

TECHNICAL SPECIFICATION



Electrical installation guide –
Part 102: Application guidelines for low-voltage direct current electrical
installations not intended to be connected to a public distribution network

IEC TS 61200-102:2020

<https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

www.iec.ch IEC TS 61200-102:2020

[https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-](https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020)

[4c43547074a0/iec-ts-61200-102-2020](https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020)

TECHNICAL SPECIFICATION



Electrical installation guide –
Part 102: Application guidelines for low-voltage direct current electrical
installations not intended to be connected to a public distribution network

IEC TS 61200-102:2020

<https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 91.140.50

ISBN 978-2-8322-8013-3

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 General	8
4.1 Concept of electrical installation	8
4.2 Architecture and operating modes of installation	9
5 Local power sources (supplies).....	9
6 Loads	9
6.1 Possible nominal voltages.....	9
6.2 Minimum and maximum voltage values	10
7 Wiring systems	10
7.1 Type of wiring system	10
7.2 Identification of conductors and terminals	10
7.3 Cross-sectional areas of conductors	11
8 Earthing.....	11
8.1 Direction of touch current.....	11
8.2 Earthing arrangement.....	12
8.3 Protective conductors.....	12
8.4 Earthing conductors	12
9 Protection for safety.....	12
9.1 Protection against electric shock.....	12
9.1.1 General	12
9.1.2 Provision for basic protection.....	12
9.1.3 Provision for fault protection	12
9.2 Protection against thermal effects	16
9.2.1 Protection against electric arc.....	16
9.2.2 Risk of explosion with batteries.....	16
9.3 Protection against overcurrent	17
9.3.1 Overload protection	17
9.3.2 Short-circuit protection	17
9.4 Protection against overvoltage	18
10 Inspection.....	18
10.1 Initial inspection.....	18
10.2 Periodic inspection.....	18
Annex A (normative) Architecture and operating modes of installations.....	20
A.1 Architecture of installations	20
A.1.1 Individual installation	20
A.1.2 Collective installation.....	20
A.1.3 Shared installations	20
A.2 Operating modes	21
A.2.1 Direct feeding mode.....	21
A.2.2 Reverse feeding mode.....	21
A.2.3 Autonomous mode.....	22
Annex B (informative) Limitation of lengths of cables	23

B.1	Limit of voltage drop in consumer installations	23
B.2	Estimation of voltage drop	23
Annex C (informative)	List of notes concerning certain countries	24
Bibliography	25
Figure 1	– Concept of DC low-voltage electrical installation	9
Figure 2	– Colours used for identification of conductors in DC electrical installations	11
Figure 3	– Downward and upward direct current in human body	11
Figure 4	– Example of electrical installation in TN-S system	13
Figure 5	– Estimation of short-circuit level in TN system	14
Figure 6	– Examples of TN-S systems in DC installation	15
Figure 7	– Different types of arc fault to be considered	16
Figure A.1	– Example of an individual installation	20
Figure A.2	– Example of a collective installation	20
Figure A.3	– Example of a shared installation	21
Figure A.4	– DC electrical installation in direct feeding mode	21
Figure A.5	– DC electrical installation in reverse feeding mode	21
Figure A.6	– DC electrical installation in autonomous mode	22
Table 1	– Preferred nominal DC voltages	10

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC TS 61200-102:2020](https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020)

<https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATION GUIDE –

Part 102: Application guidelines for low-voltage direct current electrical installations not intended to be connected to a public distribution network

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. 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 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- 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 TS 61200-102, which is a Technical Specification, has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
64/2385/DTS	64/2406/RVDTS

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 document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61200 series, published under the general title *Electrical installation guide*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex C lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

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

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

ITeH STANDARD PREVIEW
(standards.iteh.ai)

IEC TS 61200-102:2020

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

Many people in the world who still have no access to electricity would benefit from access to electrical power. This can now be achieved with distributed electrical sources using renewable energy. These electrical sources using renewable energy are all operating in direct current (e.g. photovoltaic system, wind turbines).

Supply from these renewable energies is not constant, photovoltaic panels do not operate at night, and wind turbines require wind for generating electrical energy. Therefore, the use of storage units becomes a necessity and manufacturers of stationary secondary batteries are investing in these technologies so that they can become affordable.

In addition, lighting with light emitting diodes (LED), mobile phones and other electronic devices generally operate using direct current.

All requirements and recommendations in this document comply with IEC 60364 (all parts).

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC TS 61200-102:2020](https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020)

<https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d-4c43547074a0/iec-ts-61200-102-2020>

ELECTRICAL INSTALLATION GUIDE –

Part 102: Application guidelines for low-voltage direct current electrical installations not intended to be connected to a public distribution network

1 Scope

This part of IEC 61200 applies to low-voltage DC electrical installations entirely supplied by local power sources and having a nominal voltage lower or equal to the low-voltage limit. These installations can be connected to collective or shared private electrical installations.

This document also applies to DC installations according to use cases TIER 2 and TIER 3 of the World Bank defined in ESMAP 008/15 report: Beyond Connections Energy Access Redefined.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

(standards.iteh.ai)

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock* IEC TS 61200-102:2020

<https://standards.iteh.ai/catalog/standards/sist/1e0849d2-6de6-4835-892d->

IEC 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

3 Terms and definitions

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

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

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

3.1

individual electrical installation

single consuming and/or producing electrical installation

3.2

collective electrical installation

set of consuming electrical installations sharing one common set of local power supplies and energy storage equipment

3.3**shared electrical installation**

set of consuming and/or producing electrical installations, similar to an individual electrical installation, and sharing their individual power supplies and energy storage equipment

3.4**autonomous mode**

operating mode where the electrical installation operates while disconnected from the public distribution network

3.5**public distribution network****PDN**

set of coordinated equipment intended to be used for the distribution of electrical energy to private electrical installations and operated by a public organization

3.6**prosumer**

entity or party which can be both a producer and a consumer of electrical energy

4 General**4.1 Concept of electrical installation**

Any low-voltage electrical installation is to be considered as a set of electrical equipment having the following functions (see Figure 1):

- supply (e.g. local generator, photovoltaic systems, wind turbine, batteries);
- distribution (e.g. distribution board, wiring systems, socket-outlets);
- consumption (e.g. fans, lighting, appliances, pumps, batteries).

NOTE Rechargeable batteries can be considered as a power supply and as a consuming unit.

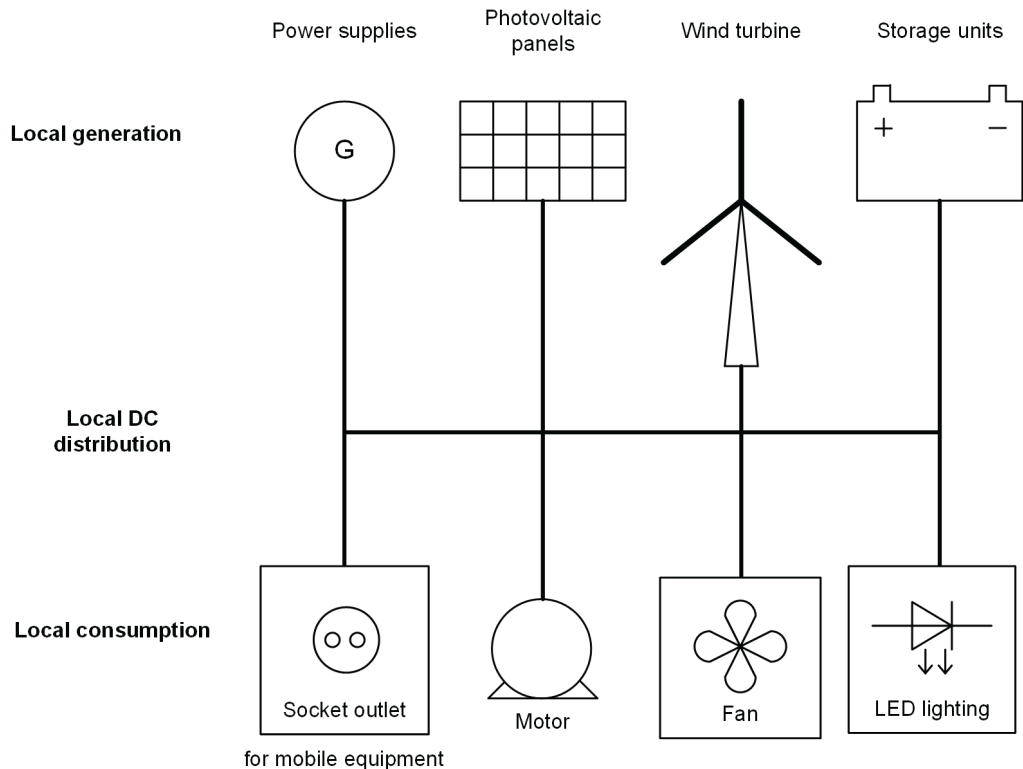


Figure 1 – Concept of DC low-voltage electrical installation

4.2 Architecture and operating modes of installation

Various architectures and operating modes of installations are defined in Annex A.

Selection of the appropriate installation architectures shall be undertaken according to the environment of the installation and its foreseeable future modification.

5 Local power sources (supplies)

Examples of local power sources are:

- local rotating generating set;
- storage units;
- photovoltaic system;
- wind turbine.

Any combination of different types of local power sources is possible. Where power sources use renewable energy, which provides intermittent supply, storage of this energy is recommended.

6 Loads

6.1 Possible nominal voltages

Table 1 provides recommended DC voltage values for equipment.

Table 1 – Preferred nominal DC voltages

Preferred V
220
350
400
440
700 or ± 350
1 400 or ± 700

Selection of voltage levels requires consideration of protective measures.

Using only one single nominal DC voltage within the installation might require voltage adaptation at different levels (e.g. through a DC/DC converter) as all power sources, storage units and current-using equipment may not operate at the same rated voltage.

6.2 Minimum and maximum voltage values

In case stationary secondary batteries (SSB) are used for supplying the DC electrical installation as backup power source, voltage level supplied by the batteries may be variable depending on their charge. This is particularly the case where no voltage regulation is used for the SSB. Large voltage tolerance for the nominal voltage (U_n) of the installation shall be considered for equipment selection.

Information from the battery/component manufacturer shall be considered.

NOTE If no calculation is possible or no details from the battery/component manufacturer is provided, the following minimum and maximum values can be used:

- maximum voltage: $1,2 U_n$;
- minimum voltage: $0,8 U_n$.

7 Wiring systems

7.1 Type of wiring system

Where automatic disconnection of supply is used as protective measure against electric shock, cables shall include three or four core conductors:

- one conductor for protective earth (PE), and
- one conductor for positive polarity, and
- one conductor for negative polarity, and/or
- one conductor for mid-point.

TN-C systems shall not be used.

7.2 Identification of conductors and terminals

A positive polarity conductor shall be identified by the colour red and a negative polarity conductor shall be identified by the colour white according to IEC 60445.

A mid-point conductor shall be identified by the colour blue.