

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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

**Appareillage à basse tension –  
Partie 5-1: Appareils et éléments de commutation pour circuits de commande –  
Appareils électromécaniques pour circuits de commande**

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CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD.....	5
1 General .....	7
1.1 Scope and object.....	7
1.2 Normative references .....	8
2 Definitions .....	10
2.1 Basic definitions .....	12
2.2 Control switches .....	12
2.3 Parts of control switches.....	15
2.4 Operation of control switches.....	17
3 Classification .....	20
3.1 Contact elements.....	20
3.2 Control switches .....	20
3.3 Control circuit devices .....	20
3.4 Time delay switching elements .....	20
3.5 Control switch mounting .....	20
4 Characteristics.....	20
4.1 Summary of characteristics.....	20
4.2 Type of control circuit device or switching element .....	21
4.3 Rated and limiting values for switching elements .....	22
4.4 Utilization categories for switching elements.....	23
4.5 Vacant.....	24
4.6 Vacant.....	24
4.7 Vacant.....	24
4.8 Vacant.....	24
4.9 Switching overvoltages .....	24
4.10 Electrically separated contact elements .....	24
4.11 Actuating quantities for pilot switches .....	24
4.12 Pilot switches having two or more contact elements.....	24
5 Product information .....	24
5.1 Nature of information .....	24
5.2 Marking .....	25
5.3 Instructions for installation, operation and maintenance.....	26
5.4 Additional information .....	26
6 Normal service, mounting and transport conditions .....	26
7 Constructional and performance requirements .....	28
7.1 Constructional requirements .....	28
7.2 Performance requirements.....	29
7.3 Electromagnetic compatibility (EMC) .....	30
8 Tests .....	32
8.1 Kinds of test .....	32
8.2 Compliance with constructional requirements .....	33
8.3 Performance.....	34

Annex A (normative) Electrical ratings based on utilization categories (see 3.1) .....	46
Annex B (normative) Example of inductive test loads for d.c. contacts .....	48
Annex C (normative) Special tests – Durability tests .....	50
Annex D Vacant.....	54
Annex E (normative) Items subject to agreement between manufacturer and user .....	55
Annex F (normative) Class II control circuit devices insulated by encapsulation Requirements and tests .....	56
Annex G (normative) Additional requirements for control circuit devices with integrally connected cables.....	60
Annex H (normative) Additional requirements for semiconductor switching elements for control circuit devices .....	63
Annex J (normative) Special requirements for indicator lights and indicating towers.....	72
Annex K (normative) Special requirements for control switches with direct opening action .....	78
Annex L (normative) Special requirements for mechanically linked contact elements .....	84
Annex M (normative) Terminal marking, distinctive number and distinctive letter for control circuit devices .....	87
Bibliography.....	92
Figure 1 – Examples of the recommended method for drawing an operating diagram of a rotary switch .....	39
Figure 2 – Operation of push-buttons.....	40
Figure 3 – Difference between the over-travel of the actuator and that of the contact element .....	41
Figure 4 – Examples of contact elements (schematic sketches) .....	42
Figure 5 – Test circuits for multi-pole control switches – Contacts of same polarity, not electrically separated.....	43
Figure 6 – Test circuits for multi-pole control switches – Contacts of opposite polarity, and electrically separated .....	43
Figure 7 – Load $L_d$ details for test conditions requiring different values of make and break current and/or power factor (time constant) .....	44
Figure 8 – Test circuit, conditional short-circuit current (see 8.3.4.2) .....	45
Figure 9 – Current/time limits for d.c. test loads (see 8.3.3.5.3) .....	45
Figure B.1 – Construction of load for d.c. contacts .....	49
Figure C.1 – Normal circuit (see C.3.2.1) .....	53
Figure C.2 – Simplified circuit (see C.3.2.1) .....	53
Figure F.1 – Insulation by encapsulation .....	57
Figure F.2 – Test apparatus .....	58
Figure H.1 – Relationship between $U_e$ and $U_B$ .....	64
Figure H.2 – Example of test circuit for the verification of voltage drop, minimum operational current and OFF-state current (see H.8.2, H.8.3 and H.8.4).....	66
Figure H.3 – Short-circuit testing (see H.8.6.1) .....	67
Figure K.1 – Verification of robustness of the actuating system.....	83

Figure L.1 – Example of representation of NO and NC contacts which are mechanically linked and NC non-linked contact..... 85

Figure L.2 – Symbol for device containing mechanically linked contacts ..... 85

  

Table 1 – Utilization categories for switching elements ..... 23

Table 2 – Mounting hole diameter and dimensions of the key recess (if any) ..... 27

Table 3 – Preferred minimum distances between centres of mounting holes ..... 27

Table 4 – Verification of making and breaking capacities of switching elements under normal conditions corresponding to the utilization categories ..... 31

Table 5 – Verification of making and breaking capacities of switching elements under abnormal conditions corresponding to the utilization categories ..... 32

Table A.1 – Examples of contact rating designation based on utilization categories ..... 46

Table A.2 – Examples of semiconductors switching element ratings for 50 Hz and/or 60 Hz ..... 47

Table A.3 – Examples of semiconductors switching element ratings for d.c. .... 47

Table B.1 – DC loads ..... 49

Table C.1 – Making and breaking conditions for electrical durability ..... 52

  

Table H.1 – Immunity tests ..... 69

Table M.1 – Diagrams of control switches ..... 89

Table M.2 – Diagrams of contactor relays designated by the distinctive letter E ..... 90

Table M.3 – Diagrams of contactor relays designated by the distinctive letter Y ..... 91

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 IEC 60947-5-1:2003  
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**LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –****Part 5-1: Control circuit devices and switching elements  
Electromechanical control circuit devices**

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International Standard IEC 60947-5-1 has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

This consolidated version of IEC 60947-5-1 consists of the third edition (2003) [documents 17B/1297/FDIS and 17B/1309/RVD] and its amendment 1 (2009) [documents 17B/1653/FDIS and 17B/1667/RVD].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 3.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

This International Standard should be used in conjunction with IEC 60947-1.

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

A list of all the parts in the IEC 60947 series, under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result 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

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## LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

### Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices

#### 1 General

The provisions of the general rules, IEC 60947-1, are applicable to this standard, where specifically called for. General rules, clauses and subclauses thus applicable, as well as tables, figures and annexes are identified by a reference to IEC 60947-1, for example 1.2.3, Table 4 or Annex A of IEC 60947-1.

##### 1.1 Scope and object

This part of IEC 60947 applies to control circuit devices and switching elements intended for controlling, signalling, interlocking, etc., of switchgear and controlgear.

It applies to control circuit devices having a rated voltage not exceeding 1 000 V a.c. (at a frequency not exceeding 1 000 Hz) or 600 V d.c.

However, for operational voltages below 100 V a.c. or d.c., see note 2 of 4.3.1.1.

This standard applies to specific types of control circuit devices such as:

- manual control switches, for example pushbuttons, rotary switches, foot switches, etc.;
- electromagnetically operated control switches, either time-delayed or instantaneous, for example contactor relays;
- pilot switches, for example pressure switches, temperature sensitive switches (thermostats), programmers, etc.;
- position switches, for example control switches operated by part of a machine or mechanism;
- associated control circuit equipment, for example indicator lights, etc.

NOTE 1 A control circuit device includes (a) control switch(es) and associated devices such as (an) indicator light(s).

NOTE 2 A control switch includes (a) switching element(s) and an actuating system.

NOTE 3 A switching element may be a contact element or a semiconductor element.

It also applies to specific types of switching elements associated with other devices (whose main circuits are covered by other standards) such as:

- auxiliary contacts of a switching device (e.g. contactor, circuit breaker, etc.) which are not dedicated exclusively for use with the coil of that device;
- interlocking contacts of enclosure doors;
- control circuit contacts of rotary switches;
- control circuit contacts of overload relays.

Contactors shall also meet the requirements and tests of IEC 60947-4-1 except for the utilization category which shall comply with this standard.

This standard does not include the relays covered in IEC 60255 or in the IEC 61810 series, nor automatic electrical control devices for household and similar purposes.

The colour requirements of indicator lights, pushbuttons, etc., are found in IEC 60073 and also in publication 2 of the International Commission of Illumination (CIE).

The object of this standard is to state:

- a) The characteristics of control circuit devices.
- b) The electrical and mechanical requirements with respect to:
  - 1) The various duties to be performed.
  - 2) The significance of the rated characteristics and of the markings.
  - 3) The tests to verify the rated characteristics.
- c) The functional requirements to be satisfied by the control circuit devices with respect to:
  - 1) Environmental conditions, including those of enclosed equipment.
  - 2) Dielectric properties.
  - 3) Terminals.

## 1.2 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(441):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*  
Amendment 1 (2000)

IEC 60050(446):1983, *International Electrotechnical Vocabulary (IEV) – Chapter 446: Electrical relays*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*  
Amendment 1 (1986)

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60073:2002, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indications and actuators*

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

IEC 60255 (all parts), *Electrical relays*

IEC 60417, *Graphical symbols for use on equipment*

IEC 60617 (all parts), *Graphical symbols for diagrams*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-4-1:2000, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

Amendment 1 (2002)

Amendment 2 (2005)

IEC 60947-5-5:2005, *Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

Amendment 1 (1998)

Amendment 2 (2000)

IEC 61000-4-3:2008, *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 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

Amendment 1 (2000)

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 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low-frequency immunity tests*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*

Amendment 1 (2004)

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

Amendment 1 (2004)

Amendment 2 (2006)

## 2 Definitions

For the purposes of this part of IEC 60947 the definitions of IEC 60947-1 and the following additions apply:

*Alphabetical index of definitions*..... References

	A	
Actuating quantity .....		2.4.2.1
Adjustable delay (of a contact element) .....		2.4.1.4

	B	
Biased position .....		2.4.3.4
Bounce time .....		2.4.4.10
Break-contact element (normally closed) .....		2.3.3.4
Button .....		2.3.4

	C	
Change-over contact elements .....		2.3.3.5
Contact element (of a control switch) .....		2.3.3
Contact unit .....		2.3.3.10
Control circuit device .....		2.1.1
Control station .....		2.1.4
Control switch .....		2.1.2
Control switch suitable for isolation .....		2.1.3
Covered push-button .....		2.2.2.11

	D	
<i>d</i> -delay (of a contact element) .....		2.4.1.2
Definite position (abbreviation: position) (of a rotary switch) .....		2.4.3.1
Delayed action push-button .....		2.2.2.9
Dependent action contact element .....		2.3.3.9
Differential value .....		2.4.2.4
Direct drive .....		2.4.4.3
Double gap contact element .....		2.3.3.2

	E	
<i>e</i> -delay (of a contact element) .....		2.4.1.1
Electrically separated contact elements .....		2.3.3.7
End stop .....		2.3.6
Extended button .....		2.3.4.3

	F	
Fixed delay (of a contact element) .....		2.4.1.3
Flush-button .....		2.3.4.1
Foot-switch (pedal) .....		2.2.2.21
Free push-button .....		2.2.2.13

	G	
Guided push-button .....		2.2.2.14

	I	
Illuminated push-button .....		2.2.2.10
Independent (snap) action contact element .....		2.3.3.8
Instantaneous contactor relay .....		2.2.1.1

	J	
Joy stick .....		2.2.2.19
	K	
Key-operated push-button .....		2.2.2.7
Key-operated rotary switch .....		2.2.2.16
	L	
Latched position .....		2.4.3.5
Latched push-button .....		2.2.2.5
Limited drive .....		2.4.4.5
Limited movement rotary switch .....		2.2.2.17
Locating mechanism (of a rotary switch) .....		2.3.5
Locked position .....		2.4.3.6
Locked push-button .....		2.2.2.6
	M	
Make-contact element .....		2.3.3.3
Minimum actuating force (or moment) .....		2.4.4.7
Minimum starting force (or moment) .....		2.4.4.6
Mushroom button .....		2.3.4.4
	O	
Operating diagram .....		2.4.3.7
Operating value .....		2.4.2.2
Over-travel of the actuator .....		2.4.4.2
Over-travel of the contact element .....		2.4.4.9
	P	
Pilot switches .....		2.2.1
Position of rest .....		2.4.3.2
Position switch .....		2.2.1.3
Positive drive .....		2.4.4.4
Pre-travel of the actuator .....		2.4.4.1
Pre-travel of the contact element .....		2.4.4.8
Programmer .....		2.2.1.4
Pull-button .....		2.2.2.2
Pulse (fleeting) contact element .....		2.3.3.6
Push-button .....		2.2.2.1
Push-pull button .....		2.2.2.3
	R	
Recessed button .....		2.3.4.2
Return value .....		2.4.2.3
Rotary control switch .....		2.2.2.15
Rotary button (selector switch) .....		2.2.2.4
	S	
Semiconductor element .....		2.3.2
Shrouded push-button .....		2.2.2.12
Single gap contact element .....		2.3.3.1
Switching element .....		2.3.1
	T	
Time-delay contactor relay .....		2.2.1.2
Time-delay push-button .....		2.2.2.8
Transit position .....		2.4.3.3

	U	
Unidirectional movement rotary switch .....		2.2.2.18
	W	
Wobble stick .....		2.2.2.20

**2.1 Basic definitions**

**2.1.1**

**control circuit device**

an electrical device intended for the controlling, signalling, interlocking, etc., of switchgear and controlgear

NOTE Control circuit devices may include associated devices dealt with in other standards, such as instruments, potentiometers, relays, in so far as associated devices are used for the purposes specified above.

**2.1.2**

**control switch (for control and auxiliary circuits)**

a mechanical switching device which serves the purpose of controlling the operation of switchgear or controlgear, including signalling, electrical interlocking, etc.

NOTE 1 A control switch consists of one or more contact elements with a common actuating system.

NOTE 2 This definition differs from IEC 441-14-46 since a control switch may include semiconductor elements or contact elements (see 2.3.2 and 2.3.3).

**2.1.3**

**control switch suitable for isolation**

a control switch which, in the open position, complies with the requirements specified for the isolating function (see 2.1.19 and 7.2.3.1 b) of IEC 60947-1)

NOTE Such control switches are intended to provide a higher degree of safety to personnel when working on the equipment controlled. For this reason, they have to be manually actuated relying on the intelligence of instructed persons to react in case they would fail to operate, e.g. in case of insufficiently opened contacts.

**2.1.4**

**control station**

an assembly of one or more control switches fixed on the same panel or located in the same enclosure

[IEV 441-12-08]

NOTE A control station panel or enclosure may also contain related equipment, e.g. potentiometers, signal lamps, instruments, etc.

**2.2 Control switches**

**2.2.1**

**automatic control switches**

NOTE Automatic control switches are operated by automatic control (see 2.4.5 of IEC 60947-1). They are also designated as *pilot switches* (see 2.2.18 of IEC 60947-1).

**2.2.1.1**

**instantaneous contactor relay**

a contactor relay operating without any intentional time delay

[IEV 441-14-36]

NOTE Unless otherwise stated, a contactor relay is an instantaneous contactor relay.