

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Low-voltage electrical installations –
Part 5-52: Selection and erection of electrical equipment – Wiring systems
(standards.iteh.ai)

Installations électriques à basse tension –
Partie 5-52: Choix et mise en œuvre des matériels électriques – Canalisations

IEC 60364-5-52:2009
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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Installations électriques à basse tension –
Partie 5-52: Choix et mise en œuvre des matériels électriques – Canalisations**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 5-52: Selection and erection of electrical equipment – Wiring systems

FOREWORD

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International Standard IEC 60364-5-52 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

This third edition cancels and replaces the second edition, published in 2001, and constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

- Subclause 521.4 introduces minor changes with regard to busbar trunking systems and powertrack systems.
- Subclause 523.6 introduces minor changes with regard to the sizing of cables where harmonic currents are present.
- A new subclause 523.9 concerning single-core cables with a metallic covering has been introduced.

- Clause 525 introduces changes in the maximum value of voltage drop permitted between the origin of the consumer's installation and the equipment which should not be greater than that given in the relevant annex.
- Clause 526 introduces minor changes to electrical connections including additional exceptions for inspection of connections and additional notes.
- Clause 528 introduces additional requirements with regard to proximity of underground power and telecommunication cables.
- Clause 529 introduces minor changes to selection and erection of wiring systems in relation to maintainability, including cleaning.

The text of this standard is based on the following documents:

FDIS	Report on voting
64/1685/FDIS	64/1705/RVD

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

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

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

A list of all the parts in the IEC 602364 series, under the general title *Low-voltage electrical installations*, can be found on the IEC website.

<http://www.iec.ch>

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 committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

The contents of the corrigendum of February 2011 have been included in this copy.

LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

Part 5-52: Selection and erection of electrical equipment – Wiring systems

520 Introduction

520.1 Scope

Part 5-52 of IEC 60364 deals with the selection and erection of wiring systems.

NOTE 1 This standard also applies in general to protective conductors, while IEC 60364-5-54 contains further requirements for those conductors.

NOTE 2 Guidance on Part 5-52 of IEC 60364 is given in IEC 61200-52.

520.2 Normative references

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

IEC 60228, *Conductors of insulated cables*

IEC 60287 (all parts), *Electric cables – Calculation of the current rating*

IEC 60287-2-1, *Electric cables – Calculation of the current rating – Part 2-1: Thermal resistance – Calculation of thermal resistance*¹

IEC 60287-3-1, *Electric cables – Calculation of the current rating – Part 3-1: Sections on operating conditions – Reference operating conditions and selection of cable type*²

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 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-42, *Electrical installations of buildings – Part 4-42: Protection for safety – Protection against thermal effects*

¹ A consolidated edition 1.2 exists (2006) that includes IEC 60287-2-1 (1994) and its amendments 1 and 2 (1999 and 2006).

² A consolidated edition 1.1 exists (1999) that includes IEC 60287-3-1 (1995) and its amendment 1 (1999).

IEC 60364-5-54, *Electrical installations of buildings – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors and protective bonding conductors*

IEC 60439-2, *Low-voltage switchgear and controlgear assemblies – Part 2: Particular requirements for busbar trunking systems (busways)*³

IEC 60449, *Voltage bands for electrical installations of buildings*

IEC 60502 (all parts), *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV)*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*⁴

IEC 60570, *Electrical supply track systems for luminaires*

IEC 60702 (all parts), *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V*

IEC 60947-7 (all parts 7), *Low-voltage switchgear and controlgear – Part 7: Ancillary equipment*

IEC 60998 (all parts), *Connecting devices for low-voltage circuits for household and similar purposes*

IEC 61084 (all parts), *Cable trunking and ducting systems for electrical installations*

IEC 61386 (all parts), *Conduit systems for cable management*

IEC 61534 (all parts), *Powertrack systems*

IEC 61537, *Cable management – Cable tray systems and cable ladder systems*

ISO 834 (all parts), *Fire-resistance tests – Elements of building construction*

520.3 Terms and definitions

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

520.3.1

wiring system

assembly made up of bare or insulated conductors or cables or busbars and the parts which secure and if necessary enclose the cables or busbars

520.3.2

busbar

low impedance conductor to which several electric circuits can be separately connected

[IEV 605-02-01]

520.4 General

Consideration shall be given to the application of the fundamental principles of IEC 60364-1 as it applies to

³ A consolidated edition 3.1 exists (2005) that includes IEC 60439-2 (1995) and its amendment 1 (2005).

⁴ A consolidated edition 2.1 exists (2001) that includes IEC 60529 (1989) and its amendment 1 (1999).

- cables and conductors,
- their termination and/or jointing,
- their associated supports or suspensions, and
- their enclosure or methods of protection against external influences.

521 Types of wiring system

521.1 The method of installation of a wiring system (excluding systems covered by 521.4) in relation to the type of conductor or cable used shall be in accordance with Table A.52.1, provided the external influences are taken into account according to Clause 522.

521.2 The method of installation of a wiring system (excluding systems covered by 521.4) in relation to the situation concerned shall be in accordance with Table A.52.2. Other methods of installation of cables, conductors and busbars not included in Table A.52.2 are permitted, provided that they fulfil the requirements of this part.

521.3 Examples of wiring systems (excluding systems covered by 521.4) together with reference to the method of installation to be used to obtain current-carrying capacity are shown in Table A.52.3.

NOTE Table A.52.3 gives the reference method of installation where it is considered that the same current-carrying capacities can safely be used. It is not implied that all these items are necessarily recognized in national rules of all countries or that other methods of installation are prohibited.

521.4 Busbar trunking systems and powertrack systems

Busbar trunking systems shall comply with IEC 60439-2 and powertrack systems shall comply with the IEC 61534 series. Busbar trunking systems and powertrack systems shall be selected and installed in accordance with manufacturers' instructions, taking account of external influences.

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521.5 AC circuits – Electromagnetic effects (prevention of eddy current)

521.5.1 Conductors of a.c. circuits installed in ferromagnetic enclosures shall be arranged so that all conductors of each circuit, including the protective conductor of each circuit, are contained in the same enclosure. Where such conductors enter a ferrous enclosure, they shall be arranged such that the conductor are only collectively surrounded by ferromagnetic materials.

521.5.2 Single-core cables armoured with steel wire or steel tape shall not be used for a.c. circuits.

NOTE The steel wire or steel tape armour of a single-core cable is regarded as a ferromagnetic enclosure. For single-core wire armoured cables, the use of aluminium armour is recommended.

521.6 Conduit systems, cable ducting systems, cable trunking systems, cable tray systems and cable ladder systems

Several circuits are allowed in the same conduit system, separated compartment of cable ducting system or cable trunking system provided all conductors are insulated for the highest nominal voltage present.

Conduit systems shall comply with the IEC 61386 series, cable trunking or ducting systems shall comply with the IEC 61084 series and cable tray and cable ladder systems shall comply with IEC 61537.

NOTE Guidance on the selection of conduit systems is given in Annex F.

521.7 Several circuits in one cable

Several circuits are allowed in the same cable provided all conductors are insulated for the highest nominal voltage present.

521.8 Circuit arrangements

521.8.1 Conductors of a circuit shall not be distributed over different multi-core cables, conduits, cable ducting systems or cable trunking systems. This is not required where a number of multi-core cables, forming one circuit, are installed in parallel. Where multi-core cables are installed in parallel, each cable shall contain one conductor of each phase and the neutral if any.

521.8.2 The use of a common neutral conductor for several main circuits is not permitted. However, single-phase a.c. final circuits may be formed from one line conductor and the neutral conductor of one multi-phase a.c. circuit with only one neutral conductor provided that the arrangement of the circuits remains recognizable. This multi-phase circuit shall be isolated by means of an isolating device according to 536.2.2 which isolates all live conductors.

NOTE For the allocation of a common protective conductor for several circuits, see IEC 60364-5-54.

521.8.3 Where several circuits are terminated in a single junction box the terminals for each circuit shall be separated by insulating partitions, except for connecting devices in accordance with the IEC 60998 series, and terminal blocks in accordance with IEC 60947-7.

521.9 Use of flexible cables or cords (standards.iteh.ai)

521.9.1 A flexible cable may be used for fixed wiring where the provisions of this standard are met.

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521.9.2 Equipment that is intended to be moved in use shall be connected by flexible cables or cords, except equipment supplied by contact rails.

521.9.3 Stationary equipment which is moved temporarily for the purpose of connecting, cleaning etc., e.g. cookers or flush-mounting units for installations in false floors, shall be connected with flexible cables or cords.

521.9.4 Flexible conduit systems may be used to protect flexible insulated conductors.

521.10 Installation of cables

Insulated conductors (non-sheathed) for fixed wiring shall be enclosed in conduit, cable ducting system or cable trunking system. This requirement does not apply to a protective conductor complying with IEC 60364-5-54.

522 Selection and erection of wiring systems in relation to external influences

The installation method selected shall be such that protection against the expected external influences is ensured in all appropriate parts of the wiring system. Particular care shall be taken at changes in direction and where wiring enters into equipment.

NOTE The external influences categorized in Table 51A of IEC 60364-5-51 which are of significance to wiring systems are included in this clause.

522.1 Ambient temperature (AA)

522.1.1 Wiring systems shall be selected and erected so as to be suitable for any temperature between the highest and the lowest local ambient temperature and to ensure that

the limiting temperature in normal operation (see Table 52.1) and the limiting temperature in case of a fault will not be exceeded.

NOTE “Limiting temperature” means maximum continuous operating temperature.

522.1.2 Wiring system components including cables and wiring accessories shall only be installed or handled at temperatures within the limits stated in the relevant product standard or as given by the manufacturer.

522.2 External heat sources

522.2.1 In order to avoid the harmful effects of heat from external sources, one or more of the following methods or an equally effective method shall be used to protect wiring systems:

- heat shielding;
- placing sufficiently far from the source of heat;
- selecting of the wiring system components with due regard for the additional temperature rise which may occur;
- local reinforcement of insulating material e.g. by heat-resisting insulated sleeving.

NOTE Heat from external sources may be radiated, convected or conducted, e.g.

- from hot water systems,
- from plant, appliances and luminaires,
- from manufacturing processes,
- through heat conducting materials,
- from solar gain of the wiring system or its surrounding medium.

522.3 Presence of water (AD) or high humidity (AB)

522.3.1 Wiring systems shall be selected and erected so that no damage is caused by condensation or ingress of water. The completed wiring system shall comply with the IP degree of protection relevant to the particular location.

NOTE In general, the sheaths and insulation of cables for fixed installations may be regarded, when intact, as proof against penetration by moisture. Special considerations apply to cables liable to frequent splashing, immersion or submersion.

522.3.2 Where water may collect or condensation may form in wiring systems, provision shall be made for its escape.

522.3.3 Where wiring systems may be subjected to waves (AD6), protection against mechanical damage shall be afforded by one or more of the methods of 522.6, 522.7 and 522.8.

522.4 Presence of solid foreign bodies (AE)

522.4.1 Wiring systems shall be selected and erected so as to minimize the danger arising from the ingress of solid foreign bodies. The completed wiring system shall comply with the IP degree of protection relevant to the particular location.

522.4.2 In a location where dust in significant quantity is present (AE4), additional precautions shall be taken to prevent the accumulation of dust or other substances in quantities which could adversely affect the heat dissipation from the wiring system.

NOTE A wiring system which facilitates the removal of dust may be necessary (see Clause 529).

522.5 Presence of corrosive or polluting substances (AF)

522.5.1 Where the presence of corrosive or polluting substances, including water, is likely to give rise to corrosion or deterioration, parts of the wiring system likely to be affected shall be suitably protected or manufactured from a material resistant to such substances.

NOTE Suitable protection for application during erection may include protective tapes, paints or grease. These measures should be coordinated with the manufacturer.

522.5.2 Dissimilar metals, liable to initiate electrolytic action, shall not be placed in contact with each other unless special arrangements are made to avoid the consequences of such contact.

522.5.3 Materials liable to cause mutual or individual deterioration or hazardous degradation shall not be placed in contact with each other.

522.6 Impact (AG)

522.6.1 Wiring systems shall be selected and erected so as to minimize the damage arising from mechanical stress, e.g. by impact, penetration or compression during installation, use or maintenance.

522.6.2 In fixed installations where impacts of medium severity (AG2) or high severity (AG3) can occur, protection shall be afforded by

- the mechanical characteristics of the wiring system, or
- the location selected, or
- the provision of additional local or general mechanical protection, or
- by any combination of the above. [IEC 60364-5-52:2009](https://standards.iteh.ai/catalog/standards/sist/83148619-64dc-43a3-9c9e-60364-5-52/iec-60364-5-52-2009)

NOTE 1 Examples are areas where the floor is likely to be penetrated and areas used by forklift trucks.

NOTE 2 Additional mechanical protection may be achieved by using suitable cable trunking/ducting or conduit systems.

522.6.3 A cable installed under a floor or above a ceiling shall be run in such a position that it is not liable to be damaged by contact with the floor or the ceiling or their fixings.

522.6.4 The degree protection of electrical equipment shall be maintained after installation of the cables and conductors.

522.7 Vibration (AH)

522.7.1 Wiring systems supported by or fixed to structures of equipment subject to vibration of medium severity (AH2) or high severity (AH3) shall be suitable for such conditions, particularly where cables and cable connections are concerned.

NOTE Special attention should be paid to connections to vibrating equipment. Local measures may be adopted such as flexible wiring systems.

522.7.2 The fixed installation of suspended current-using equipment, e.g. luminaires, shall be connected by cable with flexible cores. Where no vibration or movement can be expected, cable with non-flexible core may be used.

522.8 Other mechanical stresses (AJ)

522.8.1 Wiring systems shall be selected and erected so as to avoid during installation, use or maintenance, damage to cables and insulated conductors and their terminations.