

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Part 1: General

Condensateurs shunt de puissance non autorégénérateurs pour réseaux à courant alternatif de tension assignée inférieure ou égale à 1 000 V –

Partie 1 : Généralités

IEC 60931-1:2025

<https://standards.iteh.ai/catalog/standards/iec/18068c71-2be6-4adb-8331-a589957129ec/iec-60931-1-2025>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Warning! Make sure that you obtained this publication from an authorized distributor.

Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Service conditions	10
4.1 Normal service conditions	10
4.2 Unusual service conditions	11
5 Test requirements.....	11
5.1 General.....	11
5.2 Test conditions.....	11
6 Tests.....	11
6.1 Classification	11
6.1.1 General	11
6.1.2 Routine tests	11
6.1.3 Type tests.....	12
6.1.4 Acceptance tests.....	12
6.2 Capacitance measurement and output calculation.....	13
6.2.1 Measuring procedure	13
6.2.2 Capacitance tolerances.....	13
6.3 Measurement of the tangent of the loss angle ($\tan \delta$) of the capacitor.....	13
6.3.1 Measuring procedure	13
6.3.2 Loss requirements	14
6.4 Voltage tests between terminals	14
6.4.1 Routine test	14
6.4.2 Type test	14
6.5 Voltage tests between terminals and container	14
6.5.1 Routine test	14
6.5.2 Type test	15
6.6 Test of internal discharge device	15
6.7 Sealing test.....	15
6.8 Thermal stability test	16
6.9 Measurement of the tangent of the loss angle ($\tan \delta$) of the capacitor at elevated temperature	17
6.9.1 Measuring procedure	17
6.9.2 Requirements	17
6.10 Lightning impulse voltage test between terminals and container	17
6.11 Discharge test.....	18
6.12 Ageing test	18
6.13 Destruction test.....	18
6.14 Disconnecting test on internal fuses	18
6.14.1 General	18
6.14.2 Test procedure.....	19
6.14.3 Capacitance measurement	19
6.14.4 Inspection of the unit.....	20
6.14.5 Voltage test after opening the container.....	20
7 Maximum permissible voltage	20

7.1	Long-duration voltages	20
7.2	Switching voltages	21
8	Maximum permissible current.....	21
9	Discharge device	21
10	Container connections	22
11	Protection of the environment	22
12	Other safety requirements.....	22
13	Marking of the unit.....	22
13.1	Rating plate	22
13.2	Standardized connection symbols.....	23
13.3	Warning plate.....	23
14	Marking of the bank	23
14.1	Instruction sheet or rating plate	23
14.2	Warning plate.....	23
15	General	24
16	Choice of the rated voltage	24
17	Operating temperature.....	25
17.1	General.....	25
17.2	Installation	25
17.3	High ambient air temperature	25
17.4	Evaluation of losses	25
18	Special service conditions.....	26
19	Overvoltages	26
20	Overload currents	27
21	Switching and protective devices and connections.....	27
22	Choice of creepage distance	28
23	Capacitors connected to systems with audio-frequency remote control.....	28
24	Electromagnetic compatibility (EMC)	29
24.1	Emission.....	29
24.2	Immunity	29
24.2.1	General	29
24.2.2	Low-frequency disturbances	29
24.2.3	Conducted transients and high-frequency disturbances.....	29
24.2.4	Electrostatic discharges	29
24.2.5	Magnetic disturbances	29
24.2.6	Electromagnetic disturbances.....	30
Annex A (normative)	Additional definitions, requirements and tests for power filter capacitors.....	31
A.1	Additional terms and definitions	31
A.1.1	Band-pass and high-pass filter capacitor (filter capacitor)	31
A.1.2	Rated voltage (U_N) (see 3.11).....	31
A.1.3	Rated output (Q_N) (see 3.10)	31
A.1.4	Rated current (I_N) (see 3.16)	31
A.2	Quality requirements and tests	31
A.2.1	Capacitance tolerance.....	31
A.2.2	Voltage test between terminals (see 6.4)	32

A.2.3	Thermal stability test (see 6.8)	32
A.3	Overloads – Maximum permissible current (see Clause 8).....	32
A.4	Markings – Instruction sheet or rating plate (see 14.1)	32
A.5	Guide for installation and operation – Choice of the rated voltage (see Clause 16).....	32
Annex B	(informative) Formulae for capacitors and installations.....	33
B.1	Computation of the output of three-phase capacitor from three single-phase capacitance measurements	33
B.2	Resonance frequency.....	33
B.3	Voltage rise	33
B.4	Inrush transient current	34
B.4.1	Switching in of single capacitor	34
B.4.2	Switching of capacitors in parallel with energized capacitor(s).....	34
B.4.3	Discharge resistance in single-phase units or in one-phase or polyphase units.....	34
Annex C	(normative) Test procedures for the disconnecting test on internal fuses	36
C.1	General.....	36
C.2	Test procedure.....	36
Annex D	(informative) Guidance for coordination of fuse protection.....	38
D.1	General.....	38
D.2	Protection sequence.....	38
Bibliography		39
Figure B.1	– k values depending on the method of connection of the resistors with the capacitor units	35
Table 1	– Letter symbols for upper limit of temperature range	10
Table 2	– Ambient air temperature for the thermal stability test.....	16
Table 3	– Admissible voltage levels in service	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Shunt power capacitors of the non-self-healing type for AC systems
having a rated voltage up to and including 1 000 V –
Part 1: General**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60931-1 has been prepared by IEC technical committee 33: Power capacitors and their applications. It is an International Standard.

This third edition cancels and replaces second edition published in 1996 and Amendment 1:2002. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) integration of IEC 60931-3 within IEC 60931-1;
- b) deletion of self-healing test.

The text of this International Standard is based on the following documents:

Draft	Report on voting
33/721/FDIS	33/725/RVD

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 International Standard 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.

A list of all parts in the IEC 60931 series, published under the general title *Shunt power capacitors of the non-self-healing type for AC systems having a rated voltage up to and including 1 000 volts*, can be found on the IEC website.

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.

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

[IEC 60931-1:2025](https://standards.itih.ai/catalog/standards/iec/18068c71-2be6-4adb-8331-a589957129ec/iec-60931-1-2025)

<https://standards.itih.ai/catalog/standards/iec/18068c71-2be6-4adb-8331-a589957129ec/iec-60931-1-2025>