

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Measuring relays and protection equipment –
Part 1: Common requirements**

**Relais de mesure et dispositifs de protection –
Partie 1: Exigences communes**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 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 It also gives information on projects, replaced and withdrawn publications.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. 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 22 300 terminological entries in English and French, with equivalent terms in 19 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. 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 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Measuring relays and protection equipment –
Part 1: Common requirements**

**Relais de mesure et dispositifs de protection –
Partie 1: Exigences communes**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.70

ISBN 978-2-8322-6120-0

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.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviated terms	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	15
4 Environmental conditions.....	15
4.1 General.....	15
4.2 Normal environmental conditions	16
4.3 Special environmental conditions	16
4.4 Environmental storage conditions	16
4.5 Transport conditions	16
5 Ratings.....	16
5.1 General.....	16
5.2 Rated voltage	17
5.2.1 Input energizing voltage.....	17
5.2.2 Auxiliary power supply port energizing voltage.....	17
5.2.3 Rated insulation voltage	17
5.3 Rated current – Input energizing current	17
5.3.1 Primary relay	17
5.3.2 Secondary relay.....	17
5.4 Binary input and output port.....	18
5.4.1 Binary input port	18
5.4.2 Binary output port	18
5.5 Transducer analogue input and output port	19
5.5.1 Transducer analogue input port	19
5.5.2 Transducer analogue output port	19
5.6 Frequency.....	19
5.6.1 Rated frequency	19
5.6.2 Frequency operating range	19
5.7 Rated burden	19
5.8 Rated ambient temperature range	20
6 Design and construction	20
6.1 Marking.....	20
6.2 Dimensions.....	20
6.3 Enclosure protection	20
6.4 Product safety requirements	20
6.5 Functional performance requirements	20
6.5.1 General	20
6.5.2 Intrinsic accuracy.....	21
6.5.3 Operating accuracy.....	22
6.5.4 Performance under system conditions	22
6.5.5 Performance of multifunctional protection equipment	22
6.5.6 Internal user programmable logic.....	22
6.6 Communication protocols.....	22

6.7	Cybersecurity	22
6.8	Binary input and output port	23
6.8.1	Binary input port	23
6.8.2	Binary output port	23
6.9	Transducer analogue input and output port	23
6.9.1	Transducer analogue input port	23
6.9.2	Transducer analogue output port	23
6.10	Input circuit for measurement quantities	23
6.10.1	Analogue voltage port	23
6.10.2	Analogue current port	23
6.10.3	Communication port	24
6.11	Binary output performance (mechanical and static)	24
6.12	Climatic performance	24
6.12.1	General	24
6.12.2	Verification procedure	24
6.12.3	Climatic environmental tests	25
6.13	Mechanical requirements	29
6.13.1	Vibration response and endurance (sinusoidal)	29
6.13.2	Shock response, shock withstand and bump	29
6.13.3	Seismic risk	29
6.14	Pollution	29
6.15	Electromagnetic compatibility (EMC)	29
7	Tests	29
7.1	Test reference conditions	29
7.2	Test overview	30
7.3	Burden measurements	32
7.3.1	Burden for analogue voltage inputs	32
7.3.2	Burden for analogue current inputs	32
7.3.3	Burden for AC power supply	32
7.3.4	Burden for DC power supply	32
7.3.5	Burden for binary input	33
7.4	Type test report content	33
8	Marking, labelling and packaging	34
9	Product documentation and technical data	34
Annex A	(normative) Type testing guidelines	35
A.1	General	35
A.2	Protection setting	35
A.2.1	Introductory remark	35
A.2.2	Test philosophy	35
A.2.3	Overcurrent and undercurrent	36
A.2.4	Overvoltage and undervoltage	37
A.2.5	Over frequency and under frequency	38
A.2.6	Functions set around current, voltage and frequency	38
A.2.7	Other functions	39
Annex B	(informative) Environmental operating locations	40
B.1	Operating environment	40
B.2	Operating conditions	40
Bibliography		44

Figure 1 – Ports for measuring relays and protection equipment	13
Figure 2 – Binary output parameters	19
Figure A.1 – Settings selection criteria	36
Table 1 – Normal environmental conditions	16
Table 2 – Contact performance requirements	18
Table 3 – Hot and cold temperatures	20
Table 4 – Dry heat test – Operational	25
Table 5 – Cold test – Operational	26
Table 6 – Dry heat test, storage temperature	26
Table 7 – Cold test, storage temperature	27
Table 8 – Change of temperature test	27
Table 9 – Damp heat steady state test	28
Table 10 – Cyclic temperature with humidity test	28
Table 11 – Test reference conditions	30
Table 12 – Test overview	31
Table B.1 – Operating locations	40
Table B.2 – Climatic conditions	41
Table B.3 – Mechanical conditions	41
Table B.4 – EMC conditions	42
Table B.5 – Chemically active substance conditions	42
Table B.6 – Mechanically active substance conditions	42
Table B.7 – Biological conditions	43

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEASURING RELAYS AND PROTECTION EQUIPMENT –**Part 1: Common requirements****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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60255-1 has been prepared by IEC technical committee 95: Measuring relays and protection equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

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

- a) scope of document clarified;
- b) merging units and communications as an integral part of the protection added;
- c) binary output clarification expanded;
- d) environmental operating conditions added (Annex B);
- e) test reference conditions added;
- f) multiple changes to improve understanding across most clauses;
- g) derating by manufacturer added;

- h) safety and EMC tests removed from document and referenced only;
- i) relay setting and type test guidelines modified (Annex A)
- j) battery monitor port and low power instrument transformers added.

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

Draft	Report on voting
95/513/FDIS	95/521/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 60255 series, published under the general title *Measuring relays and protection equipment*, 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,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The following explains the numbering of documents falling under the responsibility of TC 95:

The numbering of documents follows the following principle:

- common standards start with IEC 60255–XX;
- protection functional standards fall into IEC the 60255-1XX series.

The IEC 60255 series consists of the following parts:

a) Common standards:

Part 1: Common requirements

Part 21: Vibration, shock, bump and seismic tests

Part 24: Common format for transient data exchange (COMTRADE) for power systems

Part 26: Electromagnetic compatibility requirements

Part 27: Product safety requirements

b) Protection functional standards:

Part 1XX: Functional requirements

NOTE The last two digits of the part of the proposed functional standard new numbering correspond to function numbers as established in IEEE Std C37.2TM-2008 [3]¹.

¹ Numbers in square brackets refer to the Bibliography.

MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 1: Common requirements

1 Scope

This part of IEC 60255 specifies common rules and requirements applicable to measuring relays and protection equipment, including any combination of equipment to form a distributed protection scheme for power system protection such as control, monitoring and process interface equipment, to obtain uniformity of requirements and tests. This document covers the main technologies in use today; other emerging technologies present specific EMC and safety issues but the philosophy in this document will be applied.

All measuring relays and protection equipment used for protection within the power system environment are covered by this document. Other documents in this series can define their own requirements which in such cases take precedence. The typical locations for measuring relays and protection equipment are where protection of electrical equipment is required: generally power stations, substations and industrial locations.

Measuring relays and protection equipment installed in special applications (marine, railways, aerospace, explosive atmospheres, computer centres, etc.) could be enhanced by additional requirements required by that application.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

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

IEC 60255-21-1, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section One: Vibration tests (sinusoidal)*

IEC 60255-21-2, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section Two: Shock and bump tests*

IEC 60255-21-3, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section 3: Seismic tests*

IEC 60255-26, *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*