
**Petroleum and natural gas industries —
Drilling and production equipment —
Wellhead and christmas tree equipment**

*Industries du pétrole et du gaz naturel — Équipement de forage et de
production — Équipement pour têtes de puits et arbre de Noël*

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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 10423 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*.

This third edition cancels and replaces the second edition (ISO 10423:2001), of which it constitutes a minor revision. Details of the differences between this third edition and the second edition may be obtained, upon request, from ISO/TC 67/SC 4.

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Introduction

This International Standard is based on API Spec 6A, seventeenth edition, February 1996, its errata and supplement, and API Spec 6AV1, first edition, February 1996.

The contents of API Spec 14D (upon which ISO 10433 was based) and API Recommended Practice 14H (upon which ISO 10419 was based) have been incorporated in API Spec 6A, seventeenth edition.

The International System of units (SI) is used in this International Standard. However, nominal sizes are shown as fractions in the inch system.

The fractions and their decimal equivalents are equal and interchangeable. Metric conversions and inch dimensions in this International Standard are based on the original fractional inch designs. Functional dimensions have been converted into the metric system to ensure interchangeability of products manufactured in metric or inch systems (see also Annex B).

Tables referenced in the main body of this International Standard which are marked with an asterisk are repeated in Annex B in US Customary units with the same table number as in the main body but with the prefix B. In figures where dimensions are only given in inches, the values of surface roughness have been indicated in accordance with US draughting conventions. See also Annex M for listings of tables and figures.

Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

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Petroleum and natural gas industries — Drilling and production equipment — Wellhead and christmas tree equipment

1 Scope

1.1 Purpose

This International Standard specifies requirements and gives recommendations for the performance, dimensional and functional interchangeability, design, materials, testing, inspection, welding, marking, handling, storing, shipment, purchasing, repair and remanufacture of wellhead and christmas tree equipment for use in the petroleum and natural gas industries.

This International Standard does not apply to field use, field testing or field repair of wellhead and christmas tree equipment.

1.2 Applicability

This International Standard is applicable to the following specific equipment.

a) Wellhead equipment:

- casing head housings; [ISO 10423:2003](https://standards.iteh.ai/catalog/standards/sist/f87a6293-49cf-4c8d-ba91-1af3ffb2ec6b/iso-10423-2003)
- casing head spools;
- tubing head spools;
- cross-over spools;
- multi-stage head housings and spools.

b) Connectors and fittings:

- cross-over connectors;
- tubing head adapters;
- top connectors;
- tees and crosses;
- fluid-sampling devices;
- adapter and spacer spools.

c) Casing and tubing hangers:

- mandrel hangers;

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- slip hangers.
- d) Valves and chokes:
 - single valves;
 - multiple valves;
 - actuated valves;
 - valves prepared for actuators;
 - check valves;
 - chokes;
 - surface and underwater safety valves and actuators;
 - back-pressure valves.
- e) Loose connectors [flanged, threaded, other end connectors (OEC), and welded]:
 - weld neck connectors;
 - blind connectors;
 - threaded connectors;
 - adapter and spacer connectors;
 - bullplugs;
 - valve-removal plugs.
- f) Other equipment:
 - actuators;
 - hubs;
 - pressure boundary penetrations;
 - ring gaskets;
 - running and testing tools (in Annex H);
 - wear bushings (in Annex H).

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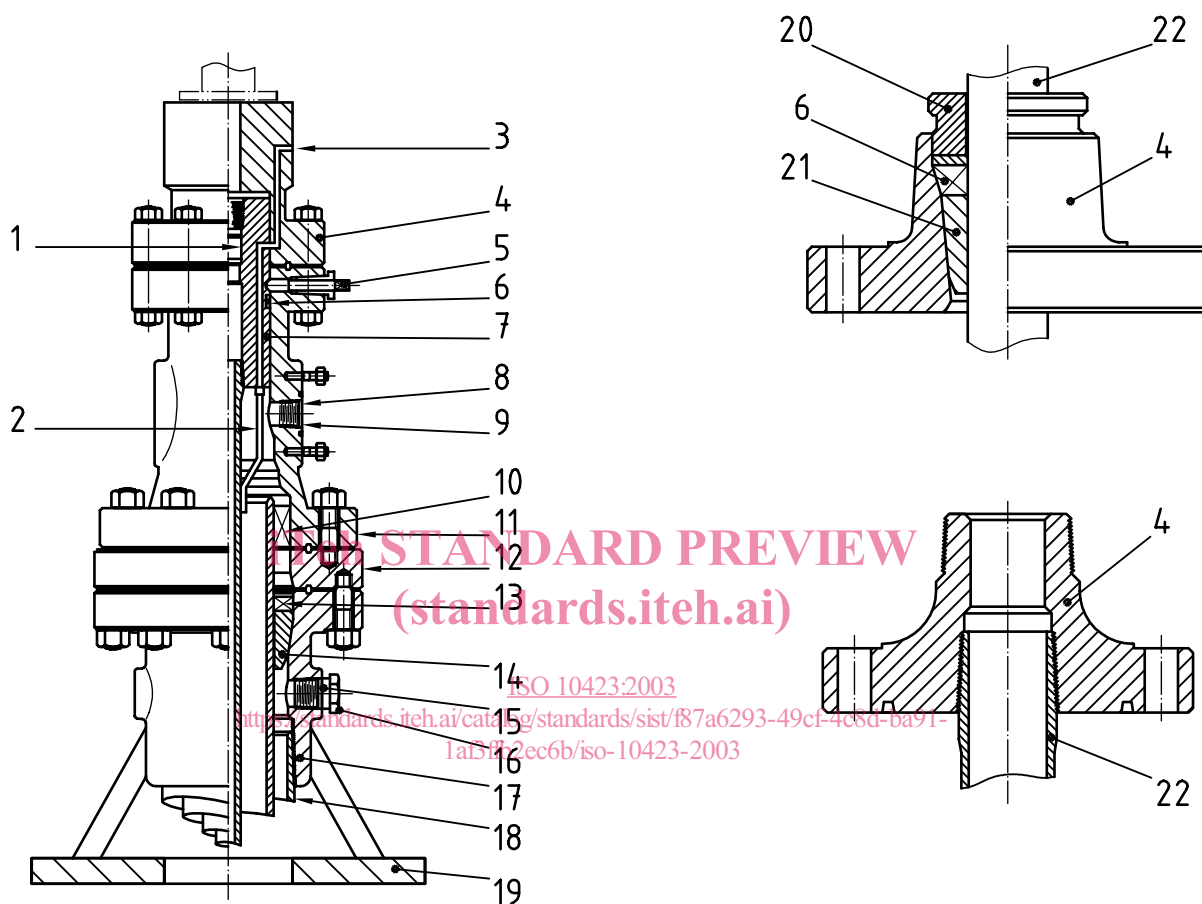
The nomenclature used in this International Standard for typical equipment is shown in Figure 1 and Figure 2. All parts whose physical dimensions conform to the metric tables incorporated into the body of this International Standard or to the US Customary units tables in Annex B are acceptable (see Introduction).

1.3 Service conditions

This International Standard defines service conditions, in terms of pressure, temperature and material class for the well-bore constituents, and operating conditions.

1.4 Product specification levels (PSL)

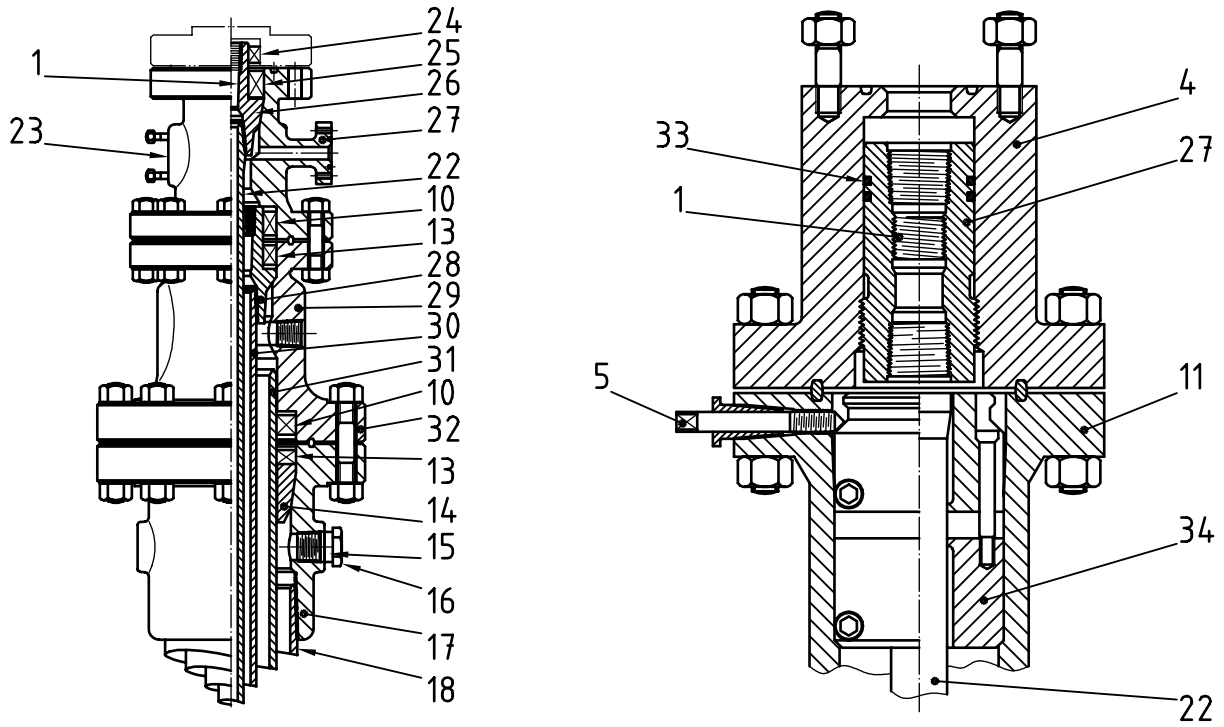
This International Standard establishes requirements for five product specification levels. These five PSL designations define different levels of technical quality requirements. Annex A provides guidelines (not requirements) for selecting an acceptable PSL.



Key

- | | |
|-----------------------------------------------------------------------|-------------------------------|
| 1 back-pressure valve preparation | 12 double studded adapter |
| 2 subsurface safety valve control line | 13 annular casing pack-off |
| 3 subsurface safety valve control line outlet | 14 casing hanger (slip style) |
| 4 tubing head adapter | 15 threaded outlet connection |
| 5 lock screw | 16 bullplug |
| 6 tubing hanger pack-off | 17 casing head housing |
| 7 extended neck tubing hanger with downhole safety valve control line | 18 surface casing |
| 8 studded side outlet | 19 wellhead support plate |
| 9 valve removal preparation | 20 tubing pack-off retainer |
| 10 bottom casing pack-off | 21 tubing hanger (slip style) |
| 11 tubing head spool | 22 tubing |

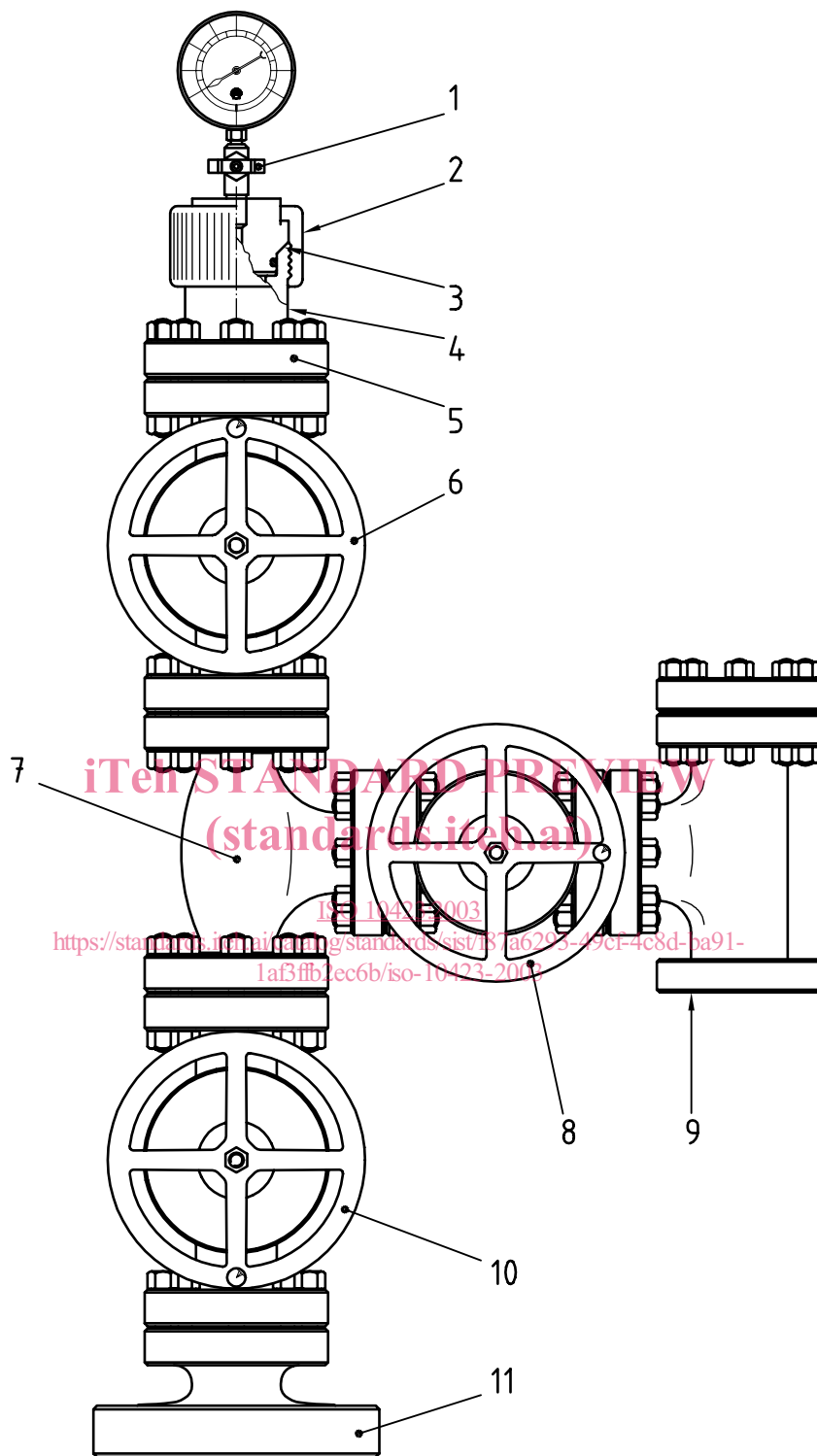
Figure 1 — Typical wellhead assembly nomenclature



Key

- | | | | |
|----|----------------------------------|----|-----------------------------|
| 23 | studded side outlet connection | 29 | casing head spool |
| 24 | extended neck tubing hanger seal | 30 | inner casing |
| 25 | annular tubing hanger seal | 31 | intermediate casing |
| 26 | tubing hanger mandrel | 32 | flanged end connection |
| 27 | flanged outlet connection | 33 | tubing hanger mandrel seals |
| 28 | casing hanger mandrel | 34 | wrap-around hanger pack-off |

Figure 1 — Typical wellhead assembly nomenclature (continued)



Key

- | | |
|-----------------------|------------------------|
| 1 gauge valve | 7 tee |
| 2 bonnet nut | 8 wing valve |
| 3 blanking plug | 9 choke |
| 4 body | 10 master valve |
| 5 top connector | 11 tubing head adapter |
| 6 swab or crown valve | |

Figure 2 — Typical christmas tree nomenclature

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

ISO 10414-1, *Petroleum and natural gas industries — Field testing of drilling fluids — Part 1: Water-based fluids*

ISO 10422:1993, *Petroleum and natural gas industries — Threading, gauging, and thread inspection of casing, tubing and line pipe threads — Specification*

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

ISO 13533, *Petroleum and natural gas industries — Drilling and production equipment — Drill-through equipment*

ISO 13628-4, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 4: Subsea wellhead and tree equipment*

ISO 13678, *Petroleum and natural gas industries — Evaluation and testing of thread compounds for use with casing, tubing and line pipe*

API¹⁾ Spec 7:1997, *Specification for rotary drill stem elements*

API RP 14F, *Recommended practice for design and installation of electrical systems for fixed and floating offshore petroleum production facilities for unclassified and class 1, division 1 and division 2 locations*

ASME²⁾ B1.1, *Unified inch screw threads*

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ASME B1.2, *Gages and gaging for unified inch screw threads*

ASME B1.20.1, *Pipe threads, general purpose (inch)*

ASME Boiler and Pressure Vessel Code:1998, Section V, *Non destructive examination*

ASME Boiler and Pressure Vessel Code:1998, Section VIII, Division 1, *Rules for construction of pressure vessels*

ASME Boiler and Pressure Vessel Code:1998, Section VIII, Division 2, *Alternative rules for construction of pressure vessels*

ASME Boiler and Pressure Vessel Code:1998, Section IX, *Welding and brazing qualifications*

ASNT³⁾ SNT-TC-1A, *Personnel qualifications and certification in non destructive testing*

ASTM⁴⁾ A 193/A 193M, *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*

1) American Petroleum Institute, 1220 L Street North West, Washington, D.C. 20005, USA.

2) ASME International, 345 East 47th Street, New York, NY 10017-2392, USA.

3) American Society for Non destructive Testing, 4153 Arlingate Plaza, Columbus, OH 43228-0518, USA.

4) American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

- ASTM A 194/A 194M, *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*
- ASTM A 320/A 320M, *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service*
- ASTM A 370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*
- ASTM A 388/A 388M, *Standard Practice for Ultrasonic Examination of Heavy Steel Forgings*
- ASTM A 453/A 453 M, *Standard Specification for High-Temperature Bolting Materials, With Expansion Coefficients Comparable to Austenitic Stainless Steels*
- ASTM A 703/A 703M:1999, *Standard Specification for Steel Castings, General Requirements, for Pressure-Containing Parts*
- ASTM D 395, *Standard Test Methods for Rubber Property — Compression Set*
- ASTM D 412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers — Tension*
- ASTM D 471, *Standard Test Method for Rubber Property — Effect of Liquids*
- ASTM D 1414, *Standard Test Methods for Rubber O-Rings*
- ASTM D 1415, *Standard Test Method for Rubber Property — International Hardness*
- ASTM D 1418, *Standard Practice for Rubber and Rubber Latices — Nomenclature*
- ASTM D 2240, *Standard Test Method for Rubber Property — Durometer Hardness*
- ASTM E 10, *Standard Test Method for Brinell Hardness of Metallic Materials*
- ASTM E 18, *Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials*
- ASTM E 92, *Standard Test Method for Vickers Hardness of Metallic Materials*
- ASTM E 94, *Standard Guide for Radiographic Examination*
- ASTM E 140, *Standard Hardness Conversion Tables for Metals — Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness and Scleroscope Hardness*
- ASTM E 165, *Standard Test Method for Liquid Penetrant Examination*
- ASTM E 428, *Standard Practice for Fabrication and Control of Steel Reference Blocks Used in Ultrasonic Examination*
- ASTM E 709, *Standard Guide for Magnetic Particle Examination*
- ASTM E 747, *Standard Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology*
- EN⁵⁾ 473, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

5) European Committee for Standardization, rue de Stassart 36, Brussels B-1050, Belgium.