IEC TS 61200-201

Edition 1.0 2026-08

TECHNICAL SPECIFICATION

Application guidance based on the IEC 60364 series - Part 201: Asynchronous motor starting and protection

ICS 91.140.50

ISBN 978-2-8327-1425-6

IEC TS 61200-201:2026-08(en)

IEC Secretariat
3, rue de Varembé
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 It also gives information on projects, replaced and withdrawn publications.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.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

Application guidance based on the IEC 60364 series - Part 201: Asynchronous motor starting and protection

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 61200-201 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock. It is a Technical Specification.

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

Draft	Report on voting
64/2860/DTS	64/2871/RVDTS

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 Technical Specification 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.

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

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

Asynchronous motors are used in a wide variety of applications. The following are examples of driven machines:

– centrifugal pumps;
– fans and blowers;
– compressors;
– crushers;
– conveyors;
– lifts and cranes.

The consequences of a motor failure due to incorrect protection or the inability of control circuits to operate can include the following.

– For persons:
  - lack of fresh air due to the blockage of motor ventilation;
  - electrocution or electric shock due to insulation failure in the motor;
  - accident due to non-stopping of the motor.
– For the driven machine and the process:
  - shaft couplings, axles, driving belts, etc. damaged due to a stalled rotor;
  - loss of production;
  - delayed manufacturing.
– For the motor itself:
  - motor winding burnt out due to stalled rotor;
  - economical aspects of repair;
  - economical aspects of replacement.

Therefore, safety of persons and properties, as well as reliability and availability levels, are highly dependent on the selection of protective devices.

In economic terms, it is important to consider the overall cost of failure. This is linked with the size of the motor and with the difficulties of access and replacement. Loss of production is a further and evidently important factor.

Specific features of motor performance influence the power supply circuits that are needed for satisfactory operation.

A motor power-supply circuit presents certain constraints not normally encountered in other (common) final circuits. These are due to the particular characteristics of motors directly connected to the line, such as the following:

– high start-up current, which is mostly reactive, and can therefore be the cause of significant voltage drop;
– high number and frequency of start-up operations;
– because of the high start-up current, motor overload protective devices must have operating characteristics which avoid tripping during the starting period;
– some safety application requiring exemption of protection against overload;
– specificities due to application, e.g. lifts, cranes, motor with strong inertia.

All guidance in this document is based on the IEC 60364 series [1].

1 Scope

This part of IEC 61200 provides guidance, based on the general requirements provided in the IEC 60364 series, on the implementation of protective measures for low-voltage asynchronous motors. This document covers the control and the protection of low-voltage asynchronous motors.

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.

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

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

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

IEC 60364-5-53:2019, *Low-voltage electrical installations - Part 5-53: Selection and erection of electrical equipment - Devices for protection for safety, isolation, switching, control and monitoring*

IEC 60947-4-1, *Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60364-1 and the following apply.

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

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
asynchronous motor
alternating current motor in which the speed of the motor is not in a fixed ratio with the frequency of the current supplied

Note 1 to entry: For more details and information on various categories of asynchronous motor, refer to Annex A.

[SOURCE: IEC 60050-811:2017 [2], 811-12-25, modified – Note 1to entry has been added.]

3.2
starter
combination of all the switching means necessary to start and stop a motor in combination with suitable overload protection

Note 1 to entry: Starters may be designated according to the method by which the force for closing the main contacts is provided.

Note 2 to entry: For more details and information on various motor starters, refer to Annex B.

[SOURCE: IEC 60050-441:1984 [3], 441-14-38, modified – Note 2 to entry has been added.]

3.3
direct-on-line starter
starter which connects the line voltage across the motor terminals in one step

[SOURCE: IEC 60050-441:1984 [3], 441-14-40]

3.4
star-delta starter
starter for a three-phase induction motor such that in the starting position the stator windings are connected in star and in the final running position they are connected in delta

[SOURCE: IEC 60050-441:1984 [3], 441-14-44]

4 General information

This document provides application guidance for low-voltage asynchronous motor starting and protection systems. Statements and guidance are based on technology known at the date of development of this document. As technology evolves quickly, this document will need frequent updates in order to follow evolution and improvement of technologies as described in its content. Users of this document should therefore pay attention to the latest technology available for this application and verify the appropriateness of the requirements, recommendations and statements given in this document.

5 Presentation of the application

5.1 Types of equipment

This document covers the following alternating asynchronous motors:

– squirrel cage rotor (see Clause A.1);
– wound rotor (slip-ring rotor) (see Clause A.2).

5.2 Technical characteristics

Table 1 gives a quick overview of available electric asynchronous motor starting methods, together with their main characteristics and the areas in which they are used.

The importance of three-phase squirrel cage asynchronous motors is emphasized. The term "standard" applied to this type of motor is now even more appropriate since they are ideal for uses that have arisen from the development of electronic devices for variable frequency drives.

Table 1 – Comparison between the different methods of starting low-voltage (LV) asynchronous motors

Methods of starting LV asynchronous motors	Squirrel cage asynchronous		Slip-ring asynchronous
	three-phase	single-phase	
Direct on-line	Adopted	Adopted	Special starting device
Variable frequency drive	Adopted	Very rare	Possible
Rheostatic or auto-transformer	Adopted	Not well adopted	Adopted
Soft-starter	Adopted	Adopted	Adopted

6 Protection

6.1 Protection against electric shock

6.1.1 General

Protection against electric shock is given by a combination of basic protection, fault protection and, in specific cases, additional protection. For more details and information on other additional types of protection, refer to Annex C.

6.1.2 Basic protection

Under normal conditions, basic protection consists of at least one provision that prevents direct contact with hazardous-live-parts.

Basic protection is usually provided by using insulating material or by barriers or enclosures (IEC 60364-4-41:2005 [4], Annex A).

In electrical installations which are controlled or supervised by skilled or instructed persons, obstacles and placing out of reach provide basic protection as well (IEC 60364-4-41:2005 [4], Annex B).

Except where safety extra-low voltage (SELV) or protective extra-low voltage (PELV) is used as protective measure, basic protection is usually provided by using enclosures. A minimum ingress protection rating of IP 2X or IP XXB as specified in IEC 60529:1989 [5] should be applied.

6.1.3 Fault protection

The most common protective provision for fault protection corresponds to automatic disconnection of supply. Requirements concerning this protective measure are specified in IEC 60364-4-41 and are not specific to motors.

When electromechanical devices are used, overcurrent protective devices used for protection of motors against overcurrent can also be used jointly for automatic disconnection of supply provided that both types of requirements are simultaneously fulfilled. Only some specified protective devices are recognized by IEC 60364-4-41 [6] and IEC 60364-5-53 [7] as appropriate for fault protection such as:

– overcurrent protective devices (OCPD) in accordance with IEC 60898-1:2015 [8] or IEC 60898-2:2016 [9] or IEC 60947-2:2016 [10] or IEC 60269-2:2013 [11] or IEC 60269-3:2010 [12] or IEC 60269-4:2009 [13];
– control and protective switching devices (CPS) in accordance with IEC 60947-6-2 [14];
– residual current devices (RCDs) in accordance with IEC 60947-2:2016 [10] or the IEC 61008 series [15] or the IEC 61009 series [16] or IEC 62423:2009 [17].

These protective devices are suitable for isolation.

Some soft-starters or variable frequency drives can provide protective functions against electric shock, as indicated in IEC 60364-4-41 [6].

6.1.4 Isolation

Devices for isolation should be installed at or near the origin of circuits (see IEC 60364-5-53 [7]). Devices for isolation should be installed for each circuit supplying a motor starter unit. Their role is to isolate circuits safely from their energy source (main power supply) to ensure the protection of persons in case of maintenance, repair, or modification of downstream electric circuit(s).

Devices for isolation shall comply with the requirements as specified in IEC 60364-5-53:2019, Clause 536, which require:

– isolation of all live conductors;
– the ability to withstand minimum impulse voltages depending on the nominal voltage and on risk assessment (see IEC 60364-4-44:2007 [18], Table 443.2);
– the prevention of unintentional or unauthorized operation (e.g. padlocking);
– position of contacts be either externally visible or clearly and reliably indicated (e.g. visible or apparent break).

NOTE A visible break means that the opening of the poles is completely visible for an operator. An apparent break can be identified either by the position of the working gear, or by the position indicator that can only indicate the de-energized position if the contacts are actually separated by an adequate distance as specified in the standards. Manufacturers offer a number of devices with these functions. Often one device can handle the functions of isolating contacts and protection against short-circuits (e.g. fuse holder or disconnector device). In the case of some basic devices, it is important to add an additional connection boosting device.

When electromechanical devices, for example, circuit-breakers, or fuse holders are used, they may be used for isolation provided they are declared as such by the manufacturer in accordance with the relevant product standard. In this case, the symbol IEC 60417-6169-1:2012-08 (see IEC 60417:2025 DB [19]) in Figure 1 shall be found on the front label of the device.

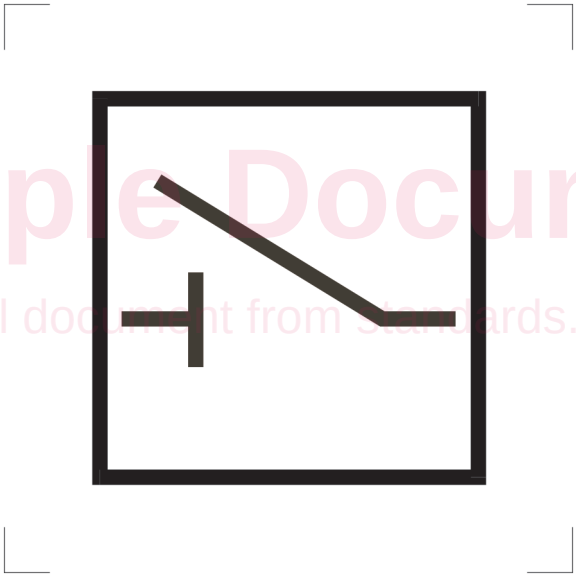

Figure 1 – Symbol IEC 60417-6169-1:2012-08 for device suitable for isolation

This symbol may be combined with other symbols, for instance, IEC 60417-6169-2:2012-08, disconnecting circuit-breaker.

Electronic devices cannot be used as devices for isolation. Therefore, a dedicated device for isolation can be installed in series with an electronic starter (soft-starter or variable frequency drives). This device for isolation may be directly installed upstream of the electronic starter.

6.2 Protection against thermal effects

6.2.1 General

Protection against thermal effects is essential. Thermal effects can result from frequent starting, motor overload, or internal faults. A combination of protection by analysing the current and thermal protector within the motor could be used to protect against thermal effects.