

Shunt power capacitors of the self-healing type for a.c. systems having a rated voltage up to and including 1000 V

Part 1. General — Performance, testing and rating — Safety requirements — Guide for installation and operation

The European Standard EN 60831-1 : 1993 has the status of a British Standard

Condensateurs shunt de puissance autorégénérateurs destinés à être installés sur des réseaux à courant alternatif de tension assignée inférieure ou égale à 1000 V
Première partie: Généralités — Caractéristiques fonctionnelles, essais et valeurs assignées — Règles de sécurité — Guide d'installation et d'exploitation

Selbstheilende Leistungs-Parallelkondensatoren für Wechselstromanlagen mit einer Nennspannung bis 1000 V
Teil 1: Allgemeines Leistungsanforderungen, Prüfung und Bemessung — Sicherheitsanforderungen — Anleitung für Errichtung und Betrieb

UDC 621.319.4:621.3.025:620.1:614.8

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

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National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and is the English language version of EN 60831-1 : 1993 *Shunt power capacitors of the self-healing type for a.c. systems having a rated voltage up to and including 1 000 V Part 1 : General — Performance, testing and rating — Safety requirements — Guide for installation and operation*, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived from IEC 831-1 : 1988 including the corrigendum issued in January 1989, Amendment 1 : 1991 and Amendment 2 : 1993, published by the International Electrotechnical Commission (IEC). It also includes common modifications agreed by CENELEC.

The CENELEC common modifications, which are quoted on page 2, have been implemented at the appropriate place in the text and are indicated by a side line in the margin.

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Descriptors: Power capacitors, self-healing capacitors, capacitor banks, performance characteristics, safety requirements, markings, installation, service conditions

English version

Shunt power capacitors of the self-healing type for a.c.
systems having a rated voltage up to and including
1 000 V

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Performance, testing and rating - Safety requirements
Guide for installation and operation

(IEC 831-1 : 1988 + corrigendum 1989 + A1 : 1991 + A2 : 1993, modified)

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Anleitung für Errichtung und Betrieb
(IEC 831-1 : 1988 + Corrigendum 1989 +
A1 : 1991 + A2 : 1993, modifiziert)

This European Standard was approved by CENELEC on 1993-09-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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Foreword

At the request of the 73rd Technical Board, the International Standard IEC 831-1 : 1988 with its corrigendum January 1989 and its amendments 1 : 1991 and 2 : 1993 (document 33 (C.O.) 103 : 1992), together with some common modifications prepared by CENELEC Reporting Secretariat SR 33, were submitted to the CENELEC Unique Acceptance Procedure (UAP) in December 1992 for acceptance as a European Standard.

The text of the draft was approved by CENELEC as EN 60831-1 on 22 September 1993.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1994-09-01
- latest date of withdrawal
of conflicting national
standards (dow) 1994-09-01

Common modifications

7. Capacitance measurement and output calculation

7.2 Replace the second and third line by:

- 5 % to +10 % for units and banks up to 100 kvar;
- 5 % to +5 % for units and banks above 100 kvar.

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**SHUNT POWER CAPACITORS OF THE
SELF-HEALING TYPE
FOR A.C. SYSTEMS HAVING A RATED VOLTAGE
UP TO AND INCLUDING 1 000 V**

Part 1: General

SECTION ONE — GENERAL

1. Scope

This standard is applicable to both capacitor units and capacitor banks intended to be used, particularly, for power-factor correction of a.c. power systems having a rated voltage up to and including 1 000 V and frequency 15 Hz to 60 Hz.

Notes 1. — This standard also applies to capacitors intended for use in power filter circuits. Additional definitions, requirements and tests for filter capacitors are given in Appendix B.

2. — Additional requirements for capacitors protected by internal element fuses and internal overpressure disconnectors, as well as requirements for the same, are given in IEC Publication 593.

3. — The following are excluded from this standard:

- Shunt power capacitors of the non-self-healing type for a.c. systems having a rated voltage up to and including 1 000 V (IEC Publication 931-1).
- Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V (IEC Publication 871).

- Capacitors for inductive heat generating plants operating at frequencies between 40 Hz and 24 000 Hz (IEC Publication 110).

- Series capacitors (IEC Publication 143).

- Capacitors for motor applications and the like (IEC Publication 252).

- Coupling capacitors and capacitor dividers (IEC Publication 358).

- Capacitors to be used in power electronic circuits (publication under consideration).

- Small a.c. capacitors to be used for fluorescent and discharge lamps (IEC Publication 566).

- Capacitors for suppression of radio interference (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 the a.c. voltage.

4. — Accessories such as insulators, switches, instrument transformers, fuses, etc., shall be in accordance with the relevant IEC standards.

2. Object

The object of this standard is:

- a) to formulate uniform rules regarding performances, testing and rating;
- b) to formulate specific safety rules;
- c) to provide a guide for installation and operation.

3. Definitions

3.1 Capacitor element (or element)

A device consisting essentially of two electrodes separated by a dielectric.

3.2 Capacitor unit (or unit)

An assembly of one or more capacitor elements in the same container with terminals brought out.

3.3 Self-healing capacitor

A capacitor, the electrical properties of which, after local breakdown of the dielectric, are rapidly and essentially restored.

3.4 Capacitor bank (or bank)

A number of capacitor units connected so as to act together.

3.5 Capacitor

In this standard, the word “capacitor” is used when it is not necessary to lay particular stress upon the different meanings of the words “capacitor unit” or “capacitor bank”.

3.6 Capacitor installation

A capacitor bank and its accessories.

3.7 Discharge device of a capacitor

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

3.8 Internal fuse of a capacitor

A fuse connected inside a capacitor unit, in series with an element or a group of elements.

3.9 Overpressure disconnecter for a capacitor

A disconnecting device designed to interrupt the current path in the case of abnormal increase of the internal pressure.

3.10 Overtemperature disconnecter for a capacitor

A disconnecting device designed to interrupt the current path in the case of abnormal increase of the internal temperature.

3.11 Line terminals

Terminals to be connected to the lines.

Note. — In polyphase capacitors, a terminal intended to be connected to the neutral conductor is not considered to be a line terminal.

3.12 Rated capacitance of a capacitor (C_N)

The capacitance value for which the capacitor has been designed.

3.13 Rated output of a capacitor (Q_N)

The reactive power derived from the rated values of capacitance, frequency and voltage.

3.14 Rated voltage of a capacitor (U_N)

The r.m.s. value of the alternating voltage for which the capacitor has been designed.

Note. — In the case of capacitors consisting of one or more separate circuits (e.g. single-phase units intended for use in polyphase connection, or polyphase units with separate circuits), U_N refers to the rated voltage of each circuit.

For polyphase capacitors with internal electrical connections between the phases, and for polyphase capacitor banks, U_N refers to the phase-to-phase voltage.

3.15 Rated frequency of a capacitor (f_N)

The frequency for which the capacitor has been designed.

3.16 Rated current of a capacitor (I_N)

The r.m.s. value of the alternating current for which the capacitor has been designed.

3.17 Capacitor losses

The active power dissipated by a capacitor.

Note. — All loss-producing components should be included, for example:

- for a unit, losses from dielectric, internal fuses, internal discharge resistor, connections, etc.
- for a bank, losses from units, external fuses, busbars, discharge and damping reactors, etc.

3.18 Tangent of the 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.

3.19 Maximum permissible voltage of a capacitor

The maximum r.m.s. alternating voltage which a capacitor can withstand for a given time in specified conditions.

3.20 Maximum permissible current of a capacitor

The maximum r.m.s. alternating current which a capacitor can carry for a given time in specified conditions.

3.21 Ambient air temperature

The temperature of the air at the proposed location of the capacitor.

3.22 Cooling air temperature

The temperature of the cooling air measured at the hottest position in the bank, under steady-state conditions, midway between two units. If only one unit is involved, it is the

temperature measured at a point approximately 0.1 m away from the capacitor container and at two-thirds of the height from its base.

3.23 *Steady-state condition*

Thermal equilibrium attained by the capacitor at constant output and at constant cooling air temperature.

3.24 *Residual voltage*

The voltage remaining on the terminals of a capacitor at a certain time following disconnection.

4. **Service conditions**

4.1 *Normal service conditions*

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

a) Residual voltage at energization

Not to exceed 10% rated voltage (Clause 22, Clause 32 and Appendix A).

b) Altitude

Not exceeding 2000 m.

c) Ambient-air temperature categories

Capacitors are classified in temperature categories, each category being specified by a number followed by a letter. The number represents the lowest ambient-air temperature at which the capacitor may operate.

The letters represent upper limits of temperature variation ranges, having maximum values specified in Table I. The temperature categories cover the temperature range of $-50\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$.

The lowest ambient-air temperature at which the capacitor may be operated should be chosen from the five preferred values $+5\text{ }^{\circ}\text{C}$, $-5\text{ }^{\circ}\text{C}$, $-25\text{ }^{\circ}\text{C}$, $-40\text{ }^{\circ}\text{C}$, $-50\text{ }^{\circ}\text{C}$.

For indoor use, a lower limit of $-5\text{ }^{\circ}\text{C}$ is normally applicable.

Table I is based on service conditions in which the capacitor does not influence the ambient-air temperature (e.g. outdoor installations).