IEC TS 61936-2

Edition 1.0 2015-03

TECHNICAL SPECIFICATION

colour inside

Power installations exceeding 1 kV a.c. and 1,5 kV d.c. – Part 2: d.c.

IEC TS 61936-2:2015-03(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.020; 29.080.01

ISBN 978-2-8322-2304-8

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POWER INSTALLATIONS EXCEEDING 1 kV a.c. and 1,5 kV d.c. –

Part 2: d.c.

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 61936-2, which is a technical specification, has been prepared by technical committee 99: System engineering and erection of electrical power installations in systems with nominal voltages above 1 kV a.c. and 1,5 kV d.c., particularly concerning safety aspects.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
99/130/DTS	99/132/RVC

Full information on the voting for the approval of this technical specification 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 2.

A list of all parts in the IEC 61936 series, published under the general title *Power installations exceeding 1 kV a.c. and 1,5 kV d.c.*, can be found on the IEC website.

The following differences exist in the countries indicated below:

7.2.4: For live parts without protective facilities, a minimum height $H = N + 2\,440$ mm shall be maintained. (Australia)

7.2.6: Guidance reference construction can be found at ENA Doc 015. (Australia)

7.5.4: Space for evacuation shall always be at least 600 mm, even when removable parts or open doors, which are blocked in the direction of escape, intrude into the escape routes. (Australia)

8.7.1: Fire rating of barriers must be a minimum fire rating of 120 minutes. (Australia)

8.7.2: The dimensions G_1 and G_2 are to be measured from the inside edge wall of any bund wall rather than the measured point shown in Figure 7a) and 7b) of IEC 61936-1:2010/AMD1:2014 from the transformer where the bund wall is wider than the transformer. (Australia)

8.8: Spill containment should extend by 50% of the height of the transformer. (Australia)

10: For requirements on earthing, refer to AS 2067, Substations and High Voltage Installations. (Australia)

10.2.1: HV earthing systems should be designed according to tolerable voltages based on body impedances not exceeded by 5 % of the population, as given in Table 10 of IEC TS 60479-1:2005. (United Kingdom)

10.2.1: Permissible touch and step voltages in power installations shall be in accordance with Federal law concerning electrical installations (High and low voltage) (SR 734.0) and Regulations for electrical power installations (SR 743.2 StV). (Switzerland)

10.2.1 and Annex B: Earthing requirements are based on probabilistic calculations and so much of the clause is not appropriate for Australia. (Australia)

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

There are few national laws, standards and internal rules dealing with the matter coming within the scope of this technical specification, and these practices have been taken as a basis for this work.

This part of IEC 61936 contains the minimum requirements valid for IEC countries and some additional information which ensures an acceptable reliability of an installation and its safe operation.

This part of IEC 61936 is published as a Technical Specification in order to welcome contribution and involvement from a wider audience. This may provide the basis for a future international standard.

The publication of this technical specification is believed to be a decisive step towards the gradual alignment all over the world of the practices concerning the design and erection of high voltage power installations.

Particular requirements for transmission and distribution installations as well as particular requirements for power generation and industrial installations are included in this technical specification.

The relevant laws or regulations of an authority having jurisdiction takes precedence.

POWER INSTALLATIONS EXCEEDING 1 kV a.c. and 1,5 kV d.c. –

Part 2: d.c.

1 Scope

This part of IEC 61936 provides, in a convenient form, common rules for the design and the erection of electrical power installations in systems with nominal voltages above 1,5 kV d.c., so as to provide safety and proper functioning for the use intended.

This technical specification does not apply to the design and erection of any of the following:

– overhead and underground lines between separate installations;
– electric railways;
– mining equipment and installations;
– installations on ships and off-shore installations;
– electrostatic equipment (e.g. electrostatic precipitators, spray-painting units);
– test sites;
– medical equipment, e.g. medical X-ray equipment;
– valve hall.

This technical specification does not apply to the design of factory-built, type-tested switchgear for which separate IEC standards exist.

This technical specification does not apply to the requirements for carrying out live working on electrical installations.

This technical specification does not apply to the design of factory-built, type-tested thyristor valves, VSC valves and switchgear for which separate IEC standards exist.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60071-2:1996*, Insulation co-ordination – Part 2: Application guide*

IEC 60071-5, *Insulation co-ordination – Part 5: Procedures for high voltage direct current (HVDC) converter stations*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Combustible dust atmospheres*

IEC TS 60479-1:2005, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 2: Earthing and cabling*

IEC 61936-1:2010, *Power installations exceeding 1 kV a.c. – Part 1: Common rules*
IEC 61936-1:2010/AMD1:2014

IEC 62271-1:2007*, High-voltage switchgear and controlgear – Part 1: Common specifications*
IEC 62271-1:2007/AMD1:2011

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61936-1 and the following apply.

3.1
valve
complete operative controllable or non-controllable valve device assembly, normally conducting in only one direction (the forward direction), which can function as a converter arm in a converter bridge

Note 1 to entry: An example of a non-controllable valve device assembly is a semiconductor diode valve. An example of a controllable valve device assembly is a thyristor valve.

[SOURCE: IEC 60633:1998, 6.3]

3.2
electronic valve device
indivisible electronic device for electronic power conversion or electronic power switching, comprising a single non-controllable or bistably controlled unidirectionally conducting current path

Note 1 to entry: Typical electronic valve devices are thyristors, power rectifier diodes, power switching bipolar and field effect transistors and insulated-gate bipolar transistors (IGBT).

Note 2 to entry: Two or more electronic valve devices may be integrated on a common semiconductor chip (examples: a thyristor and a rectifier diode in a reverse conducting thyristor, a power switching field effect transistor with its inverse diode) or packaged in a common case (semiconductor power module). These combinations are to be considered as separate electronic valve devices.

[SOURCE: IEC 60050-551:1998, 551-14-02]

3.3
nominal voltage, <of a system>
suitable approximate value of voltage used to designate or identify a system

[SOURCE: IEC 60050-601:1985, 601-01-21]

3.4
highest voltage, <of a d.c. system>
U_{dm}
highest mean or average pole d.c. voltage to earth, excluding harmonics and commutation overshoots, for which the installation is designed in respect of its insulation

3.5
d.c. neutral point
common point of two monopoles forming a bipole converter or the earthed point of a monopole converter

3.6
d.c. electrode line
electrical connection between a d.c. earth electrode and the d.c. installation

3.7
high voltage
d.c. voltage exceeding 1 500V d.c.

3.8
low voltage
d.c. voltage not exceeding 1 500V d.c.

3.9
converter station
part of a power system which interconnects an a.c. system to a d.c. system or two d.c. systems with different voltages enabling power transfer from one system to the other and/or vice versa

3.10
d.c. earth electrode
d.c. ground electrode
array of conductive elements placed in the earth, or the sea, which provides a low resistance path between a point in the d.c. circuit and the earth and is capable of carrying continuous current for some extended period

Note 1 to entry: An earth electrode may be located at a point some distance from the HVDC substation.

Note 2 to entry: Where the electrode is placed in the sea it may be termed as sea electrode.

[SOURCE: IEC 60633:1998, 8.14, modified – The indication "d.c." has been added to the term and a synonym, d.c. ground electrode, has been added.]

3.11
pole
part of an HVDC system consisting of all the equipment in the HVDC substations and interconnecting transmission lines, if any, which during normal operation, exhibit a common direct voltage polarity with respect to earth.

[SOURCE: IEC 60633:1998, 8.5]

3.12
lightning impulse protective level, <of a protective device>
U_{pl}
maximum permissible peak voltage value, on the terminals of a protective device subjected to lightning impulses under specific conditions

[SOURCE: IEC 60050-604:1987, 604-03-56]