INTERNATIONAL STANDARD

ISO 10417

Second edition
2004-07-01

Petroleum and natural gas industries — Subsurface safety valve systems — Design, installation, operation and redress

Industries du pétrole et du gaz naturel — Systèmes de vannes de protection de fond de puits — Étude, installation, fonctionnement et réparation

Reference number
ISO 10417:2004(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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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 10417 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 second edition cancels and replaces the first edition (ISO 10417:1993), which has been technically revised.

Introduction

This International Standard has been developed by users/purchasers and suppliers/manufacturers of subsurface safety valve (SSSV) equipment intended for use in the petroleum and natural gas industry worldwide. This International Standard is intended to give requirements and information to both parties on the design, operation, installation and testing of subsurface safety valve system equipment and also the storage/transport, maintenance, and redress of the SSSV equipment.

Users of this International Standard should be aware that further or differing requirements might be needed for individual installations, storage/transport and maintenance. This International Standard is not intended to inhibit the user/purchaser from accepting alternative engineering solutions. This may be particularly applicable where there is innovative or developing well-completion technology.

Petroleum and natural gas industries — Subsurface safety valve systems — Design, installation, operation and redress

1 Scope

This International Standard establishes requirements and provides guidelines for configuration, installation, test, operation and documentation of subsurface safety valve (SSSV) systems. In addition, this International Standard establishes requirements and provides guidelines for selection, handling, redress and documentation of SSSV downhole production equipment.

This International Standard is not applicable to repair activities.

NOTE ISO 10432 provides requirements for SSSV equipment repair.

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 9000, *Quality management systems — Fundamentals and vocabulary*

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

ISO 10432:—[1], *Petroleum and natural gas industries — Downhole equipment — Subsurface safety valve equipment*

ISO 16070, *Petroleum and natural gas industries — Downhole equipment — Lock mandrels and landing nipples*

ANSI/NCSL Z 540-1, *Calibration — Calibration Laboratories and Measuring and Test Equipment — General Requirements*

3 Terms and definitions

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

3.1
control line
conduit utilized to transmit control signals to SCSSVs

3.2
emergency shutdown system
system of stations which, when activated, initiate facility shutdown

3.3
equalizing feature
SSSV mechanism which permits the well pressure to bypass the SCSSV closure mechanism

1) To be published.

3.4
fail-safe device
device which, upon loss of the control medium, automatically shifts to a safe position

3.5
fail-safe setting depth
maximum true vertical depth at which an SCSSV can be set and closed under worst-case hydrostatic conditions

3.6
maintenance
service operations performed on SSSV system equipment as part of routine operations

3.7
manufacturer
principal agent in the design, fabrication and furnishing of original SSSV system equipment

3.8
operating manual
publication issued by the manufacturer, which contains detailed data and instructions related to the design, installation, operation and maintenance of SSSV system equipment

3.9
operator
user of SSSV system equipment

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3.10
orifice
designed restriction which causes the pressure drop in velocity-type SSCSVs

3.11
packaging
enclosure(s) of sufficient structural integrity to protect contents from damage or contamination, including impacts and environmental conditions encountered during the various phases of transport

3.12
qualified part
part manufactured under a recognized quality assurance programme and, in the case of replacement, produced to meet or exceed the performance of the original part produced by the original equipment manufacturer (OEM)

NOTE ISO 9001 is an example of a recognized quality assurance programme.

3.13
qualified personnel
personnel with characteristics or abilities, gained through training and/or experience as measured against established requirements, standards or tests, that enable the individual to perform a required function

3.14
redress
any activity involving the replacement of **qualified parts** (3.12) within the limits described in 5.3.3

3.15
repair
any activity beyond the scope of redress that includes disassembly, re-assembly and testing, with or without the replacement of qualified parts, and may include machining, welding, heat-treating or other manufacturing operations, that restores the equipment to its original performance

3.16
safety valve landing nipple
any receptacle containing a profile designed for the installation of an SSSV lock mandrel

NOTE It may be ported for communication to an outside source for SSSV operation.

3.17
safety valve lock mandrel
retention device used for SSSV equipment

3.18
self-equalizing feature
SCSSV mechanism which, on initiation of opening sequence of the SSSV, permits the well pressure to automatically bypass the SCSSV closure mechanism

3.19
storage
act of retaining SSSV system equipment without damage or contamination, after processing is completed and prior to or after field use, including the transport process

3.20
SSSV system equipment
components which include the **surface-control system** (3.2.4), **control line** (3.1), **SSSV** (3.23), **safety valve lock** (3.17), **safety valve landing nipple** (3.16), flow couplings and other downhole control components

3.21
surface-controlled subsurface safety valve
SCSSV
SSSV controlled from the surface by hydraulic, electrical, mechanical or other means

3.22
subsurface-controlled subsurface safety valve
SSCSV
SSSV actuated by the characteristics of the well itself

NOTE These devices are usually actuated by the differential pressure through the SSCSV (velocity type) or by tubing pressure at the SSCSV (high or low pressure type).

3.23
subsurface safety valve
SSSV
device whose design function is to prevent uncontrolled well flow when closed

NOTE These devices can be installed and retrieved by wireline or pump-down methods (wireline-retrievable) or be an integral part of the tubing string (tubing-retrievable).

[ISO 10432]

3.24
surface control system
surface equipment including manifolding, sensors, and power source to control the SCSSV

3.25
surface safety valve
SSV
automatic wellhead valve assembly which closes upon loss of power supply

NOTE Where used in this International Standard, the term is understood to include an SSV valve and SSV actuator.

[ISO 10423]

3.26
transport
actions required to ship SSSV system equipment from one geographic location to another

3.27
underwater safety valve
USV
automatic valve assembly (installed at an underwater wellhead location) which will close upon loss of power supply

NOTE Where used in this International Standard, the term is understood to include a USV valve and USV actuator.

[ISO 10423]

3.28
well test rate
stabilized rate at which the well is produced on a routine basis

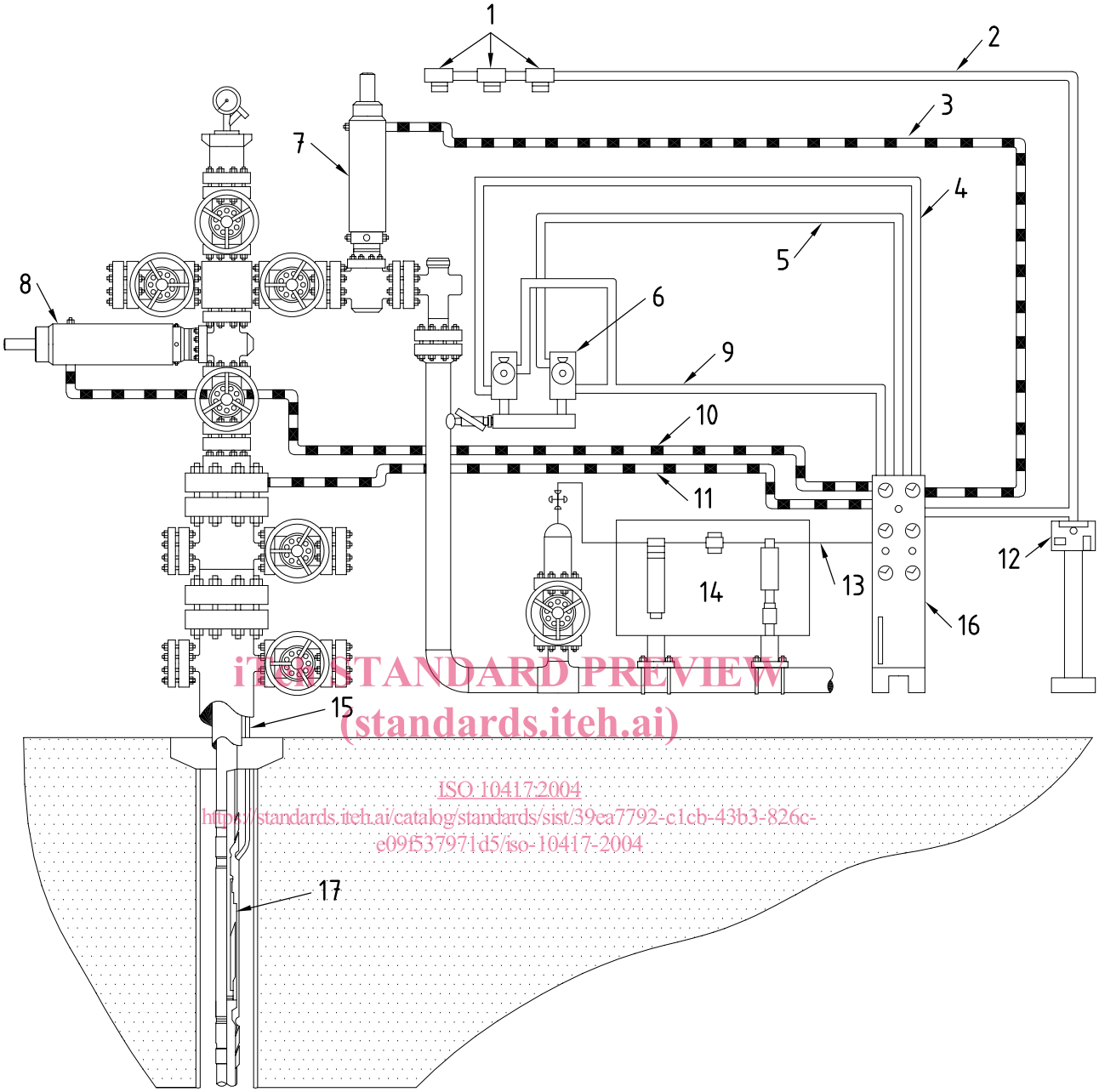
4 Abbreviated terms

ESD	emergency shut-down
FSSD	fail-safe setting depth
NDE	non-destructive examination
OEM	original equipment manufacturer
SCSSV	surface-controlled subsurface safety valve
SDV	shutdown valve
SSCSV	subsurface-controlled subsurface safety valve
SSSV	subsurface safety valve
SSV	surface safety valve
SVLN	safety valve landing nipple
TFL	through flow line
TRSV	tubing-retrievable safety valve
TR-SCSSV	tubing-retrievable surface-controlled subsurface safety valve
USV	underwater safety valve

5 System configuration

5.1 General

Subsurface safety valve systems are provided for the prevention of uncontrolled well flow when actuated. They include SCSSVs and SSCSVs, which are positioned below the wellhead and below ground level/mudline and are installed/retrieved by tubing, wireline, and TFL and their control systems (see Figure 1).



1 fusible plugs
2 ESD pressure line [207 kPa to 345 kPa (30 psi to 50 psi)]
3 hydraulic/pneumatic pressure line to wing valve
4 high pilot signal
5 low pilot signal
6 pilot box
7 wing SSV hydraulic or pneumatic actuator
8 master SSV hydraulic or pneumatic actuator
9 supply to pilots [172 kPa (25 psi)]
10 hydraulic/pneumatic pressure to master valve
11 hydraulic pressure line to SCSSV
12 manual remote emergency shutdown station
13 supply line
14 flowline scrubber assembly
15 hydraulic pressure line to the SCSSV
16 hydraulic/pneumatic control panel
17 surface-controlled subsurface safety valve (SCSSV)

Figure 1 — Example: Surface-controlled subsurface safety valve system

5.2 System requirements

5.2.1 General

The user/purchaser, when developing the system configuration, shall consider all the pertinent elements and their compatibility. These elements shall include the following: control system, control line, wellhead/tubing hanger passages and connectors, control line protectors, control fluid (for SCSSV); SSSV; flow couplings; locking and sealing devices (for wireline safety valves); safety-valve landing nipples; related tools and exposed fluids.

5.2.2 Installation

5.2.2.1 General

The user/purchaser shall assure that installation and installation testing of the SSSV system is performed and approved by qualified personnel using documented procedures and acceptance criteria in accordance with the manufacturer's operating manual and operator's system integration manual. System configuration and installation testing results shall become a part of the well records (see 5.4).

5.2.2.2 Control system

The surface-control system shall include the elements necessary to sense abnormal conditions that may contribute to uncontrolled well flow and shall transmit the necessary signal to the SCSSV for closure.

All elements of the integrated system shall be analysed for potential hazards that may render the system vulnerable to failure or may preclude safe use. For example, automatic resets shall not be incorporated in the control system since this feature may cause the SCSSV to reopen when it should remain closed. Systems shall be designed and operated to address the potential hazards to safe use.

It is desirable to integrate the SCSSV surface-control system into the surface safety system to avoid duplication. Features shall be designed in the integrated system whereby routine production upsets do not result in closure of the SCSSV(s).

If hydraulic or pneumatic control systems are utilized, the test pressure of those systems shall be equal to or greater than the highest operating pressure of that system when installed. System components shall be verified capable of meeting all anticipated environmental conditions, including temperature.

For multiple-well installations, the control-system manifolding shall include provisions for individual well and SSSV isolation.

ESD controls should be installed in strategic locations in accordance with applicable regulations and sound engineering judgement. To avoid closure of the SCSSV under full well-flow conditions, a delay shall be incorporated between closure of the tree valves controlled by the ESD and the downhole SCSSV. The opening sequence should be reversed on returning production facilities to normal operations. This delay mechanism shall be carefully analysed and documented to verify that it does not create additional hazards that render the system vulnerable to failure.

For additional information, see ISO 13628-6.

5.2.2.3 Control line

Prior to installation, the control line shall be verified as filled with the specified control fluid of the specified cleanliness. During installation, care shall be taken to ensure that, when fully installed, the control line has no detrimental physical damage that can cause fluid flow restriction, stress risers or corrosion initiation sites. See 5.3.1.7 for control-line selection criteria.

