshore oil and gas fields by the use of subsea wellhead and christmas tree equipment. This part of ISO 13628 is written in a manner which will allow the use of a wide variety of technology varying from the well established to the state of the art. This part of ISO 13628 does not wish to restrict or deter the development of new technology. However, the reader is encouraged to closely look at standard interfaces and the re-use of intervention systems and tools, in the interests of minimizing life cycle costs and increasing reliability by the use of proven interfaces.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this part of ISO 13628 may involve the use of one or more patents concerning certain of the horizontal tree designs given in subclause 6.1.2, annex B and Figures 4, B.1, B.2 and B.3.

The ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with the applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with the ISO.

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U.S.A.

Attention is drawn to the possibility that some of the elements of this part of ISO 13628 may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

This part of ISO 13628 is based on API Specification 17D First edition, October 30, 1992, *Specification for Subsea Wellhead and Christmas Tree Equipment* including Supplement 1 (March 1, 1993).

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# Petroleum and natural gas industries — Design and operation of subsea production systems —

## Part 4: Subsea wellhead and tree equipment

### 1 Scope

1.1 This part of ISO 13628 specifies subsea copewellhead, conventional mudline wellhead, drill through mudline wellhead, conventional subsea trees and horizontal subsea trees. It also specifies the associated tooling necessary to handle, test and install the equipment. It also specifies the areas of design, material, welding, quality control (including factory acceptance testing), marking, storing and shipping for both individual sub-assemblies (used to build complete subsea tree assemblies) and complete subsea tree assemblies.

Where applicable, this part of ISO 13628 may also be used for equipment on satellite, cluster arrangements and multiple well template applications.

1.2 Equipment which is within the scope of this part of ISO 13628 is listed as follows:

#### a) Subsea trees

- tree connectors and tubing hanger spools;
- valves, valve blocks, and valve actuators;
- chokes and choke actuators;
- bleed, test and isolation valves;
- TFL wye spool;
- re-entry spool;
- tree cap;
- tree piping;
- tree guide frames;
- tree running tools;
- tree cap running tools;
- tree mounted flowline/umbilical connector;
- control module/pod running/retrieval and testing tools;
- flowline base running/retrieval tools;
- tree mounted controls interfaces (instrumentation, sensors, hydraulic tubing/piping and fittings, electrical controls cable and fittings).

## b) Subsea wellheads

- conductor housings;
- wellhead housings;
- casing hangers;
- seal assemblies;
- guidebases;
- bore protectors and wear bushings;
- corrosion caps.

## c) Conventional mudline suspension systems

- wellheads;
- running tools;
- casing hangers;
- casing hanger running tool;
- tieback tools for subsea completion;
- subsea completion adaptors for mudline wellheads;
- tubing spools;
- corrosion caps.

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## d) Drill through mudline suspension systems

- conductor housings;
- surface casing hangers;
- wellhead housings;
- casing hangers;
- annulus seal assemblies;
- bore protectors and wear bushings;
- abandonment caps.

## e) Tubing hanger systems

- tubing hangers;
- running tools.

## f) Miscellaneous equipment

- flanged end and outlet connections;

- clamp hub-type connections;
- threaded end and outlet connections;
- other end connections;
- studs and nuts;
- ring joint gaskets;
- intervention equipment;
- guide line establishment equipment.

**1.3** Equipment which is beyond the scope of this part of ISO 13628 includes:

- subsea wireline/coiled tubing BOPs;
- workover and production risers;
- control systems and control pods;
- platform tiebacks;
- primary protective structures;
- subsea process equipment;
- subsea manifolding;
- subsea wellhead tools;
- repair and rework;
- multiple well template structures;
- mudline suspension high pressure risers;
- template piping;
- template interfaces.

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**1.4** Equipment definitions are given in clause 3 and equipment use and function are explained in annexes A to F.

Service conditions and product specification levels are given in clause 4.

Critical components are those parts having requirements specified in this part of ISO 13628.

Rework and repair of used equipment are beyond the scope of this part of ISO 13628.

## **2 Normative references**

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13628. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13628 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 10422, *Petroleum and natural gas industries — Threading, gauging, and thread inspection of casing, tubing, and line pipe threads — Specification.*

ISO 10423:1994, *Petroleum and natural gas industries — Drilling and production equipment — Specification for valves, wellhead and Christmas tree equipment.*

ISO 10424, *Petroleum and natural gas industries — Drilling and production equipment — Specification for rotary drilling equipment.*

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

ISO 13628-1, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 1: General requirements and recommendations.*

ISO 13628-2, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 2: Flexible pipe systems for subsea and marine applications.*

ISO 13628-9, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 9: Remote Operated Tools (ROT) intervention systems.*

ANSI/ASME B16.11, *Forged Fittings, Socket-Welding and Threaded.*

ANSI/ASME B31.3, *Process Piping.*

ANSI/NACE MR0175, *Sulphide Stress Cracking Resistant Metallic Materials for Oilfield Equipment.*

ANSI/SAE J517, *Hydraulic Hose.*

ANSI/SAE J343, *Tests and Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies.*

API Spec 16A<sup>1)</sup>

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API Spec 16R<sup>2)</sup>

API RP 17C<sup>3)</sup>

AWS D1.1, *Structural Welding Code.*

Det Norske Veritas Offshore Standard RP B401, *Cathodic Protection Design.*

INACE RP0176, *Cathodic protection of steel fixed offshore structures.*

NAS 1638-64, *National Aerospace Standard-Cleanliness Requirements of Parts Used in Hydraulic Systems.*

PFI Standard ES-24, *Pipe Bending Methods, Tolerances, Process and Material Requirements.*

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<sup>1)</sup> For the purposes of this part of ISO 13628, API Spec 16A will be replaced by ISO 13533 when the latter becomes publicly available.

<sup>2)</sup> For the purposes of this part of ISO 13628, API Spec 16R will be replaced by ISO 13625 when the latter becomes publicly available.

<sup>3)</sup> For the purposes of this part of ISO 13628, API Spec 17C will be replaced by ISO 13628-3 when the latter becomes publicly available.

### 3 Terms, definitions, symbols and abbreviations

For the purposes of this part of ISO 13628, the following terms, definitions, symbols and abbreviations apply.

#### 3.1 Terms and definitions

##### 3.1.1

##### **annulus seal assembly**

mechanism which provides pressure isolation between each casing hanger and the wellhead housing

##### 3.1.2

##### **bore protector**

device which protects internal bore surfaces during drilling or workover operations

##### 3.1.3

##### **check valve**

device designed to restrict flow in one direction

##### 3.1.4

##### **completion riser**

riser that is designed to fit inside a BOP to allow installation of a tubing hanger, and may also be suitable for connection to the tree upper connection for use as a means for running the tree or for use as a workover riser

##### 3.1.5

##### **conductor housing**

top of the first casing string which forms the basic foundation of the subsea wellhead and provides attachments for guidance structures

##### 3.1.6

##### **corrosion cap**

cap placed over the wellhead to protect it from contamination by debris, marine growth, or corrosion during temporary abandonment of the well

##### 3.1.7

##### **corrosion-resistant alloys**

ferrous and non-ferrous alloys which are more corrosion resistant than low alloy steels

NOTE This term includes nickel alloys, stainless steels, copper-nickel alloys and titanium.

##### 3.1.8

##### **depth rating**

maximum rated working depth of a piece of equipment at a given set of operating conditions

##### 3.1.9

##### **downstream**

direction of movement away from the reservoir

##### 3.1.10

##### **extension sub**

sealing tubular member that provides tree bore continuity between adjacent tree components

##### 3.1.11

##### **fail closed valve**

actuated valve designed to fail to the closed position

##### 3.1.12

##### **fail open valve**

actuated valve designed to fail to the open position

**3.1.13  
flowline**

any pipeline connecting to the subsea tree assembly

**3.1.14  
flowline connector support frame**

structural frame which receives and supports the flowline connector and transfers flowline loads back into the wellhead or seabed anchored structure

**3.1.15  
flowline connector system**

equipment used to attach subsea pipelines and/or control umbilicals to a subsea tree

NOTE The system may include means to guide the end of the pipeline or umbilical into place and may include remote connection or disconnection capability.

**3.1.16  
flow loops**

piping which connects the outlet(s) of the subsea tree to the subsea flowline connection and/or to other tree piping connections (crossover piping, etc.)

**3.1.17  
guide funnel**

tapered enlargement at the end of a guidance member to provide primary guidance over another guidance member

**3.1.18  
guide lineless systems**

systems which do not depend on the establishment of guide lines from the seafloor to the surface vessel for guidance and alignment of subsea equipment during installation, operation, intervention, or retrieval

**3.1.19  
guide lines**

taut lines from the seafloor to the surface for the purpose of guiding equipment to the seafloor structure

**3.1.20  
high pressure riser**

tubular member which extends the wellbore from the mudline wellhead or tubing spool to a surface BOP

**3.1.21  
inboard tree piping**

subsea tree piping which is upstream of the first tree wing valve

**3.1.22  
intervention fixtures**

devices or features permanently fitted to subsea well equipment to facilitate subsea intervention tasks including, but not limited to:

- grasping intervention fixtures
- docking intervention fixtures
- landing intervention fixtures
- linear actuator intervention fixtures
- rotary actuator intervention fixtures
- fluid coupling intervention fixtures

**3.1.23****intervention system**

means to deploy or convey intervention tools to subsea well equipment to carry out intervention tasks including:

- ROV;
- ROT;
- ADS;
- diver.

**3.1.24****intervention tools**

device or ROT deployed by an intervention system to mate or interface with intervention fixtures

**3.1.25****LWRP**

unitized assembly that interfaces with the tree upper connection and allows sealing of the tree vertical bore(s)

NOTE This may also allow disconnection from the top connection of the LWRP, to permit retrieval of the workover riser, while wireline equipment is in the tree bore(s).

**3.1.26****mudline suspension system**

drilling system consisting of a series of housings used to support casing strings at the mudline, installed from a bottom-supported rig using a surface BOP

**3.1.27****nonpressure-containing/controlling parts**

structural and other parts that do not contain or control pressure, such as guidebases, guideframes, and wear bushings

**3.1.28****orienting bushings**

non-pressure-containing parts which are used to orient equipment or tools with respect to the wellhead

**3.1.29****outboard tree piping**

subsea tree piping which is downstream of the first tree wing valve and upstream of flowline connector (see flow loop)

**3.1.30****permanent guidebase**

structure that sets alignment and orientation of the wellhead system and provides entry guidance for running equipment on or into the wellhead assembly

**3.1.31****plug catcher**

device at the bottom of the tubing hanger annulus bore to prevent the wireline plug from passing through the tubing hanger when an annulus string is not used

**3.1.32****pressure-containing parts**

those parts whose failure to function as intended would result in a release of retained fluid to the environment

EXAMPLES Bodies, bonnets and stems.