IEC 60252-2

Edition 2.1 2013-08
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AC motor capacitors –
Part 2: Motor start capacitors

Condensateurs des moteurs à courant alternatif –
Partie 2: Condensateurs de démarrage de moteurs

IEC 60252-2:2010-12+AMD1:2013-08 CSV(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60252-2 edition 2.1 contains the second edition (2010) [documents 33/476/FDIS and 33/480/RVD] and its amendment 1 (2013) [documents 33/533/FDIS and 33/539/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60252-2 has been prepared by IEC technical committee 33: Power capacitors and their applications.

The main changes with respect to the previous edition are listed below:

– definition of segmented film capacitors;
– clearer definition of the purpose of d.c. conditioning in destruction test.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 60252 series, published under the general title *AC motor capacitors*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

AC MOTOR CAPACITORS –

Part 2: Motor start capacitors

1 Scope

This part of IEC 60252 applies to motor start capacitors intended for connection to windings of asynchronous motors supplied from a single-phase system having the frequency of the mains.

This standard covers impregnated or unimpregnated metallized motor start capacitors having a dielectric of paper or plastic film, or a combination of both and electrolytic motor start capacitors with non-solid electrolyte, with rated voltages up to and including 660 V.

2 Normative references

The following referenced documents are indispensable for the application 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 60062, *Marking codes for resistors and capacitors*

IEC 60068-2 (all parts), *Environmental testing – Part 2: Tests*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-20, *Environmental testing – Part 2-20: Tests – Test T: Soldering*

IEC 60068-2-21, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60112, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60309-1:1999, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60529:2001, *Degrees of protection provided by enclosures (IP Code)*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

ISO 4046:2002, *Paper, board, pulps and related terms – Vocabulary*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
motor running capacitor
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.

3.2
motor starting capacitor
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

3.3
metal foil capacitor
capacitor, whose electrodes consist of metal foils or strips separated by a dielectric

3.4
metallized capacitor
capacitor, in which the electrodes consist of a metallic deposit on the dielectric

3.5
self-healing capacitor
capacitor, whose electrical properties, after local breakdown of the dielectric, are rapidly and essentially self-restored

3.6
segmented film capacitor
metallised capacitor with a repeating pattern on the metallic deposit on at least one layer, designed to isolate sections of the capacitor in the event of localised faults occurring in the dielectric

3.7
discharge device of a capacitor
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

3.8
continuous operation

operation with no time limit within the normal life of the capacitor

3.9
intermittent operation
operation in which periods with the capacitor energized are followed by intervals during which the capacitor is unenergized

3.10
starting operation
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

3.11
rated duty cycle
rated value indicating the rate of intermittent or starting duty for which a capacitor is suitable

NOTE It is specified by the duty cycle duration, in minutes, and the percentage of the time during which the capacitor is energized.

3.12
duty cycle duration
total time of one energized and one unenergized interval during the intermittent operation

3.13
relative operation time
percentage of the cycle duration in which the capacitor is energized

3.14
capacitor for continuous and starting operation
capacitor designed to operate at one voltage when in continuous operation and at a different (usually higher) voltage when in starting operation

3.15
minimum permissible capacitor operating temperature
minimum permissible temperature on the outside of the case at the moment of switching on the capacitor

3.16
maximum permissible capacitor operating temperature
t_c
maximum permissible temperature of the hottest area of the outside of the capacitor case during operation

3.17
rated voltage of a capacitor
U_N
r.m.s. value of the alternating voltage for which the capacitor has been designed

3.18
maximum voltage
maximum r.m.s. voltage permissible at the starting capacitor terminals between the point of starting and the instant at which the capacitor is disconnected

3.19
rated frequency of a capacitor
f_N
highest frequency for which the capacitor has been designed

3.20
rated capacitance of a capacitor
C_N
capacitance value for which the capacitor has been designed

3.21
rated current of a capacitor
I_N
r.m.s. value of the alternating current at the rated voltage and frequency

3.22
rated output of a capacitor
Q_N
reactive power derived from the rated values of capacitance, frequency and voltage (or current)

3.23
capacitor losses
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.

3.24
tangent of loss angle (tan delta) of a capacitor
ratio between the equivalent series resistance and the capacitive reactance of a capacitor at specified sinusoidal alternating voltage and frequency

3.25
power factor
ratio between the active power and the apparent power of a capacitor

3.26
capacitive leakage current (only for capacitors with a metal case)
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

3.27
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

NOTE 1 Capacitors of the same type can differ only in rated capacitance and size; minor differences between terminations and mounting devices are permitted.

NOTE 2 The same construction includes, for example, the same dielectric material, dielectric thickness and type of case (metal or plastic).

3.28
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

3.29
class of safety protection
degree of safety protection identified by one of ~~three~~ four 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 5.1.16~~

~~(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 5.1.16~~

~~(P0) indicates that the capacitor type has no specific failure protection~~

~~This subclause does not apply to electrolytic capacitors.~~

Note 1 to entry: This definition does not apply to electrolytic capacitors.

3.29.1
(SO) class of safety protection
degree of safety protection indicating that the capacitor type has no specific failure protection

Note 1 to entry: Formerly referred to as P0.

3.29.2
(S1) class of safety protection
degree of safety protection indicating that the capacitor type may fail in the open-circuit or short-circuit mode and is protected against fire or shock hazard

Note 1 to entry: Compliance is verified by the test described in 5.1.16.3 and 5.1.16.5.

Note 2 to entry: Formerly referred to as P1.

3.29.3
(S2) class of safety protection
degree of safety protection indicating that the capacitor type has been designed to fail in the open-circuit mode only and is protected against fire or shock hazard.

Note 1 to entry: Compliance is verified by the test described in 5.1.16.3 and 5.1.16.5.

Note 2 to entry: Formerly referred to as P2.

3.29.4
(S3) class of safety protection
degree of safety protection indicating that the capacitor is of segmented film construction as defined in 3.6

Note 1 to entry: This capacitor type is required to fail with low residual capacitance (<1 % C_N) and has protection against fire and shock hazard. Compliance is verified by the test described in 5.1.16.4 and 5.1.16.6.

4 Service conditions

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: shall not exceed 10 % rated voltage (see notes to 5.3.4 and 6.3.4);

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 3.15 and 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.