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2007-06

**Auxiliaries for lamps –
Starting devices (other than glow starters) –
Performance requirements**

iTeh STANDARD PREVIEW

**(standard iTeH.ai)
Appareils auxiliaires pour lampes –
Dispositifs d'amorçage (autres
que starters à lueur) –
Exigences de performance**

IEC 60927:2007
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CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Definitions	7
4 General requirements for tests	8
4.1 Ambient conditions, test quantity and sequence of tests	8
4.2 Supply voltage.....	8
4.3 Corresponding safety requirements	8
4.4 Immunity	8
4.5 Relation to lamp standards	8
5 Marking	8
6 Performance requirements for starters (other than glow starters) for fluorescent lamps	9
6.1 Starting test.....	9
6.1.1 Starting test quantity	9
6.1.2 Conditions of acceptance	9
6.1.3 Conditions of test	9
6.1.4 Starters having a mechanical switching element.....	10
6.1.5 Starters having an electronic switching element	11
6.1.6 Non-reoperating level	12
6.1.7 Maximum pre-heat current (lamp fails to start).....	13
6.1.8 Interruption of starter function.....	13
6.2 Endurance test.....	13
6.2.1 Test quantity.....	13
6.2.2 Test conditions	13
6.2.3 Starters replaceable without tools.....	13
6.2.4 Starters not intended for replacement.....	13
6.2.5 Conditions of acceptance	13
6.3 Deactivated lamp test.....	14
6.3.1 Test quantity.....	14
6.3.2 Test conditions	14
6.3.3 Starters with a mechanical switching element but without cut-out	14
6.3.4 Starters with an electronic switching element but without cut-out.....	14
6.3.5 Starters with a mechanical switching element and with thermal cut-out.....	14
6.3.6 Starters with an electronic switching element and electronic cut-out.....	15
6.3.7 Condition of acceptance	15
7 Performance requirements for ignitors	15
7.1 Starting test.....	15
7.1.1 Test quantity.....	15
7.1.2 Test conditions	15
7.1.3 Conditions of acceptance	15
7.1.4 Switching speed	16
7.1.5 Pulse voltage.....	16
7.1.6 Repetition rate, pulse position, width and height of starting pulse for triggered ignitors	16

7.1.7	Ignition energy for non-triggered ignitors	16
7.2	Non-reoperating level	16
7.3	Endurance test	17
7.3.1	Test quantity	17
7.3.2	Test conditions	17
7.3.3	Ignitors without replaceable switching elements	17
7.3.4	Ignitors with switching elements replaceable without tools	17
7.3.5	Ignitors with additional cut-outs	18
7.3.6	Conditions of compliance	18
Annex A (normative)	Ballasts to be used for life testing	21
Annex B (informative)	Explanation of starting conditions for electronic starters with an electronic switching element	22
Annex C (informative)	A guide to quoting product life and failure rate	30
Bibliography	31
Figure 1	– Pulse voltage measurement for starting devices	19
Figure 2	– Ignition energy measurement for non-triggered starting devices	20
Figure B.1	– Cathode heating current requirements for electronic starters with electronic switching element	26
Figure B.2	– Interpretation of effective heating current	27
Figure B.3	– Starters which remove pre-heating current when open-circuit voltages are elevated	28
Figure B.4	– Starters which have open-circuit voltage transition times higher than 100 ms	29
Table 1	– Starting aid requirements	9

INTERNATIONAL ELECTROTECHNICAL COMMISSION

AUXILIARIES FOR LAMPS – STARTING DEVICES (OTHER THAN GLOW STARTERS) – PERFORMANCE REQUIREMENTS

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International standard IEC 60927 has been prepared by subcommittee 34C: Auxiliaries for lamps, of IEC technical committee 34: Lamps and related equipment.

This third edition of IEC 60927 replaces the second edition (1996) and its Amendments 1 (1999) and 2 (2004). Subclause 4.5 has been inserted in order to install an obligatory link to the relevant lamp standard.

This standard is to be used in conjunction with IEC 61347-1 and IEC 61347-2-1. It was established on the basis of the second (2007) edition of IEC 61347-1 and on the basis of the first (2000) edition and Amendment 1 (2005) of IEC 61347-2-1.

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

FDIS	Report on voting
34C/783/FDIS	34C/797/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.

The committee has decided that the contents of this publication 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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AUXILIARIES FOR LAMPS – STARTING DEVICES (OTHER THAN GLOW STARTERS) – PERFORMANCE REQUIREMENTS

1 Scope

This International Standard specifies performance requirements for starting devices (starters and ignitors) for tubular fluorescent and other discharge lamps for use on a.c. supplies up to 1 000 V at 50 Hz or 60 Hz, which produce starting pulses not greater than 5 kV.

This standard is used in conjunction with IEC 61347-1 and IEC 61347-2-1.

NOTE 1 All glow starters for fluorescent and other discharge lamps including thermal relay/cut-outs will be included in IEC 60155.

NOTE 2 There are regional standards regarding the regulation of EMC requirements for end-products like luminaires and independent control gear. In a luminaire, the control gear is dominant in this respect. Control gear, together with other components, should comply with these standards.

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 60081, *Double-capped fluorescent lamps – Performance specifications*

[https://standards.iteh.ai/catalog/standards/sist/dc00b72d-e263-4b3f-8ddd-](https://standards.iteh.ai/catalog/standards/sist/dc00b72d-e263-4b3f-8ddd-d4584511833/iec-60927-2007)

IEC 60192, *Low-pressure sodium vapour lamps – Performance specifications*

IEC 60598-1:2003, *Luminaires – Part 1: General requirements and tests*¹⁾
Amendment 1 (2006)

IEC 60662, *High-pressure sodium vapour lamps*

IEC 60901, *Single-capped fluorescent lamps – Performance specifications*

IEC 60921, *Ballasts for tubular fluorescent lamps – Performance requirements*

IEC 60923, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

IEC 61167, *Metal halide lamps*

IEC 61347-1, *Lamp controlgear - General and safety requirements*

IEC 61347-2-1, *Lamp controlgear – Particular requirements for starting devices (other than glow starters)*

¹⁾ A consolidated edition 6.1 exists, including IEC 60598-1 (2003) and its Amendment 1 (2006).

IEC 61347-2-9, *Lamp controlgear – Particular requirements for ballasts for discharge lamps (excluding fluorescent lamps)*

IEC 61547, *Equipment for general lighting purposes – EMC immunity requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 61347-2-1 together with the following apply.

3.1

starter with mechanical switching element

starter which provides cathode pre-heating current and lamp-starting pulse(s) by mechanical means (e.g. thermal or magnetic)

3.2

starter with electronic switching element

starter which provides cathode pre-heating current and lamp-starting voltage(s) or pulse(s) by electronic means and contains no moving parts

3.3

deactivated lamp

lamp in which one or both cathodes are deprived of emitting material but neither of which is broken

3.4

non-re-operating level

reduced level of voltage and/or current at which a starting device must not re-operate after the completion of the starting cycle, and the lamp is operating normally

3.5

maximum abnormal current

value of continuous r.m.s. current through the ballast which shall not be exceeded at the end of the starting cycle when the circuit is in an abnormal condition (e.g. deactivated lamp, or lamp that has been removed)

3.6

starting aid

means to facilitate the starting of a lamp, which can be either a conductive strip affixed to the outer surface of a lamp or a conductive plate which is placed within an appropriate distance from a lamp

NOTE A starting aid can only be effective when it has an adequate potential difference from one end of the lamp.

3.7

maximum case temperature ($t_c + X$) under abnormal conditions

maximum allowable case temperature of the ignitor under abnormal conditions with metal halide lamps

The value of ($t_c + X$) is declared by the manufacturer

4 General requirements for tests

4.1 Ambient conditions, test quantity and sequence of tests

Only requirements for type tests are included.

Unless otherwise specified, the tests shall be made at an ambient temperature between 10 °C and 30 °C.

The tests shall be carried out in the order of the clauses of this standard.

The following numbers of samples shall be submitted:

- six samples of starters as defined in 3.1 and 3.2;
- four samples of ignitors (where appropriate, together with those circuit components which are necessary to carry out the tests).

4.2 Supply voltage

The total harmonic content of the supply voltage shall not exceed 3 %, the harmonic content being defined as the root-mean-square (r.m.s.) summation of the individual harmonic components, using the fundamental as 100 %.

Care shall be taken that this applies under all conditions that occur during the measurement.

NOTE This implies that the source of supply will have sufficient power and that the supply circuit has sufficiently low impedance at supply frequency and impulse frequency compared with the ballast impedance. The correct impedance at impulse frequency can be obtained by connecting a 2 µF (approximately) capacitor in parallel with the source.

4.3 Corresponding safety requirements

All starting devices specified in this standard shall meet the requirements of IEC 61347-2-1.

4.4 Immunity

All starting devices specified in this standard shall meet the requirements of IEC 61547.

NOTE The requirements for starting devices are under consideration in IEC 61547.

4.5 Relation to lamp standards

Attention is drawn to lamp performance standards which contain "Information for ignitor design". This information should be followed for proper lamp operation. However, this standard does not require the testing of lamp performance as part of the type test approval for ignitors.

5 Marking

The marking requirements of IEC 61347-2-1 shall apply, together with the following, to be either clearly marked on the starting device or made available in the manufacturer's catalogue, or the like.

- a) The manufacturer shall declare the type of switching element as defined in 3.1 and 3.2.
- b) The manufacturer shall declare the maximum load capacitance for satisfactory operation of the ignitor.
- c) The manufacturer shall declare the allowable maximum case temperature under abnormal conditions ($t_c + X$) of the ignitor.

6 Performance requirements for starters (other than glow starters) for fluorescent lamps

This clause specifies performance requirements for starters other than glow starters, used with tubular fluorescent lamps with pre-heated cathodes, and their associated ballasts (see IEC 60081 and IEC 60921, where appropriate).

6.1 Starting test

6.1.1 Starting test quantity

The starting test quantity consists of six new starters which have not been subjected to the tests specified in IEC 61347-2-1.

6.1.2 Conditions of acceptance

The type is considered as satisfying the requirements of this subclause if all six starters comply with the appropriate tests specified in 6.1.4 to 6.1.8. If one failure occurs, a further six starters shall be selected and tested and all these shall comply. If more than one failure occurs the starter is deemed not to satisfy the requirements of this clause.

6.1.3 Conditions of test

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6.1.3.1 Circuit

<https://standards.iteh.ai/catalog/standards/sist/dc00b72d-e263-4b3f-8ddd-d458f4511833/iec-60927-2007>

The starter is tested in the circuit declared by the manufacturer.

A starting aid complying with the requirements of Table 1 shall be used unless otherwise indicated on the starter or in the manufacturer's literature.

In case of doubt a choice shall be made by mutual agreement between the testing authority and the manufacturer.

Table 1 – Starting aid requirements

Lamp diameter	Starting aid width	Spacing from lamp	Length
mm	mm	Mm	
15	25	7	Not less than lamp length
25	40	12	
38	40	20	
15/25/38	1,5 ^a	0 ^a	
NOTE A starting aid spaced from the lamp can only be effective if the outer surface of the lamp is treated to be non-wetting.			
^a Strip affixed to lamp surface.			

6.1.3.2 Ballast

The ballast used shall meet the requirements of IEC 60921, where appropriate. It shall have a rated voltage equal to the supply voltage, or equal to the lowest value of the supply voltage range for which the starter is designed.

The rated wattage of the ballast shall be chosen to give the most onerous starting conditions of the range of lamp types for which the starter is designed. In case of doubt the rated wattage of the ballast shall correspond to the main lamp type for which the starter is designed.

Where a starter is designed to operate with different ballast types (e.g. capacitive or inductive), the tests are made with both types of ballast.

6.1.3.3 Lamps

The lamp shall be of the pre-heated cathode type and, where appropriate, meet the requirements of IEC 60081. The rated wattage of the lamp shall be equal to the rated wattage of the ballast used.

For starters of the mechanical type defined in 3.1 the lamp shall normally be of the "with starter" type. For starters of the electronic type defined in 3.2 the lamp shall normally be of the "starterless type". Where a choice of lamp of "with starter" or "starterless" type is declared by the manufacturer, the "with starter" type shall be used.

6.1.4 Starters having a mechanical switching element

6.1.4.1 Speed of operation

a) *Current operated starters*

[IEC 60927:2007](https://standards.iteh.ai/catalog/standards/sist/dc00b72d-e263-4b3f-8ddd-44684116352e-60927-2007)

A current equal to the minimum pre-heating current prescribed on the relevant lamp data sheet in IEC 60081 shall be passed through the circuit.

For starters which incorporate a cut-out, the starter shall operate at least once during the test period of 30 s. For continuously operating starters, the starter shall operate at least twice during the test period of 30 s.

The test is made with a deactivated lamp or with an equivalent resistance of both cathodes in series as prescribed on the relevant lamp data sheet in IEC 60081.

b) *Voltage operated starters*

A voltage of 0,92 times the rated voltage of the ballast shall be applied to the circuit.

For starters which incorporate a cut-out, the starter shall operate at least once during the test period of 30 s.

For continuously operating starters, the starter shall operate at least twice during the test period of 30 s.

The test is made with a deactivated lamp or with an equivalent resistance of both cathodes in series as prescribed on the relevant lamp data sheet in IEC 60081.

6.1.4.2 Cathode pre-heating

A voltage of 0,92 times the rated voltage of the ballast shall be applied to the circuit.

Starters shall provide sufficient lamp cathode heating. The pre-heating current shall be either as specified on the relevant lamp data sheet in IEC 60081 or shall be in line with the lamp manufacturer's requirements relating to current and time.

6.1.4.3 Pulse voltage

The circuit for measuring pulse voltage shall be as shown in Figure 1.

A voltage of 0,92 times the rated voltage of the ballast shall be applied to the circuit for 30 s. On at least one occasion during this period, the highest pulse voltage (indicated by either of the two voltmeters) shall be not less than the value mentioned in the column "information for starter design" of the relevant lamp data sheet of IEC 60081. If the starter is designed for a range of lamps, care should be taken that the highest voltage value quoted in the sheets for the lamps within that range should be used.

NOTE As an alternative to the electrostatic voltmeter prescribed in Figure 1, a memory oscilloscope may be used in the circuit together with a high-voltage probe having the following properties:

- input resistance: $\geq 100 \text{ M}\Omega$,
- input capacitance $\leq 15 \text{ pF}$,
- cut-off frequency $\geq 1 \text{ MHz}$.

In case of doubt, the measurement with the electrostatic voltmeter is the reference method.

6.1.5 Starters having an electronic switching element

6.1.5.1 General <https://standards.iteh.ai/catalog/standards/sist/dc00b72d-e263-4b3f-8ddd-d4584511833/iec-60927-2007>

For explanatory notes and guidance to testing see Annex B.

It may be expected that starters complying with this subclause, when associated with lamps which comply with IEC 60081 or IEC 60901, will provide satisfactory starting of the lamp at an air temperature immediately around the lamp between 10 °C and 35 °C and at voltages within 92 % and 106 % of the rated voltage.

For 6.1.5.2, 6.1.5.3 and 6.1.5.4 compliance is checked with:

- a) *each lamp cathode replaced by a resistance corresponding to the substitution resistor value prescribed on the relevant lamp data sheet in IEC 60081 or IEC 60901;*
- b) *supply voltages of 0,92 times and 1,06 times the rated voltage of the ballast.*

6.1.5.2 Speed of operation

For starters which incorporate a cut-out, the starter shall operate at least once during the test period of 30 s.

For continuously operating starters, the starter shall operate at least twice during the test period of 30 s.

6.1.5.3 Cathode pre-heating

The starter shall operate so that the minimum total effective heating current shall comply with the time/current limits specified on the relevant lamp data sheets (see Annex B, Figure B.2).

The absolute minimum pre-heating time shall be at least 0,4 s unless otherwise specified on the relevant lamp data sheet.

The maximum effective heating current shall not exceed the limits specified on the relevant lamp data sheet at any time t .

6.1.5.4 Open-circuit voltage

The open-circuit voltage between any pairs of substitution resistors representing a lamp shall not exceed the maximum values specified on the lamp data sheet, during the pre-heating period.

After the pre-heating period the voltage shall attain a value, not less than the minimum value for lamp starting, as specified on the lamp data sheet.

If the current through the substitution resistor, as specified in 6.1.5.3, is interrupted before the minimum specified voltage for lamp starting has been reached, the voltage rise to minimum starting voltage shall take place within not more than 0,1 s (see Figure B.3).

If the voltage rise takes more than 0,1 s, the current through the substitution resistor shall not fall below the absolute minimum value specified on the relevant lamp data sheet (see Figure B.4).

6.1.6 Non-reoperating level

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This subclause applies to starters with mechanical and electronic switching elements.

With a circuit and ballast as previously specified in 6.1.3 but with a lamp connected as in normal use the following test shall be applied.

6.1.6.1 For voltage operated starters

A supply voltage equal to the rated voltage of the ballast shall be applied to the circuit, and the lamp shall start and operate normally.

After a period of 30 s lamp operation, the supply voltage shall be reduced within 5 s without interruption to 85 % of the rated value and held in this condition for 90 s. The lamp shall remain alight without disturbance from the starter.

6.1.6.2 For current operated starters

A supply voltage equal to the rated voltage of the ballast shall be applied to the circuit, and the lamp shall start and operate normally.

After a period of 30 s lamp operation the lamp current shall be reduced within 5 s without interruption to a value which shall be 80 % of the nominal lamp running current as prescribed on the relevant lamp data sheet given in IEC 60081. This condition is held for 90 s. The lamp shall remain alight without disturbance from the starter.

6.1.7 Maximum pre-heat current (lamp fails to start)

In order to protect lamp cathodes against excessive pre-heating current, if a healthy lamp fails to start, the following test shall be applied to starters with mechanical and electronic switching elements.

With the starter connected as for normal operation and with a supply voltage equal to 106 % of the ballast rated voltage applied to the circuit, the total effective heating current through the cathodes during the 60 s period immediately after switch-on shall not exceed 115 % of the nominal running current of the lamps, as prescribed on the relevant lamp data sheets given in IEC 60081 and IEC 60901.

For this test a deactivated lamp or two separate lamp ends with real cathodes shall be used.

6.1.8 Interruption of starter function

If a manufacturer or responsible vendor declares that the starter has an additional cut-out to disconnect the starter from the circuit the following test shall be applied.

With the supply voltage equal to the rated voltage of the ballast and with a deactivated cathode lamp or two separate lamp ends with real cathodes, in the place of the lamp, the additional cut-out shall operate within 5 min from the application of the supply voltage to the circuit.

6.2 Endurance test

6.2.1 Test quantity

The test quantity shall consist of three starters which have passed the test of 6.1.

6.2.2 Test conditions

For this test the starters are connected as in normal use, operated at the maximum case temperature t_c and associated with a lamp of the highest wattage rating for which the starter is intended together with an appropriate ballast. The ballast shall conform with the requirements of Annex A. The test voltage shall be equal to the rated voltage of the ballast.

In the event of the lamp failing during this test, arrangements shall be made for its immediate replacement.

6.2.3 Starters replaceable without tools

The test duration shall be 6 000 cycles, each of 4 min. During each cycle, the voltage shall be applied to the circuit for $90 \text{ s} \pm 30 \text{ s}$.

A rest period of 30 min shall be applied during each 12 h testing.

6.2.4 Starters not intended for replacement

The test duration shall be 25 000 cycles, each of 4 min. During each cycle, the voltage shall be applied to the circuit for $90 \text{ s} \pm 30 \text{ s}$.

A rest period of 30 min shall be applied during each 12 h testing.

6.2.5 Conditions of acceptance

After this test, the tests of 6.1.4 to 6.1.7 are repeated.