

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

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 oeuvre 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

AMENDMENT 1

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Amendment 1 to IEC 60364-5-52:2009 has been prepared by IEC technical committee 64: Electrical installations and protection against electrical shock.

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

Draft	Report on voting
64/2675/FDIS	64/2703/RVD

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

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications/.

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- reconfirmed,
- withdrawn, or
- revised.

520.2 Normative references

Add the following new reference:

IEC 60364-4-43:2023, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

524 Cross-sectional areas of conductors

524.2 Cross-sectional area of the neutral conductor

Replace the existing Subclause 524.2 with the following new Subclause 524.2:

524.2 Cross-sectional area of the neutral conductor

The cross-sectional area of the neutral conductor, if any, shall be at least equal to the cross-sectional area of the line conductors:

- in single-phase circuits; or
- in polyphase circuits where the cross-sectional area of the line conductors is less than or equal to 16 mm² copper or 25 mm² aluminium.

In all other cases, the cross-sectional area of the neutral conductor may be less than that of the line conductors and:

- shall be at least 16 mm² copper or 25 mm² aluminium; and
- shall not be less than 50 % of the cross-sectional area of the line conductors.

Where triplen harmonics are present, see 524.3.

Add, at the end of 524.2, the following new Subclause 524.3:

524.3 Cross-sectional area of live conductors with triplen harmonics

In three-phase circuits where the third harmonic and multiples of third harmonic currents are expected to flow, the cross-sectional area of the line conductors and the neutral conductor may be selected in accordance with Annex E.

Where cross-sectional areas are not selected in accordance with Annex E, IEC 60364-4-43:2023, 431.2.3 shall be taken into consideration.

Annex E

Replace the existing Annex E with the following new Annex E:

Annex E (normative)

Effect of harmonic currents on balanced three-phase systems

E.52.1 General

Subclause 523.6.3 states that where the neutral conductor carries current without a corresponding reduction in load of the line conductors, the current flowing in the neutral conductor shall be taken into account in ascertaining the current-carrying capacity of the circuit.

This annex is intended to cover the situation where currents in the line conductors of a balanced three-phase system have triplen harmonics content which are superimposed in the neutral conductor. The magnitude of the current in the neutral conductor due to triplen harmonics can exceed the magnitude of the power frequency current in the line conductors. In such cases, the current in the neutral conductor will have a significant effect on the current-carrying capacity of the cables in the circuit.

The reduction factors given in this annex apply to balanced three-phase circuits; it is recognized that the situation is more onerous if only two of the three line conductors are loaded. In this situation, the neutral conductor will carry the harmonic currents in addition to the unbalanced current. Such a situation can lead to overloading of the neutral conductor.

Equipment likely to cause significant harmonic currents are, for example, LED lighting banks and DC power supplies such as those found in computers. Further information on harmonic disturbances can be found in the IEC 61000 series.

The tabulated reduction factors only apply to cables where the neutral conductor is of the same material as the line conductor and within a four-core or five-core cable or within a circuit of four adjacent single-core cables or insulated conductors. These reduction factors have been calculated based on triplen harmonic currents. The tabulated reduction factors, when applied to the current-carrying capacity of a cable with three loaded conductors, will give the current-carrying capacity of a cable with four loaded conductors where the current in the fourth conductor is due to harmonics. The reduction factors also take the heating effect of the harmonic current in the line conductors into account.

E.52.2 Reduction factors

The following symbols are used:

- I_B design current, expressed in A;
- I_L power frequency load current, expressed in A;
- I_{It} total current in the line conductor, expressed in A;
- I_z current carrying capacity, expressed in A;

- I_{zB} current carrying capacity, expressed in A, in accordance with Annex B;
- k reduction factor;
- P_z losses per unit length, expressed in W/m, generated in the cable with line conductors only;
- P_{zN} losses per unit length, expressed in W/m, generated in the cable with line and neutral conductors;
- r_l resistance per unit length, expressed in Ω/m , of line conductors;
- r_N resistance per unit length, expressed in Ω/m , of the neutral conductor;
- THD_i total harmonic current content, expressed in %;
- THD_{i3n} total 3n harmonic current content, expressed in %.

The minimum cross-sectional area of the conductors shall be selected to provide a current-carrying capacity not less than the power frequency load current, I_L thus:

$$I_L \leq I_z = k I_{zB} \quad (E.52.1)$$

Where the design current I_B is given as a power frequency load current I_L , the reduction factor k provided in Table E.52.1 shall be applied.

Table E.52.1 – Reduction factors

THD_{i3n}^a %	Reduction factor k for the neutral CSA equal to the line CSA	Reduction factor k for the neutral CSA half the line CSA
5	0,99	0,99
10	0,98	0,97
15	0,96	0,93
20	0,93	NA
25	0,89	NA
30	0,86	NA
35	0,82	NA
40	0,78	NA
45	0,74	NA
50	0,71	NA

Key
 CSA cross-sectional area
 NA not applicable, see 523.6.3

NOTE The triplen harmonics current in the neutral conductor is, due to the superimposing, three times the triplen harmonics current in the line conductors.

^a Where the value of THD_{i3n} is not known, apply the value of THD_i .

The reduction factor k given in Table E.52.1 is based on the following:

The current-carrying capacity, I_{zB} , of a three-phase loaded cable is the current that can flow in the live conductors where the heat generated by the losses in the conductors are balanced with the heat dissipation from the cable without causing the temperature of the insulation of the conductors to exceed its maximum allowed temperature under normal operation.