



International
Standard

ISO 19901-7

**Specific requirements for offshore
structures —**

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

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*

**Third edition
2026-07**

Sample Document

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 7, *Offshore structures*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Oil and gas industries including lower carbon energy*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 19901-7:2013), which has been technically revised.

The main changes are as follows:

- addition of requirements for a mooring integrity management system;
- emphasis on the definition of the operator's expectations on the performance standard;
- inclusion of fibre ropes as a standard material such as chain and steel wire ropes;
- alignment of text relating to the geotechnical design of anchors with ISO 19901-4;
- inclusion of guidance on OPB (out of plane bending) fatigue and squall design cases.

A list of all parts in the ISO 19901 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The International Standards on offshore structures prepared by TC 67 (i.e. ISO 19900, the ISO 19901 series, ISO 19902, ISO 19903, ISO 19904-1, the ISO 19905 series, ISO 19906) constitute a common basis covering those aspects that address design requirements and assessments of offshore structures used by the oil and gas industries worldwide. The intention in their application is to achieve reliability levels appropriate for manned and unmanned offshore structures, irrespective type of structure and the nature or combination of materials used.

It is important to recognize that structural integrity is a concept comprised of models that describe 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 design or structural system. The implications involved in modifications therefore should be considered in relation to the overall reliability of all offshore structural systems.

The International Standards on offshore structures prepared by TC 67 are intended to provide a wide breadth of choice for structural configurations, materials and techniques without hindering innovation. Informed engineering judgement is therefore necessary in the use of these International Standards.

This document 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 energy production platforms (with and without storage) 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 and flotels) and construction units (such as heavy lift vessels and pipelay units).

This document assumes that permanently moored hydrocarbon production systems that are equipped with stationkeeping systems as a minimum have the ability to both shut-in wells and the facility in case of emergency (e.g. emergency shut-down valves on the seabed), otherwise the consequence of mooring failure can be significantly different.

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

- mooring systems (e.g. spread mooring systems or single point mooring systems);
- dynamic positioning systems (generally consisting of thrusters)
- a combination of mooring system and thrusters (thruster assisted mooring systems).

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

The procedures for the design of permanent or site-specific assessment of mobile mooring systems specified in this document are based on a deterministic approach where mooring system responses (such as line tensions, vessel offsets, and anchor loads) are evaluated for a design environment defined by an annual probability of exceedance or return period. Mooring system responses are then checked against specified requirements for mooring strength, offsets and orientation, clearances, anchor capacity, fatigue resistance, etc. The minimum specified requirements are defined either in this document or by the operator if more stringent.

NOTE Stationkeeping systems designed based on this deterministic approach can have differing levels of reliability.

For moored structures (vessels), system responses are calculated and compared to minimum specified requirements for:

- Ultimate limit states (ULS): mooring component strength. Vessel offset, orientation, and clearance constraints. Herein the ULS includes both intact and single failure condition for stationkeeping systems.

- Serviceability limit states (SLS): vessel offset, orientation, and clearance constraints. For mooring components this includes clearances with the vessel, risers, umbilicals, seabed, water surface, field infrastructure, exclusion zones, etc.
- Fatigue limit states (FLS) : cumulative mooring component fatigue damage.
- Accidental and abnormal limit state (ALS): no criteria are given for accidental or abnormal limit state which are left to operator decision or local authorities requirements.

The methodology described in this document identifies a set of coherent analysis techniques 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 functional requirements specified in this document.

Descriptions of characteristics and typical components found in these systems are given in [Annex A](#).

Some background to, and guidance on, the use of this document is provided in [Annex A](#). The clause numbering in [Annex A](#) is the same as in the main text to facilitate cross-referencing.

Regional information, where available, is provided in [Annex B](#).

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Specific requirements for offshore structures —

Part 7:

Stationkeeping systems for floating offshore structures and mobile offshore units

1 Scope

This document specifies methodologies for:

- a) the design, analysis and evaluation of stationkeeping systems for floating offshore structures;
- b) the assessment of stationkeeping systems for site-specific applications of mobile offshore units and construction units.

Originally developed for floating structures used in the oil and gas industry, this document is now also used in the renewable energy sector. The extent of application of this document to floating structures used in other industries is at the discretion of the relevant standard entity and its users. For example, IEC 61400-3-2 for floating wind applies this document to determine stationkeeping system responses while incorporating its own load conditions, safety factors, and environmental return periods.

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

- spread mooring systems;
- single point mooring systems;
- dynamic positioning systems;
- thruster-assisted mooring systems.

This document is not applicable to:

- stationkeeping systems which do not have redundancy against failure of any single component, e.g., single anchor leg moorings (SALMs);
- stationkeeping systems which use any means other than mooring lines or thrusters such as tower soft yoke systems, or tension leg platforms (TLPs) that use tendons.

The requirements for this document address spread mooring systems and single point mooring systems with mooring lines composed of steel chain, steel wire or synthetic fibre rope.

This document is applicable to all aspects of the life cycle of mooring systems. It includes requirements relating to the selection of mooring components, mooring system configuration and performance, components design, installation, post-installation survey, and as-installed assessments as needed for mooring integrity management.

For mooring systems deployed in ice-prone environments, additional requirements in ISO 19906 apply.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 18692-1, *Fibre ropes for offshore stationkeeping — Part 1: General specification*

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

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

ISO 19901-4, *Oil and gas industries including lower carbon energy — Specific requirements for offshore structures — Part 4: Geotechnical design considerations*

ISO 19901-6, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 6: Marine operations*

ISO 19901-8, *Oil and gas industries including lower carbon energy — Offshore structures — Part 8: Marine soil investigations*

ISO 19901-10, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 10: Marine geophysical investigations*

ISO 19904-1, *Petroleum and natural gas industries — Floating offshore structures — Part 1: Ship-shaped, semi-submersible, spar and shallow-draught cylindrical structures*

ISO 19905-3, *Petroleum and natural gas industries — Site-specific assessment of mobile offshore units — Part 3: Floating units*

ISO 19906, *Petroleum and natural gas industries — Arctic offshore structures*

ISO 20438, *Ships and marine technology — Offshore mooring chains*

ISO 31000, *Risk management — Guidelines*

IMO MSC.1/Circ.1580, *Guidelines for vessels and units with dynamic positioning (DP) systems*, International Maritime Organization, 16 June 2017

IACS Unified Requirement UR W22 — *Offshore mooring chains*, International Association of Classification Societies

API RP 2I, *In-service inspection of mooring hardware for floating structures*, American Petroleum Institute

API RP 2MIM, *Mooring Integrity Management*, American Petroleum Institute

API SPEC 9A, *Specification for wire rope*, American Petroleum Institute

ASME Section VIII, Division 1 *Boiler and Pressure Vessel Code — Rules for Construction of Pressure Vessels*, American Society of Mechanical Engineers

DNV-OS-E301:2024, *Position mooring*, DNV Offshore Standard

DNV-RP-E301:2021, *Design and installation of fluke anchors*, DNV Recommended Practice

DNV-RP-E302:2021, *Design and installation of plate anchors in clay*, DNV Recommended Practice

DNV-RP-E303:2021, *Geotechnical design and installation of suction anchors in clay*, DNV Recommended Practice

MTS, *DP operations guidance*, Marine Technology Society

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

action

external load applied to the *structure* (3.1.59) (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. An imposed acceleration can be caused by an earthquake

[SOURCE: ISO 19900:2019, 3.3]

3.1.2

action effect

result of *actions* (3.1.1) on a *structural component* (3.1.57) (e.g. internal force, moment, stress, strain) or on the *structure* (3.1.59) (e.g. deflection, rotation)

[SOURCE: ISO 19900:2019, 3.4]

3.1.3

active stationkeeping system

stationkeeping system (3.1.55) that makes use of *dynamic positioning* (3.1.15), thruster assistance, line length or pretension adjustments, planned changes in vessel draught, winching (kedging) off location, or disconnection, as opposed to a *passive mooring system* (3.1.34)

3.1.4

catenary mooring system

mooring system (3.1.30) where the restoring *action* (3.1.1) is provided by both distributed weight and strain deformation of *mooring lines* (3.1.29)

3.1.5

close proximity

when any part of another surface facility lies within a contour described by the set of offsets coinciding with each *mooring line* (3.1.29) reaching 100 % *minimum break strength* (3.1.24) in the intact or *redundancy* (3.1.37) check condition, whichever is larger

3.1.6

clump weight

heavy component typically used in shallow water where the restoring of a chain-only *catenary mooring system* (3.1.4) is not sufficient to meet the specified offsets

Note 1 to entry: These components are generally fastened to a large diameter chain segment.

Note 2 to entry: This segment is usually around the touch down zone or on the seabed.

3.1.7

common mode failure

failures of similar components on different *mooring lines* (3.1.29) resulting from the same direct cause, where these failures are not consequences of each other

Note 1 to entry: The potential for common mode failures reduces the effectiveness of system *redundancy* (3.1.37).

Note 2 to entry: It is generally accepted that the failures occur simultaneously or within a short time of each other.

3.1.8

cyclic action

repetitive environmental *action* (3.1.1) that can cause cumulative damage of the *structure* (3.1.59), *structural component* (3.1.57), or *resistance* (3.1.39) of materials including soils

Note 1 to entry: cyclic action causes no significant acceleration of the structure or structural members.

3.1.9

damaged condition

state of the *stationkeeping system* (3.1.55) with a weakened or missing *mooring line* (3.1.29) or a failure of the thruster system or a combination of both

Note 1 to entry: A missing line can have either failed or been weakened by external damage (e.g., cut in synthetic ropes or corroded chain) or been removed for *maintenance* (3.1.23) or inspection.

Note 2 to entry: A total or partial loss of a buoyancy or weight element is also a damaged condition.

Note 3 to entry: For thruster assisted *mooring systems* (3.1.30), the damaged condition includes the most critical case with one leg damaged or the single worst failure of the integrated thruster control system as identified by the *failure mode* (3.1.18) and effect analysis.

3.1.10

degradation mechanism

time-based physical or chemical mechanism or process resulting in reduced functionality or capacity

EXAMPLE Corrosion, wear, fatigue.

3.1.11

design criteria

quantitative formulations that describe the conditions to be fulfilled for each *design situation* (3.1.13)

3.1.12

design service life

design life

planned period for which a *structure* (3.1.59) is used for its intended purpose with anticipated *maintenance* (3.1.23), but without substantial repair being necessary

3.1.13

design situation

design condition

set of physical conditions for which the *structure* (3.1.59) or its components are verified

EXAMPLE A defined combination of one environmental condition, one vessel loading condition, one water depth, *riser* (3.1.41) configuration, intact or one-line missing

[SOURCE: ISO 19900:2019, 3.16, modified — The preferred term has been changed from "design/assessment situation" to "design situation"; the admitted term "design condition" has been added; EXAMPLE has been added.]

3.1.14

dynamic action

external *action* (3.1.1) that induces acceleration of a *structural component* (3.1.57), normally specified by a spectrum and associated parameters for wind and waves or by time series of wind speed and direction for *squalls* (3.1.54)

3.1.15

dynamic positioning

DP

stationkeeping technique consisting primarily of a system of automatically controlled on-board thrusters, which generate appropriate thrust vectors to counter the mean and slowly varying induced *actions* (3.1.1)

[SOURCE: ISO 19904-1:2019, 3.17, modified — "automatically controlled" has been added.]

3.1.16

end-of-life break strength

ELBS

break strength of a *mooring component* (3.1.28) at the end of the *design service life* (3.1.12) that accounts for the reduction of *minimum break strength* (3.1.24) due to degradation during service

3.1.17

expected value

first-order statistical moment of the probability density function for the considered variable that, in the case of a time-dependent parameter, can be associated with a specific reference period

3.1.18

failure mode

manifestation of loss of functionality of a *mooring component* (3.1.28) and manner by which a failure is observed

3.1.19

fitness-for-service assessment

engineering evaluations to demonstrate that a *structure* (3.1.59) or a *structural component* (3.1.57) which deviates from its design basis fulfills defined *structural integrity* (3.1.58) and performance requirements

Note 1 to entry: Deviations can include deterioration or damage, life extension, and other changes and modifications to the structure or to the design basis.

[SOURCE: ISO 19900:2019, 3.23, modified — "is fit-for-service" has been replaced by "fulfills defined structural integrity and performance requirements".]

3.1.20

floating structure

floating facility

floating unit

ship

vessel

structure (3.1.59) where the full weight is supported by buoyancy

Note 1 to entry: The full weight includes lightship weight, *mooring system* (3.1.30) pre-tension, *riser* (3.1.41) pre-tension, operating weight, etc.

Note 2 to entry: this definition encompasses any structure using permanent or *mobile mooring systems* (3.1.25). Sometimes shortened to structure.

[SOURCE: ISO 19900:2019, 3.25, modified — The abbreviated terms have been added; notes 1 and 2 to entry have been added.]

3.1.21

integrated thruster control system

ITCS

complete propulsion system consisting of thrusters, and control, power generation and distribution systems

3.1.22

limit state

state beyond which the *structure* (3.1.59) or *structural component* (3.1.57) no longer satisfies the *design criteria* (3.1.11)

[SOURCE: ISO 19900:2019, 3.31]

3.1.23

maintenance

combination of all technical, administrative and managerial tasks during the life of a facility, intended to retain it in, or restore it to, a state in which it can perform the required function

[SOURCE: ISO 50007:2017, 3.21, modified — "actions" has been replaced by "tasks"; "asset" has been replaced by "facility".]

3.1.24

minimum break strength

MBS

minimum break load

MBL

break test load

BTL

catalogue break strength

CBS

hardware component's certified break strength meeting requirements of an industry standard

3.1.25

mobile mooring system

mooring system ([3.1.30](#)), generally retrievable, intended for deployment at a specific location for a short-term operation, such as those for *mobile offshore units* ([3.1.27](#))

Note 1 to entry: Some components of a mobile mooring system can be irretrievable and thus are designed following the requirements for a *permanent mooring system* ([3.1.35](#)).

Note 2 to entry: Mobile mooring systems that cannot follow the nominal inspection schedule are categorised as permanent mooring systems.

3.1.26

mobile offshore drilling unit

MODU

mobile offshore unit ([3.1.27](#)) capable of engaging in drilling and well intervention operations for exploration or exploitation of subseafloor energy related fluid and gas resources

3.1.27

mobile offshore unit

MOU

offshore structure ([3.1.59](#)) intended to be frequently relocated to perform a particular function

EXAMPLE Pipelaying vessel or barge, offshore construction structure, accommodation structure (flotel), service structure, or *mobile offshore drilling units* ([3.1.26](#)).

Note 1 to entry: Those units can be either in operating condition (when intended operation is ongoing), in standby condition (when intended operation is temporarily stopped) or in survival condition (when intended operation is stopped and unit is not adjacent to another unit).

[SOURCE: ISO 19904-1:2019, 3.33, modified — In the definition, "offshore" and "frequently" have been added; EXAMPLE and note 1 to entry have been added.]

3.1.28

mooring component

component used in the mooring of *floating structures* ([3.1.20](#))

EXAMPLE Chain, steel wire rope, synthetic fibre rope, connector, *clump weight* ([3.1.6](#)), buoy, winch, windlass, fairlead or anchor.

3.1.29

mooring line

mooring leg

anchor leg

assembly of connected *mooring components* (3.1.28), including the anchor up to and including the weld (or bolted joint) connecting the on-vessel mooring equipment to the *floating structure* (3.1.20)

3.1.30

mooring system

stationkeeping system (3.1.55) consisting of one or more *mooring lines* (3.1.29), including their associated on-vessel mooring equipment

3.1.31

natural frequency

frequency at which a mechanical oscillator has its maximum response when subjected to a white noise excitation

3.1.32

natural period

period at which a mechanical oscillator has its maximum response when subjected to a white noise excitation

3.1.33

operator

representative of the company or companies leasing the site

Note 1 to entry: The operator is normally the energy company acting on behalf of co-licensees.

Note 2 to entry: The operator can be termed the owner or the duty holder.

Note 3 to entry: The operator is the entity responsible for the definition of the design basis for the *stationkeeping system* (3.1.55).

EXAMPLE The operator owns the development while the MODU is owned by the drilling contractor.

[SOURCE: ISO 19900:2019, 3.35, modified — In note 1 to entry, "oil company" has been replaced by "energy company"; note 3 to entry and EXAMPLE have been added]

3.1.34

passive mooring system

mooring system (3.1.30) that responds to changes in *floating structure* (3.1.20) draught, trim, and environmental actions without any intervention or adjustment of the *mooring lines* (3.1.29), and does not use thrusters

3.1.35

permanent mooring system

mooring system (3.1.30) normally used to moor *floating structures* (3.1.20) deployed for long-term operations, such as those for a floating production system

3.1.36

recognized classification society

RCS

member of the International Association of Classification Societies (IACS), with established rules and procedures for classification and certification of *floating structures* (3.1.20) used in energy activities, located at a specific site, for an extended period of time

3.1.37

redundancy

ability of the *structure* (3.1.59) to find alternative load paths following structural failure of one or more components, thus limiting the consequences of such failures

[SOURCE: ISO 19902:2020, 3.38, modified — Note 1 to entry has been removed.]