

Power capacitors — Low-voltage power factor correction banks

The European Standard EN 61921:2003 has the status of a
British Standard

ICS 31.060.70

National foreword

This British Standard is the official English language version of EN 61921:2003. It is identical with IEC 61921:2003.

The UK participation in its preparation was entrusted to Technical Committee PEL/33, Power capacitors, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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English version

**Power capacitors –
Low-voltage power factor correction banks
(IEC 61921:2003)**

Condensateurs de puissance -
Batteries de compensation
du facteur de puissance basse tension
(CEI 61921:2003)

Kondensatorbatterien zur Korrektur
des Niederspannungsleistungsfaktors
(IEC 61921:2003)

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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.

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CENELEC

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

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Foreword

The text of document 33/387/FDIS, future edition 1 of IEC 61921, prepared by IEC TC 33, Power capacitors, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61921 on 2003-06-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2004-03-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-06-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B and ZA are normative and annexes C and D are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61921:2003 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60060-1	NOTE	Harmonized as HD 588.1 S1:1991 (not modified).
IEC 60831-2	NOTE	Harmonized as EN 60831-2:1996 (not modified).
IEC 60931-2	NOTE	Harmonized as EN 60931-2:1996 (not modified).
IEC 60931-3	NOTE	Harmonized as EN 60931-3:1996 (not modified).
IEC 61000-2-2	NOTE	Harmonized as EN 61000-2-2:2002 (not modified).
IEC 61000-4-1	NOTE	Harmonized as EN 61000-4-1:2000 (not modified).

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POWER CAPACITORS – LOW-VOLTAGE POWER FACTOR CORRECTION BANKS

1 Scope

This International Standard is applicable to low-voltage a.c. capacitor banks intended to be used for power factor correction purposes, equipped with a built-in switchgear and controlgear apparatus capable of connecting to or disconnecting from the mains part(s) of the bank with the aim to correct its power factor.

Low-voltage power factor correction banks if not otherwise indicated hereinafter and where applicable shall comply with the requirements of IEC 60439-1 and those of IEC 60439-3.

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 60439-1:1999, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*

IEC 60439-3:1990, *Low-voltage switchgear and controlgear assemblies – Part 3: Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use – Distribution boards*

IEC 60831-1:1996, *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*

IEC 60931-1:1996, *Shunt power capacitors of the non-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*

3 Terms and definitions

For the purpose of this document, the following definitions, together with the definitions found in IEC 60439-1, IEC 60831-1 and IEC 60931-1 apply.

3.1

low-voltage a.c. capacitor bank

combination of one or more low-voltage capacitor units together with associated switching devices and control, measuring, signalling, protective, regulating equipment, etc., completely assembled under the responsibility of the manufacturer with all the internal electrical and mechanical interconnections and structural parts

NOTE 1 Throughout this standard, the abbreviations “automatic bank” and “assembly” are used for a low-voltage a.c capacitors automatic or non-automatic bank.

NOTE 2 The components of switchgear and controlgear of the automatic bank may be electromechanical or electronic.

3.2

step of capacitor bank

step

combination of one or more capacitor units switched together

3.3

automatic reactive power regulator

controller

circuit designed to calculate the reactive power absorbed by the load connected to the power line and to control the switching on and off of the steps of the automatic bank, in order to compensate for the reactive power

NOTE 1 The reactive power is normally calculated at the fundamental frequency.

NOTE 2 The controller may be “built-in” or “free-standing” and has usually to be adjusted for each bank before operation.

3.4

transient inrush current I_t

transient overcurrent of high amplitude and frequency that may occur when a capacitor is switched on, the amplitude and frequency being determined by factors such as the short-circuit impedance of the supply, the amount of energized capacitance switched in parallel and the instant of the switching

3.5

rated reactive power Q_N (of an assembly)

total reactive power of an assembly at the rated frequency and voltage, calculated by the total impedance of the bank including reactors, if any

4 Marking of a capacitor bank

The following minimum information shall be given by the manufacturer in an instruction sheet or alternatively, on request of the purchaser, on a rating plate to be fixed on the assembly.

- 1) Manufacturer's name or trademark.
- 2) Identification number or type designation.
- 3) Date of manufacture, in clear or code form.
- 4) Rated reactive power, Q_N in kilovars (kvar).
- 5) Rated voltage, U_N in volts (V).
- 6) Rated frequency, f_N in hertz (Hz).
- 7) Minimum and maximum ambient temperatures in degrees Celsius (°C).
- 8) Degree of protection.
- 9) Short-circuit withstand strength, in amperes (A).

5 Guide for design, installation, operation and safety

5.1 General

Unlike most electrical apparatus, shunt capacitors, whenever energized, operate continuously at full load, or at loads that deviate from this value only as a result of voltage and frequency variations.

Overstressing and overheating shorten the life of a capacitor, and therefore the operating conditions (that is temperature, voltage and current) should be strictly controlled.

It should be noted that the introduction of a capacitance in a system might produce unsatisfactory operating conditions (for example amplification of harmonics, self-excitation of machines, overvoltage due to switching, unsatisfactory working of audio-frequency remote-control apparatus, etc.).

Because of the different types of capacitors and the many factors involved, it is not possible to cover, by simple rules, installation and operation in all possible cases. The following information is given with regard to the more important points to be considered. In addition, the instructions of the manufacturer and the power supply authorities shall be followed.

5.2 Choice of components

The choice of components of an assembly shall be carried out with careful reference to compliance between their ambient air temperature category and that of the assembly itself.

5.3 Design

5.3.1 Power factor correction system enclosed within a main switchboard

The equipment needed for the automatic correction of power factor in an installation, including controller, fuses, switching devices, capacitors and reactors (chokes), can be installed as an integral part of the main switchboard.

This equipment can be also installed in a separate shell of the main board or simply as an added part in the common main switchboard shell.

5.3.2 Free standing power factor correction system

The equipment is free standing and usually installed adjacent or close to the main switchboard or relevant sub-board. It generally has a main bus bar arrangement of the required fault level to match the adjacent main switchboard or sub-board or the required fault current of that section of the installation.

This bus bar section is bus barred or cabled back to the main supply of the installation.

Feeding off this bus bar section is a group of fuses, circuit-breakers or fused switch which are wired to a switching device and then to the capacitor banks.

5.3.3 Automatic power factor correction system with remote mounted capacitors

All components except for the capacitors are mounted in the control cubicle.