
**Petroleum and natural gas industries —
Specific requirements for offshore
structures —**

**Part 7:
Stationkeeping systems for floating
offshore structures and mobile offshore
units**

*Industries du pétrole et du gaz naturel — Exigences spécifiques
relatives aux structures en mer —*

*Partie 7: Systèmes de maintien en position des structures en mer
flottantes et des unités mobiles en mer*



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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 19901-7 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 7, *Offshore structures*.

This first edition of ISO 19901-7 cancels and replaces ISO/TR 13637:1997, of which it constitutes a technical revision.

ISO 19901 consists of the following parts, under the general title *Petroleum and natural gas industries — Specific requirements for offshore structures*:

- *Part 1: Metocean design and operating considerations*
- *Part 2: Seismic design procedures and criteria*
- *Part 4: Geotechnical and foundation design considerations*
- *Part 5: Weight control during engineering and construction*
- *Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*

The following parts are under preparation:

- *Part 3: Topsides structure*
- *Part 6: Marine operations*

ISO 19901 is one of a series of standards for offshore structures. The full series consists of the following International Standards.

- ISO 19900, *Petroleum and natural gas industries — General requirements for offshore structures*
- ISO 19901 (all parts), *Petroleum and natural gas industries — Specific requirements for offshore structures*

- ISO 19902, *Petroleum and natural gas industries — Fixed steel offshore structures* ¹⁾
- ISO 19903, *Petroleum and natural gas industries — Fixed concrete offshore structures* ¹⁾
- ISO 19904-1, *Petroleum and natural gas industries — Floating offshore structures — Part 1: Monohulls, semi-submersibles and spars* ²⁾
- ISO 19904-2, *Petroleum and natural gas industries — Floating offshore structures — Part 2: Tension leg platforms* ³⁾
- ISO 19905-1, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 1: Jack-ups* ³⁾
- ISO/TR 19905-2, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 2: Jack-ups commentary* ³⁾
- ISO 19906, *Petroleum and natural gas industries — Arctic offshore structures* ³⁾

1) To be published.
2) To be published.
3) Under preparation.

Introduction

The series of International Standards applicable to types of offshore structure, ISO 19900 to ISO 19906, constitutes a common basis covering those aspects that address design requirements and assessments of all offshore structures used by the petroleum, petrochemical and natural gas industries worldwide. Through their application the intention is to achieve reliability levels appropriate for manned and unmanned offshore structures, whatever type of structure and nature or combination of materials used.

It is important to recognize that structural integrity is an overall concept comprising models for describing actions, structural analyses, design rules, safety elements, workmanship, quality control procedures and national requirements, all of which are mutually dependent. The modification of one aspect of design in isolation can disturb the balance of reliability inherent in the overall concept or structural system. The implications involved in modifications, therefore, need to be considered in relation to the overall reliability of all offshore structural systems.

The series of International Standards applicable to types of offshore structure is intended to provide wide latitude in the choice of structural configurations, materials and techniques without hindering innovation. Sound engineering judgement is therefore necessary in the use of these International Standards.

This part of ISO 19901 was developed in response to the worldwide offshore industry's demand for a coherent and consistent definition of methodologies to analyse, design and evaluate stationkeeping systems used for floating production and/or storage platforms of various types (e.g. semi-submersibles, spar platforms, ship-shaped structures) and to assess site-specific applications of mobile offshore units (such as mobile offshore drilling units, pipelay units, construction units).

Stationkeeping is a generic term covering systems for keeping a floating structure, which is under the constant influence of external actions, on a pre-defined location and/or heading with limited excursions. Stationkeeping systems resist external actions by means of any combination of the following:

- mooring systems (e.g. spread moorings or single point moorings).
- dynamic positioning systems (generally consisting of thrusters).

The external actions generally consist of wind, wave, current and ice actions on the floating structure, mooring and/or risers.

Some background to, and guidance on, the use of this part of ISO 19901 is provided in informative Annex A. The clause numbering in Annex A is the same as in the normative text to facilitate cross referencing.

Regional information, where available, is provided in informative Annex B.

Petroleum and natural gas industries — Specific requirements for offshore structures —

Part 7:

Stationkeeping systems for floating offshore structures and mobile offshore units

1 Scope

This part of ISO 19901 specifies methodologies for

- a) the design, analysis and evaluation of stationkeeping systems for floating structures used by the oil and gas industries to support
 - production,
 - storage,
 - drilling, well intervention and production,
 - production and storage,
 - drilling, well intervention, production and storage, and
- b) the assessment of stationkeeping systems for site-specific applications of mobile offshore units (e.g. mobile offshore drilling units, construction units, and pipeline units).

Most stationkeeping systems used with the class of floating structures covered by a) are termed “permanent mooring systems”, for which this part of ISO 19901 is applicable to all aspects of the life cycle and includes requirements relating to the manufacture of mooring components, as well as considerations for in-service inspections. Most stationkeeping systems used with mobile offshore units, the class covered by b), are termed “mobile mooring systems”. Throughout this document, the term “floating structure”, sometimes shortened to “structure”, is used as a generic term to indicate any member of the two classes, a) and b).

This part of ISO 19901 is applicable to the following types of stationkeeping systems, which are either covered directly in this document or through reference to other guidelines:

- spread moorings (catenary, taut-line and semi-taut-line moorings);
- single point moorings, anchored by spread mooring arrangements;
- dynamic positioning systems;
- thruster-assisted moorings.

Descriptions of the characteristics and of typical components of these systems are given in Annex A.

The requirements of this part of ISO 19901 mainly address spread mooring systems and single point mooring systems with mooring lines composed of steel chain and wire rope. This document also provides guidance on the application of the methodology to synthetic fibre rope mooring systems, and includes additional requirements related to the unique properties of synthetic fibre ropes.

The document applies to single anchor leg moorings (SALMs) and other single point mooring systems (e.g. tower soft yoke systems) only to the extent to which the requirements are relevant.

The requirements of this document do not apply to the vertical moorings of tension leg platforms (TLPs).

The methodology described in this part of ISO 19901 identifies a set of coherent analysis tools that, combined with an understanding of the site-specific metocean conditions, the characteristics of the floating structure under consideration, and other factors, can be used to determine the adequacy of the stationkeeping system to meet the document's functional requirements.

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 19900, *Petroleum and natural gas industries – General requirements for offshore structures*

ISO 19901-1, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 1: Metocean design and operating considerations*

ISO 19904-1, *Petroleum and natural gas industries — Floating offshore structures — Part 1: Monohulls, semi-submersibles and spars*

3 Terms and definitions

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

**3.1
action**
external load applied to the structure (direct action) or an imposed deformation or acceleration (indirect action)

EXAMPLE An imposed deformation can be caused by fabrication tolerances, settlement, temperature change or moisture variation.

NOTE An earthquake typically generates imposed accelerations.

[ISO 19900:2002]

**3.2
action effect**
effect of actions on structural components

[ISO 19900:2002]

EXAMPLE Internal forces, moments, stresses, strains, rigid body motions or elastic deformations.

**3.3
catenary mooring**
mooring system where the restoring action is provided by the distributed weight of mooring lines

[ISO 19900:2002]

**3.4
characteristic value**
value assigned to a basic variable, an action or a resistance from which the design value can be found by the application of a partial factor