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Part 201: Asynchronous motor starting and protection

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

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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:

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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– withdrawn, or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*

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

[5] IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

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[12] IEC 60269-3:2010, *Low-voltage fuses - Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) - Examples of standardized systems of fuses A to F*

[13] IEC 60269-4:2009, *Low-voltage fuses - Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices*

[14] IEC 60947-6-2, *Low-voltage switchgear and controlgear - Part 6-2: Multiple function equipment - Control and protective switching devices (or equipment) (CPS)*

[15] IEC 61008 series, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)*

[16] IEC 61009 series, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*

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[19] IEC 60417:2025 DB, *Graphical symbols for use on equipment - 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417*

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

[21] IEC 60034-12:2016, *Rotating electrical machines - Part 12: Starting performance of single-speed three-phase cage induction motors*

[22] IEC 60947-4-1:2023, *Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters*

[23] IEC 60947-1, *Low-voltage switchgear and controlgear - Part 1: General rules*

[24] IEC 60947-4-2, *Low-voltage switchgear and controlgear - Part 4-2: Contactors and motor-starters - Semiconductor motor controllers, starters and soft-starters*

[25] IEC 60947-3:2020, *Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

[26] IEC 61800-5-1:2022, *Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy*

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