4

NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI
IEC
364-5-551

Première édition
First edition
1994-10

Installations électriques des bâtiments –

Partie 5:
Choix et mise en oeuvre des matériels électriques –
Chapitre 55: Autres matériels –
Section 551: Groupes générateurs à basse tension

Electrical installations of buildings –

Part 5:
Selection and erection of electrical equipment –
Chapter 55: Other equipment –
Section 551: Low-voltage generating sets

Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembé Genève, Suisse

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE J

Pour prix, voir catalogue en vigueur
For price, see current catalogue

IEC

VOL. 11

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS OF BUILDINGS –

Part 5: Selection and erection of electrical equipment – Chapter 55: Other equipment – Section 551: Low-voltage generating sets

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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. The 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 the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

International Standard IEC 364-5-551 has been prepared by IEC technical committee 64: Electrical installations of buildings.

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

DIS	Reports on voting
64(CO)212 64(CO)247	64(CO)230 64(CO)248

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

Annex A is for information only.

ELECTRICAL INSTALLATIONS OF BUILDINGS –

Part 5: Selection and erection of electrical equipment – Chapter 55: Other equipment – Section 551: Low-voltage generating sets

551.1 General

551.1.1 *Scope*

551.1.1.1 This section of IEC 364-5 applies to low-voltage and extra-low voltage installations which incorporate generating sets intended to supply, either continuously or occasionally, all or part of the installation. Requirements are included for installation with the following supply arrangements:

- supply to an installation which is not connected to the public supply;
- supply to an installation as an alternative to the public supply;
- supply to an installation in parallel with the public supply;
- appropriate combinations of the above.

This section does not apply to self-contained items of extra-low voltage electrical equipment which incorporate both the source of energy and the energy-using load and for which a specific product standard exists that includes the requirements for electrical safety.

NOTES

1 Particular requirements for supplies for safety services are given in IEC 364-5-56.

2 Requirements of the public supply undertaking should be ascertained before a generating set is installed in an installation which is connected to the public supply.

551.1.1.2 Generating sets with the following power sources are considered:

- combustion engines;
- turbines;
- electric motors;
- photovoltaic cells;
- electrochemical accumulators;
- other suitable sources.

551.1.1.3 Generating sets with the following electrical characteristics are considered:

- mains-excited and separately excited synchronous generators;
- mains-excited and self-excited asynchronous generators;
- mains-commutated and self-commutated static inverters with or without by-pass facilities.

551.1.1.4 The use of generating sets for the following purposes is considered:

- supply to permanent installations;
- supply to temporary installations;
- supply to portable equipment which is not connected to a permanent fixed installation.

551.1.2 *Normative references*

The following normative documents contain provisions which, through reference in this text, constitute provisions of this section of IEC 364-5. At the time of publication, the editions indicated were valid. All normative documents are subject to revision and parties to agreements based on this section of IEC 364-5 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 364-4-41: 1992, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 364-4-46: 1981, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 46: Isolation and switching*

IEC 364-5-54: 1980, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 54: Earthing arrangements and protective conductors*

551.2 General requirements

551.2.1 The means of excitation and commutation shall be appropriate for the intended use of the generating set and the safety and proper functioning of other sources of supply shall not be impaired by the generating set.

NOTE – See clause 551.7 for particular requirements where the generating set may operate in parallel with a public supply.

551.2.2 The prospective short-circuit current and prospective earth fault current shall be assessed for each source of supply or combination of sources which can operate independently of other sources or combinations. The short-circuit rating of protective devices within the installation and, where appropriate, connected to the public supply network, shall not be exceeded for any of the intended methods of operation of the sources.

551.2.3 Where the generating set is intended to provide a supply to an installation which is not connected to the public supply or to provide a supply as a switched alternative to the public supply, the capacity and operating characteristics of the generating set shall be such that danger or damage to equipment does not arise after the connection or disconnection of any intended load as a result of the deviation of the voltage or frequency from the intended operating range. Means shall be provided to automatically disconnect such parts of the installation as may be necessary if the capacity of the generating set is exceeded.

NOTES

1 Attention should be given to the size of individual loads as a proportion of the capacity of the generating set and to motor starting currents.

2 Attention should be given to the power factor specified for protective devices in the installation.

3 The installation of a generating set within an existing building or installation may change the conditions of external influence for the installation (see IEC 364-3-32), for example by the introduction of moving parts, parts at high temperature or by the presence of noxious gases, etc.

551.3 Protection against both direct and indirect contact

Additional requirements for extra-low voltage (ELV) systems which provide protection against both direct and indirect contact and where the installation is supplied from more than one source.

551.3.1 Where a SELV of PELV system may be supplied by more than one source, the requirements of 411.1.2 of IEC 364-4-41 shall apply to each source. Where one or more of the sources is earthed, the requirements of 411.1.3 and 411.1.5 of IEC 364-4-41 for PELV systems shall apply.

If one or more of the sources does not meet the requirements of 411.1.2 of IEC 364-4-41, the system shall be treated as a FELV system and the requirements of 411.3 of IEC 364-4-41 shall apply.

551.3.2 Where it is necessary to maintain the supply to an extra-low voltage system following the loss of one or more sources of supply, each source of supply or combination of sources of supply which can operate independently of other sources or combinations shall be capable of supplying the intended load of the extra-low voltage system. Provisions shall be made so that the loss of low-voltage supply to an extra-low voltage source does not lead to danger or damage for other extra-low voltage equipment.

NOTE – Such precautions may be necessary in supplies for safety services (see IEC 364-3-35).

551.4 Protection against indirect contact

Protection against indirect contact shall be provided for the installation in respect of each source of supply or combination of sources of supply which can operate independently of other sources or combinations of sources.

551.4.1 *Protection by automatic disconnection of supply*

Protection by automatic disconnection of supply shall be provided in accordance with section 413.1 of IEC 364-4-41, except as modified for particular cases by 551.4.2, 551.4.3 or 551.4.4.

551.4.2 *Additional requirements for installations where the generating set provides a switched alternative to the public supply (stand-by systems)*

Protection by automatic disconnection of supply shall not rely upon the connection to the earthed point of the public supply system when the generator is operating as a switched alternative to a TN system. A suitable earth electrode shall be provided.

551.4.3 *Additional requirements for installations incorporating static inverters*

551.4.3.1 Where protection against indirect contact for parts of the installation supplied by the static inverter relies upon the automatic closure of the by-pass switch and the operation of protective devices on the supply side of the by-pass switch is not within the time required by section 413.1 of IEC 364-4-41, supplementary equipotential bonding shall be provided between simultaneous accessible exposed conductive parts and extraneous conductive parts on the load side of the static inverter in accordance with 413.1.6 of IEC 364-4-41.

The resistance of supplementary equipotential bonding conductors required between simultaneously accessible conductive parts shall fulfil the following condition:

$$R \leq \frac{50}{I_a}$$

where

I_a is the maximum earth fault current which can be supplied by the static inverter alone for a period of up to 5 s.

NOTE – Where such equipment is intended to operate in parallel with a public supply system the requirements of clause 551.7 also apply.

551.4.3.2 Precautions shall be taken or equipment shall be selected so that the correct operation of protective devices is not impaired by d.c. currents generated by a static inverter or by the presence of filters.

551.4.4 *Additional requirements for protection by automatic disconnection where the installation and generating set are not permanently fixed*

This subclause applies to portable generating sets and to generating sets which are intended to be moved to unspecified locations for temporary or short-term use. Such generating sets may be part of an installation which is subject to similar use. This subclause does not apply to permanent fixed installations.

NOTE – For suitable connection arrangements see IEC 309.

551.4.4.1 Between separate items of equipment protective conductors shall be provided which are part of a suitable cord or cable and which comply with table 54F. All protective conductors shall comply with IEC 365-5-54.

551.4.4.2 In TN, TT and IT systems a residual current protective device with a rated residual operating current of not more than 30 mA shall be installed in accordance with clause 413.1 of IEC 364-4-41 to provide automatic disconnection.

NOTE – In IT systems, a residual current device may not operate unless one of the earth faults is on a part of system on the supply side of the device.

551.5 Protection against overcurrent

551.5.1 Where means of detecting overcurrent of the generating set is provided, this shall be located as near as practicable to the generator terminals.

NOTE – The contribution to the prospective short-circuit current by a generating set may be time-dependent and may be much less than the contribution made by a public supply.

551.5.2 Where a generating set is intended to operate in parallel with a public supply, or where two or more generating sets may operate in parallel, circulating harmonic currents shall be limited so that the thermal rating of conductors is not exceeded.

The effects of circulating harmonic currents may be limited as follows:

- the selection of generating sets with compensated windings;
- the provision of a suitable impedance in the connection to generator star points;
- the provision of switches which interrupt the circulatory circuit but which are interlocked so that at all times protection against indirect contact is not impaired;
- the provision of filtering equipment;
- other suitable means.

NOTE – Consideration should be given to the maximum voltage which may be produced across an impedance connected to limit circulating harmonics.

551.6 Additional requirements for installations where the generating set provides a supply as a switched alternative to the public supply (stand-by systems)

551.6.1 Precautions complying with the relevant requirements of IEC 364-4-46 for isolation shall be taken, so that the generator cannot operate in parallel with the public supply system. Suitable precautions may include:

- an electrical, mechanical or electro-mechanical interlock between the operating mechanisms or control circuits of the change-over switching devices;
- a system of locks with a single transferable key;
- a three-position break-before-make change-over switch;
- an automatic change-over switching device with a suitable interlock;
- other means providing equivalent security of operation.

551.6.2 For TN-S systems where the neutral is not isolated, any residual current device shall be positioned to avoid incorrect operation due to the existence of any parallel neutral-earth path.

NOTE – It may be desirable in TN systems to disconnect the neutral of the installation from the public supply system neutral to avoid disturbances such as induced voltage surges caused by lightning.

551.7 Additional requirements for installations where the generating set may operate in parallel with the public supply system

551.7.1 In selecting and using a generating set to run in parallel with a public supply, care shall be taken to avoid adverse effects to the supply network and to other installations in respect of power factor, voltage changes, harmonic distortion, unbalance, starting, synchronizing or voltage fluctuation effects. The public supply undertaking shall be consulted in respect of particular requirements. Where synchronization is necessary, the use of automatic synchronizing systems which consider frequency, phase and voltage is to be preferred.

551.7.2 Protection shall be provided to disconnect the generating set from the public supply in the event of loss of that supply or deviation of the voltage or frequency at the supply terminals from values declared for normal supply.

The type of protection and the sensitivity and operating times depend upon the protection of the public supply system and shall be agreed by the public supply undertaking.

551.7.3 Means shall be provided to prevent the connection of a generating set to the public supply system if the voltage and frequency of the public supply are outside the limits of operation of the protection required in 551.7.2.

551.7.4 Means shall be provided to enable the generating set to be isolated from the public supply. The means of isolation shall be accessible to the public supply undertaking at all times.

551.7.5 Where a generating set may also operate as switched alternative to the public supply, the installation shall also comply with clause 551.6.

Annex A
(informative)

Bibliography

IEC 309, Plugs, socket-outlets and couplers for industrial purposes

IEC 364-3: 1993, Electrical installations of buildings – Part 3: Assessment of general characteristics

IEC 364-5-56: 1980, Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 56: Safety services