

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

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

Appareillage à basse tension –
Partie 5-5: Appareils et éléments de commutation pour circuits de commande –
Appareil d'arrêt d'urgence électrique à accrochage mécanique





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FOREWORD

This amendment has been prepared by subcommittee SC 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

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

FDIS	Report of voting
121A/60/FDIS	121A/72/RVD

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

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

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- replaced by a revised edition, or
- amended.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 60947-5-5:1997/AMD2:2016](https://standards.iteh.ai/catalog/standards/sist/d678c1d4-8708-40b3-bf44-117b10c3f698/iec-60947-5-5-1997-amd2-2016)

1 Scope

<https://standards.iteh.ai/catalog/standards/sist/d678c1d4-8708-40b3-bf44-117b10c3f698/iec-60947-5-5-1997-amd2-2016>

Delete, in the existing 4th paragraph “(see annex A)”.

Add, after the existing 4th paragraph, the following new paragraph and note:

This standard does not deal with any specific requirements on noise as the noise emission of electrical emergency stop devices with mechanical latching function is not considered to be a relevant hazard.

NOTE See also 9.2.5.4 of IEC 60204-1:2005.

2 Normative references

Delete, from the existing list, the references to IEC 60073:1996, modified by Amendment 1, to ISO 3864 and IEC 60204-1.

Replace the existing reference to IEC 60068-2-1, modified by Amendment 1, by the following new reference:

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

Replace the existing references to IEC 60068-2-2 modified by Amendment 1, IEC 60068-2-6, IEC 60068-2-27, IEC 60068-2-30, IEC 60947-1 modified by Amendment 1, IEC 60947-5-1, IEC 61310-1, and ISO 13850 by the following new references:

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

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

IEC 60947-1:2007/AMD1:2010

IEC 60947-1:2007/AMD2:2014

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61310-1:2007, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, acoustic and tactile signals*

ISO 13850:2015, *Safety of machinery – Emergency stop function – Principles for design*

Add the following new reference to the existing list:

IEC 60417-DB:2002¹, *Graphical symbols for use on equipment*

3 Definitions

(standards.iteh.ai)

Replace the existing item under “D” modified by Amendment 1 by the following new item:

<https://standards.iteh.ai/catalog/standards/sist/d678c1d4-8708-40b3-bf44-117b10c3f698/iec-60947-5-5-1997-amd2-2016>

Direct opening action (of a contact element)3.9

Add the following new item under new “P”:

P

Positive opening action (of a contact element)3.9

3.1

emergency stop (function or signal)

Replace the existing source by the following new source:

[ISO 13850:2015, definition 3.1, modified – extended to “emergency stop signal”, no use of E-stop]

3.2

emergency stop device

Replace the existing definition and source by the following new definition, without modifying the existing note:

manually operated control circuit device used to initiate an emergency stop function

¹ “DB” refers to the IEC on-line database, available at: <http://www.graphical-symbols.info/equipment>.

3.3 actuating system (of an emergency stop device)

Replace the existing definition and source by the following new definition and source:

mechanical parts which transmit the actuating force to the contact elements

[IEC 60050-441:1984, 441-15-21, modified – restricted to electromechanical emergency stop devices; the note is not relevant anymore]

3.4 actuator (of an emergency stop device)

Replace the existing definition and source by the following new definition and source, without modifying the existing note:

part of the actuating system which is actuated by a part of the human body

[IEC 60050-441:1984, 441-15-22, modified – actuation is intended to be achieved by human only]

3.5 rest position

Replace the existing definition by the following new definition:

position of an emergency stop device, or of a part of it, which has not been actuated

3.6 actuated position

Replace the existing definition by the following new definition:

position of an emergency stop device, or of a part of it, after it has been actuated

3.8 resetting (of an emergency stop device)

Replace the existing note, modified by Amendment 1, by the following new note:

NOTE Examples of resetting include the rotation of a key, or of the actuator, pulling the actuator or pushing or rotating a special reset button.

3.9 direct opening action (positive opening action) (of a contact element)

Replace the existing term, definition and source by the following new terms, definition and source:

3.9 direct opening action (of a contact element)

DEPRECATED: positive opening action (of a contact element)

achievement of contact separation as the direct result of a specified movement of the switch actuator through non-resilient members (for example not dependent upon springs)

[IEC 60947-5-1:2016, K.2.2, modified – addition of a deprecated term]

4.1 General

Replace the existing third dashed item in NOTE 1 by the following new dashed item:

– by a graphical symbol (see 4.2.2 or Table A.1 of IEC 61310-1:2007).

Delete the existing NOTE 2.

4.2.1

Replace the existing text by the following two new paragraphs and new figure:

Buttons used as emergency stop device actuators shall be coloured red. When a background exists behind the actuator, it shall be coloured yellow.

Where a symbol is needed for clarification, the symbol IEC 60417-5638 (DB:2002-10) shall be used (see Figure 2).



Figure 2 – Symbol (5638) for emergency stop

4.2.2

Replace the existing text and note as follows:

The direction of unlatching shall be identified when resetting is achieved by rotation of the button. This identification shall have the same or nearly the same colour as the actuator in order to avoid misinterpretation. (standards.iteh.ai)

NOTE See also IEC 60073 and ISO 3864 series.

4.4 Additional requirements for colour coding

Replace the existing second paragraph, including the two dashed items, by the following:

Where coloured indicators are provided to assist setting of a trip wire switch:

- green shall indicate the correct setting of the rest position; and
- yellow shall indicate the correct setting of the actuated position.

5.1

Replace the existing paragraph of this subclause by the following new paragraph and note:

Depending on the associated devices, the utilization categories shall be one or more categories selected from Table 1 of IEC 60947-5-1:2016.

NOTE For guidance refer to Annex K of IEC 60947-5-1:2016.

5.2

Replace the existing text of this subclause by the following new text:

All normally closed contact elements of an emergency stop device shall have a direct opening action, in accordance with Annex K of IEC 60947-5-1:2016.

The tests shall be conducted according to Annex K of IEC 60947-5-1:2016.

5.3

This correction does not apply to the English text.

5.4

Replace the existing note of this subclause, added by Amendment 1, by the following new note:

NOTE Subclause 7.2.7 of IEC 60947-5-1:2016 only applies to control switches suitable for isolation.

Add, after the existing 5.4, the following new subclause 5.5:

5.5 Electrical requirements for functional safety applications: in cases where it is necessary to obtain data, tests shall be made according to A.3.2.3 of this standard.

6.2.1

Replace the existing first paragraph of this subclause by the following new text, and delete the existing footnote“”:*

When the emergency stop signal (including the necessary clearance distance) has been generated during actuation of the emergency stop device, the emergency stop function shall be maintained by latching of the actuating system. The emergency stop signal shall be maintained until the emergency stop device is reset (disengaged). It shall not be possible for the emergency stop device to latch-in without generating the emergency stop signal.

6.3.1

IEC 60947-5-5:1997/AMD2:2016

Replace the existing first paragraph of this subclause by the following new text:

The resetting of the latching means shall be by turning a key, by rotation in the designated direction, or by a pulling motion.

6.3.2

Replace the existing text, modified by Amendment 1, by the following new text:

The emergency stop device shall be so designed that:

- the emergency stop actuator can be operated in a direction perpendicular to its mounting surface;
- removal of the actuator is from the inside of the enclosure, or from the outside of the enclosure by use of a tool intended for that purpose;
- it can be actuated by a one-handed continuous motion.

This shall be verified by inspection (see 7.2.1).

6.4.1

Replace the existing second dashed item by the following new dashed item:

- the installation of the emergency stop device can fulfil the requirements of 4.4.1 and 4.4.2 of ISO 13850:2015.

6.4.2

Replace the existing first paragraph of this subclause, modified by Amendment 1, including the five dashed items, by the following:

When the actuator is installed according to the manufacturer's instructions:

- the perpendicular pulling force, applied at the mid-length of the wire or rope, necessary for generating the emergency stop signal (opening of the contacts), shall be less than 200 N;
- the perpendicular deflection of the wire or rope (at mid-length), necessary for generating the emergency stop signal, shall be less than 400 mm;
- the breaking or disengagement of the wire or rope shall generate the emergency stop signal;
- the wire or rope shall resist a tension force 10 times higher than the perpendicular pulling force necessary for generating the emergency stop signal.

Delete the first sentence introduced by Amendment 1 following the dashed items.

Insert, after the existing 6.5, the following new Subclause 6.6:

6.6 Mechanical requirements for functional safety applications

In cases where it is necessary to obtain data needed for functional safety applications, tests shall be made according to A.3.2.2 of this standard.

Table 1 – Robustness of a button-type actuator

Replace the existing table, introduced by Amendment 1, by the following new table:

Table 1 – Robustness of a button-type actuator

Mounting hole diameter mm	Force N	Torque N m
D16: 16,2 ^{+0,2} ₀	80	1,6
D22: 22,3 ^{+0,4} ₀	110	2,2
D30: 30,5 ^{+0,5} ₀	150	3,0

Add, after the new Table 1, the following new text:

For mounting holes having dimension other than in Table 1:

- force (in newton) shall be five times the largest dimension of the mounting hole (i.e., for a square or rectangular hole, the diagonal measurement) in mm;
- torque (in newton meter) shall be equal to 0,1 time the largest dimension of the mounting hole (i.e., for a square or rectangular hole, the diagonal measurement) in mm.

For an emergency stop button not mounted in a single hole:

- if the actuator diameter (or largest dimension) is less than 30 mm, use the values for D22 mm;
- if the actuator diameter (or largest dimension) is equal to or greater than 30 mm, use the values for D30 mm.

7.3.3 Durability test

Add the following sentence at the end of the second paragraph:

For pushbuttons, the requirements of IEC 60947-5-1:2016, 8.3.2.1 a) applies.

Add the following sentence at the end of the third paragraph:

For the actuating forces, verification at the beginning and at the end is required.

7.4 Conditioning procedures

Add, at the end of the first paragraph, the following two new paragraphs:

Devices intended for mounting on enclosures shall be mounted for the purposes of this conditioning in such a manner as to permit the entire emergency stop device to be exposed to the conditioning media except for the exposure to salt mist in accordance with IEC 60068-2-11. Devices subjected to salt mist may be either provided with their own enclosure, or installed in an enclosure according to the manufacturer's instructions. The device is exposed to the salt mist only outside the enclosure.

The device shall be rinsed clean before further tests are performed.

Replace the existing first bulleted item by the following new bulleted item:

- 96 h at +70 °C in dry atmosphere (see test Bb of IEC 60068-2-2 and IEC 60721-3-3 class 3K7)

Replace the existing third bulleted item by the following new bulleted item:

- 96 h at -40 °C (see IEC 60068-2-1: test Ab and IEC 60721-3-3 class 3K7)

7.7.2 Opening test

IEC 60947-5-5:1997/AMD2:2016

Replace, in the existing second paragraph of this subclause " K.8.3.4.4.1 of IEC 60947-5-1" by " K.8.3.4.4.1 of IEC 60947-5-1:2016".

7.7.3 Latching test

Replace the existing title of this subclause by the following new title:

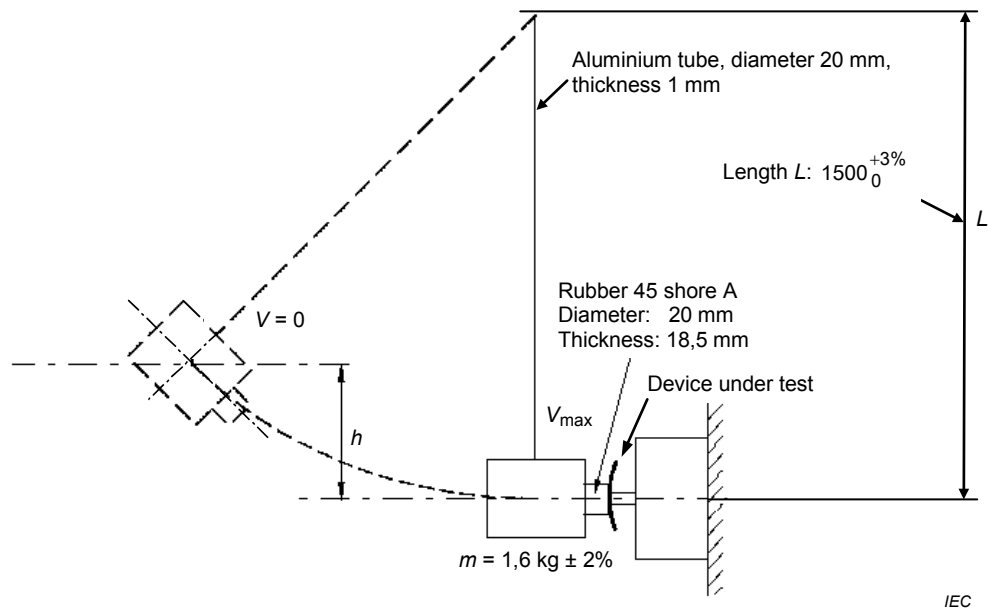
7.7.3 Latching test for button-type emergency stop device

Replace the existing first paragraph introduced in Amendment 1 by the following new paragraph:

To simulate the typical human actuation of a button-type switch, the emergency stop device and its actuator shall be mounted and tested by a pendulum-type hammer as shown in Figure 1. The support of the device under test shall not move more than 0,1 mm when the shock is applied (see IEC 60068-2-75).

Figure 1 – Hammer for tests

Replace the existing figure, modified by Amendment 1, by the following new figure:



NOTE The 1,6 kg mass does not include the mass of the aluminium tube.

Figure 1 – Hammer for tests

Table 2 – Relationship between the emergency stop mounting hole and the hammer height

Replace the existing table, introduced by Amendment 1, by the following new table:
 IEC 60947-5-5:1997/AMD2:2016

Table 2 – Relationship between the emergency stop mounting hole and the hammer height

Largest dimension of mounting hole mm	Hammer height (h) mm
D16: 16,2 $\begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$	60 if the actuator diameter is < 30 mm 75 if the actuator diameter is \geq 30 mm
D22: 22,3 $\begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$	75
D30: 30,5 $\begin{smallmatrix} +0,5 \\ 0 \end{smallmatrix}$	75

Add, after the new Table 2, the following three new paragraphs:

For mounting holes having dimension other than in Table 2 the hammer height shall be 75 mm.

For non-circular mounting holes, the largest dimension of the mounting hole (i.e. for a rectangular hole, the diagonal) shall be used to determine the hammer height.

For an emergency stop button not mounted in a single hole:

- if the actuator diameter (or largest dimension) is less than 30 mm, use the values for D22 mm;

- if the actuator diameter (or largest dimension) is equal to or greater than 30 mm, use the values for D30 mm.

Delete the last sentence of 7.7.3, modified by Amendment 1: "Other types are under consideration".

7.7.4 Resetting test

Delete the existing item c).

7.7.5 Impact test for button-type actuators

Replace the first paragraph, introduced by Amendment 1, by the following new paragraph:

In order to verify 6.1.2 and 6.1.3 where applicable, the three sample emergency stop devices are tested by striking each actuator three times with the hammer shown in Figure 1, where $h = 310 \text{ mm} \pm 2 \text{ mm}$.

Replace the last paragraph, introduced by Amendment, 1 by the following new paragraph:

After the third strike, the opening contact element shall meet the requirements of K.8.3.4.4.1 of IEC 60947-5-1:2016.

7.8.1 Disengagement of wire or rope

Replace the existing first paragraph by the following new paragraph:

In order to verify 6.4.2 where applicable, one emergency stop device is installed with the wire or rope in accordance with the manufacturer's instructions.

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