BS EN 61810-3:2015

BSI Standards Publication

Electromechanical elementary relays

Part 3: Relays with forcibly guided (mechanically linked) contacts

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 61810-3:2015. It is identical to IEC 61810-3:2015. It supersedes BS EN 50205:2002 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/94, General purpose relays and reed contact units.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2015

ISBN 978 0 580 84480 5
ICS 29.120.70

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2015.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61810-3

April 2015

ICS 29.120.70

Supersedes EN 50205:2002

English Version

Electromechanical elementary relays - Part 3: Relays with forcibly guided (mechanically linked) contacts (IEC 61810-3:2015)

Relais électromécaniques élémentaires - Partie 3: Relais à contacts guidés (liés mécaniquement) (IEC 61810-3:2015)

Elektromechanische Elementarrelais - Teil 3: Relais mit (mechanisch) zwangsgeführten Kontakten (IEC 61810-3:2015)

This European Standard was approved by CENELEC on 2015-04-01. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 61810-3:2015 E

Foreword

The text of document 94/378/FDIS, future edition 1 of IEC 61810-3, prepared by IEC/TC 94 “All-ornothing electrical relays” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61810-3:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-01-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-04-01

This document supersedes EN 50205:2002.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61810-3:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated :

IEC 61810-2-1	NOTE	Harmonized as EN 61810-2-1.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60947-5-1	-	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	-
IEC 61810-1	2015	Electromechanical elementary relays - Part 1: General and safety requirements	EN 61810-1	2015
IEC 61810-7	-	Electromechanical elementary relays - Part 7: Test and measurement procedures	EN 61810-7	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 3: Relays with forcibly guided (mechanically linked) contacts

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 61810-3 has been prepared by IEC technical committee 94: All-or-nothing electrical relays.

The content of this standard was already published in EN 50205:2002. The revisions in this standard only involve editorial changes and update of references.

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

FDIS	Report on voting
94/378/FDIS	94/382/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 IEC 61810 series, published under the general title *Electromechanical elementary relays* can be found 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 website 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.

INTRODUCTION

This Standard applies to elementary relays in which special design and constructional measures are used to ensure that make (normally-open) contacts cannot assume the same state as break (normally-closed) contacts. These relays can be used in self-monitoring control systems, e.g. safety-related control systems.

ELECTROMECHANICAL ELEMENTARY RELAYS –

Part 3: Relays with forcibly guided (mechanically linked) contacts

1 Scope

This part of IEC 61810 specifies special requirements and tests for elementary relays with forcibly guided contacts, also known as mechanically linked contacts. These special requirements apply in addition to the general requirements of IEC 61810-1.

NOTE 1 This standard does not apply to electromechanical control circuit devices as described in IEC 60947-5-1.

NOTE 2 IEC 61810-2-1 provides guidelines for the assignment of reliability values.

NOTE 3 Contacts that are not mechanically linked (forcibly guided) are not considered in this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61810-1:2015*, Electromechanical elementary relays – Part 1: General and safety requirement*s

IEC 61810-7, *Electromechanical elementary relays – Part 7: Test and measurement procedures*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
elementary relay
non-specified time all-or-nothing relay

Note 1 to entry: In this document the word “elementary” is sometimes omitted for clarity.

[SOURCE: IEC 60050-444:2002, 444-01-03, modified – modification of the definition]

3.2
failure to open
fault condition when a contact does not open when expected to do so

3.3
failure criteria
specified conditions to judge if a fault or malfunction is a failure

3.4
fault
fault condition
deviation of the existing condition from the expected condition

3.5
failure
termination of the ability of an item to perform a required function as defined in the failure criteria

3.6
relay with mechanically linked contacts
relay with forcibly guided contacts
elementary relay with at least one make contact and at least one break contact and including mechanical measures to prevent any make contact(s) and any break contact(s) being in the closed position simultaneously

3.7
type A
relay in which all contacts are mechanically linked

3.8
type B
relay containing contacts that are mechanically linked to each other as well as contacts that are not mechanically linked

4 Functional requirements

4.1 Forcibly guided (mechanically linked) operation

The relay shall be designed such that if a make contact is closed, none of the mechanically linked break contacts can close and that if a break contact is closed, none of the mechanically linked make contacts can close. These requirements apply throughout the lifetime of the relay and under reasonably foreseeable failure conditions.

The effects of reasonably foreseeable breakage of and/or wear to parts of the elementary relay shall not nullify the function of forcibly guided (mechanically linked) operation.

Contact gaps of open contacts shall be greater than 0,5 mm for single break contacts and 0,3 mm each for double break contacts throughout the manufacturer’s specified endurance of the relay.

Operation of forcibly guided (mechanically linked) contacts means that if any make contact fails to open when the relay is de-energized, none of the break contacts shall close. If any break contact fails to open when the relay is energized, no make contact shall close.

4.2 Changeover contacts

Only break contacts and make contacts are covered by this standard; in the case of relays that include changeover contacts, either the make circuit or the break circuit of a changeover contact can be considered to meet the requirements of this standard.

Changeover contacts shall be break-before-make. It shall be assured that the forcibly guided operation is maintained, as described under the fault conditions described in 5.1.

NOTE Special care is taken in the design of the application to ensure that the integrity of the safety-related circuit is maintained in the event of a failure.

4.3 Mechanical endurance

Elementary relays containing forcibly guided (mechanically linked) contacts shall have a mechanical endurance of at least 10^7 operating cycles.

4.4 Electrical endurance

The electrical endurance shall be as specified by the manufacturer in accordance with IEC 61810-1.

4.5 Operating conditions

4.5.1 Ambient temperature

Elementary relays with forcibly guided (mechanically linked) contacts shall function correctly over an ambient temperature range of at least –10 °C to +55 °C.

4.5.2 Energizing quantity

Unless otherwise stated by the manufacturer, elementary relays with forcibly guided (mechanically linked) contacts shall at least correspond to class ‘2’ in the operative range of their rated coil voltage (see 5.3.1 of IEC 61810-1:2015).

4.6 Characteristic values and marking

4.6.1 Characteristic values

The manufacturer shall state in his documentation the following:

a) whether the relay is type A or type B. In the case of type B relays, which contacts are mechanically linked and which contacts are not mechanically linked;

b) the vibration resistance over the frequency range at least from f = 10 Hz to 200 Hz (see IEC 61810-7);

c) the shock resistance of the relay in accordance with IEC 61810-7;

d) the contact load(s) according to IEC 61810-1:2015, Annex B or the utilization category(ies) in accordance with IEC 60947-5-1;

NOTE Commonly utilisation categories AC15 and DC13 are applied.

e) the limits of the operative range.

4.6.2 Marking

Relays with forcibly guided (mechanically linked) contacts shall be marked to indicate whether they are type A or type B. If a contact schematic is marked on the relay then the following marking shall be placed adjacent to the schematic.

Type A relays with forcibly guided (mechanically linked) contacts shall be marked either with the words “type A” or with the symbol given in the Figure 1 below:

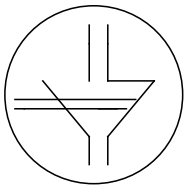

Figure 1 – Symbol for a forcibly guided (mechanically linked) contact set, type A

Type B relays with forcibly guided (mechanically linked) contacts shall be marked either with the words “type B” or with the symbols given in the Figure 2 (Source ISO 7000:2014/Figure 0434) below:

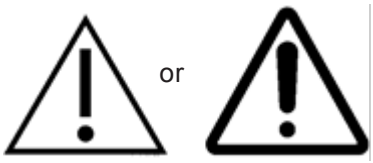

Figure 2 – Symbols for use on type B relays

5 Verification and type tests

5.1 Design verification

A failure mode and effect analysis shall be performed considering all parts that are involved in the forcibly guided (mechanically linked) operation. The analysis shall consider the breakage and wear of these parts as well as failure to open.

All reasonably foreseeable single faults shall be assumed and their effects considered. If the fault of a part leads directly to a second fault then the two faults shall be considered. If the fault of a part is excluded as a failure criteria, the manufacturer shall justify the exclusion, for example by design calculations or measurements showing over-dimensioning. The failure criteria “spring broken” shall not be excluded.

It shall be considered whether, in case any electrically conductive parts break or come loose, the construction of the elementary relay prevents any short-circuits or conductive connections from occurring which would nullify the function of forcibly guided (mechanically linked) operation.

NOTE 1 Bridging by conductive parts can be prevented by such means as, for example, insulation or other appropriate methods applied between the conducting parts.

NOTE 2 Examples of conductive parts are contacts, contact springs and return springs.

The failure of movable functional parts as a result of, for example, breakage or wear shall be considered and the result expected shall be evaluated.

NOTE 3 An example of a movable functional part is the actuator of the contact set.

5.2 Type tests

Type tests shall be performed to verify the function of forcibly guided (mechanically linked) operation.

The tests shall be performed on new relays and also on relays that have been subjected to the electrical and mechanical endurance tests.

The test shall be conducted by simulating the welding of a contact of the elementary relay. The simulated welding shall be performed under worst case conditions using a separate sample for each make contact and each break contact. A separate sample shall be used for each simulated contact welding unless it can be demonstrated by analysis that a reduced number of samples will give an equivalent test result.

Welding of the contacts shall be simulated by such means as, for example, soldering the contacts together or using an appropriate glue. The thickness of the contact tips shall not change by more than 0,02 mm as a result of having been soldered or glued. Break contacts

shall be soldered or glued with the relay in the release condition. Make contacts shall be soldered or glued with the relay energised at the lower limit of the operative range.

The defect shall be built into break contacts with the elementary relay in the release condition. The defect shall be built into make contacts at the lower limit of the operative range of the coil voltage.

5.3 Test procedure

5.3.1 Testing for failure to open

5.3.1.1 Verification of the contact gap

The tests shall be performed at an ambient temperature of (23 ± 5) °C.

Either of the following methods may be used to verify the contact gap. The manufacturer shall state in his documentation which method is used:

a) an optical check to determine if the contact gap is ≥ 0,5 mm in the case of single break contacts, ≥ 0,3 mm in the case of double break contacts;

b) it shall be possible to pass a measurement wire with a diameter of $0,5\ ^{+0,02}_{-0,0}$ mm in the case of single break contacts, $0,3\ ^{+0,02}_{-0,0}$ mm in the case of double break contacts between the contact tips without the wire closing the circuit that includes the contact(s).

It shall be verified by analysis and/or additional tests as necessary that these requirements are met throughout the manufacturer's specified operating temperature range.

5.3.1.2 Testing

5.3.1.2.1 Failure to open of a make contact

After a defect has been built into a make contact and the relay de-energized, it shall be verified that the contact gap of any break contact is ≥ 0,5 mm / ≥ 0,3 mm.

The relay shall then be energized with the maximum coil voltage for ≥ 5 min then de-energized and the contact gap verified immediately.

5.3.1.2.2 Failure to open of a break contact

After a defect has been built into a break contact and the relay energized with the maximum coil voltage the contact gap of any make contact shall be ≥ 0,5 mm / ≥ 0,3 mm.

The contact gap shall be verified

a) immediately after the application of the coil voltage,

b) after the relay has been energized for ≥ 5 min.

The tests shall be performed at an ambient temperature of (23 ± 5) °C. For the test, consideration shall be given to the effect of the permissible range of operating temperature by recalculating the values of the energizing quantity.

The contact gap of the make contact shall be determined after energizing the elementary relay with the maximum value of the energizing quantity.

5.3.2 Mechanical and electrical endurance

The effects of wear shall be determined by means of appropriate endurance tests as specified in 4.3 and 4.4.

Bibliography

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

IEC 61810-2-1, *Electromechanical elementary relays – Part 2-1: Reliability – Procedure for the verification of B_{10} values*

ISO 7000:2014, *Graphical symbols for use on equipment – Registered symbols*

_____

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™