



IEC 61812-1

Edition 2.0 2011-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Time relays for industrial and residential use –
Part 1: Requirements and tests**

**Relais à temps spécifié pour applications industrielles et résidentielles –
Partie 1: Exigences et essais**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2011 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 la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00



IEC 61812-1

Edition 2.0 2011-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Time relays for industrial and residential use –
Part 1: Requirements and tests**

**Relais à temps spécifié pour applications industrielles et résidentielles –
Partie 1: Exigences et essais**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX X

ICS 29.120.70

ISBN 978-2-88912-488-6

CONTENTS

FOREWORD	5
1 Scope	7
2 Normative references	7
3 Terms and definitions	9
3.1 Terms and definitions related to general terms	9
3.2 Terms and definitions of relay types	11
4 Influence quantities	17
5 Rated values	18
5.1 General	18
5.2 Input voltage and frequency	18
5.3 Release voltage	19
5.4 Power consumption	19
5.5 Output circuit	19
5.5.1 Electromechanical output circuit	19
5.5.2 Mechanical endurance	19
5.5.3 Solid state output circuit	19
5.5.4 Endurance and operating frequency	20
5.5.5 Conditional short circuit current	20
5.6 Ambient temperature	20
5.7 Transport and storage temperature	20
5.8 Humidity	20
5.9 Pollution degree	21
5.10 Altitude	21
5.11 Timing circuit function	21
5.11.1 General	21
5.11.2 Setting accuracy	21
5.11.3 Repeatability	21
5.11.4 Recovery time and minimum control impulse	21
6 Provisions for testing	22
7 Documentation and marking	22
7.1 Data	22
7.2 Marking	24
8 Heating	25
8.1 General	25
8.2 Test conditions	25
8.3 Heating of terminals	25
8.3.1 General	25
8.3.2 Heating of screw terminals and screwless terminals	25
8.3.3 Heating of quick-connect terminations	26
8.3.4 Heating of sockets	26
8.3.5 Heating of alternative termination types	27
8.4 Heating of accessible parts	27
8.5 Heating of insulating materials	27
9 Basic operating function	27
9.1 General	27
9.2 Operate	27

9.3	Release.....	28
9.4	Time function	28
9.4.1	Functional test at reference values of input quantities	28
9.4.2	Influencing effects of voltage and temperature.....	28
10	Insulation	28
10.1	General	28
10.2	Preconditioning	29
10.3	Dielectric strength	29
10.3.1	General	29
10.3.2	Impulse withstand test	29
10.3.3	Dielectric a.c. power frequency voltage test.....	30
10.4	Protection against direct contact	31
11	Electrical endurance	31
11.1	General	31
11.2	Resistive loads, inductive loads, and special loads.....	32
11.3	Low energy loads	32
12	Conditional short-circuit current.....	32
12.1	General	32
12.2	Test procedure	32
12.3	Test circuit electromechanical output circuit	32
12.4	Test circuit solid state output circuit	33
12.5	Condition of switching element after test	34
13	Clearances and creepage distances	34
13.1	General	34
13.2	Creepage distances.....	35
13.3	Clearances	36
13.4	Measurement of creepage distances and clearances.....	37
14	Mechanical strength	37
14.1	General	37
14.2	Mechanical strength of terminals and current-carrying parts	38
14.2.1	General	38
14.2.2	Mechanical strength of screw terminals and screwless terminals	38
14.2.3	Mechanical strength of flat quick-connect terminations	38
14.2.4	Mechanical strength of sockets.....	38
14.2.5	Mechanical strength of alternative termination types.....	38
15	Heat and fire resistance.....	38
16	Vibration and shock	39
16.1	Vibration.....	39
16.2	Shock	39
17	Electromagnetic compatibility (EMC)	40
17.1	General	40
17.2	EMC immunity	40
17.3	EMC radiated and conducted emission.....	42
Annex A (informative)	Ball pressure test	44
Bibliography.....	45	
Figure 1 – Definition of ports.....	11	

Figure 2 – Definition of symbols	11
Figure 3 – Power on-delay relay	12
Figure 4 – Power off-delay relay	12
Figure 5 – Off-delay relay with control signal	12
Figure 6 – On- and off-delay relay with control signal.....	13
Figure 7 – Flasher relay	13
Figure 8 – Star-delta relay	14
Figure 9 – Summation time relay.....	14
Figure 10 – Pulse delayed relay.....	15
Figure 11 – Pulse delayed relay with control signal.....	15
Figure 12 – Interval relay	15
Figure 13 – Interval relay with control signal	16
Figure 14 – Retriggerable interval relay with control signal on	16
Figure 15 – Retriggerable interval relay with control signal off	17
Figure 16 – Maintained time relay	17
Figure 17 – Test circuit electromechanical output, conditional short-circuit current	33
Figure 18 – Test circuit solid state output, conditional short-circuit current.....	34
 Table 1 – Influence quantities and reference values.....	17
Table 2 – Preferred values of endurance	20
Table 3 – Preferred values of maximum permissible operating frequency.....	20
Table 4 – Recommended final values of the setting range	21
Table 5 – Type testing	22
Table 6 – Required relay information	23
Table 7 – Areas and lengths of conductors dependent on the current carried by the terminal	26
Table 8 – Temperature rise limits of accessible parts.....	27
Table 9 – Changing of influencing quantities	28
Table 10 – Impulse test for basic insulation	30
Table 11 – Dielectric test voltage for devices suitable for use in single-phase three or two-wire a.c. and d.c. systems	30
Table 12 – Dielectric test voltage for devices suitable for use in three-phase four or three-wire a.c. systems	31
Table 13 – Minimum creepage distances for basic insulation	36
Table 14 – Minimum clearances for basic insulation	37
Table 15 – Minimum clearances in controlled overvoltage conditions for internal circuits.....	37
Table 16 – Environmental conditions influencing EMC	40
Table 17 – Immunity tests for industrial environments	41
Table 18 – Immunity tests for residential, commercial and light-industrial environments.....	42

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TIME RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –**Part 1: Requirements and tests****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.

International Standard IEC 61812-1 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

This second edition cancels and replaces the first edition published in 1996. This edition constitutes a technical revision.

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

- update of references;
- addition of terms and definitions more commonly used by industry;
- addition of timing charts to help explain terms and definitions involving a sequence of events;
- renumbering of clauses to bring them into a more logical order;
- addition of provisions for residential use.

The text of this standard is based on the following documents:

FDIS	Report on voting
94/324/FDIS	94/333/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

A list of all parts of the IEC 61812 series can be found, under the general title *Time relays for industrial and residential use*, on the IEC website.

The committee has decided that the contents of this publication 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.

TIME RELAYS FOR INDUSTRIAL AND RESIDENTIAL USE –**Part 1: Requirements and tests****1 Scope**

This part of the IEC 61812 applies to time relays for industrial applications (e.g. control, automation, signal and industrial equipment).

It also applies to time relays for automatic electrical controls for use in, on, or in association with equipment for residential and similar use.

The term “relay” as used in this standard comprises all types of relays with specified time functions, other than measuring relays.

NOTE Depending on the field of application of these relays (for example automatic electrical controls for household and similar use, switches for household and similar fixed electrical installations), further standards may be applicable, for example IEC 60730-2-7 or IEC 60669-2-3.

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 60050-444:2002, *International Electrotechnical Vocabulary – Part 444: Elementary relays*

IEC 60050-445:2010, *International Electrotechnical Vocabulary – Part 445: Time relays*

IEC 60068 (all parts), *Environmental testing*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60664-5:2007, *Insulation coordination for equipment within low-voltage systems – Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than 2 mm*

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*

IEC 60695-10-2:2003, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60947-5-4:2002, *Low-voltage switchgear and controlgear – Part 5-4: Control circuit devices and switching elements – Method of assessing the performance of low-energy contacts – Special tests*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61210:2010, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61810-1:2008, *Electromechanical elementary relays – Part 1: General requirements*

IEC 61984:2008, *Connectors – Safety requirements and tests*

IEC 62314:2006, *Solid-state relays*

CISPR 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
Amendment 1 (2010)

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*