
**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



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 Terms, definitions and abbreviations.....	2
3.1 Terms and definitions.....	2
3.2 Abbreviated terms.....	3
4 Systems and interface descriptions.....	6
4.1 General.....	6
4.2 System description.....	7
4.3 Subsystem interfaces.....	9
5 Design.....	9
5.1 General.....	9
5.2 Design criteria.....	9
5.3 Field development.....	13
5.4 Design loads.....	14
5.5 System design.....	14
5.6 Subsea wellhead.....	17
5.7 Tubing hanger/tree system.....	21
5.8 Completion/workover riser system.....	24
5.9 Mudline casing suspension system.....	24
5.10 Production controls.....	25
5.11 Flowlines and end connections.....	26
5.12 Template and manifold systems.....	34
5.13 Production risers.....	40
5.14 ROV/ROT intervention systems.....	41
5.15 Colours and marking.....	41
6 Materials and corrosion protection.....	42
6.1 Material evaluation.....	42
6.2 Metallic materials.....	42
6.3 Non-metallic materials.....	44
6.4 Bolting materials for subsea applications.....	45
6.5 External corrosion protection.....	46
6.6 Design limitations for materials.....	46
7 Manufacturing and testing.....	48
7.1 General requirements and recommendations.....	48
7.2 Test procedures.....	48
7.3 Integration testing.....	49
8 Operations.....	50
8.1 General.....	50
8.2 Transportation and handling.....	50
8.3 Installation.....	51
8.4 Drilling and completion.....	52
8.5 Hook-up and commissioning.....	53
8.6 Well intervention.....	58
8.7 Maintenance.....	59
8.8 Decommissioning.....	61

9	Documentation	62
9.1	General	62
9.2	Engineering and manufacturing	62
9.3	Operating and maintenance	63
9.4	As-built/as-installed documentation	63
Annex A (informative)	Description of subsea production systems	64
Annex B (normative)	Colours and marking	163
Annex C (informative)	Integration testing of subsea production equipment	170
Annex D (informative)	Typical procedures for commissioning	175
Annex E (informative)	Documentation for operation	179
Annex F (informative)	Data sheets	184
Annex G (informative)	Structures, process valves and piping	191
Annex H (informative)	System engineering in subsea field developments	194
Annex I (informative)	Flow assurance considerations	196
Annex J (informative)	Barrier philosophy considerations	223
Annex K (normative)	Requirements and recommendations for lifting devices and unpressurized structural components	227
	Bibliography	231

This document is a preview generated by EVS

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.

This document is a preview generated by EVS

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 situation 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.