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Petroleum and natural gas industries - Design and operation of subsea production systems - Part 1: General requirements and recommendations (ISO 13628-1:2005)

Erdöl- und Erdgasindustrie - Auslegung und Betrieb von Unterwasser-Produktionssystemen - Teil 1: Allgemeine Anforderungen und Empfehlungen (ISO 13628 -1:2005)

Industries du pétrole et du gaz naturel - Conception et exploitation des systemes de production immergés - Partie 1: Exigences générales et recommandations (ISO 13628-1:2005)

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75.180.10	Oprema za raziskovanje in odkopavanje	Exploratory and extraction equipment

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English Version

Petroleum and natural gas industries - Design and operation of subsea production systems - Part 1: General requirements and recommendations (ISO 13628-1:2005)

Industries du pétrole et du gaz naturel - Conception et exploitation des systèmes de production immergés - Partie 1: Exigences générales et recommandations (ISO 13628-1:2005)

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This European Standard was approved by CEN on 21 October 2005.

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Foreword

This document (EN ISO 13628-1:2005) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2006, and conflicting national standards shall be withdrawn at the latest by May 2006.

This document supersedes EN ISO 13628-1:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 13628-1:2005 has been approved by CEN as EN ISO 13628-1:2005 without any modifications.

INTERNATIONAL STANDARD

ISO 13628-1

Second edition
2005-11-15

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

Part 1: General requirements and recommendations

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

Partie 1: Exigences générales et recommandations

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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 13628-1 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 13628-1:1999), which has been technically revised.

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* [1)]

— *Part 3: Through flowline (TFL) systems*

— *Part 4: Subsea wellhead and tree equipment*

— *Part 5: Subsea umbilicals*

— *Part 6: Subsea production control systems*

— *Part 8: Remotely Operated Vehicle (ROV) interfaces on subsea production systems*

— *Part 9: Remotely Operated Tool (ROT) intervention systems*

The following parts are under preparation:

— *Part 7: Completion/workover riser systems*

— *Part 10: Specification for bonded flexible pipe*

— *Part 11: Flexible pipe systems for subsea and marine applications*

1) Under revision.

Introduction

This part of ISO 13628 has been prepared to provide general requirements, recommendations and overall guidance for the user to the various areas requiring consideration during development of a subsea production system for the petroleum and natural gas industries. The functional requirements defined in this part of ISO 13628 will allow alternatives in order to suit specific field requirements. The intention is to facilitate and complement the decision process rather than to replace individual engineering judgement and, where requirements are non-mandatory, to provide positive guidance for the selection of an optimum solution.

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

Part 1: General requirements and recommendations

1 Scope

This part of ISO 13628 provides general requirements and overall recommendations for development of complete subsea production systems, from the design phase to decommissioning and abandonment. This part of ISO 13628 is intended as an umbrella document to govern other parts of ISO 13628 dealing with more detailed requirements for the subsystems which typically form part of a subsea production system. However, in some areas (e.g. system design, structures, manifolds, lifting devices, and colour and marking) more detailed requirements are included herein, as these subjects are not covered in a subsystem standard.

The complete subsea production system comprises several subsystems necessary to produce hydrocarbons from one or more subsea wells and transfer them to a given processing facility located offshore (fixed, floating or subsea) or onshore, or to inject water/gas through subsea wells. This part of ISO 13628 and its related subsystem standards apply as far as the interface limits described in Clause 4.

Specialized equipment, such as split trees and trees and manifolds in atmospheric chambers, are not specifically discussed because of their limited use. However, the information presented is applicable to those types of equipment.

If requirements as stated in this part of ISO 13628 are in conflict with, or are inconsistent with, requirements as stated in the relevant complementary parts of ISO 13628, then the specific requirements in the complementary parts take precedence.

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 3506-1, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 1: Bolts, screws and studs*

ISO 3506-2, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 2: Nuts*

ISO 10423, *Petroleum and natural gas industries — Drilling and production equipment — Wellhead and christmas tree equipment*

ISO 13535, *Petroleum and natural gas industries — Drilling and production equipment — Hoisting equipment*

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

ISO 13628-5, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 5: Subsea umbilicals*

ISO 13628-6, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 6: Subsea production control systems*

ISO 13628-7: —[2)], *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 7: Completion/workover riser systems*

ISO 13628-8, *Petroleum and natural gas industries — Design and operation of subsea production systems — Part 8: Remotely Operated Vehicle (ROV) interfaces on subsea production systems*

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

API RP 2A, *Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms — Working Stress Design* Twenty-First Edition

DNV2.7-1, *Offshore freight containers*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

3.1 Terms and definitions

3.1.1
barrier
element forming part of a pressure-containing envelope which is designed to prevent unintentional flow of produced/injected fluids, particularly to the external environment

3.1.2
deep water
water depth generally ranging from 610 m (2 000 ft) to 1 830 m (6 000 ft)

NOTE Since the physical circumstances of any situtation will change as a function of water depth, use of the term “deep water” implies that it may be necessary to consider design and/or technology alternatives.

3.1.3
first-end connection
connection made at the initiation point of the flowline or umbilical installation process

3.1.4
flowline
production/injection line, service line or pipeline through which fluid flows

NOTE In this part of ISO 13628, the term is used to describe solutions or circumstances of general nature related to a flowline.

3.1.5
flying lead
unarmoured umbilical jumper with a termination plate at either end (incorporating connectors for the various lines) used to connect subsea facilities together

NOTE 1 A flying lead is commonly used to connect e.g. a subsea control module on a subsea tree to a subsea umbilical distribution unit.

NOTE 2 This type of umbilical jumper is lightweight and hence can be picked up from a deployment basket on the seabed and manoeuvred into position using a free-flying ROV.

2) To be published.

3.1.6
jumper
short segment of flexible pipe with a connector half at either end

NOTE A jumper is commonly used to connect flowlines and/or subsea facilities together, e.g. a subsea flowline to a hard pipe riser installed on a production platform.

3.1.7
process valve
any valve located downstream of the tree wing valves in the production flow path

3.1.8
pull-in head
device used for terminating the end of a flowline or umbilical so that it can be loaded/offloaded from a vessel and pulled along the seabed and/or through an I-tube or J-tube

3.1.9
second-end connection
connection made at the termination point of the flowline or umbilical installation process

3.1.10
spool
short segment of rigid pipe with a connector half at either end

NOTE A spool is commonly used to connect flowlines and/or subsea facilities together, e.g. a subsea tree to a subsea manifold.

3.1.11
ultra-deep water
water depth exceeding 1 830 m (6 000 ft)

NOTE 1 Since the physical circumstances of any situtation will change as a function of water depth, use of the term “ultra-deep water” implies that it may be necessary to consider design and/or technology alternatives.

NOTE 2 For description of pressure and temperature ratings, the definition given in the applicable subsystem International Standard and other relevant standards and design codes is used.

3.1.12
umbilical jumper
short segment of umbilical with a termination plate at either end (incorporating connectors for the various lines) used to connect subsea facilities together

NOTE An umbilical jumper is commonly used to connect e.g. a subsea umbilical termination to a subsea umbilical distribution unit.

3.2 Abbreviated terms

AAV annulus access valve

AC alternating current

ADS atmospheric diving system

AIV annulus isolation valve

AMV annulus master valve

API American Petroleum Institute

ASV annulus swab valve

AUV	autonomous underwater vehicle
AWS	American Welding Society
BOP	blow-out preventer
CRA	corrosion-resistant alloy
C/WO	completion/workover
DC	direct current
DFI	design, fabrication, installation
DHPTT	downhole pressure temperature transmitter
DNV	Det Norske Veritas
EDP	emergency disconnect package
ESD	emergency shutdown
ESP	electrical submersible pump
FAT	factory acceptance test
FMEA	failure mode and effects analysis
FPS	floating production system
FPU	floating production unit
GOR	gas-oil ratio
GVF	gas volume fraction
HAZOP	hazards in operation analysis
HBW	Brinell hardness
HIPPS	high-integrity pressure protection system
HPU	hydraulic power unit
HV	Vickers hardness
HXT	horizontal tree
ID	internal diameter
IPU	integrated pipeline umbilical
LMRP	lower marine riser package (for drilling)
LPMV	lower production master valve
LRFD	load and resistance factored design
LRP	lower riser package (for workover)

LWI	light well intervention
MEG	monoethylene glycol
MIV	methanol injection valve
MODU	mobile offshore drilling unit
MPFM	multiphase flowmeter
MPP	multiphase pump
NACE	National Association of Corrosion Engineers
OTDR	optical time domain reflectometry
PCS	production control system
PGB	permanent guide base
PIV	production isolation valve
PLEM	pipeline end manifold
PLET	pipeline end termination
PLS	plastic limit state
PMV	production master valve
PRE	pitting-resistance equivalent
PSD	production shut-down
PSW	production swab valve
PWV	production wing valve
QRA	quantitative risk analysis
RAL	“Reichsausschuss für Lieferbedingungen”, a Colour system used by German paint manufacturers
ROT	remotely operated tool
ROV	remotely operated vehicle
SAS	safety and automation system
SCM	subsea control module
SCSSV	surface-controlled subsurface safety valve
SEM	subsea electronic module
SIL	safety integrity level
SITHP	shut-in tubing head pressure
SSIV	subsea isolation valve