

Subsea production systems

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. Furthermore, NORSOK standards are as far as possible intended to replace oil company specifications and serve as references in the authorities regulations.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standards will be withdrawn.

The NORSOK standards are developed according to the consensus principle, generally applicable standards work and according to established procedures defined in NORSOK A-001N.

The NORSOK standards are prepared and published with supported by OLF (The Norwegian Oil Industry Association) and TBL (Federation of Norwegian Manufacturing Industries). NORSOK standards are administered and published by NTS (Norwegian Technology Centre).

Annex A is normative.

Introduction

This NORSOK standard is based on ISO 13628, *Petroleum and natural gas industries – Design and operation of subsea production systems – (Part 1 through Part 9)*, and includes specific national requirements and recommendations that are not covered by ISO 13628.

This NORSOK standard shall therefore be read in conjunction with all parts of ISO 13628.

This NORSOK standard refers to the first edition of ISO 13628-1, which is currently being revised. When this revision work is completed this NORSOK standard will be revised to reflect the latest edition of ISO 13628-1.

This NORSOK standard is completely rewritten and it replaces Rev. 2 of this NORSOK standard, NORSOK U-002, *Subsea Structures and Piping System*, Rev 2, NORSOK U-006, *Subsea Production Control Umbilicals*, Rev 2, and NORSOK U-007, *Subsea Intervention*, Rev 2, which were issued in June 1998.

The EU Pressure Equipment Directive (PED 97/23/EC) has been implemented in Norway by the "Forskrift om trykkpåkjent utstyr" which applies exclusively from 29 May 2002. The following are, however, excluded from the scope of PED and the Norwegian implementation regulation:

- (3.1) "pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore) starting from and including the last isolation device located within the confines of the installation, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment such as may be found in pressure reduction stations or compression stations";
- (3.9) "well-control equipment used in the petroleum, gas or geothermal exploration and extraction industry and in underground storage which is intended to contain and/or control well pressure. This comprises the wellhead (Christmas tree), the blow out preventers (BOP), the piping manifolds and all their equipment upstream".

Other pressurized parts of the subsea system (e.g. pressure vessels) needs to be accounted for during the development of a subsea production system and certain amendments may be required for this NORSOK standard in order to comply with the essential requirements of the PED.

For further interpretation of the PED please consult with NPD.

1 Scope

See ISO 13628-1.

2 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements and guidelines of the standards referenced below.

ASME B31.3,	<i>Process Piping</i>
ASME B31.8,	<i>Gas Transmission and Distribution Piping Systems</i>
DNV,	<i>Rules for Planning and Execution of Marine Operations</i>
DNV-OS-F101,	<i>Submarine pipeline systems</i>
EU Directive 98/37/EC,	<i>Safety of machinery</i>
EU Directive 97/23/EC,	<i>Pressure Equipment Directive (PED)</i>
IEC 60885,	<i>Electrical test methods for electrical cables</i>
IEC 60811,	<i>Common test method for insulating and sheeting materials of electric and optical cables</i>
IEC 60794,	<i>Optical fibre cables</i>
ISO 10423,	<i>Petroleum and natural gas industries – Drilling and production equipment - Specification for valves, wellhead and Christmas tree equipment</i>
ISO 13628-1,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 1: General requirements and recommendations</i>
ISO 13628-2,	<i>Petroleum and natural gas industries – Design and operation of subsea production systems – Part 2: Flexible pipe systems for subsea and marine applications</i>
ISO 13628-3,	<i>Petroleum and natural gas industries – Design and operation of subsea production systems – Part 3: Through Flow Line (TFL) systems</i>
ISO 13628-4,	<i>Petroleum and natural gas industries – Design and operation of subsea production systems – Part 4: Subsea wellhead and tree equipment</i>
ISO 13628-5,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 5: Subsea control umbilicals</i>
ISO 13628-6,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 6: Subsea production controls</i>
ISO 13628-7,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 7: Completion/workover riser systems (currently DIS)</i>
ISO 13628-8,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 8: Remotely Operated Vehicle (ROV) interfaces on subsea production systems (currently FDIS)</i>
ISO 13628-9,	<i>Petroleum and natural gas industries - Design and operation of subsea production systems – Part 9: ROT intervention systems</i>
ISO 14313,	<i>Petroleum and natural gas industries – Pipeline transportation systems- Pipeline valves</i>
ITU-T G.652,	<i>Characteristic of a single-mode optical fibre cable</i>
NMD,	<i>Regulations for mobile offshore units</i>
NORSOK J-003,	<i>Marine Operations</i>
NORSOK M-001,	<i>Material selection</i>
NORSOK M-501,	<i>Surface preparation and protective coating</i>
NORSOK M-503,	<i>Cathodic protection</i>
NORSOK M-601,	<i>Welding and inspection of piping</i>
NORSOK M-630,	<i>Material datasheets for piping</i>
NORSOK M-650,	<i>Qualification of manufacturers of special materials</i>
NORSOK M-710,	<i>Qualification of non-metallic sealing materials and manufacturers</i>
NORSOK N-001,	<i>Structural design</i>
NORSOK Z-010,	<i>Electrical, instrumentations and telecommunication</i>

3 Definitions and abbreviations

3.1 Definitions

3.1.1

shall

verbal form used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.2

should

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.1.3

may

verbal form used to indicate a course of action permissible within the limits of the standard

3.1.4

can

verbal form used for statements of possibility and capability, whether material, physical or casual

For other definitions, see ISO 13628 (Part 1 through Part 9).

3.2 Abbreviations

BOP	blow out preventer
FAT	factory acceptance test
ID	internal diameter
NMD	Norwegian Maritime Directorate
NPD	Norwegian Petroleum Directorate
PE	polyethylene
PED	Pressure Equipment Directive
PGB	permanent guide base
PLS	plastic limit state
PVC	polyvinylchloride
QT	qualification test
ROV	remotely operated vehicle
TGB	temporary guide base
ULS	ultimate limit state

4 Technical requirements

ISO 13628 (Part 1 through Part 9) apply in full.

The following requirements shall be read in conjunction with the relevant part of ISO 13628 and supersede and/or add to the provisions listed therein. The provisions in this NORSOK standard are presented sequential as listed in the applicable part of ISO 13628.

It is considered favourable that a design basis covering typically the following areas is developed as early as possible for a specific field development:

- a) operational requirements;
- b) process flowcharts;
- c) wellstream composition;
- d) injection requirements and media;
- e) simultaneous operations;
- f) intervention strategy;
- g) test requirements;
- h) condition monitoring;
- i) control system design data;