SLOVENSKI STANDARD
SIST EN 60252:1999

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A.C. motor capacitors

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Motorkondensatoren

Condensateurs des moteurs à courant alternatif

Ta slovenski standard je istoveten z: **EN 60252:1994**

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English version

A.C. motor capacitors

(IEC 252 : 1993, modified)

Condensateurs des moteurs à courant alternatif
(CEI 252 : 1993, modifiée)

Motorkondensatoren
(IEC 252 : 1993, modifiziert)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 33(CO)107, as prepared by IEC Technical Committee 33: Power capacitors, was submitted to the IEC-CENELEC parallel vote in March 1993.

The reference document with common modifications prepared by CENELEC Reporting Secretariat SR 33 was approved by CENELEC as EN 60252 on 8 December 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-12-01
- latest date of withdrawal of conflicting national standards (dow) 1994-12-01

For products which have complied with the relevant national standard before 1994-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-12-01.

Annexes designated 'normative' are part of the body of the standard. In this standard, annexes A and ZA are normative.

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A.C. MOTOR CAPACITORS

SECTION 1: GENERAL

1.1 Scope and object

This International Standard applies to motor capacitors intended for connection to windings of asynchronous motors supplied from a single-phase system having a frequency up to and including 100 Hz, and to capacitors to be connected to three-phase asynchronous motors so that these motors may be supplied from a single-phase system.

This standard covers impregnated or unimpregnated capacitors having a dielectric of paper, plastic film, or a combination of both, either metallized or with metal-foil electrodes, with rated voltages up to and including 660 V.

Electrolytic motor start capacitors will be covered by IEC 252-2 which is under consideration.

NOTE – The following are excluded from this standard:

– Shunt capacitors of the self-healing type for a.c. power systems of up to and including 1 000 V nominal voltage. (IEC 831-1)

– Shunt capacitors of non self-healing type for a.c. power systems of up to and including 1 000 V nominal voltage. (IEC 931-1)

– Shunt capacitors for a.c. power systems having a nominal voltage above 1 000 V. (IEC 871-1)

– Capacitors for induction heat-generating plants, operating at frequencies between 40 Hz and 24 000 Hz (IEC 110: Recommendation for capacitors for inductive heat generating plants operating at frequencies between 40 Hz and 24 000 Hz).

– Series capacitors (IEC 143: Series capacitors for power systems).

– Coupling capacitors and capacitor dividers (IEC 358: Coupling capacitors and capacitor dividers).

– Capacitors to be used in power electronic circuits (IEC 1071-1: Power electronic capacitors).

– Small a.c. capacitors to be used for fluorescent and discharge lamps (IEC 566: Capacitors for use in tubular fluorescent and other discharge lamp circuits).

– Capacitors for suppression of radio interference (IEC publication under consideration).

– Capacitors intended to be used in various types of electrical equipment and thus considered as components.

– Capacitors intended for use with d.c. voltage superimposed on a.c. voltage.

The object of this standard is:

a) to formulate uniform rules regarding performance, testing and rating;

b) to formulate specific safety rules;

c) to provide a guide for installation and operation.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard 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 68-2-1: 1990, *Environmental testing. Part 2: Tests – Test A: Cold*

IEC 68-2-3: 1969, *Environmental testing. Part 2: Tests – Test Ca: Damp heat, steady state*

IEC 68-2-6: 1982, *Environmental testing. Part 2: Tests – Test Fc and guidance: Vibration (sinusoidal)*

IEC 68-2-20: 1979, *Environmental testing, Part 2: Tests – Test T: Soldering*

IEC 68-2-21: 1983, *Environmental testing. Part 2: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 529: 1989, *Degrees of protection provided by enclosures (IP Code).*

1.3 Definitions

For the purposes of this International Standard, the following definitions apply:

1.3.1 **motor running capacitor:** A power capacitor which, when used in conjunction with an auxiliary winding of a motor, assists the motor to start and improves the torque under running conditions.

NOTE - The running capacitor is usually connected permanently to the motor winding and remains in circuit throughout the running period of the motor. During the starting period, if it is in parallel with the starting capacitor, it helps to start the motor.

1.3.2 **motor starting capacitor:** A power capacitor which provides a leading current to an auxiliary winding of a motor and which is switched out of circuit once the motor is running.

1.3.3 **metal foil capacitor:** A capacitor, the electrodes of which consist of metal foils or strips separated by a dielectric.

1.3.4 **metallized capacitor:** A capacitor, in which the electrodes consist of a metallic deposit on the dielectric.

1.3.5 **self-healing capacitor:** A capacitor, the electrical properties of which, after local breakdown of the dielectric, are rapidly and essentially self restored.

1.3.6 **discharge device of a capacitor:** A device which may be incorporated in a capacitor, capable of reducing the voltage between the terminals effectively to zero, within a given time, after the capacitor has been disconnected from a network.

1.3.7 **continuous operation:** Operation with no time limit within the normal life of the capacitor.

1.3.8 **intermittent operation:** Operation in which periods with the capacitor energized are followed by intervals during which the capacitor is unenergized.

1.3.9 **starting operation:** A special type of intermittent operation in which the capacitor is energized for only a very short period while the motor is accelerating to rated speed.

1.3.10 **rated duty cycle:** A rated value indicating the type of intermittent or starting duty for which a capacitor is suitable. It is specified by the duty cycle duration, in minutes, and the percentage of the time during which the capacitor is energized.

1.3.11 **duty cycle duration:** Total time of one energized and one unenergized interval during the intermittent operation.

1.3.12 **relative operation time:** The percentage of the cycle duration in which the capacitor is energized.

1.3.13 **capacitor for continuous and intermittent operation:** A capacitor designed to operate at one voltage when in continuous operation and at a different (usually higher) voltage when in intermittent operation.

1.3.14 **class of operation:** The minimum total life for which the capacitor has been designed at rated duty, voltage, temperature and frequency.

Class A - 30 000 h
Class B - 10 000 h
Class C - 3 000 h
Class D - 1 000 h

These classes of operation are intended to represent a true failure rate not exceeding 3 % during the life of the product.

A capacitor may have more than one class with corresponding voltages.

1.3.15 **minimum permissible capacitor operating temperature:** The minimum permissible temperature on the outside of the case at the moment of switching on the capacitor.

1.3.16 **maximum permissible capacitor operating temperature (t_c):** The maximum permissible temperature of the hottest area of the outside of the capacitor case during operation.

1.3.17 **rated voltage of a capacitor (U_N):** The r.m.s. value of the alternating voltage for which the capacitor has been designed.

1.3.18 **maximum voltage (only for motor starting capacitors):** The maximum r.m.s. voltage permissible at the starting capacitor terminals between the point of starting and the instant at which the switch disconnects the capacitor.

1.3.19 **rated frequency of a capacitor (f_N):** The highest frequency for which the capacitor has been designed.

1.3.20 **rated capacitance of a capacitor (C_N):** The capacitance value for which the capacitor has been designed.

1.3.21 **rated current of a capacitor (I_N):** The r.m.s. value of the alternating current at the rated voltage and frequency.

1.3.22 **rated output of a capacitor (Q_N):** The reactive power derived from the rated values of capacitance, frequency and voltage (or current).

1.3.23 **capacitor losses:** The active power dissipated by a capacitor.

NOTE - Unless otherwise stated, the capacitor losses will be understood to include losses in fuses and discharge resistors forming an integral part of the capacitor.

1.3.24 **tangent of loss angle (tan delta) of a capacitor:** The ratio between the equivalent series resistance and the capacitive reactance of a capacitor at specified sinusoidal alternating voltage and frequency.

1.3.25 **capacitive leakage current (only for capacitors with a metal case):** The current flowing through a conductor connecting the metallic case to earth, when the capacitor is energized from an a.c. supply system with an earthed neutral.

1.3.26 **type of capacitor:** Capacitors are considered to be of the same type when of similar constructional form, the same constructional technology, same rated voltage, same climatic category and same kind of operation. Capacitors of the same type can differ only in rated capacitance and size. Minor differences between terminations and mounting devices are permitted.

NOTE - The same construction includes, for example, the same dielectric material, dielectric thickness and type of case (metal or plastic).

1.3.27 **model of capacitor:** Capacitors are considered to be of the same model when they are of the same construction and have the same functional and dimensional characteristics within the tolerance limits and are consequently interchangeable.

1.3.28 **class of safety protection:** The degree of safety protection identified by one of three codes to be marked on the capacitor.

(P2) Indicates that the capacitor type has been designed to fail in the open-circuit mode only and is protected against fire or shock hazard. Compliance is verified by the test described in clause 2.16.

(P1) Indicates that the capacitor type may fail in the open-circuit or short-circuit mode and is protected against fire or shock hazard. Compliance is verified by the test described in clause 2.16.

(P0) Indicates that the capacitor type has no specific failure protection.

1.4 Service conditions

1.4.1 *Normal service conditions*

This standard gives requirements for capacitors intended for use under the following conditions:

a) Altitude

Not exceeding 2 000 m.

b) Residual voltage at energization

Not to exceed 10 % rated voltage (clause 4.4, note).

c) Pollution

Capacitors included in the scope of this standard are designed for operation in lightly polluted atmospheres.

NOTE - The IEC has not yet established a definition for "lightly polluted". When this definition is established by the IEC it will be incorporated in this standard.

d) Operating temperature

Between –40 °C and +100 °C (see 1.3.15 and 1.3.16).

The preferred minimum and maximum permissible capacitor operating temperatures are as follows:

Minimum temperatures: –40 °C, –25 °C, –10 °C and 0 °C

Maximum temperatures: 55 °C, 70 °C, 85 °C and 100 °C.

Capacitors shall be suitable for transport and storage at temperatures down to –25 °C, or the minimum operating temperature, whichever is the lower, without adverse effect on their quality.

e) Damp heat severity

Between 4 days and 56 days. The preferred severity is 21 days.

(According to IEC 68-2-3. The damp heat severity shall be selected from the values indicated by IEC 68-2-3, i.e.: 4 days, 10 days, 21 days and 56 days.)

Capacitors are classified in climatic categories defined by the minimum and maximum permissible capacitor operating temperatures and damp heat severity; i.e. 10/70/21 indicates that the minimum and the maximum permissible capacitor operating temperatures are –10 °C and 70 °C and the damp heat severity is 21 days.

1.5 Preferred tolerances on capacitance

Preferred tolerances are: ±5 %, ±10 % and ±15 %.

Asymmetric tolerances are permitted but no tolerance shall exceed 15 %.

SECTION 2: QUALITY REQUIREMENTS AND TESTS

2.1 Test requirements

2.1.1 *General*

This section gives the test requirements for capacitors.

2.1.2 *Test conditions*

Unless otherwise specified for a particular test or measurement, the temperature of the capacitor dielectric shall be in the range +15 °C to 35 °C range and shall be recorded.

If corrections are necessary, the reference temperature shall be +20 °C.

NOTE - It may be assumed that the dielectric temperature is the same as the ambient temperature, provided that the capacitor has been left in an unenergized state at this ambient temperature for an adequate period, depending on the size of the capacitor.

2.2 Nature of tests

The tests specified are of two sorts:

a) type tests;

b) routine tests.

2.2.1 *Type tests*

Type tests are intended to prove the soundness of the design of the capacitor and its suitability for operation under the conditions detailed in this standard.

Type tests are carried out by the manufacturer and/or the test-authority if there is need for an approval.

These tests may be carried out under the supervision of a proper authority which will issue a certified record and/or type approval.

2.2.2 *Routine tests*

Routine tests shall be carried out by the manufacturer on every capacitor before delivery. If the purchaser so requests, he shall be supplied with a certificate stating that routine tests have been carried out.