

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Low-voltage switchgear and controlgear –
Part 6-1: Multiple function equipment – Transfer switching equipment
(standards.iteh.ai)

Appareillage à basse tension –
Partie 6-1: Matériels à fonctions multiples – Matériels de connexion de transfert

IEC 60947-6-1:2005/AMD1:2013
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FOREWORD

This amendment has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

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

FDIS	Report on voting
17B/1830FDIS	17B/1840/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 amendment and the base 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- withdrawn,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.

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INTRODUCTION to the Amendment

This amendment includes the following significant technical changes with respect to the second edition of IEC 60947-6-1 published in 2005:

- clarification of the scope and object;
- update of the normative references;
- clarification of the classification in Clause 4;
- new EMC test: voltage harmonics
- minimum test for derived TSE;
- alignments to the Amendment 1 (2010) of IEC 60947-1:2007:
 - electrically or electronically controlled circuits;
 - markings ("s", "sol", "r" or "f");
 - constructional requirements including material requirements;
 - requirement for screwless terminals;
 - references to EMC test.
- alignments to the Amendment 1 (2012) of IEC 60947-4-1:2009:
 - test at the rated conditional short-circuit current I_q of protected switching devices;
 - short-circuit tests harmonisation.
- creation of bibliography.

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1 Scope and object

Replace the existing first paragraph of this clause by the following new paragraph:

This part of IEC 60947 applies to transfer switching equipment (TSE) to be used in power systems for transferring a load supply between a normal and an alternate source with a supply interruption during transfer, the rated voltage of which does not exceed 1 000 V a.c. or 1 500 V d.c.

Replace in the second dash of the second paragraph "remote" by "remotely".

Renumber the existing note as "NOTE 1".

Delete, in the existing list, the existing items a) and b) under 1).

Add, at the end of the existing text, the following new notes:

NOTE 2 This standard covers also ATSE or RTSE which can be used for safety services as defined in IEC 60364-1 and for which the installation requirements are given by IEC 60364-5-56.

NOTE 3 Other ATSE requirements are under consideration such as closed transition TSE (make before break transfer operation).

2 Normative references

Replace the existing references to the IEC 60947-1, IEC 60947-2, IEC 60947-3, IEC 60947-4-1 and to the IEC 60947-6-2 by the following new references:

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*
Amendment 1:2010

IEC 60947-2:2006, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*
Amendment 1:2009
Amendment 2:2013

IEC 60947-3:2008, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*
Amendment 1:2012

IEC 60947-4-1:2009, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*
Amendment 1:2012

IEC 60947-6-2:2002, *Low voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS)*
Amendment 1:2007

Add the following new references to the existing list:

IEC 60417-DB¹, *Graphical symbols for use on equipment*

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

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*
Amendment 1:2009



3 Terms and definitions, symbols and abbreviations

Add the following new term and new reference to the existing list as follows:

S

Switching position 3.3.4

3.3 Main contact positions

Add, after the existing term and definition 3.3.3, the following new term and definition:

3.3.4

switching position (of a TSE)

mechanical configuration of the main contacts of a TSE regarding the load connexion to a source, which could be either connected to the normal source in the normal position, the alternate source in the alternative position, or disconnected in the off position (if applicable)

3.4 Symbols and abbreviations

Add the following new symbols and abbreviations to the existing list:

¹ Available at: <http://www.graphical-symbols.info/equipment>

ATSE	Automatic transfer switching equipment
MTSE	Manually operated transfer switching equipment
RTSE	Remotely operated transfer switching equipment
TSE	Transfer switching equipment
" <i>r</i> "	Minimum short-circuit test current
I_q	Rated conditional short-circuit current

4 Classification

Renumber the existing note as "NOTE 1".

Replace in a) the second existing dash by the following new dash:

- class CB: TSE that is capable of making, withstanding and is intended for breaking short-circuit currents and is provided with over-current releases;

Replace, in the third existing dash of a), "short-circuit currents. TSE based" by "short-circuit currents and is based".

Add, after the existing text of a), the following new notes:

NOTE 2 The mirror contact defined in IEC 60947-4-1 should be used to monitor the state of the contacts of a class CC TSE.

NOTE 3 The appropriate ATSE classification for use for safety services in electrical supply systems is under consideration.

Replace, in the second existing dash of b), "remote" by "remotely".

<https://standards.iteh.ai/catalog/standards/sist/44a852bf-a5b6-4244-b543-1005-amd1-2013>

5.3 Rated and limiting values for the main circuit

Add, at the end of the existing text, "or in Table 11".

5.3.6.1 Rated short-time withstand current (I_{cw})

Add, at the end of the third paragraph, "or in Table 11".

5.3.6.3 Rated short-circuit breaking capacity (I_{cn})

Add, at the end of the first sentence of the third paragraph, "or in Table 11".

5.3.6.4 Rated conditional short-circuit current

Add, at the end of the second paragraph, "or in Table 11".

5.4 Utilization category

Replace, in the first paragraph, "assigned one" by "assigned to one" and replace "utilization voltages" by "operational voltages".

5.5.2 Transfer control devices

Replace the existing item b) by the following new items:

- b) the contact transfer time and the off time range for all TSE;
- c) the operating transfer time and the return transfer time range for ATSE.

Add, after the existing text of this subclause, the following new text:

The tolerance of the voltage frequency deviations and of the times shall be specified by the manufacturer but no more than $\pm 10\%$. If the time value is lower than 1 s, the manufacturer shall state the tolerances.

6.1 Nature of information

Replace the existing item h) by the following new item h):

h) rated short-circuit making capacity for class PC;

Add, at the end of item j), "for class PC and CC".

Replace the existing item n) by the following new item n):

n) operating sequence time data according to 5.5.2 b), time delays and their position in the operating sequence if any;

Renumber the existing note as "NOTE 1".

Replace the existing item r) by the following new items and new note:

r) length of insulation to be removed before insertion of the conductor into the terminal;

s) maximum number of conductors which may be clamped;

t) for non-universal screwless terminals:

- "s" or "sol" for terminals declared for rigid-solid conductors;
- "r" for terminals declared for rigid (solid and stranded) conductors;
- "f" for terminals declared for flexible conductors.

u) switching position of the TSE. [IEC 60947-6-1:2005/AMD1:2013](https://standards.iteh.ai/catalog/standards/sist/44a852bf-a5b6-4244-b543-44a01b939e6c/iec-60947-6-1-2007-amd-1-2013)

NOTE 2 In the case of electronically controlled electromagnets, other information can also be necessary, for example the control circuit configuration (see 4.5 and Annex U of IEC 60947-1:2007, Amendment 1 (2010)).

6.2 Marking

Replace, in the second paragraph, "and o)" by ", o) and u)".

Replace, in the last paragraph, "to r)" by "to t)".

6.3 Instructions for installation, operation and maintenance

Delete the existing second paragraph.

8.1.1.1 Resistance to abnormal heat and fire

Renumber this subclause as 8.1.1 and replace the existing text by the following new text:

Subclause 7.1.2 of IEC 60947-1:2007, Amendment 1 (2010) applies.

When tests on the equipment or on sections taken from the equipment are used, parts of insulating materials necessary to retain current-carrying parts in position shall conform to the glow wire test of subclause 8.2.1.1.1 of IEC 60947-1:2007, Amendment 1 (2010) with the test temperature given by IEC 60947-4-1 for class CC TSE, or by IEC 60947-2 for class CB TSE, or by IEC 60947-3 for class PC TSE.

Add, before the existing subclause 8.2, the following new subclauses:

8.1.2 Indication of the switching position

The indicating means of TSE shall indicate the normal, alternative and if any, the Off position. The marking shall be preferably in accordance with IEC 60417:

- I Normal (60417-IEC-5007:2002)
- O Off (60417-IEC-5008:2002)
- II Alternative (60417-IEC-6176:2012)

8.1.3 Equipment suitable for isolation

Subclause 7.1.7 of IEC 60947-1:2007, Amendment 1 (2010) applies with the following addition:

For TSE, open position is called off position and closed position correspond to the positions normal and alternative.

8.2.1.1 Operating mechanism

Replace the existing second paragraph of item c) by the following new paragraph:

TSE may have an intentional timed off period and/or an off/rest position.

8.2.1.2 Controls, sequence and limits of operation

Replace, in the existing item c), the words "supply to the" by "supply to an".

Replace, in the existing item d), the words "normal to the" by "normal to an".

Replace, in the existing item e), the words "availability of the" by "availability of an".

Add, at the end of the existing item f), the following:

" , but not less than 50 ms."

Add, after the end of the existing item f), the following new note:

NOTE For an application requesting a fast transfer time (for example less than 50 ms), a comprehensive study taking in account the range of the off time of the TSE, the time constants of the loads and the relative phase angle of the residual voltage, is highly recommended before applying this fast transfer. In any case this should be in agreement between the manufacturer and the user if adequate measurement or/and protection function in the installation is not provided.

Add, after "above requirements" in the last existing paragraph, the words "and the requirements of 5.5.2".

Table 2 – Verification of making and breaking capacity – Conditions for making and breaking corresponding to the utilization categories

Replace, in the existing table, "I" by "I_c".(2 occurrences)

Table 3 – Verification of operational performance – Conditions for making and breaking corresponding to the utilization categories

Replace, in the existing table, "I" by "I_c".(6 occurrences)

8.2.5.1 Rated short-time withstand current

Replace the first existing paragraph by the following new paragraph:

Class PC TSE for which the manufacturer has not specified a short-circuit protective device shall withstand the test currents given in Table 4 or preferably Table 11 at the discretion of the manufacturer. Both tables are considered equivalent for the equipment to comply with this standard. If the manufacturer assigns a short-time withstand current higher than that given in Table 4 or Table 11, the TSE shall withstand a current of the assigned value.

Table 4 – Value of the test current for the verification of the ability to operate under short-circuit conditions

Replace, in the existing header of this table, the unit "V" by "A".

Add, after the existing Table 4, the following new table and the following new note:

Table 11 – Value of the test current for the verification of the ability to operate under short-circuit conditions (harmonized table)

Rated operational current I_e^c A	Test current kA ^d (r.m.s.)	Power factor
$I_e \leq 100^a$	5 ^e	0,7 – 0,8
$100 < I_e \leq 250^b$	10	0,5 – 0,7
$250 < I_e \leq 500$	18	0,2 – 0,3
$500 < I_e \leq 800$	30	0,2 – 0,3
$800 < I_e \leq 1\ 300$	42	0,2 – 0,3
$1\ 300 < I_e$	Subject to agreement between manufacturer and user.	0,2 – 0,3

^a at 690 V and above: $I_e \leq 125$ A. [IEC 60947-6-1:2005/AMD1:2013](https://standards.iteh.ai/catalog/standards/sist/44a852bf-a5b6-4244-b543-51d2a071653e/iec-60947-6-1-2005-amd1-2013)
^b at 690 V and above: $125 < I_e$ (A) ≤ 250 .
^c Rated operational current may be marked "current rating" in North America.
^d Test current may be called "fault current rating" in North America.
^e For lower ratings, Table 17 of IEC 60947-4-1:2009, Amendment 1 (2012) applies.

NOTE New Table 11 had been introduced for harmonization purposes with IEC 60947-4-1:2009, Amendment 1 (2012), Table 17.

8.2.5.2 Rated conditional short-circuit current

Replace, in the existing first paragraph, "Class PC TSE for which" by "Class PC or Class CC TSE for which", and "in Table 4" by "in Table 4 or in Table 11".

Replace, in the second existing paragraph, "in Table 4" by "in Table 4 or in Table 11".

8.2.5.3 Rated short-circuit making capacity

Replace, in the first and second existing paragraphs, "Table 4" by "Table 4 or Table 11".

8.2.5.4 Rated short-circuit breaking capacity

Replace, at the end of the first paragraph, "in Table 4" by "in Table 4 or in Table 11".

Replace, in the second existing paragraph, "in Table 4" by "in Table 4 or in Table 11".

8.3.1 General

Delete the second existing paragraph of this subclause.

8.3.2 Immunity

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

Subclause 7.3.2 of IEC 60947-1:2007, Amendment 1 (2010) applies with the following addition:

The procedures are given in 9.5.

Delete the existing Table 5.

Add, after the existing subclause 9.1.4, the following new subclauses:

9.1.5 Special tests

9.1.5.1 Durability tests

Under consideration.

9.1.5.2 Damp heat, salt mist, vibration and shock

Under consideration (see Annex Q of IEC 60947-1:2007, Amendment 1 (2010)).

9.2 Compliance with constructional requirements

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

Subclause 8.2 of IEC 60947-1:2007, Amendment 1 (2010) applies with the following additions:

9.2.1 Electrical performance of screwless-type clamping units

Subclause 8.2.4.7 of IEC 60947-1:2007, Amendment 1 (2010) applies with following additions:

The insertion and disconnection of the conductors shall be made in accordance with the manufacturer's instructions.

The measurement methods and the results shall be documented in the test report. The test current is I_{th} .

9.2.2 Ageing test for screwless-type clamping units

Subclause 8.2.4.8 of IEC 60947-1:2007, Amendment 1 (2010) applies with following additions:

The test shall be done on the device equipped with the clamping units.

The test current is I_{th} . The air temperature in the cabinet is raised in approximately 20 min to 40 °C or the highest temperature for service conditions as declared by the manufacturer.

Table 6 – List of type tests (overall scheme of test sequences)

Replace the existing Table 6 by the following new table:

Table 6 – List of type tests (overall scheme of test sequences)

Test sequence	Tests	Ref.	Applicable to class of TSE		N° sample ^b
I General performance characteristics	a) Constructional requirements	9.2	PC/CC	CB	1
	b) Operation	9.3.3.1			
	c) Controls, sequence and limits of operation	9.3.3.2			
	d) Temperature rise	9.3.3.3			
	e) Dielectric properties	9.3.3.4			
II Operating performance	f) Making and breaking capacities	9.3.3.5	PC/CC	CB	1
	g) Operational performance capability (electrical)	9.3.3.6.2	PC/CC	CB	
	– Dielectric withstand verification	9.3.3.4	PC/CC	CB	
	h) Temperature rise	9.3.3.3	PC	-	
	i) Operational performance capability (mechanical)	9.3.3.6.3	PC/CC	CB	
III Verification of short-circuit capabilities	j) Short-circuit making capacity	9.3.4.2.2	PC ^a	CB	1
	– Dielectric withstand verification ^c	9.3.3.4	PC/CC	CB	
	k) Short-circuit breaking capacity	9.3.4.2.3	–	CB	
	– Dielectric withstand verification ^c	9.3.3.4	–	CB	
	l) Short time withstand current	9.3.4.3	PC ^a	–	
	– Dielectric withstand verification ^c	9.3.3.4	PC/CC	–	
	m) Conditional short-circuit current	9.3.4.4	PC/CC	–	
	– Dielectric withstand verification ^c	9.3.3.4	PC/CC	CB	
– Temperature rise verification ^c	9.3.3.3	PC/CC	CB		
IV Environmental tests	n) Electromagnetic compatibility	9.5	PC/CC	CB	1

^a This test is not required if the manufacturer has assigned a conditional short-circuit current.

^b Tests can be made on one sample only at the manufacturer's discretion.

^c Test to be made only if not required after a further test on the same sample.

Table 7 – List of type tests (referred to by their subclause numbers) to which a given derived TSE shall be submitted

Replace the existing table by the following new table: