INTERNATIONAL STANDARD

IEC 61892-1

First edition
2001-12

Mobile and fixed offshore units – Electrical installations –

Part 1: General requirements and conditions

Unités fixes et mobiles en mer –
Installations électriques –

Partie 1:
Prescriptions et conditions générales

Reference number
IEC 61892-1:2001(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/catlg-e.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/JP.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 61892-1

First edition
2001-12

Mobile and fixed offshore units – Electrical installations –

Part 1: General requirements and conditions

Unités fixes et mobiles en mer –
Installations électriques –

Partie 1:
Prescriptions et conditions générales

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE U

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MOBILE AND FIXED OFFSHORE UNITS – ELECTRICAL INSTALLATIONS –

Part 1: General requirements and conditions

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61892-1 has been prepared by IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

The text of this standard based on the following documents:

FDIS	Report on voting
18/916/FDIS	18/920/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex A is for information only.

IEC 61892 consists of the following parts, under the general title: *Mobile and fixed offshore units – Electrical installations*:

Part 1: General requirements and conditions

Part 2: System design[1]

Part 3: Equipment

[1] Under consideration. Before IEC 61892-2 is published, reference is made to IEC 60092-201.

Part 4: Cables[2]

Part 5: Mobile units

Part 6: Installation

Part 7: Hazardous areas

The committee has decided that this publication remains valid until 2006. At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

[2] Under consideration. Before IEC 61892-4 is published, reference is made to IEC 60092-35X-series.

INTRODUCTION

IEC 61892 forms a series of International Standards intended to enable safety in the design, selection, installation, maintenance and use of electrical equipment for the generation, storage, distribution and utilization of electrical energy for all purposes in offshore units which are used for the purpose of exploration or exploitation of petroleum resources.

This part of IEC 61892 also incorporates and co-ordinates, as far as possible, existing rules and forms a code of interpretation, where applicable, of the requirements of the International Maritime Organization, a guide for future regulations which may be prepared and a statement of practice for offshore unit owners, constructors and appropriate organizations.

This standard is based on equipment and practices which are in current use, but it is not intended in any way to impede development of new or improved techniques.

The ultimate aim has been to produce a set of International Standards exclusively for the offshore petroleum industry.

In this part of IEC 61892, references are made to other parts of the standard, which are still in preparation. Such references are marked with footnotes. A footnote indicates which current standard should be used until the part under preparation is published.

MOBILE AND FIXED OFFSHORE UNITS – ELECTRICAL INSTALLATIONS –

Part 1: General requirements and conditions

1 Scope

This part of IEC 61892 contains provisions for electrical installations in mobile and fixed units used in the offshore petroleum industry for drilling, production, processing and for storage purposes including pipeline, pumping or 'pigging' stations, compressor stations and exposed location single buoy moorings.

It applies to all installations, whether permanent, temporary, transportable or hand-held, to a.c. installations up to and including 35 000 V and d.c. installations up to and including 1 500 V.

This standard does not apply either to fixed equipment for medical purposes or to the electrical installations of tankers.

NOTE For medical rooms see IEC 60364-7-710

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.

IEC 60034 (all parts), *Rotating electrical machines*

IEC 60079-0:1998, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*
Amendment 1 (2000) [1]

IEC 61892-3:1999, *Mobile and fixed offshore units – Electrical installations – Part 3: Equipment*

IEC 61892-7:1997, *Mobile and fixed offshore units – Electrical installations – Part 7: Hazardous areas*

IMO-110E, *The International Convention of Safety of Life at Sea* (SOLAS)

3 Definitions

For the purposes of this part of IEC 61892 the following definitions apply.

NOTE The definitions included in this part are those having general application in the IEC 61892 series. Definitions applying to particular apparatus or equipment are included in the other parts of IEC 61892.

3.1
accessible (as applied to equipment)
condition applied to an object or device that can be inadvertently touched or approached nearer than a safe distance by any person. It is applied to objects not suitably guarded or insulated

3.2
accessible (as applied to wiring methods)
not concealed

[1] There exists a consolidated version including IEC 60079-0 (1998) and its amendment 1 (2000).

3.3
accessory
any device, other than a luminaire (see IEC 61892-3) associated with the wiring and current-using appliances of an installation; for example, a switch, a fuse, a plug, a socket-outlet, a lampholder, or a junction box

3.4
appropriate authority
governmental body with whose rules a unit is required to comply

3.5
bond
connection of non-current-carrying parts to ensure continuity of electrical connection, or to equalize the potential between parts

3.6
degree of protection of enclosures
designation to indicate the degree of protection, consisting of the characteristic letters IP followed by two numerals (the "characteristic numerals") indicating conformity with the conditions stated in tables 1 and 2 below

NOTE The enclosures referred to in the various parts of IEC 61892 are those as defined in IEC 60529.

3.7
distribution board
assembly of one or more overcurrent protective devices for the control and distribution of electrical power to final subcircuits

3.8
earth
general mass of the metal structure or hull of the unit

NOTE In the U.S.A. and Canada "ground" is used instead of "earth".

3.9
earthed
connected to the general mass of the structure or hull of the unit in such a manner as will ensure at all times an immediate discharge of electrical energy without danger

3.10
essential services
services essential for the navigation, steering or manoeuvring of the mobile unit, or for the safety of human life, or for special characteristics of the unit (for example special services)

3.11
final subcircuit
portion of a wiring system extending beyond the final overcurrent protective device of a board

3.12 Frequency

3.12.1
cyclic frequency variation
periodic deviation in frequency during normal operation such as might be caused by regularly repeated loading

$$\text{Cyclic frequency variation} = \frac{\pm(f_{max} - f_{min}) \times 100}{2\, f_{nominal}} \%$$

3.12.2
frequency tolerance
maximum departure from nominal frequency during normal operation conditions excluding transient and cyclic frequency variations

NOTE Frequency tolerance is a steady state tolerance and includes variations caused by loads and governor characteristics. It also includes variations due to environmental conditions.

3.12.3
frequency transient
sudden change in frequency which goes outside the frequency tolerance limits and returns to and remains inside these limits within a specified recovery time after initiation of the disturbance (time range: seconds)

3.13 Insulation

3.13.1
basic insulation
insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.13.2
supplementary insulation
independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation

3.13.3
double insulation
insulation comprising both basic insulation and supplementary insulation

3.13.4
reinforced insulation
single insulation system applied to live parts which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in the relevant IEC standard

NOTE The term "insulation system" does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

3.14
live
a conductor or circuit is live when a difference of potential exists between it and earth

3.15
petroleum
complex mixture of hydrocarbons that occurs in the earth in liquid or gaseous forms

3.16
point (in wiring)
any termination of the fixed wiring intended for the attachment of a luminaire or for connecting to the supply a current-using appliance

3.17
section board
switchgear and controlgear assembly for controlling the supply of electrical power to other section boards, distribution boards, or final subcircuits

3.18 Spaces

3.18.1
accommodation spaces
spaces used for public spaces, corridors, lavatories, cabins, offices, crew quarters, hospitals, game and hobby rooms, pantries containing no cooking appliances and similar spaces

3.18.2
machinery spaces
spaces containing propelling machinery, boilers, oil fuel units, steam and internal combustion engines, hydrocarbon process equipment, water treatment and handling equipment, drilling and associated equipment, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air-conditioning machinery, and similar spaces and trunks to such spaces

3.18.3
public spaces
portions of the accommodation used for halls, dining rooms, lounges, and similar permanently enclosed spaces

3.18.4
service spaces
spaces used for galleys, pantries containing cooking appliances, lockers and store-rooms, workshops other than those forming part of machinery spaces, and similar spaces and trunks to such spaces

3.19 Voltages

3.19.1
safety voltage
voltage which does not exceed 50 V a.c. r.m.s. between conductors, or between any conductor and earth, in a circuit isolated from the supply by means such as a safety isolating transformer, or convertor with separate windings

voltage which does not exceed 50 V d.c. between conductors, or between any conductor and earth, in a circuit which is isolated from higher voltage circuits

NOTE 1 Consideration should be given to the reduction of the limit of 50 V under certain conditions, such as wet surroundings or exposure to heavy seas.

NOTE 2 The voltage limit should not be exceeded either at full load or no load, but it is assumed, for the purpose of this definition, that any transformer or convertor is operated at its rated supply voltage.

3.19.2
voltage tolerance
maximum departure from nominal user voltage during normal operating conditions, excluding transient and cyclic voltage variations

NOTE Voltage tolerance is a steady state tolerance and includes voltage drop in cables and voltage regulator characteristics. It also includes variations due to environmental conditions.

3.19.3
voltage unbalance tolerance
difference between the highest and lowest phase to phase voltage

3.19.4
cyclic voltage variation
periodic voltage deviation (max. to min. r.m.s. values) of the nominal voltage, such as might be caused by regularly repeated loading

$$\text{Cyclic voltage variation} = \frac{\pm(U_{\max} - U_{\min}) \times 100}{2\,U_{\text{nominal}}}\ \%$$

3.19.5
voltage transient
sudden change in voltage (excluding spikes) which goes outside the nominal voltage tolerance limits and returns to and remains inside these limits within a specified recovery time after the initiation of the disturbance (time range: seconds)

3.20 Recovery time

3.20.1
voltage transient recovery time
time elapsed from exceeding the normal tolerance until the voltage recovers and remains within the normal tolerance limits

3.20.2
frequency transient recovery time
time elapsed from exceeding the normal tolerance until the frequency recovers and remains within the frequency tolerance limits

3.21 Waveform

3.21.1
total harmonic distortion
ratio of the r.m.s. value of the residue, after elimination of the fundamental, to the r.m.s. value of the fundamental, expressed in per cent

3.21.2
single harmonic content
ratio of the effective r.m.s. value of that harmonic to the r.m.s. value of the fundamental expressed in per cent

Table 1 – Degrees of protection against foreign objects indicated by the first characteristic numeral

First characteristic numeral	Degree of protection	
	Short description	Definition
0	Non-protected	–
1	Protected against solid objects greater than 50 mm	A large surface of the body, such as a hand (but no protection against deliberate access). Solid objects exceeding 50 mm in diameter
2	Protected against solid objects greater than 12 mm	Finger or similar objects not exceeding 80 mm in length Solid objects exceeding 12 mm in diameter
3	Protected against solid objects greater than 2,5 mm	Tools, wires, etc. of diameter or thickness greater than 2,5 mm. Solid objects exceeding 2,5 mm in diameter
4	Protected against solid objects greater than 1 mm	Wires or strips of thickness greater than 1 mm. Solid objects exceeding 1 mm in diameter
5	Dust-protected	Ingress of dust is not totally prevented, but dust does not enter in sufficient quantity to interfere with satisfactory operation of the equipment
6	Dust-tight	No ingress of dust

Table 2 – Degrees of protection against water indicated by the second characteristic numeral

Second characteristic numeral	Degree of protection	
	Short description	Definition
0	Non-protected	–
1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
7	Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7

Notes common to tables 1 and 2:

NOTE 1 For information about degrees of protection against access to hazardous parts indicated by an additional letter and/or a supplementary letter, see IEC 60529.

NOTE 2 For information about degrees of protection for rotating electrical machines, see IEC 60034-5, Rotating electrical machines – Part 5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP code).

NOTE 3 Second characteristic numeral 6, will also include protection against heavy seas.

4 General requirements and conditions

4.1 General

This clause contains conditions and requirements which are common to all equipment and installations in the IEC 61892-series.

Electrical installations in units shall be such that:

– essential services will be maintained under various emergency conditions;

– the safety of crew, contractors, visitors and unit will be ensured;

– the requirements with respect to safety in this standard are considered;

– the requirements of the International Convention for the Safety of Life at Sea (SOLAS) are met as far as applicable.

4.2 Workmanship and material

Good workmanship and adequate material are essential requirements for compliance with these standards.

4.3 Applicability of the standards to a.c. and d.c.

Except where a specific statement is made to the contrary, the IEC 61892 series is equally applicable to equipment in all installations whether permanent, temporary, transportable or hand-held, for a.c. installations up to and including 35 000 V and d.c. installations up to and including 1 500 V.

4.4 Acceptance of substitutes or alternatives

Where in these standards any special type of equipment, construction, or arrangement is specified, the use of any other equipment, construction or arrangement is admissible, provided it is not less effective and reliable.

4.5 Provision for maximum load

All conductors, switchgear and accessories shall be of such size as to be capable of carrying, without their respective ratings being exceeded, the current which can normally flow through them. They shall be capable of carrying anticipated overloads and transient currents, for example the starting currents of motors, without damage or reaching abnormal temperatures.

4.6 Additions and alterations

An addition or alteration, temporary or permanent, shall not be made to an existing installation until it has been ascertained that the ratings and the condition of existing accessories, conductors, switchgear, etc. affected, are adequate for the new situation.

Special attention is drawn to those factors affecting the existing system design such as current-carrying capacity, short-circuit level, voltage drop, harmonics, stability and proper discrimination of the protective devices.

4.7 Environmental conditions

4.7.1 General

Electrical equipment shall operate satisfactorily under various environmental conditions.

Environmental conditions are characterised by a number of variables:

– one set including mainly climatic conditions, biological conditions, conditions dependent upon chemically and mechanically active substances and mechanical conditions;

– another set dependent mainly upon locations in unit, operational patterns and transient conditions.

For guidance only, annex A gives a list of a limited number of environmental conditions in conjunction with some selected locations, operational patterns and transient conditions which are considered to be generally representative.

4.7.2 Design parameters

Design parameters based on environmental conditions applicable to certain types of equipment may be determined according to location. Where no data is available the following tables give recommended values.

4.7.2.1 Temperature

In other parts of IEC 61892, where no "high air temperature" has been specified as a design parameter for equipment, a value of 45 ºC shall apply.

Where equipment is designed to operate with temperatures higher or lower than those stated, permissible temperature rises may be reduced or increased accordingly.

Table 3 – Design parameters – Temperature

Type of equipment	Value – °C
High air temperature	
Cables	45
Generators and motors	50
Switchgear	45
Transformers	45
Control and instrumentation	55
Other electrical equipment	45
Low air temperature	
Control and instrumentation	5 (general)
	–25 (open deck)
High water temperature	
Generators and motors	30

NOTE For batteries see 8.5 of IEC 61892-3.

4.7.2.2 Humidity, relative

Table 4 – Design parameters – Humidity, relative

Value	
%	°C
95	up to 45
70	above 45

4.8 Materials

In general, all electrical equipment shall be constructed of durable, flame-retardant, moisture-resistant materials, which are not subject to deterioration in the atmosphere and at the temperatures to which they are likely to be exposed.

4.9 Power supply system characteristics

4.9.1 General

Unless otherwise stated in other parts of this standard, equipment shall function when supplied from general distribution systems with due regard to voltage and frequency variations, harmonic distortion and conducted disturbances. The characteristics of general distribution systems are given in the following subclauses.

NOTE 1 Where the power supply is obtained from the shore, due regard should be paid to the effect that the quality of the supply, if different from that specified in this clause, may have on the performance of equipment.

NOTE 2 For systems where semiconductors are connected having a total rating which is a significant portion of the total system rating, it may be feasible to suppress the harmonics. Consideration should be given to taking appropriate measures to attenuate these effects of the distribution system so that safe operation is assured. Care should be taken in selecting consumers supplied from an electric power supply system with a higher harmonic content than specified in this clause.

NOTE 3 Electrical equipment which requires a higher quality power supply may need additional provisions to be made locally. Where additional equipment is fitted to achieve this higher quality power supply it may be required to be duplicated and segregated to the same degree as the electrical equipment it supplies.

NOTE 4 Special attention should be paid to the installation of electrical equipment which may influence the quality of power supply on a local basis or react with any harmonics present on the general distribution system.

NOTE 5 Variable frequency/voltage systems may be admissible provided safe operation of the system is assured and equipment is suitably rated for the expected variations.

4.9.2 AC distribution systems

4.9.2.1 Voltage characteristics

Tolerances are expressed in a percentage of the nominal voltage.

Voltages are root mean square (r.m.s.) unless otherwise stated.

Voltage tolerance (continuous)..... $^{+\ 6}_{-10}$ %

Voltage unbalance tolerance including phase voltage unbalance as a result of unbalance of load according to IEC61892-2[2]..... 7 %

Cyclic voltage variation (continuous)..... 2 %

Voltage transients:

slow transients e.g. due to load variations tolerance.....

(deviation from nominal voltage) ..... $^{+20}_{-20}$ %

voltage transients recovery time..... maximum 1,5 s

Where three-phase a.c. motors conforming to the IEC 60034 series are connected, then the system negative sequence component shall not exceed 1 % of the positive sequence component over a long period, or 1,5 % for a short period not exceeding a few minutes, and a zero sequence component not exceeding 1 % of the positive sequence component.

NOTE The sum of voltage excursions at any point on the system (tolerances and transients) from nominal voltage should not exceed $^{+20}_{-20}$ %

4.9.2.2 Harmonic distortion (voltage waveform)

Total harmonic distortion ..... maximum 8 %

Single harmonic..... maximum 5 %

NOTE Other values may be considered subject to approval of the appropriate authority.

4.9.2.3 Frequency characteristics

Tolerances are expressed in a percentage of the nominal frequency.

Frequency tolerance (continuous) ..... $^{+5}_{-5}$ %

Cyclic frequency variation (continuous) ..... 0,5 %

Frequency transient tolerance..... $^{+5}_{-5}$ %

Frequency transients recovery time..... maximum 5 s

NOTE The sum of frequency excursions at any point on the system (tolerances and transients) from nominal frequency should not exceed $^{+12.5}_{-12.5}$ %.

4.9.3 DC distribution systems

Tolerances are expressed in a percentage of the nominal voltage.

Voltage tolerance (continuous)..... $^{+10}_{-10}$ %

Cyclic voltage variation ..... 5 %

[2] Under consideration. Until future IEC 61892-2 is published, reference is made to IEC 60092-201 Amendment 1.

Voltage ripple (a.c. r.m.s. over steady d.c. voltage) ..... 10 %

NOTE 1 When battery chargers/(battery combinations) are used as d.c. power supply systems, adequate measures should be taken to keep the voltage within the specified limits during charging, quickcharging and discharging of the battery.

NOTE 2 For control and instrumentation systems, see IEC 61892-2

Fast transients e.g. spikes caused by switching, peak impulse voltage amplitude

24 V d.c. systems ..... 500 V

II0 V d.c. systems ..... 1 500 V

220 V d.c. systems ..... 2 500 V

4.10 Electrical apparatus for explosive gas atmospheres

When an apparatus is required to be suitable for use in explosive gas atmospheres it shall comply with the requirements of IEC 61892-7.

Such apparatus shall also be type tested, where required, in accordance with IEC 60079-0 and, where it is required to be of a certified safe type, the certification for use in the relevant atmosphere(s) is to be carried out by a recognised competent independent testing authority.

4.11 Precautions against galvanic corrosion

Suitable means shall be taken to prevent galvanic corrosion when securing dissimilar metals, for example aluminium to the structure or hull of a unit.

4.12 Clearance and creepage distances

The distances between live parts of different potential and between live parts and the cases of other earthed metal, whether across surfaces or in air, shall be adequate for the working voltage, having regard to the nature of the insulating material and the conditions of service.

NOTE For clearance and creepage distances for electrical equipment see IEC 61892-3

4.13 Insulation

Insulating materials and insulated windings shall be resistant to moisture, sea air and oil vapour, unless special precautions are taken to protect insulants against such agencies.

NOTE As a consequence of this clause, insulating materials in important applications, such as busbar supports, etc., should have sufficient resistance against tracking. It is recommended that the comparative tracking index of such materials be not less than 175 V when determined according to IEC 60112.

4.14 Maintenance and inspection

Equipment shall be so designed and installed as to permit its being maintained and inspected as required for all its parts.

4.15 Cable entries

Cable glands or bushings, or fittings for screwed conduits, shall be provided according to the way in which the cables enter the equipment. All entries shall maintain the degree of protection provided by the enclosure of the associated equipment.

NOTE Bottom entry is preferred for outdoor or deluge protected areas. Side entry is acceptable by use of dripnose installation for the cable in question.

4.16 Precautions against vibration and mechanical shock

Equipment shall be unaffected by vibration and shock likely to arise under normal service. Connections shall be secured against becoming loose due to vibration.

4.17 Location of electrical equipment in units

Spaces in which electrical equipment is placed shall be suitably constructed and, if necessary, ventilated. Electrical installations in hazardous areas shall comply with IEC 61892-7.

4.18 Spaces and compartments

Spaces in which engine-driven generating sets are placed shall be constructed of metal or other incombustible material. Compartments or cupboards containing switchgear assemblies shall be constructed of, or lined with, incombustible material.

4.19 Mechanical protection

Electrical equipment shall be placed so that, as far as practicable, it is not exposed to risk of mechanical damage.

4.20 Protection from heat, water, steam and oil

Electrical equipment shall be so selected and located or protected that the effects of exposure to sea-air, water, steam, oil or oil fumes, spray, ice formation, etc., are minimised. It should be located well clear of boilers, steam, oil or water pipes, and engine exhaust pipes and manifolds, unless specifically designed for such locations. If pipes must be run adjacent to electrical equipment there shall be no joints in the immediate vicinity of the electrical equipment.

NOTE Where sprinkler heads or water spraying devices are fitted for fire-fighting, due consideration should be given to the siting of electrical equipment which would be seriously affected by the inadvertent operation of the extinguishing arrangement. This is particularly applicable to switchgear and switch rooms, where a suitable alternative method of extinguishing should be used.

4.21 Protection against electrical shock

All electrical equipment shall be constructed or located in such a way that live parts cannot be inadvertently touched.

4.22 Enclosures

Enclosures shall comply with the degrees of protection as required in Table X[3] of IEC 61892-2. Enclosing cases for electrical equipment shall be of adequate mechanical strength and rigidity and mounted so that their enclosing arrangements and the functioning of the built-in equipment will not be affected by distortions, vibrations and movements of the unit's construction, or by risk of damage.

4.23 Classification tests for materials

NOTE 1 These do not apply to electric cables for which special tests exist.

NOTE 2 These tests are under review and until completed reference is made to the IEC 60695 series for guidance on burning tests and to IEC 60092-101 for guidance on moisture-resistance tests.

[3] Table under consideration. Before IEC 61892-2 is published, reference is made to table 5 in IEC 60092-201.

Annex A
(informative)

Guidance on environmental conditions

A.1 This annex is a non-mandatory guide giving details of the environmental conditions for electrical installations of mobile and fixed offshore units.

The guidance is presented in five tables, A.1 to A.5. Table A.1 contains a survey of environmental conditions related to specific locations and is intended to serve as the introduction to the remaining tables. Tables A.2 to A.5 deal with specific conditions, that is climatic, biological, mechanical and those dependent on chemically and mechanically active substances.

The parameters and their severities of environmental conditions given in tables A.2 to A.5 are based on IEC 60721-3-6.

The severities given are those which will have a low probability of being exceeded. Only severe conditions which affect the structural integrity or functional performance are included. Accidental incidents are not included, but the possibility of their occurrence may need to be taken into account for products vital to the safety of the unit. In the tables, the expression "general" refers to the least severe conditions.

The simultaneous occurrence of environmental parameters is envisaged in the guidance, but is not always a reality. Furthermore, no reference to duration of parameters or severities, or to frequency of operation in certain climates or areas, has been made.

In tables A.2 to A.5, the first column describes the locations and, where applicable, the areas or conditions of operation.

The last column indicates for each item in the first column the designation of the class according to IEC 60721-3-6, which is the lowest class covering the environmental conditions specified. In the majority of cases this class covers more parameters or higher severities beyond those listed. The use of the class is optional.

In the remaining columns of tables A.2 to A.5 an X indicates the applicable environmental parameter and its severity.

In table A.2 an O indicates the type of open-air climate in which the unit is navigated.

The types of open-air climate covered are:

C	= Cold	MWDr	= Mild Warm Dry
CT	= Cold Temperate	WDa	= Warm Damp
WT	= Warm Temperate	WDaE	= Warm Damp Equable
WDr	= Warm Dry		

according to IEC 60721-2-1.

NOTE 1 The open-air types of climate Warm Damp and Warm Damp Equable correspond to what is generally termed Tropical Belt.

NOTE 2 The most extreme types of open-air climate in IEC 60721-2-1, Extremely Cold and Extremely Warm Dry, can normally only be found in inland areas, and have therefore been excluded here. It should be noted, however, that units may be subjected to these types of climate during inland navigation (on rivers, lakes, etc.) although this can be regarded as very exceptional.

Table A.1 – Survey of environmental conditions related to locations

Conditions [a]		Climatic		Biological		Chemically active substances		Mechanically active substances		Mechanical	
Locations [a]		Item of table A.2 b	Class c	Item of table A.3 b	Class c	Item of table A.4 b	Class c	Item of table A.4 b	Class c	Item of table A.5 b	Class c
1	Navigation bridge (wheelhouse, wireless-room, chartroom)	1.2 + 1.4	6K2	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
2	Control rooms	1.2	6K2	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
3	Accommodation spaces	1.2 +1.4	6K2	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
4	Air-conditioned spaces	1.2 + 1.4	6K2	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
5	Lavatories, bathrooms, showers	1.2 + 1.5	6K2	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
6	Galleys, laundries, pantries	1.2 + 1.5 +1.6	6K3	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
7	General stores, provision rooms	1.2	6K2	2 + 3	6B2	1.1	6C1	1.1	6S2	1.1	6M2
8	Machinery spaces, process areas	1.7.2	6K3	2 + 3	6B2	1.4.1	6C1	1.4.1	6S1	1.1	6M2
9	Refrigerated cargo spaces	1.2 + 1.8	6K5	2 + 3	6B2	1.1	6C1	1.1	6S1	1.1	6M2
10	Steering gear rooms	1.7.2	6K3	2 + 3	6B2	1.1	6C1	1.1	6S1	1.4	6M3
11	General cargo spaces	2.2 + 2.3 +2.6	6K5	2 + 3	6B2	1.2	6C2	1.3	6S2	1.1	6M2
12	Semi-enclosed spaces	3.2 + 3.3 +3.5	6K5	2 + 3	6B2	1.2	6C2	2.2.3	6S3	1.1	6M2
13	Open decks	3.2 + 3.3 +3.6	6K5	2 + 3	6B2	2.2.1	6C3	2.2.3	6S3	1.1	6M2
14	External submerged parts of hull	4.3	6K2	2 + 3	6B2	2.2.1	6C3	2.2.1	6S1	1.1	6M2

a) Conditions include those related to all types of open air climates, to all geographical areas with biological risk, and to vessels in excess of approximately 500 tonnes gross tonnage, but not passing through ice.

b) When locations and conditions not referred to in table A.1 are applicable, consideration should be given to the appropriate items of tables A.2 to A.5.

c) Lowest environmental class needed according to IEC 60721-3-6.

Table A.2 – Climatic conditions

Climatic conditions according to IEC 60721-3-6		Type of open air climate [a]		Temperature: Low: Air [b] °C	Low: Water [c] °C	Surface: Air [d] °C	Surface: Surface [e] °C	Water °C	Change of temperature: Gradual air/air [b f] °C min	Change of temperature: Air/water °C	Humidity [g]: High relative not combined with rapid change of temperature % °C	Combined with rapid change of temperature air/air at high: Relative humidity [f] % °C	Combined with rapid change of temperature air/air at high: Water content [h] g/m³ °C	Low relative %	Movement of surrounding air rain m/s	Precipitation Rain [g i] mm/min	Radiation: Solar [j] W/m²	Radiation: Heat W/m²	Water from sources other than rain [k] m/s	Wetness	Lowest environmental class needed according to IEC 60721-3-67
Locations		C	CT WT WDr MWDr	Wda WdaE	+5	-25	-40	Freezing point	40	55	70	70	25	30	35	1	3	40/5	30	35	45	-25/+35	+70/+15	30	30	50	6	15	700	1120	600	1200	0,3	3	10	Conditions of wet surfaces	
					-25/+20	-25/+40													95	95	95	95	95	10												
1	*Locations, totally weatherprotected, heated, ventilated* [l]																																			
1.1	General	O	O		X				X										X					X											6K1
1.2	Operation in types of open-air climates Warm Damp and Warm Damp Equable	O	O	O	X				X											X				X											6K2
1.3	In proximity to heaters	O	O		X				X										X					X						X					6K2
1.4	Subject to solar radiation through glass	O	O		X				X										X					X				X							6K2
1.5	Subject to dripping water	O	O		X				X										X					X								X			6K2
1.6	Containing equipment dissipating considerable heat	O	O		X					X									X					X											6K3
1.7	Machinery spaces																																			
	1 General	O	O		X				X										X					X								X			6K2
	2 Operation in open-air climate types Warm Damp and Warm Damp Equable	O	O	O	X					X									X					X								X			6K3
	3 In proximity to equipment radiating moderate heat	O	O		X				X										X					X						X		X			6K2
	4 In proximity to equipment radiating considerable heat	O	O		X				X										X					X							X	X			6K3
	5 On hot parts of machinery [m]	O	O		X		X		X		X								X					X								X			6K4
1.8	Refrigerated cargo spaces	O	O						X										X					X								X			6K5
1.9	Before and during warm-up [n]																																			
	1 General		O			X			X								X			X					X											6K2
	2 In open-air climate type Cold	O	O				X		X								X			X					X											6K5
	3 Machinery spaces		O		X				X									X		X					X											6K3
1.10	During loading and unloading [n]																																			
	1 Close to gates, ramps, covers	O	O				X		X									X			X			X												6K3
	2 Refrigerated cargo spaces	O	O				X		X									X			X		X	X												6K5
2	*Locations, totally weatherprotectedunheated*																																			
2.1	General		O			X			X									X						X												6K2
2.2	Operation in open-air climate types Warm Damp and Warm Damp Equable		O	O		X			X											X				X												6K2
2.3	Operation in open-air climate type Cold [o]		O	O			X		X												X			X				X								6K5
2.4	Ventilated, subject to solar radiation through glass		O			X			X										X					X												6K2
2.5	Ventilated wet areas, e.g. on wet surfaces		O			X			X										X					X											X	6K3

Table A.2 – (*continued*)

Climatic conditions according to IEC 60721-3-6	Type of open air climate 1)			Temperature									Humidity 7)			Combined with rapid change of temperature air/air at high		Low relative %	Movement of surrounding air rain		Precipitation Rain 7) 9)		Radiation Solar 10)		Heat		Water from sources other than rain 11)			Wetness	Lowest environmental class needed according to IEC 60721-3-67
				Low			Surface						Change of temperature																		
				Air 2)		Water 3)	Air 4)		Surface 5)	Water			Gradual air/air 2) 6)		Air/water	High relative not combined with rapid cange of temperature			Relative humidity 6)	Water content 8)											
				°C			°C		°C	°C			°C min		°C	% °C			% °C	g/m³ °C	°C	m/s		mm/min		W/m²		W/m²		m/s			
Locations	C	CT WT WDr MWDr	Wda WdaE	+5	-25	-40	40	55	70	70	25	30	35	-25/+20 1	-25/+40 3	40/5	95 30	95 35	95 45	95 -25/+35	95 +70/+15	10 30	30	50	6	15	700	1120	600	1200	0,3	3	10	Conditions of wet surfaces	
2.6 Subject to dripping water		O			X			X									X					X								X			6K2
2.7 Unventilated enclosed spaces, the external surface of the enclosure subject to solar radiation																																		
1 Without internal wet surfaces		O			X			X									X					X											6K4
2 With internal wet surfaces (evaporation of water)		O			X			X											X			X										X	6K4
3 With internal wet surfaces, the external surface subjected to rain or water jets after period of solar radiation		O			X			X											X		X	X										X	6K4
3 Locations, not totally weatherprotected																																		
3.1 General		O			X			X									X					X	X		X		X						6K4
3.2 Operation in open-air climate types Warm Damp and Warm Damp Equable		O	O		X			X									X					X	X		X		X						6K4
3.3 Operation in open-air climate type Cold [o]	O	O				X		X									X					X	X		X		X						6K5
3.4 Operation in areas with abnormal rain intensities and hurricanes		O			X			X									X					X		X		X							6K5
3.5 Subject to water jets		O			X			X							X		X					X	X		X		X				X		6K4
3.6 Subject to heavy seas		O			X			X							X		X					X	X		X		X					X	6K5
4 *Locations, submerged*																																		
4.1 General	O	O				X				X																								6K1
4.2 Operation in open-air climates types Warm Damp and Warm Damp Equable	O	O	O			X					X																							6K1
4.3 Operation in areas with high water temperature for example the Arabian Gulf	O	O				X						X																						6K2

Table A.2 – (*continued*)

a	Type of open-air climate in which the vessel is navigated (according to IEC 60721-2-1) C: Cold WT: Warm Temperate MWDr: Mild Warm dry WDaE: Warm Damp Equable CT: Cold Temperate WDr: Warm dry WDa: Warm Damp
b	A number of products in machinery spaces are required to operate only after a period of warming-up. For these products, the low temperature for operation is +5 °C, and the Gradual Change of Temperature condition applies only to the non-operational state.
c	The freezing-point may be below 0 °C due to the presence of salt or other substances.
d	For control and instrumentation equipment located in panels or cubicles, consideration should be given to the temperature rises inside those panels or cubicles due to the dissipation of heat from components therein.
e	Surface temperature refers to hot parts to which a product may be attached. More extreme surface temperature can exist, and may have to be considered.
f	The change of temperature is either an increase or a decrease.
g	It should be noted that formation of ice may occur in locations on externally or internally mounted products, possibly causing malfunction of moving parts. This can be caused by condensation and freezing on cold surfaces, undercooled rain water, or the combination of air velocity and relative humidity (depending on product shape).
h	The rapid change of temperature is a rapid decrease. The figure of water content applies to temperatures down to dew-point. At lower temperatures relative humidity is assumed to be 100 %.
i	Drop sizes may also be of importance, especially combined with high wind speeds.
j	The lower value applies to glass not specifically treated to reduce heat transmission.
k	The velocity should not be taken as the amount of water collected on a surface per time unit.
l	Failure of the ventilation, heating or air-conditioning system may change the environmental condition specified.
m	For boilers, engines, etc. more extreme temperatures may exist, depending on type of boiler or engine, and exact location. Such cases are not covered here and have to be specially considered.
n	Transient conditions.
o	Vessels will not normally be navigated in air temperatures below –40 °C. Temperatures may fall below –40 °C, however, when vessels are laid up and left unprotected. In such cases the temperature may reach -55 °C.

Table A.3 –Biological conditions

Biological conditions according to IEC 60721-3-6	Presence of flora and fauna in air		Lowest environ mental class needed according to IEC 60721-3-6
Locations Operation	Mould, fungus, etc.	Rodents and other animals	
1 Operation in geographical areas with low biological risk or locations protected from growth of mould, fungus, etc. and from attacks by rodents and other animals			6B1
2 Operation in geographical areas with high risk of growth of mould, fungus, etc.	X		6B2
3 Operation in geographical areas with high risk of attacks by rodents and other animals		X	6B2
NOTE – Externally installed products on submerged parts of the hull will be subjected to marine flora and fauna (growth of algae, sea animals).			