BRITISH STANDARD

BS EN
50205:2002

Relays with forcibly guided (mechanically linked) contacts

The European Standard EN 50205:2002 has the status of a British Standard

ICS 29.120.70

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 50205:2002. It supersedes BS EN 50205:1998 which is withdrawn.

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

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Summary of pages

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EUROPEAN STANDARD **EN 50205**

NORME EUROPÉENNE

EUROPÄISCHE NORM May 2002

ICS 29.120.70 Supersedes EN 50205:1997

English version

Relays with forcibly guided (mechanically linked) contacts

Relais de tout ou rien
à contacts guidés (liés)

Relais mit (mechanisch)
zwangsgeführten Kontakten

This European Standard was approved by CENELEC on 2002-05-01. 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 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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Ref. No. EN 50205:2002 E

Foreword

Following a request from the UK National Committee, the Technical Committee CENELEC TC 94, Relays, decided to revise the standard EN 50205 and prepare a second edition. This approach was endorsed by CENELEC Technical Board.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50205 on 2002-05-01.

This European Standard supersedes EN 50205:1997.

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) 2003-05-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-05-01

The contents of the standard has been amended by TC 94 in a way to
- improve the wording for better readability,
- improve the structure of the document,
- take into account other recently published standards.

Introduction

This Standard applies to elementary relays in which special design and constructional measures are used to ensure that make (normally-open) contacts can not 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.

1 Scope

This European Standard 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 EN 61810-1, EN 61810-5, EN 116000-3 and EN 60255-23.

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

NOTE 2 EN 116000-3 is nearly equivalent to IEC 61810-7.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 60255-23	*Electrical relays* *Part 23: Contact performance*
EN 60947-5-1	*Low-voltage switchgear and controlgear* *Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices*
EN 61810-1	*Electromechanical non-specified time all-or-nothing relays* *Part 1: General requirements*
EN 61810-5	*Electromechanical non-specified time all-or-nothing relays* *Part 5: Insulation coordination*
EN 116000-3	*Generic specification: Electromechanical all-or-nothing relays* *Part 3: Test and measurement procedures*

3 Definitions

For the purposes of this standard, the following definitions apply:

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

[IEV 444-01-03]

NOTE In this document the word “elementary” is sometimes omitted for clarity.

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

3.3
relay with forcibly guided (mechanically linked) 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

3.4
Type A
relay in which all contacts are mechanically linked

3.5
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 specified endurance 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 should be 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 EN 60255-23.

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 ... +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 3.2.1.2 of EN 61810-1).

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. See 3.3.2 of EN 61810-1 (caution mark, with the words “use of contacts”);

b) the vibration resistance over the frequency range of at least f = 10 Hz ... 200 Hz (see EN 116000-3);

c) the shock resistance of the relay in accordance with EN 116000-3;

d) the contact load(s) according to EN 60255-23 or the utilization category(ies) in accordance with IEC 60947-5-1;

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 following symbol:

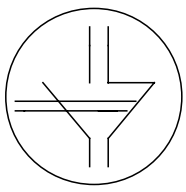

Figure 1 - Symbol for a forcibly guided (mechanically linked) contact set, Type A

Type B relays with forcibly guided (mechanically linked) contacts shall be marked either with the words “Type B” or with the following symbol:

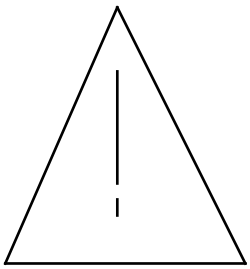

Figure 2 - Symbol for use on Type B relays

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 failure of a part leads directly to a second fault then the two faults shall be considered. If the failure of a part is excluded as a failure mode, the manufacturer shall justify the exclusion, for example by design calculations or measurements showing over-dimensioning. The failure mode “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 may 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 $\underline{\geq}$ 0,5 mm in the case of single break contacts, $\underline{\geq}$ 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 $\underline{\geq}$ 0,5 mm / $\underline{\geq}$ 0,3 mm.

The relay shall then be energized with the maximum coil voltage for ≥ 5 minutes 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 $\underline{\geq}$ 0,5 mm / $\underline{\geq}$ 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 minutes.

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.

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