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ITER Electrical Design Handbook Codes & Standards

AUTHOR/AUTHORS
Joel Hourtoule

AUTHOR EMAIL(S)
Joel.Hourtoule@iter.org

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ITER Electrical Design Handbook

Codes & Standards



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- ❖ Introduction
- ❖ Terminology & Acronyms
- ❖ Codes and Standards

Introduction

Abstract

This manual is provided for the use of all Departments of the ITER Organization and is addressed to system specifiers, designers and users of electrical components in otherwise non-electrical plant systems.

This is an initial version of this document that has been reviewed in accordance with the ITER MQP. Review comments have in part been addressed and others will be considered in detail and addressed at the next revision.

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1 Introduction

This document will be published in the Baseline documentation folder of the ITER Document Management (IDM) System and will be the subject of continual review and revision throughout the lifetime of the ITER project.

This handbook is provided for the use of all Departments of the ITER Organization and is addressed primarily to system specifiers, designers and users of electrical components in otherwise non-electrical plant systems, rather than to designers of the power supply systems. The latter shall in addition comply with many other standards, instructions and industrial practices that are beyond the scope of this handbook.

Standardisation Guides

All electrical components and plant systems used or installed at ITER shall comply with the requirements set out in this EDH.

In particular, voltage and current ratings must be selected for connection to the ITER standard nominal system voltages that have been selected from the IEC standards as given in the Section on [Standard Voltages](#).

The related test voltages are given in the Section on [Standard Test Voltages](#).

1.1 Standard Voltages

1.1.1 Applicable IEC standards

IEC 60038 IEC Standard Voltages

International Standard **IEC 60038** defines a set of standard voltages for use in low voltage and high voltage AC electricity supply systems.

The definition of voltage levels is as follows:

IEC voltage range	AC	DC	defining risk
Extra-low voltage	< 50 V _{rms}	< 120 V	low risk
Low voltage	50–1000 V _{rms}	120–1500 V	electrical shock
High voltage	> 1000 V _{rms}	> 1500 V	electrical arcing

Table 1.1 IEC Definition of Voltage Levels

1.1.2 Low Voltage, single & 3 phase, 50Hz

The 230V/400V level (in bold text) is that adopted for use by ITER:

	rms voltage between a phase and the neutral connector	Corresponding rms voltage between two phases. Four-wire (with neutral) or three-wire (without neutral) systems
LV	230 V	400 V
	400V	690V
	1000V	-

Table 1.2 Low Voltage (LV) used at ITER

1.1.3 High Voltage, 3 phase, 50 Hz

Whilst defined by IEC as being **High Voltage**, i.e. $> 1000 V_{rms}$, the following voltage levels shall be referred to within ITER as **Medium Voltage (MV)**, i.e. $1 \text{ kV} < V_r \leq 35 \text{ kV}$, **Intermediate Voltage (IV)**, i.e. $35 \text{ kV} < V_r \leq 230 \text{ kV}$ or as **High Voltage (HV)**, i.e. $230 \text{ kV} < V_r \leq 800 \text{ kV}$.

The levels in bold are those adopted for use by ITER:

	Highest voltage for equipment * V_m kV	Nominal system voltage $\boxtimes V_r$ kV ($\pm 10\%$)
MV	3.6	3.3
	7.2	6.6
	12	11
	17.5	-
	24	22
IV	72.5	66
	123	110
	145	132
HV	245	220
	420	400

Table 1.3 Medium Voltages (MV), Intermediate Voltage (IV) and High Voltage (HV) used at ITER

1.2 Standard Test Voltages

1.2.1 Applicable IEC standards

IEC 60060 High-Voltage Test Techniques

International Standard **IEC 60060** defines a set of tests on equipment having its highest voltage for equipment V_m above 1kV, i.e. in the case of components and plant systems used or installed at ITER, any that are to be connected to a supply voltage higher than that classed as low voltage, must be subjected to testing.

This standard is applicable to:

- dielectric tests with direct voltage;
- dielectric tests with alternating voltage;
- dielectric tests with impulse voltage;

* V_m represents the dielectric strength of an equipment, device or system for which it is designated

$\boxtimes V_r$ represents the nominal or rated system voltage at which an equipment, device or system shall usually operate

- tests with impulse current;
- tests with combinations of the above.

Highest voltage for equipment V_m kV	Standard short-duration power frequency withstand voltage kV (rms value)	Standard lightning impulse withstand voltage
7.2	20	40/60
24	50	95/125/145
36	70	145/170
72.5	140	325
245	(275)/(325)/360/395/460	(650)/850/950/1050

Note: If values in brackets are considered insufficient to prove that the required phase-to-phase withstand voltage are met, additional tests are needed.

Table 1.4 Test Voltages

1.3 Voltage Classes

The voltage class of a power circuit defines the degree of availability of the power delivery. The following classification of the power delivery circuits have been adopted at ITER:

Class I	Uninterruptible DC (up to 250 V)	DC battery supplies; batteries charging when AC supply is available. AC supply may be Class III or Class IV depending on Safety Level
Class II	Uninterruptible AC (230/400 V)	Provided from UPS systems, will switch to alternate supply. Alternate AC supply may be Class III or Class IV depending on Safety Level
Class III	Temporarily interruptible AC (230/400 V and 6.6 kV)	Provided from diesel motor generators, interruption for 30 s while generators start up
Class IV	Indefinitely interruptible AC (230/400 V and 6.6 kV).	Directly provided from the electrical supply network

Table 1.5 Voltage Classes

1.4 Insulation Coordination

1.4.1 Applicable IEC standards

IEC 60071 IEC Insulation Coordination

The following table shows standard insulation levels for range I ($1\text{kV} < V_m = 245\text{ kV}$)

Highest voltage for equipment (V_m) kV (rms value)	Standard rated short- duration power-frequency withstand voltage kV (rms value)	Standard rated lightning impulse withstand voltage kV (peak value)
7.2	20	40 60
24	50	95 125 145
36	70	145 170
72.5	140	325
245	(275) (325) 360 395 460	(650) (750) 850 950 1050

Note: If values in brackets are considered insufficient to prove that the required phase-to-phase withstand voltage are met, additional tests are needed.

Table 1.6 Insulation Withstand Voltages

1.5 Standard Current Ratings

1.5.1 Applicable IEC standards

IEC 60059 IEC Standard Current Ratings

This standard specifies standard current ratings for electrical devices, apparatus, instruments and equipment and should be applied to the designing or utilisation of systems or equipment as well as to operating characteristics. This standard does not apply to current ratings of components and parts used within electrical devices or items of equipment.

Standard current ratings in amperes have been fixed by the IEC as follows:

1	1.25	1.6	2	2.5	3.15	4	5	6.3	8
10	12.5	16	20	25	31.5	40	50	63	80
100	125	160	200	250	315	400	500	630	800
1000	1250	1600	2000	2500	3150	4000	5000	6300	8000
10000	12500	16000	20000	25000	31500	40000	50000	63000	80000
100000	125000	160000	200000						

Table 1.7 IEC Standard Current Ratings

Terminology & Acronyms

Abstract

This part lists all terms, definitions and acronyms that may be referenced when specifying an electrical component, device or system for use by the ITER Organization.

This is an initial version of this document that has been reviewed in accordance with the ITER MQP. Review comments have in part been addressed and others will be considered in detail and addressed at the next revision.

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1 Terminology

This part of EDH (Electrical Design Handbook) outlines the terminology adopted by the ITER Organization for specific electrical components, devices or systems.

For components, devices and systems not covered by this document, the following references shall be considered to identify the proper terminology:

1. IEC dictionaries and glossaries (<http://www.electropedia.org>)
2. Electrical Installations Handbook, Executive Editor: Gunter G. Seip, John Wiley and Sons, ISBN 0-471-40435-6

In case of inconsistency between the above documents, requests for clarification shall be submitted to the ITER Electrical Implementation Division.

The ITER Organization has adopted the International System of Units, universally known as the **SI** (from the French *Système International d'Unités*), see http://www.bipm.org/en/si/si_brochure. The SI prefixes are given in the table below:

Factor	Name	Symbol		Factor	Name	Symbol
10 ¹	deca	da		10 ⁻¹	deci	d
10 ²	hecto	h		10 ⁻²	centi	c
10 ³	kilo	k		10 ⁻³	milli	m
10 ⁶	mega	M		10 ⁻⁶	micro	μ
10 ⁹	giga	G		10 ⁻⁹	nano	n
10 ¹²	tera	T		10 ⁻¹²	pico	p
10 ¹⁵	peta	P		10 ⁻¹⁵	femto	f
10 ¹⁸	exa	E		10 ⁻¹⁸	atto	a
10 ²¹	zetta	Z		10 ⁻²¹	zepto	z
10 ²⁴	yotta	Y		10 ⁻²⁴	yocto	y

Table 1.1 SI Prefixes

1.1 Main Definitions from IEC Standards

1.1.1 Nominal System Voltage

The voltage by which a system is designated.

1.1.2 Rated Voltage/Current of Equipment

The voltage/current assigned generally by a manufacturer, for a specified operating condition of a component, device or equipment.

1.1.3 Highest System Voltage

The highest value of voltage which occurs under normal operating conditions at any time and any point on the system. It excludes voltage transients, such as those due to system switching, and temporary voltage variations.

1.1.4 Highest Voltage for Equipment

The highest rms value of phase-to-phase voltage for which the equipment is designed in respect of its insulation as well as other characteristics which relate to this voltage in the relevant equipment standards.

The highest voltage for equipment is the maximum value of the “highest system voltage” (see above) for which the equipment may be used.

1.1.5 Insulation Coordination

The selection of the dielectric strength of equipment in relation to the voltages which can appear on the system for which the equipment is intended and taking into account the service environment and the characteristics of the available protective devices. The process is determined from the known characteristics of voltage surges and the characteristics of surge arresters.

1.1.6 The Standard Short-Duration Power Frequency Voltage

A sinusoidal voltage with frequency between 48 Hz and 52 Hz, and duration of 60 s. The voltage level is determined for specific tests.

1.1.7 The Lightning Impulse Voltage

An impulse voltage having a front time of 12 μ s and a time to half-value of 50 μ s. The voltage level is determined for specific tests.

2 Common Definitions Adopted for ITER

2.1.1 AC/DC Charger

A battery charger converting alternating current (AC) power into DC power, being the converter section of a UPS which charges batteries and supplies DC to the inverter.

2.1.2 Batteries

One or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices. A battery stores and supplies electrical energy to an electrical circuit when the normal power supply of that electrical circuit is interrupted.

2.1.3 Busbar

Conductors fabricated from thick strips of copper or aluminium to conduct electricity within a switchboard, distribution board, substation, or other electrical apparatus.

2.1.4 Bus Coupler

Inbuilt mechanical interlocking which connects busbar systems, where position change is via the OFF position, ensuring downstream distribution in case of failure of upstream lines. In a substation a circuit-breaker located between two busbars and which permits the busbars to be coupled; it may be associated with selectors in case of more than two busbars

2.1.5 Cable

Assembly of one or more conductors and/or optical fibres, with a protective covering and possibly filling, insulating and protective material

2.1.6 Cable Tray

a unit or assembly of units or sections and associated fittings forming a rigid structural system used to securely fasten or support cables and raceways. Cable trays are used to support and distribute cables.

2.1.7 Circuit Breaker

A switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and carrying for a specified time during abnormal circuit conditions such as a short circuit.

2.1.8 Converter

A functional unit which changes the representation of information. Examples of converters are: analog-digital converter, digital-analog converter, code converter, parallel-serial converter, serial-parallel converter.

2.1.9 Current Transformer

A device that reduces current values at a point in a network where they are connected, to proportional and manageable values, whilst separating measuring instruments, meters, relays, etc. from the medium or low voltage circuit.

2.1.10 Diesel Generator

A diesel generator is the combination of a diesel engine with an electrical generator (often called an alternator) to generate electrical energy. Diesel generating sets are used as emergency power-supply if the grid fails. There are four 6.6kV diesel generator sets, two seismic qualified to feed SR loads and two non-seismic qualified for IP loads.

2.1.11 Disconnect

A mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements. A Mechanical switching device which, in the open position, disconnects all the poles of an electrical circuit and is equipped with a reliable contact position indicator. A closed disconnect is capable of carrying currents under normal circuit conditions and carrying for a specified time currents under abnormal conditions such as those of short circuit.

2.1.12 Earth Switch

Mechanical switching device for earthing parts of an electrical circuit, capable of withstanding for a specified duration, electric currents under abnormal conditions such as those of a short-circuit, but not required to carry electric current under normal conditions of the electrical circuit

2.1.13 Electrical Interlock

Type of circuit in which the auxiliary contacts of various devices are switched in such a ways that the circuit states are interdependent. This makes it impossible to switch on one switching device if another is already switched on.

2.1.14 Insulators

A device designed to support and insulate a conductive element. A device intended for electrical insulation and mechanical fixing of equipment or conductors which are subject to potential differences.

2.1.15 Inverter

Electrical energy converter that changes direct current to single-phase or polyphase alternating current

2.1.16 Load Centre

The load voltage load centres are connected to the secondary 22 kV distribution switchgear through the MV/LV transformers.

They are mainly used at the load level. They are used for:

- Protecting persons and property
- Protecting electrical loads
- Protecting cables and electric lines
- Overvoltage protection
- Safety disconnection
- Monitoring and signalling
- Open and closed-loop control
- Metering, measuring and display purposes

This load centres are composed of:

- Incoming circuit breakers and coupler circuit breaker (interlocked function)
- 400V copper strip semi-busbars.
- Outgoing draw-out circuit breakers to the Local Panels and MCC.

2.1.17 Load Tap Changer

The on-load tap changer is used to change the tapping connection of the transformer winding while the transformer is energized. A connection made at some intermediate point in a winding. It is used to control the voltage over the SSEN

2.1.18 Main Busbar

The busbar is an assembly necessary to make a common connection for several circuits. A low-impedance conductor, to which several electric circuits can be connected

2.1.19 Main Distribution Board

Assembly containing different types of switchgear and control gear associated with one or more outgoing electric circuits fed from one or more incoming electric circuits, together with terminals for the neutral and protective conductors.

They are used for up to 6300 A. They are used first and foremost for:

- Safety disconnection
- Coupling busbar sections
- Protecting busbars
- Selectivity vis-à-vis upstream protection equipment

They are primarily equipped with:

- Circuit-breakers and non-automatic circuit-breakers
- Tie circuit-breakers
- Fuses

2.1.20 Motor Control Centre

MCC is a low-voltage withdrawable-unit-type switchgear station for motor feeders with a main switch and door interlock. The MCC will consist of individual cubicles housed in the correspondent switchgear placed as close as possible of the LV motors zone. The MCC shall include:

- Motor protection systems.
- Monitoring & Control devices.
- Starter devices if applicable.

2.1.21 Outlet/Connector

Device which provides connection and disconnection to a suitable mating component. Conductor of electricity used for carrying current between components in an electric circuit

2.1.22 Penetration

A cable transit assembly designed to implement safely the passage of cables lines through walls , floors or ceilings of areas with various environmental conditions, maintaining their integrity

2.1.23 Soft Starters

The combination of the switching means necessary to start and stop a motor in combination with suitable overload protection.

2.1.24 Raceway

An enclosed channel of metallic or nonmetallic materials designed expressly for holding wires, cables or busbars. Examples are electrical metallic tubing (EMT), flexible metallic tubing and nonmetallic rigid conduit.

2.1.25 Relay

Switching device which brings about sudden predetermined changes in one or more electric output circuits when specific conditions that control the device arise in the electric input circuit.

2.1.26 Sockets

Connector attached to an apparatus or to a constructional element or the like. Contact members of a socket may be socket contacts, pin contacts or both.

2.1.27 Static Transfer Switch

Device which transfers load automatically and without disturbance between inverter and utility power

2.1.28 Sub-Distribution Board

Part of an electrical installation for distributing energy to downstream loads or groups of loads

They are used up for 2500 A. They are used for:

- Safety disconnection
- Switching electrical loads, e.g. lighting systems and motors
- Protecting cables, electric lines and loads
- Back-up protection and selectivity vis-à-vis upstream and downstream protection equipment
- Overvoltage protection
- Control, metering and measuring purposes

The following devices are integrated in order to carry out these functions:

- Circuit-breakers, switch-disconnectors and fuse switch-disconnectors.
- Miniature circuit-breakers
- Fuses
- Modular built-in equipment for control, metering and measuring purposes

2.1.29 Surge Arrester

A protective device designed primarily for connection between a conductor of an electrical system and earth to limit the magnitude of transient overvoltages on equipment.

2.1.30 Switchgear

Electrical equipment switching devices for the purpose of carrying out one or more of the following functions: protection, control, isolation, switching and their combination with associated control, measuring, protective and regulating equipment Also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy.

2.1.31 Transformers

A device that is used to change the voltage in an alternating current (AC) circuit. Three kinds of transformers are identified taking into account the voltage level: The four main step down transformers which transform from HV (400 kV) to MV (22 kV) Oil transformers, which transform from MV (22 kV) to MV (6.6 kV) and located outside of buildings and dry transformers which transform from MV (6.6 kV) to LV (0.4 kV) and located inside buildings.

2.1.32 UPS

An uninterruptible power supply (UPS) system is designed to provide conditioned power which offsets the effects of adverse normal power. A static UPS consists of:

- a battery to provide continuous source of electrical power;
- a rectifier/charger to maintain battery charge and to provide input to inverter when utility power is available;

- an inverter to provide power to load during normal operation;
- a static switch ,to transfer load automatically and without disturbance between inverter and utility power,
- a manual switch to bypass the static switch for maintenance;
- input and output isolation transformers and filters to provide appropriate isolation and disturbance attenuation; and monitors, sensors, and control circuits.

2.1.33 Voltage Transformers

These reduce the voltage values from the point in the network where they are connected to proportional and manageable values, whilst separating measuring instruments, meters, relays etc. from the medium or low voltage circuit.

3 Acronyms

A complete list of Acronyme used within ITER Organization is available at ITER Abbreviations (ITER_D_2MU6W5), here follows a list of those frequently used in EDH:

AC	Alternating Current
BO	Blackout
CB	Circuit Breaker
CC	Control Cubicle
CD	Current Drive
CMF	Common Mode Failure
CT	Current Transformer
CWS	Cooling Water System
D/G	Diesel Generator
DC	Direct Current
DDD	Design Description Document
DP	Distribution Panel for 400 V loads located within buildings
EDG	Emergency Diesel Motor Generator
EDH	Electrical Design Handbook
EHV	Extra High Voltage, > 275 kV, not used at ITER
ELV	Extra Low Voltage, <50 V _{rms} or < 120 V DC (IEC Definition)
EM	Electromagnetic
EPS	Emergency Power Supply
EPSS	Emergency Power Supply System

FDS	Fire Detection and alarm System
FFS	Fire Fighting System
FO	Fibre Optic
FPS	Fire Protection System
FSS	Fire Suppression System
H&CD	Heating & Current Drive
HV	High Voltage, > 1000 V _{rms} or > 1500 V (IEC Definition), 400 kV level on ITER
HVAC	Heating, Ventilation and Air Conditioning
HVDC	High Voltage Direct Current
I&C	Instrumentation and Control
IAEA	International Atomic Energy Agency
ICD	Interface Control Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IET	Institution of Engineering and Technology
IO	ITER Organization
IP	Investment Protection
IPEG	Integrated Plant Earth Grid
IV	Intermediate Voltage, 66 kV level on ITER
LC	Load Centre
LCC	Local Control Cubicle
LEP	Local Electrical Panel
LOSP	Loss of Off-Site Power
LTM	Construction/Long Term Maintenance
LV	Low Voltage, 5 – 1000 V _{rms} or 120 – 1500 V DC, 400 V level on ITER
MCC	Motor Control Centre
MP	Main 400V Distribution Panel located in LC
MPCB	Magnet Power Conversion Building
MPSSN	Magnet Power Supply Switching Network
MV	Medium Voltage, 6.6 kV and 22 kV levels on ITER

NBI	Neutral Beam Injection
NBPS	Neutral Beam Power Supply
OL	Ordinary Load
P&ID	Process and Instrumentation Diagram
PA	Procurement Arrangement
PBS	Plant Breakdown Structure
PEC	Prefabricated Electric Centre
PF	Power Factor
PHTS	Primary Heat Transport System
PID	Proportional, Integral and Differential Control
PID	Project Integration Document
PINI	Positive Ion Neutral Injector
PLC	Programmable Logic Controller
POS	Pulse Operation State
PP	Procurement Package
PPEN	Pulsed Power Electrical Network
PS	Power Supply
PSH	Plant System Host
QA	Quality Assurance
RCC-E	Règles de Conception et de Construction des matériels Electriques des îlots nucléaires
RF	Radio Frequency
RPC	Reactive Power Compensation
RPC&HF	Reactive Power Compensation and Harmonic Filtering system
RTE	Réseau de Transport d'Electricité (French Transmission Grid Operator)
SCADA	Supervisory Control And Data Acquisition
SCS	Supervisory Control System
SF6	Sulphur Hexafluoride
SIC	Safety Important Component
SIC	Safety Important Classification
S-ICD	System Interface Control Document

SR	Safety Relevant
SRD	System Requirements Document
SSEN	Steady State Electrical Network
SSPD	Steady State Power Distribution
SSS	Steady State 400 kV Substation
STM	Short term Maintenance
STS	Short Term Standby
TBC	To Be Confirmed
TBD	To Be Defined
TCR	Thyristor Controlled Reactor
TCS	Test and Conditioning State
UPS	Uninterruptible Power Supply
VT	Voltage Transformer
WBS	Work Breakdown Structure

4 Reference and Bibliography

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Transformer Handbook

Pub. ABB Power Technologies Business Unit Power Transformers

Codes and Standards

Abstract

This part lists all codes and standards to which reference may be made when specifying an electrical component, device or system for use by ITER Organization.

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1 Introduction

The general adopted guidelines referring to codes and standards shall take account of the following needs:

1. To adopt wherever possible the international electrical standards issued by the International Electrotechnical Commission (IEC).
2. To facilitate the licensing process by adopting French Standards and European Directives covering the following items:
 - a. Installation and operation rules;
 - b. Design, manufacturing and testing of components affecting safety (nuclear and personnel) and fire protection.

The identification of codes and standards applicable to electrical equipment shall also take account of the European harmonisation process which started in the 1950s in support of European legislation and which has helped shape the European internal market. This harmonisation process is coordinated by CENELEC, the European Committee for Electrical Standardisation. This Committee also supports the IEC in achieving its mission and therefore promotes the harmonisation between the electrical standards adopted by the EU Member States and the international electrical standards issued by the IEC. As a consequence of this process, a large proportion of the national electrical standards of the EU Member States are harmonised with the IEC standards.

The main codes and standards, affecting nuclear safety, are also reported in the Preliminary Safety Report (Rapport Préliminaire de Sûreté) (RPrS). This EDH may require revision following approval of the RPrS.

2 General Binding Rules and Guidelines

Electrical components, devices or systems shall be designed, constructed, tested and operated in accordance with best engineering and industry practice.

The codes and standards listed hereafter apply to the design, manufacturing, testing, installation and operation of electrical components, device or systems for use in the ITER plant:

1. Code and Standards listed in the ITER Preliminary Safety Report.
2. French Standards and Rules applicable or affecting:
 - a. Safety (nuclear and personnel safety);
 - b. Fire prevention, fire detection and/or fire suppression;
 - c. Guidelines and rules for installation of electrical components, devices or systems;
 - d. Applicable building codes.
3. European Directives.
4. Codes, Standards and Design Criteria reported in the ITER Baseline Documentation, Task Agreements, Contract Technical Specifications and Procurement Arrangement documents.
5. IEC standards.

The above list also indicates the top-down priority to be considered in case of inconsistency among the codes standards and design criteria quoted in the above listed documents.

If the approval process of a code or standard is well advanced and is expected to come into force during the manufacturing, installation or operational phase of ITER, the ITER Organization may decide to immediately apply the draft version of the new code or standard.

The following chapters and paragraphs of this document have been produced to assist the staff of the ITER Organization and the Domestic Agencies in the identification of the codes and standards applicable to the design, manufacturing, testing, installation and operation of electrical components, devices or systems for use in the ITER plant. However, the following chapters are for information only, therefore designers, manufactures and operators of electrical components, devices and systems shall ensure the implementation of the general binding rules and guidelines reported in the above paragraphs of this Chapter 2.

3 International Standards Related to Nuclear Safety

<u>Standard</u>	<u>Description</u>
IEC 60439-1	Low-Voltage switchgear and control gear assemblies. Part 1: Type tested and partially type-tested assemblies
IEC 60034-1 / NF EN 60034-1	Rotating electrical machines-Part 1: Rating and Performances
IEC 60038	IEC standard voltages
IEC 60050-161	International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility
IEC 60050-461	International Electrotechnical Vocabulary. Chapter 461: Electric cables
IEC 60059	IEC standard current ratings
IEC 60060-1,...,3	High Voltage test techniques
IEC 60068	Environmental testing
IEC 60068-1	Environmental testing – Part 1 General and Guidance
IEC 60068-2-14	Environmental testing – Part 2: Tests –Test N: Change of temperature
IEC 60068-2-2	Basic environmental testing procedure f-Part 2: Tests – Tests B: Dry Heat
IEC 60068-2-57	Environmental testing – Part 2: Tests –Test Fc: Vibration Time history method
IEC 60068-2-59	Environmental testing – Part 2-57: Tests –Test Ff: Sine-Beat method
IEC 60068-2-6	Environmental testing – Part 2: Tests –Test Fc: Vibration (sinusoidal)
IEC 60068-3-3	Environmental testing. Part 3 : Guidance –Seismic test method for equipment
IEC 60071-1,2	Insulation co-ordination
IEC 60076-11	Power transformers – Part 11 : Dry-type transformers
IEC 60085	Electrical insulation - Thermal evaluation and designation
IEC 60146-2	Semiconductor converters – Part 2 : Self commutated semiconductor converters including direct dc converters
IEC 60216-1	Electrical insulating materials - Properties of thermal endurance - Part 1: Ageing procedures and evaluation of test results
IEC 60216-2	Electrical insulating materials - Thermal endurance properties - Part 2: Determination of thermal endurance properties of electrical insulating materials - Choice of test criteria
IEC 60231A	General principles of nuclear reactor instrumentation
IEC 60297-1	Dimensions of mechanical structures of the 482.6 mm (19 in) series. Part 1: Panels and racks

Standard	Description
IEC 60297-2	Dimensions of mechanical structures of the 482.6 mm (19 in) series. Part 2: Cabinets and pitches of rack structures
IEC 60297-3	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series
IEC 60300	Dependability management
IEC 60332-1-1	Tests on electric and optical fibre cables under fire conditions - Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus
IEC 60332-1-2	Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame
IEC 60332-1-3	Tests on electric and optical fibre cables under fire conditions - Part 1-3: Test for vertical flame propagation for a single insulated wire or cable - Procedure for determination of flaming droplets/particles
IEC 60332-2-1	Tests on electric and optical fibre cables under fire conditions - Part 2-1: Test for vertical flame propagation for a single small insulated wire or cable - Apparatus
IEC 60332-2-2	Tests on electric and optical fibre cables under fire conditions - Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable - Procedure for diffusion flame
IEC 60332-3-10	Tests on electric cables under fire conditions - Part 3-10: Test for vertical flame spread of vertically-mounted bunched wires or cables - Apparatus
IEC 60352-1	Solderless connections - Part 1: Wrapped connections - General requirements, test methods and practical guidance
IEC 60352-2	Solderless connections - Part 2: Crimped connections - General requirements, test methods and practical guidance
IEC 60359	Electrical and electronic measurement equipment - Expression of performance
IEC 60364 NF C 15-100	Low voltage Electrical Installations Rules
IEC 60364-4-41	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock
IEC 60446	Basic and safety principles for man-machine interface, marking and identification – Identification of conductors by colours or alphanumeric
IEC 60470	High-voltage alternating current contactors and contactor-based motor-starters
IEC 60479-1	Effects of current on human beings and livestock – Part 1: General aspects
IEC 60529	Degrees of protection provided by enclosures (IP code)
IEC 60654-2	Operating conditions of measurement, control equipment in industrial processes
IEC 60671	Nuclear power plants - Instrumentation and control systems important to safety - Surveillance testing
IEC 60695-11-20	Fire hazard testing - Part 11-20: Test flames - 500 W flame test methods
IEC 60706	Maintainability of equipment
IEC 60721	Classification of environmental classes and severity levels
IEC 60725	Reference impedance for LV power lines
IEC 60780	Nuclear power plants - Electrical equipment of the safety system – Qualification

<u>Standard</u>	<u>Description</u>
IEC 60811-1-2	Insulating and sheathing materials of electric cables – common test methods Part 1-2: Method for general application- thermal ageing method
IEC 60880	Nuclear power plants - Instrumentation and control systems important to safety - Software aspects for computer-based systems performing category A functions
IEC 60909-0	Short-circuit currents in three-phase ac systems - Part 0: Calculation of currents
IEC 60947-2	Low voltage switchgear and control gear – Part 2: Circuit Breakers.
IEC 60947-3	Low voltage switchgear and control gear – Part 3: Switches, disconnectors, switch-disconnectors and fuse combination units.
IEC 60947-4-1	Low voltage switchgear and control gear – Part 4-1: Contactors and motors starters- Electromechanical contactors and motor starters
IEC 60964	Design for control rooms of nuclear power plants
IEC 60980	Recommended practices for seismic qualification of electrical equipment of the safety system for nuclear generating stations
IEC 61000-1	Electromagnetic compatibility. General considerations
IEC 61000-1-2	Methodology to achieve functional safety on E/E equipment
IEC 61000-2-10	Description of HEMP environment - Conducted disturbance
IEC 61000-2-11	Environment - Classification of HEMP environments
IEC 61000-2-12	Compatibility levels for low frequency conducted disturbances and signalling in public medium voltage power supply systems
IEC 61000-2-13	Environment - High-power electromagnetic (HPEM) environments - Radiated and conducted
IEC 61000-2-2	Compatibility levels in public LV power systems
IEC 61000-2-3	Description, radiated and non-network frequency conducted disturbances
IEC 61000-2-4	Compatibility levels in industrial plants
IEC 61000-2-5	Classification of the EM environments
IEC 61000-2-7	Low frequency magnetic fields in various environments
IEC 61000-2-8	Voltage dips, short interruptions
IEC 61000-2-9	Description of HEMP environment - Radiated disturbance
IEC 61000-3	Emission variations distribution networks
IEC 61000-4	Immunity tests
IEC 61000-4-7	Measurement techniques. Harmonics
IEC 61000-5	Installation and mitigation guidelines. Protection degree
IEC 6100-6-2	Generic standard Industrial environmental immunity
IEC 6100-6-4	Generic standard Industrial environmental emissions
IEC 61014	Programs for reliability growth
IEC 61024-1-1 (Replaced by 62305-1)	Protection against lightning - Part 1: General principles

<u>Standard</u>	<u>Description</u>
IEC 61024-1-2 (Replaced by 62305-3)	Protection against lightning - Part 3: Physical damage to structures and life hazard
IEC 61124	Reliability testing - Compliance tests for constant failure rate and constant failure intensity
IEC 61131-2	Programmable controllers - Part 2: Equipment requirements and tests
IEC 61160	Design review
IEC 61163	Reliability stress screening
IEC 61165	Application of Markov Techniques
IEC 61180-1	High-voltage test techniques for low voltage equipment – Part 1: Definitions, test and procedure requirements
IEC 61189	Test methods for electrical materials, interconnection structures and assemblies
IEC 61225	Safety Instrumented systems for process industry
IEC 61226	Nuclear Power Plants - Instrumentation and Control Systems Important to Safety - Classification of Instrumentation and Control Functions
IEC 61227	Nuclear power plants - Control rooms – Operator controls
IEC 61312-1 (Replaced by 62305-4)	Protection against lightning - Part 4: Electrical and electronic systems within structures
IEC 61312-4 (Replaced by 62305-4)	Protection against lightning - Part 4: Electrical and electronic systems within structures
IEC 61326	Electrical equipment for measurement control and laboratory use
IEC 61508-1,...,7	Functional safety of electrical electronic/electronic programmable safety
IEC 61513	Nuclear power plants - Instrumentation and control for systems important to safety - General requirements for systems
IEC 61662 (Replaced by 62305-2)	Protection against lightning - Part 2: Risk management
IEC 61709	Reference conditions for failure rates and stress models for conversions
IEC 61771	Nuclear power plants - Main control-room - Verification and validation of design
IEC 61772	Nuclear power plants - Main control room - Application of visual display units (VDU)
IEC 61936-1	Electrical Installations of nominal voltage above 1 kV in AC
IEC 62138	Nuclear power plants - Instrumentation and control important for safety - Software aspects for computer-based systems performing category B or C functions
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK codes)
IEC 62271-100	High-voltage switchgear and control gear - Part 100: High-voltage alternating-current circuit-breakers
IEC 62271-200	High-voltage switchgear and control gear - Part 200: AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV

Standard	Description
IEC 62308	Reliability assessment methods
IEC 62347	Guidance on system dependability specifications
IEC 62429	Reliability growth – Stress testing for early failures in unique complex systems
IEC/TS 61000-6-5	Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for power station and substation environments
NF C 13-200	High Voltage Electrical Installations – Requirements (V<63 kV)
NF C 15-100	Low Voltage Electrical Installations
NF C 17-100	Protection against Lightning – Protection of structures against Lightning- Installation of lightning Protective System
NF C 32-070	Classification test on cable and cords with respect of the behaviour to fire insulated cables and flexible cords for installations
NF C 93-022	Electronic components-Point-to-point Clip Terminals
NF C04-200	Marking of conductors (status change of the standard NF C 04-200 dated June 1974, ENR)
NF EN 2812-1	Paints and varnishes – determinations of resistance to liquids – Part 1: General methods
NF EN 45014	General Criteria for Supplier’s Declaration of Conformity
NF EN 50110 -1,2	Operation of electrical installations
NF EN ISO 9000-3	Quality assurance and quality management standards – Part 3: Directives for the application of ISO 9001:9004 with reference to the provision, installation and maintenance of software
NF ISO 2859-0	Sample procedures for inspection by attributes. Part 0: Introduction to the ISO 2859 Attribute Sampling System.
NF ISO 3951	Sampling procedures and charts for inspection by variables
NF ISO 9001	Quality management systems – Requirements
NF M 64-001	Procedure for qualifications of electric equipment installed in containments for pressurised water reactors and subject to accident conditions.
NF T 30-900	Paints and varnishes. Paint for the nuclear industry. Behavioural test under controlled accident conditions and reparability of paint systems (PWR)
NF T 30-901	Paints and varnishes. Paint for the nuclear industry. Performance test for susceptibility to contamination and fitness to decontamination.
NF T 30-903	Paints and varnishes. Paint for the nuclear industry.- Test of the behaviour in ionising radiation (PWR)
NF X 06-021	Application of statistics – Principles of the statistical control of batches.
UTE C93-751	Electronic components – Base materials for printed circuits – Detailed specifications.
UTE C96-027	Semi-conductor devices. Rules concerning the management of product discontinuance and replacement (obsolescence of electronic components) Provisional recommendations.
UTE-C18-540	Operation of electrical installations

4 Applicable Standards for Electrical Distribution Networks in Nuclear Power Plants

A table of standards applicable to every device has been created and organised by standard category.

Standards applicable for each component list are organised as described below:

- Manufacturing Standard: Processes used by a manufacturer including communication standard, e.g. IEC 61850: Seismic Area
- Site Installation Standard: Standards to be met in order to enable the operation of the system in all situations
- Personal Safety: Standards to be met for personal safety during the construction and device installation phase. Standards for personal protection in case of fault due to the device or due to human factors
- Nuclear Safety: Standards defined for every nuclear installation. (Refer to RCC-E manual)
- Tokamak Building: A particularity of this building is the high humidity level that may occur in event of an accident. Consequently, components installed in that building must tolerate this condition
- Tokamak Complex (including buildings 11, 14 and 74): Particularities of these buildings are that no halogen is allowed; consequently any component installed in these buildings must respect this condition
- Test and Commissioning: All standards to be met during tests, including tests after installation, recurring commissioning tests during the exploitation and tests after a fault
- Devices Installed Inside or Outside: For all equipment, an analysis must be performed to determine the influence of an installation inside or outside. In accordance with SRD conditions

4.1 Applicable Standards by Voltage Level

4.1.1 HIGH VOLTAGE

Table 4.1-1 Standards for HV Electrical Components

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
HIGH VOLTAGE							
400 kV SWITCHYARD							
CIRCUIT BREAKER							
	IEC 60071-2 IEC 60265-2 IEC 62271-1 IEC 62271-100 IEC 62271-102	IEC 60068-1	IEC 60265-2 IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-100 IEC 62271-102 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140 IEC 62271-1 IEC 62271-100 IEC 62271-102		IEC 60060 – 1 IEC 60068-1 IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-30 IEC 60068-3-3 IEC 60265-2 IEC 60815 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-300
DISCONNECTOR							
	IEC 60071-2 IEC 60265-2 IEC 62271-1 IEC 62271-102	IEC 60068-1	IEC 60265-2 IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-102 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140 IEC 62271-1 IEC 62271-102		IEC 60060 – 1 IEC 60068-3-3 IEC 60815 IEC 62271-1 IEC 62271-102

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
HIGH VOLTAGE							
LIGHTNING ARRESTER							
	IEC 60071-1 IEC 60071-2 IEC 60071-4 IEC 60071-5 IEC 60099-1 IEC 60099-4 IEC 60099-5 IEC 60672-3		IEC 61140 IEC 61936 IEC 62305-1 / NF C 17-100 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140		IEC 60060 – 1 IEC 60068-3-3 IEC 60071-1 IEC 60071-4 IEC 60099-1 IEC 60099-3 IEC 60099-4 IEC 60099-5 IEC 60507 IEC 60815
LINE AND BUSBARS CURRENT TRANSFORMER							
	IEC 60071-2 IEC 60044-1 IEC 60044-6 IEC 60137 IEC 62271-1	IEC 60068-1	IEC 61140 IEC 61936 IEC 62271-1 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140 IEC 62271-1		IEC 60044-1 IEC 60044-6 IEC 60060 – 1 IEC 60060-2 IEC 60068-3-3 IEC 60137 IEC 60695-2 IEC 60815 IEC 62271-1
VOLTAGE TRANSFORMER							
	IEC 60044-2 IEC 60071-2 IEC 60137 IEC 62271-1	IEC 60068-1	IEC 61140 IEC 61936 IEC 62271-1 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140 IEC 62271-1		IEC 60060 – 1 IEC 60060-2 IEC 60068-3-3 IEC 60137 IEC 60695-2 IEC 60815 IEC 62271-1

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
HIGH VOLTAGE							
EARTH SWITCH							
	IEC 60071-2 IEC 62271-1 IEC 62271-102	IEC 60068-1	IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-102 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140 IEC 62271-102		IEC 60060 – 1 IEC 60060-2 IEC 60068-3-3 IEC 60815 IEC 62271-1 IEC 62271-102
MAIN STEP-DOWN TRANSFORMERS							
STEP-DOWN TRANSFORMER							
	IEC 60071-2 IEC 60076-1 IEC 60076-2 IEC 60076-3 IEC 60076-4 IEC 60076-5 IEC 60076-11 IEC 60296 IEC 60905 IEC 61000-6-2 IEC 61000-6-4 IEC 61000-5 NF C 52-100 (1990)	IEC 60068-1	IEC 61000-5 IEC 61140 IEC 61936 NFC 13000 HD 637 S1	IEC 60068-3-3	IEC 60479 IEC 61140		IEC 60060 – 1 IEC 60068-2-6 IEC 60068-2-57 IEC 60068-3-3 IEC 60076-1 IEC 60076-2 IEC 60076-3 IEC 60076-4 IEC 60076-5 IEC 60076-11 IEC 61000-6-2 IEC 61000-6-4

4.1.2 MEDIUM VOLTAGE

Table 4.1-2 Standards for MV Electrical Components

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
MV 6,6 KV SWITCHGEAR (CLASS 4)							
SWITCHGEAR							
	IEC 60044-1 IEC 60044-2 IEC 60044-8 IEC 60071-2 IEC 60079-7 IEC 60255 IEC 60265-1 IEC 60282-1 IEC 60282-2 IEC 60470 IEC 60529 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203 IEC 62271-301	IEC 60068-1	IEC 60265-1 IEC 60470 IEC 61000-5 IEC 61140 IEC 61936 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 60529 IEC 61140 IEC 61936 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-2-2 IEC 60068-2-30 IEC 60068-3-3 IEC 60079-7 IEC 60255 IEC 60265-1 IEC 60282-1 IEC 60282-2 IEC 60470 IEC 60529 IEC 60721-2-1 IEC 60754 IEC 61000-4-2 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
MOTOR CONTROL CENTRE							
MCC							
	IEC 60044-1 IEC 60044-2 IEC 60044-8 IEC 60071-2 IEC 60079-7 IEC 60255 IEC 60265-1 IEC 60282-1 IEC 60282-2 IEC 60470 IEC 60529 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203 IEC 62271-301	IEC 60068-1	IEC 60265-1 IEC 60470 IEC 61000-5 IEC 61140 IEC 61936 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 60529 IEC 61140 IEC 61936 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-2-2 IEC 60068-2-30 IEC 60068-3-3 IEC 60079-7 IEC 60255 IEC 60265-1 IEC 60282-1 IEC 60282-2 IEC 60470 IEC 60529 IEC 60721-2-1 IEC 60754 IEC 61000-4-2 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 IEC 62271-201 IEC 62271-203

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
CIRCUIT BREAKER							
	IEC 60071-2 IEC 60079-7 IEC 60265-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200	IEC 60068-1	IEC 60265-1 IEC 61000-5 IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-105 IEC 62271-200 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 61140 IEC 61958 IEC 62271-1 IEC 62271-100 IEC 62271-102 IEC 62271-102 IEC 62271-105 IEC 62271-200 EN 50019	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60079-7 IEC 60068-2-2 IEC 60068-2-30 IEC 60068-3-3 IEC 60721-2-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21
Income circuit breaker Coupling circuit breaker Outlets circuit breaker							
COUPLER DISCONNECTOR							
	IEC 60071-2 IEC 60079-7 IEC 60265-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62271-1 IEC 62271-102	IEC 60068-1	IEC 60265-1 IEC 61000-5 IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-102 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 61140 IEC 62271-1 IEC 62271-102	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-3-3 IEC 60079-7 IEC 60265-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 62271-1 IEC 62271-102

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
FUSES							
	IEC 60071-2 IEC 60079-7 IEC 60282-1 IEC 60282-2 IEC 60787 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62271-1 IEC 62271-105	IEC 60068-1	IEC 61000-5 IEC 61140 IEC 61936 IEC 62271-1 IEC 62271-105 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 61140 IEC 62271-1 IEC 62271-105	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-3-3 IEC 60079-7 IEC 60282-1 IEC 60282-2 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 62271-1 IEC 62271-105
INSTRUMENTATION TRANSFORMERS							
	IEC 60044-1 IEC 60044-2 IEC 60044-6 IEC 60071-2 IEC 60079-7 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62271-1	IEC 60068-1	IEC 61000-5 IEC 61140 IEC 61936 IEC 62271-1 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 61140 IEC 62271-1	IEC 60754 IEC 61249-2-21	IEC 60044-1 IEC 60044-2 IEC 60060 – 1 IEC 60068-3-3 IEC 60079-7 IEC 60216 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 62271-1
Current transformers (windows type) Voltage transformers zero sequential toroidal transformers							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
RELAYS							
	IEC 60071-2 IEC 60255 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1	IEC 61000-5 IEC 61140 IEC 61936 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3	IEC 60079-7 IEC 60479 IEC 61140	IEC 60754 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-2 IEC 60068-3-3 IEC 60255-5 IEC 60255-11 IEC 60754 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-10 IEC 61000-4-12 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 EN 55022
MEDIUM VOLTAGE POWER CABLES							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
	IEC 60038 IEC 60055-2 IEC 60071-2 IEC 60183 IEC 60228 IEC 60287 IEC 60304 IEC 60502 IEC 60840 (ABOVE 36KV) IEC 60949 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 NF C 32070 NF C 32323 HD 308 HD 620S1 HD 632 S1 (above 36 kV) HD 632.16 (above 36 kV)	IEC 60068-1	IEC 61000-5 IEC 61140 IEC 61936 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60079-7 IEC 60446 IEC 60479 IEC 61140	IEC 60754 IEC 61249-2-21 EN 50267-2-1	IEC 60055-1 IEC 60332-1 IEC 60332-2 IEC 60332-3-24 IEC 60502 IEC 60754 IEC 60811 IEC 60840 (ABOVE 30KV) IEC 61034 IEC 61000-6-2 IEC 61000-6-4 EN 50266-2-4 EN 50267-2-1 EN 50267-2-3 NFC 20454 NF C 32070
MV SWITCHGEAR (CLASS 3) SR (*)							
(*) Comply with the standards shown above but it has to be into account safety relevant condition				IEC 60068-3-3 IEC 60780 IEC 60980		IEC 60754 IEC 61249-2-21	
EMERGENCY POWER SUPPLY							
DIESEL GENERATOR WITH AUXILIARIES							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
	IEC 60034 IEC 60071-2 IEC 60529 IEC 60950 IEC 61131-3 IEC 62305-3 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1	IEC 60950 IEC 61000-5 IEC 61140 IEC 61936 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60079-7 IEC 60479 IEC 61140		IEC 60060 – 1 IEC 60529 IEC 61000-6-2 IEC 61000-6-4
Main motor							
Generator							
Control Panels							
MOTORS							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
	IEC 60034-1 IEC 60034-2 IEC 60034-5 IEC 60034-6 IEC 60034-7 IEC 60034-8 IEC 60034-9 IEC 60034-11 IEC 60034-12 IEC 60034-14 IEC 60071-2 IEC 60072-1 IEC 60072-2 IEC 60072-3 IEC 60079-0 IEC 60079-1 IEC 60079-2 IEC 60079-7 IEC 60079-14 IEC 60079-15 IEC 60079-19 IEC 60204-11 IEC 60071-2 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61241-11 IEC 61241-17	IEC 60068-1	IEC 60034-7 IEC 60079-14 IEC 60204-11 IEC 61000-5 IEC 61140 IEC 61241-14 IEC 61936 NFC 13000 NF C13.200 HD 637 S1	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60034-5 IEC 60204-11 IEC 60479 IEC 60529 IEC 61140	IEC 60754 IEC 61249-2-21	IEC 60034-1 IEC 60034-2 IEC 60034-5 IEC 60034-9 IEC 60034-11 IEC 60034-12 IEC 60060 – 1 IEC 60071-2 IEC 60079-0 IEC 60079-1 IEC 60079-2 IEC 60079-7 IEC 60079-14 IEC 60079-15 IEC 60079-19 IEC 60204-11 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61241-11 IEC 61241-17 IEC 61249-2-21
SPEED DRIVES							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
MEDIUM VOLTAGE							
	IEC 60071-2 IEC 60079-0 IEC 60079-1 IEC 61000-2-4 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61800-3 IEC 61800-4 EN 50178	IEC 60068-1	IEC 60204-1 IEC 61000-5 IEC 61140 IEC 61800-1 IEC 61800-2 IEC 61800-5 IEC 61936 NFC 13000 NF C13.200 HD 637 S1 EN 50178	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60204-1 IEC 60479 IEC 61140	IEC 60754 IEC 61249-2-21	IEC 60060-1 IEC 60068-3-3 IEC 60079-0 IEC 60079-1 IEC 60754 IEC 61000-2-4 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61249-2-21 IEC 61800-3 IEC 61800-4

4.1.3 LOW VOLTAGE

Table 4.1-3 Standards for LV Electrical Components

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
MV / LV DISTRIBUTION TRANSFORMERS							
	IEC 60076-1 IEC 60076-2 IEC 60076-3 IEC 60076-4 IEC 60076-5 IEC 60076-10 IEC 60076-11 IEC 60296 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 HD 538-2 S1 NF C 52-112 / NF EN 50464	IEC 60068-1 IEC 60364	IEC 60076-7 IEC 60364 IEC 60905 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60068-3-3 IEC 60076-1 IEC 60076-2 IEC 60076-3 IEC 60076-4 IEC 60076-5 IEC 60076-5 IEC 60076-11 IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21
DRY TRANSFORMER							
OIL TRANSFORMER							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
LOCAL INSTRUMENTATION CONTROL, PROTECTION SYSTEM							
LOAD DISTRIBUTION CENTRE (CLASS 4 & 3) IP							
	IEC 60269 IEC 60439-1 IEC 60529 IEC 60664-1 IEC 60715 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 60947-4 IEC 60947-5 IEC 60947-6 IEC 60947-7 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62208/EN 50298 EN 50 102 NF C 20-010/IEC 60529/EN 50 102 NF C 20-015/IEC 62262 NF C 20-030/IEC 61140 NF C 20-040/IEC 60664-4	IEC 60068-1 IEC 60364	IEC 60364 IEC 60439-1 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 60947-4 IEC 60947-5 IEC 60947-6 IEC 60947-7 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60439-1 IEC 60479 IEC 60529 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60068-3-3 IEC 60439-1 IEC 60529 IEC 60664-1 IEC 60754 IEC 60947 IEC 61000 IEC 61249-2-21 IEC 61641 IEC 62262 NF C 63-421/IEC 60439-1 NF C 20-010/IEC 60529 NF C 20-015/IEC 62262 NF C 20-030/IEC 61140 NF C 20-040/IEC 60664-4

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
CIRCUIT BREAKER							
	IEC 60664-1 IEC 60947-1 IEC 60947-2 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1 IEC 60364	IEC 60364 IEC 60947-1 IEC 60947-2 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60068-3-3 IEC 60439-1 IEC 60664-1 IEC 60947-1 IEC 60947-2 IEC 61000-4-2 IEC 61000-4-4 IEC 61000-4-8 IEC 61000-4-9 IEC 61000-4-10 IEC 61000-4-13 IEC 61000-6-2 IEC 61000-6-4
Income and coupling automatic circuit breaker (double-ended type)							
Circuit Breaker for outgoing circuits Thermal magnetic breaker							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
PROTECTION RELAYS							
	IEC 60255 IEC 60664-1 IEC 60755 IEC 60947-1 IEC 60947-5-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1 IEC 60364	IEC 60364 IEC 60755 IEC 60947-1 IEC 60947-5-1 IEC 60755 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 IEC 60755 IEC 61140 NF C15-100	IEC 60754-1 IEC 61249-2-21	IEC 60060 – 1 IEC 60068-2 IEC 60068-3-3 IEC 60255-5 IEC 60255-11 IEC 60529 IEC 60664-1 IEC 60754-1 IEC 60755 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-10 IEC 61000-4-12 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 EN 55022
Motor Electronic protection relay							
Undervoltage (ANSI) relay							
DC undervoltage relay (ANSI 80)							
Differential Relay							
Isolation relays							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
INSTRUMENT TRANSFORMERS							
	IEC 60044-1 IEC 60044-2 IEC 60664-1 IEC 61000-5 NF C 42502	IEC 60068-1 IEC 60364	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100		IEC 60364-4 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60044-1 IEC 60044-2 IEC 60664-1 IEC 60754 IEC 61249-2-21 NF C 42502
Potential transformers Current transformers							
METERING UNIT (Comprise all components)							
	IEC 60051 IEC 60359 IEC 60529 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62053	IEC 60068-1 IEC 60364	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100		IEC 60364-4 IEC 60479 IEC 60529 IEC 61140 IEC 61010-1 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60529 IEC 60664-1 IEC 60754 IEC 61000-4-2 IEC 61000-4-3 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-6 IEC 61000-4-8 IEC 61000-4-11 IEC 61000-6-2 IEC 61000-6-4 IEC 61010-1 IEC 61249-2-21 EN 55011
Voltmeter Ammeter Communication bus communication protocol							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
LOAD DISTRIBUTION CENTRE (CLASS 3) SR (*)							
<p>(*) Comply with the standards shown above but it has to be into account safety relevant condition</p>				<p>IEC 60068-3-3 IEC 60780 IEC 60980</p>		<p>IEC 60754 IEC 61249-2-21</p>	

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
MOTORS							
	IEC 60034-1 IEC 60034-2 IEC 60034-5 IEC 60034-6 IEC 60034-7 IEC 60034-8 IEC 60034-9 IEC 60034-11 IEC 60034-12 IEC 60034-14 IEC 60072-1 IEC 60072-2 IEC 60072-3 IEC 60079-0 IEC 60079-1 IEC 60079-2 IEC 60079-7 IEC 60079-14 IEC 60079-15 IEC 60079-19 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61241-11 IEC 61241-17	IEC 60068-1 IEC 60364	IEC 60034-7 IEC 60079-14 IEC 60204-1 IEC 60364 IEC 61000-5 IEC 61241-14 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60034-5 IEC 60204-1 IEC 60364-4 IEC 60034-5 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60034-1 IEC 60034-2 IEC 60034-5 IEC 60034-9 IEC 60034-11 IEC 60034-12 IEC 60071-2 IEC 60079-0 IEC 60079-1 IEC 60079-2 IEC 60079-7 IEC 60079-14 IEC 60079-15 IEC 60079-19 IEC 60079-19 IEC 60204-11 IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61241-11 IEC 61241-17 IEC 61249-2-21

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
SPEED DRIVES							
	IEC 60079-0 IEC 60079-1 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61800-1 IEC 61800-2 IEC 61800-3 IEC 61800-5 IEC 61241-0 IEC 61241-1 EN 50178	IEC 60068-1 IEC 60364	IEC 60204-1 IEC 60364 IEC 61000-5 IEC 61140 IEC 61800-1 IEC 61800-2 IEC 61800-5 EN 50178 NF C15-100	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60204-1 IEC 60364-4 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60079-0 IEC 60079-1 IEC 60664-1 IEC 60754 IEC 61000-2-4 IEC 61000-6-2 IEC 61000-6-4 IEC 61241-0 IEC 61241-1 IEC 61249-2-21 IEC 61800-1 IEC 61800-2 IEC 61800-3 IEC 61800-5

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
LOW VOLTAGE MOTOR CONTROL CENTRE (CLASS 4 & 3) (as an Unit)							
	IEC 60269 IEC 60439 IEC 60529 IEC 60664-1 IEC 60715 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 60947-4 IEC 60947-5 IEC 60947-6 IEC 60947-7 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 EN 50102	IEC 60068-1 IEC 60364	IEC 60269-2 IEC 60269-3 IEC 60364 IEC 60439 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60269-2 IEC 60269-3 IEC 60364-4 IEC 60479 IEC 60529 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60068-3-3 IEC 60269 IEC 60439-1 IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61641 IEC 61249-2-21 IEC 61641 IEC 61249-2-21

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
EMERGENCY POWER SUPPLY							
DIRECT CURRENT SYSTEM (class I)							
	IEC 60038 IEC 60146-2 IEC 60664-1 IEC 60896-11 IEC 60896-21 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61056-1 IEC 61056-2 IEC 61660-1 IEC 62040-3 EN 55022	IEC 60068-1 IEC 60364	IEC 60364 IEC 60947-2 IEC 60947-3 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100		IEC 60254-1 IEC 60254-2 IEC 60664-1 IEC 60896-11 IEC 60896-21 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 61000-4-2 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-8 IEC 61000-4-9 IEC 61000-4-10 IEC 61000-4-13 IEC 61000-4-17 IEC 61000-6-2 IEC 61000-6-4 IEC 62040-2 EN 55022 NF C 58-311
125 Vdc lead-acid accumulator, Stationary battery							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
	IEC 60038 IEC 60664-1 IEC 60896-11 IEC 60896-21 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61056-1 IEC 61056-2	IEC 60068-1 IEC 60364	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100		IEC 60254-1 IEC 60254-2 IEC 60664-1 IEC 60896-11 IEC 60896-21 IEC 61000-4-17 IEC 61000-6-2 IEC 61000-6-4 NF C 58-311
400 Vac/250 Vdc charger							
	IEC 60146-2 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62040-3 EN 55022	IEC 60068-1 IEC 60364	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100		IEC 60664-1 IEC 61000-4-4 IEC 61000-4-5 IEC 61000-4-17 IEC 61000-6-4 IEC 62040-2 EN 55022 NF C 58-311
Dc circuit breakers							
	IEC 60664-1 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 61660-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1 IEC 60364	IEC 60364 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 61000-5 IEC 61140	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100		IEC 60664-1 IEC 60947-1 IEC 60947-2 IEC 60947-3 IEC 61000-4-2 IEC 61000-4-4 IEC 61000-4-8 IEC 61000-4-9 IEC 61000-4-10 IEC 61000-4-13 IEC 61000-6-2 IEC 61000-6-4

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
REGULATED UNINTERRUPTIBLE SYSTEM (UPS)							
	IEC 60664-1 IEC 60950-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62040-1-1 IEC 62040-1-2 IEC 62040-2 IEC 62040-3 IEC 60950-1 EN 55022	IEC 60068-1 IEC 60364	IEC 60364-1 IEC 60364-4 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 IEC 62040-1-1 IEC 62040-1-2 NF C15-100		IEC 60664-1 IEC 61000-4-17 IEC 61000-6-2 IEC 61000-6-4 IEC 62040-2 IEC 62040-3 EN 55022
Static inverter							
	IEC 60146-2 IEC 60664-1 IEC 60950-1 IEC 61000-5 IEC 62040-1 IEC 62040-3 EN 55022	IEC 60364	IEC 60364-1 IEC 60364-4 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60980 IEC 60780	IEC 60364-4 IEC 60479 IEC 61140 IEC 62040-1-1 IEC 62040-1-2 NF C15-100		IEC 60664-1 IEC 61000-6-2 IEC 61000-6-4
Static transfer switch							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
	IEC 60146-1-1 IEC 60146-1-3 IEC 60146-2 IEC 60439-1 IEC 60439-2 IEC 60439-3 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 62310-1 IEC 62310-2 EN50178	IEC 60068-1 IEC 60364	IEC 60364 IEC 60439-1 IEC 60439-2 IEC 60439-3 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60439-1 IEC 60479 IEC 60529 IEC 61140 IEC 62310-1 NF C15-100		IEC 60439-1 IEC 60664-1 IEC 61000-6-2 IEC 61000-6-4
Batteries (open vs. closed)							
	IEC 60896-11 IEC 60896-21 IEC 61056-1 IEC 61056-2 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4	IEC 60068-1 IEC 60364	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 IEC 60980	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100		IEC 60664-1 IEC 60695-11-10 IEC 60695-11-20 IEC 61000-4-17 IEC 61000-6-2 IEC 61000-6-4

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
LV POWER CABLES AND CONTROL CABLES							
	IEC 60227 IEC 60228 IEC 60245 IEC 60287-1-1 IEC 60304 IEC 60664-1 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61210 IEC 62440 HD 22.9.S3 HD 21.5 S 3 HD 21.3 S 3 HD 22.4S4 HD 22.6S2 HD 308 HD 361 HD 603 S1 NF C 30202 NF C 32070 NFC 32102.13 NF C 32323	IEC 60068-1 IEC 60364 IEC 60364-5-52 IEC 60364-4-43	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)	IEC 60364-4 IEC 60446 IEC 60479 IEC 61140 NF C15-100	IEC 60754-1 NF C 32070 EN 50267-2-1	IEC 60055 IEC 60093 IEC 60227 IEC 60243 IEC 60245 IEC 60250 IEC 60331 IEC 60332-1 IEC 60332-2 IEC 60332-3 IEC 60664-1 IEC 60684-2 IEC 60754-1 IEC 60754-2 IEC 60811 IEC 61000-6-2 IEC 61000-6-4 IEC 61034-1 IEC 61034-2 IEC 61210 EN 50266-1 EN 50266-2-2 EN 50266-2-3 EN 50266-2-4 EN 50266-2-5 EN 50267-1 EN 50267-2-1 EN 50267-2-2 NF C 20454 NF C 32070 NF C 32076

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
CABLE TRAYS							
	IEC 61537 NF P 92507 EN 10327 EN 12329 EN 12330 EN 10088-2	IEC 60068-1 IEC 60364 EN 10327 EN 12329 EN 12330 EN 10088-2	IEC 60364	IEC 60068-3-3 IEC 60780 (SR) IEC 60980 (SR)		IEC 60754-1 NF C 32070	EN 10327 EN 10088-2
LIGHTING SYSTEM							
LIGHTING							
Metal halide lamps							
	IEC 60664-1 IEC 60927 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61167 IEC 61347-1 IEC 61347-2-1 IEC 61547 EN 55015	IEC 60068-1 IEC 60364 IEC 60364-7-714	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 IEC 61347-1 IEC 61347-2-1 IEC 61140 IEC 61347-1 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60068-3-3 IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61167 IEC 61249-2-21 IEC 61547 EN 55015
High-pressure sodium vapour lamps							
	IEC 60662 IEC 60664-1 IEC 60923 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61347-2-9 IEC 61547 EN 55015	IEC 60068-1 IEC 60364 IEC 60364-7-714	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 IEC 61140 NF C15-100	IEC 60754 IEC 61249-2-21	IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 61547 EN 55015
Fluorescent lamps							

SSEN EQUIPMENT	Manufacturing Standard	Indoor / Outdoor Facilities	Site Installation Standard	Nuclear Safety	Personal Safety	Tokamak Complex	Test
LOW VOLTAGE							
	IEC 60081 IEC 60664-1 IEC 60901 IEC 60929 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61195 IEC 61347-1 IEC 61347-2-3 IEC 61547 EN 55015	IEC 60068-1 IEC 60364 IEC 60364-7-714	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 EN 60901 IEC 61140 IEC 61195 IEC 61199 IEC 61347-1 IEC 61347-2-3 NF C15-100	IEC 61249-2-21 IEC 60754	IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 61547 EN 55015
High frequency ballast lamps							
	IEC 60081 IEC 60664-1 IEC 60901 IEC 60929 IEC 61000-5 IEC 61000-6-2 IEC 61000-6-4 IEC 61347-1 IEC 61347-2-3 IEC 61547 EN 55015 EN 50294	IEC 60068-1 IEC 60364 IEC 60364-7-714	IEC 60364 IEC 61000-5 IEC 61140 NF C15-100	IEC 60068-3-3	IEC 60364-4 IEC 60479 EN 60901 IEC 61140 IEC 61347-1 IEC 61347-2-3 NF C15-100	IEC 61249-2-21 IEC 60754	IEC 60664-1 IEC 60754 IEC 61000-6-2 IEC 61000-6-4 IEC 61249-2-21 IEC 61547 EN 55015

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References

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