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PAKISTAN STANDARD

DOUBLE-CAPPED FLUORESCENT LAMPS – PERFORMANCE SPECIFICATIONS



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PAKISTAN STANDARD SPECIFICATION FOR

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0. **FOREWORD**

- 0.1 This Pakistan Standard was adopted by the authority of the Board of Directors of Pakistan Standard and Quality Control Authority after the draft prepared by the Technical Committee for "Electric Lamps (EDC-2)" had been approved and endorsed by the National Standards Committee on 19th January 2012.
- 0.2 This Pakistan Standard PS: 292 was based on IEC 60081/1997 which was subsequently revise. It deemed necessary to revise the standard on the basis of latest IEC: 60081/2010 in order to keep abreast with the latest development in technology.
- 0.3 This Standard is an adoption of IEC: 60081 / 2010 alongwith amendment-4 and its use is hereby acknowledged with thanks.
- 0.4 This Standard is subject to periodical review in order to keep pace with the changing requirements and latest development in the industry. Any suggestions for improvement will be recorded and placed before the revising committee in due course.
- 0.5 This Standard covers technical provisions and it does not purport to include all the necessary provision of a contract.

DOUBLE-CAPPED FLUORESCENT LAMPS – PERFORMANCE SPECIFICATIONS

1 General

1.1 Scope

This International Standard specifies the performance requirements for double-capped fluorescent lamps for general lighting service.

The requirements of this standard relate only to type testing. Conditions of compliance, including methods of statistical assessment, are under consideration

The following lamp types and modes of operation are included:

- a) lamps having preheated cathodes, designed for operation on a.c. mains frequencies with the use of a starter, and additionally operating on high frequency:
- b) lamps having preheated high-resistance cathodes, designed for operation on a.c. mains frequencies without the use of a starter (starterless), and additionally operating on high frequency;
- c) lamps having preheated low-resistance cathodes, designed for operation on a.c. mains frequencies without the use of a starter (starterless), and additionally operating on high frequency;
- d) lamps having preheated cathodes, designed for operation on high frequency;
- e) lamps having non-preheated cathodes, designed for operation on a.c. mains frequencies;
- f) lamps having non-preheated cathodes, designed for operation on high frequency.

For some of the requirements given in this standard, reference is made to "the relevant lamp data sheet". For some lamps these data sheets are contained in this standard. For other lamps, falling under the scope of this standard, the relevant data are supplied by the lamp manufacturer or responsible vendor.

1.2 Statement

It may be expected that lamps which comply with this standard will start and operate satisfactorily at voltages between 92 % and 106 % of rated supply voltage and at an ambient air temperature of between 10 °C and 50 °C, when operated with a ballast complying with IEC 60921 or IEC 60929, where relevant with a starter complying with IEC 60155 or IEC 60927, and in a luminaire complying with IEC 60598.

1.3 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(845):1987, International Electrotechnical Vocabulary (IEV) - Chapter 845: Lighting

IEC 60061-1:1969, Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps

IEC 60155:1993, Glow starters for fluorescent lamps

IEC 60598 (all parts), Luminaires

IEC 60921:1988, Ballasts for tubular fluorescent lamps - Performance requirements

IEC 60927:1996, Auxiliaries for lamps – Starting devices (other than glow starters) – Performance requirements

IEC 60929:1990, A.C. supplied electronic ballasts for tubular fluorescent lamps - Performance requirements

IEC 61049:1991, Capacitors for use in tubular fluorescent and other discharge lamp circuits – Performance requirements

IEC 61195:1993, Double-capped fluorescent lamps - Safety specifications

IEC 61231:1993, International lamp coding system (ILCOS)

1.4 Definitions

For the purpose of this International Standard, the definitions of IEC 60050(845) and the following definitions apply.

1.4.1

fluorescent lamp

discharge lamp of the low-pressure mercury type, in which most of the light is emitted by one or several layers of phosphors excited by the ultra-violet radiat on from the discharge [IEV 845-07-26, modified]

1.4.2

double-capped fluorescent lamp

fluorescent lamp having two separate caps and mostly of tubular form and linear shape

1.4.3

nominal value

approximate quantity value used to designate or identify a lamp

1.4.4

rated value

quantity value for a characteristic of a lamp for specified operating conditions. The value and the conditions are specified in this standard, or assigned by the manufacturer or responsible vendor

1.4.5

lumen maintenance

ratio of the luminous flux of a lamp at a given time in its life to its initial luminous flux, the lamp being operated under specific conditions. The ratio is generally expressed as a percentage

1.4.6

initial readings

starting characteristics of a lamp, measured before ageing, and the electrical, photometric and cathode characteristics of a lamp, measured at the end of the 100 h ageing period

1.4.7

starting aid

conductive strip affixed to the outer surface of a lamp, or a conductive plate which is spaced within an appropriate distance from the lamp. A starting aid is usually connected to earth potential, and can only be effective when it has an adequate potential difference from one end of the lamp

1.4.8

reference ballast

special ballast, either inductive for lamps for operation on a.c. mains frequencies, or resistive for lamps for operation on high frequency. It is designed for the purpose of providing comparison standards for use in testing ballasts, for the selection of reference lamps and for testing regular production lamps under standardized conditions. It is essentially characterized by the fact that, at its rated frequency, it has a stable voltage/current ratio which is relatively uninfluenced by variations in current, temperature and magnetic surroundings, as outlined in the relevant ballast standard [IEC 845-08-36, modified]

1.4.9

calibration current of a reference ballast

value of the current on which the calibration and control of the reference ballast are based

1.4.10

type test

test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard

1.4.11

type test sample

sample consisting of one or more similar units submitted by the manufacturer or responsible vendor for the purpose of a type test

1.5 Lamp requirements

1.5.1 General

A lamp, on which compliance with this standard is claimed, shall comply with the requirements of IEC 61195.

A lamp shall be so designed that its performance is reliable in normal and accepted use. In general, this can be achieved by satisfying the requirements of the following subclauses.

The requirements and information given apply to 95 % of production.

NOTE The requirements and tolerances permitted by this standard are based on submitted by the manufacturer for that purpose. In principle, this type test sample should consist of units having characteristics typical of the manufacturer's production and be as close to the production centre-point values as possible.

It may be expected with the tolerances given in the standard that products manufactured in accordance with the type test sample will comply with the standard for the majority of the production. Due to the production spread, however, it is inevitable that there will sometimes be products outside the specified tolerances. For guidance on sampling plans and procedures for inspection by attributes, see IEC 60410.

1.5.2 Caps

The dimensions of the caps on a finished lamp shall be in accordance with IEC 60061-1.

- a) For lamps with G5 or G13 caps, both pins (excluding flanges) of the two caps of a finished lamp shall pass simultaneously, freely without binding, through parallel slots, suitably spaced longitudinally to receive the lamp. The slots shall each be 2,87 mm wide for G5 caps, and 3,05 mm wide for G13 caps.
- b) For lamps with R17d caps, both cap bosses of a finished lamp shall pass simultaneously, freely without binding, through parallel slots, suitably spaced longitudinally to receive the lamp with the bottom of the slots against the boss ends. The slots shall each be 6,35 mm deep and 9,22 mm wide.

1.5.3 Dimensions

The dimensions of a lamp shall comply with the values specified on the relevant lamp data sheet.

1.5.4 Starting characteristics

A lamp shall start fully within the time specified on the relevant lamp data sheet and remain alight.

Conditions and method of test are given in Annex A.

1.5.5 Electrical and cathode characteristics

a) The initial reading of the voltage at the lamp terminals shall comply with the values specified on the relevant lamp data sheet.

NOTE 1 It may be expected that over the declared lifetime of the lamp, the lamp voltage may rise typically by 5 V to 10 V.

- b) The initial reading of the power dissipated by a lamp shall not exceed the rated wattage, specified on the relevant lamp data sheet, by more than 5 % + 0,5 W.
- NOTE 2 Cathode watts due to supplementary heating are not included in the rated lamp wattage unless otherwise stated on the lamp data sheet.
- c) For a lamp having preheated cathodes for operation on a.c. mains frequencies starterless circuits, the initial reading of the resistance of each cathode shall be not less than the minimum value specified on the relevant lamp data sheet.
- d) For a lamp having preheated cathodes for operation on high frequency, the initial reading of the resistance of each cathode shall comply with the values specified on the relevant lamp data sheet.

Conditions and method of test are given in Annex B.

1.5.6 Photometric characteristics

- a) The initial reading of the luminous flux of a lamp shall be not less than 92 % of the rated value.
- b) The initial reading of the chromaticity coordinates x and y of a lamp shall be within 5 SDCM (standard deviation of colour matching) from the rated values.

NOTE See also Annex D on chromaticity co-ordinates.

c) The initial reading of the general colour rendering index Ra of a lamp shall be not less than the rated value decreased by three.

Conditions and method of test are given in Annex B.

1.5.7 Lumen maintenance

The lumen maintenance of a lamp shall be not less than 92 % (under consideration) of the rated lumen maintenance value at any time in its life.

Conditions and method of test are given in annex C.

1.5.8 Marking

A lamp shall be marked with an identification which defines, with the aid of information made available by the manufacturer or responsible vendor, the electrical and photometric characteristics of the lamp.

1.6 Information for ballast and starter design

Refer to the relevant lamp data sheet and to annex E for information for ballast and starter design.

1.7 Information for luminaire design

Refer to annex F for information for luminaire design.

Annex A (normative)

Method of test for starting characteristics

A.1 General

Tests shall be made in a draught-free atmosphere at an ambient temperature of between 20 °C and 27 °C and a relative humidity of 65 % maximum.

Metallic parts and wires in the vicinity of the lamp, except starting aids when required, shall be avoided as far as possible.

Immediately prior to the starting test the lamps shall be kept inoperative and in an ambient temperature of between 20 °C and 27 °C and a relative humidity of 65 % maximum for a period of at least 24 h.

A.2 Lamps having preheated cathodes for operation on a.c. mains frequencies with the use of a starter

A.2.1 Test circuit

Lamps shall be tested with a 50 Hz or 60 Hz supply in the circuit shown in figure A.1.

A.2.2 Ballast

The ballast used shall be of the inductive type, unless specified otherwise on the relevant lamp data sheet, and shall comply with the requirements of IEC 60921. It shall be rated as specified on the relevant lamp data sheet. Where a capacitive circuit is specified, additionally the capacitor used shall comply with the requirements of IEC 61049.

When the ballast, at its rated voltage, is associated with a test lamp, the lamp shall dissipate a power which does not differ from its rated value by more than 4 %. A test lamp is a lamp whose voltage at lamp terminals does not deviate by more than 2 % from its rated value, when operated with its reference ballast.

The preheating current, when measured at 90 % of rated ballast voltage, shall be between 1,1 and 1,2 times the rated lamp current. To obtain a value of the preheating current within this range, it may be necessary either to make a special selection from among commercial ballasts or else to design and manufacture a ballast for this specific purpose. In some cases, it may be possible to bring the preheating current down to be within this range by adding resistance in series with the starter.

NOTE – In some cases the ballast may include an autotransformer to increase (or reduce) the voltage to the proper value for the starting and operation of the lamp. Ballasts incorporating step-up transformers are particularly likely to be used in countries where 120 V or 100 V power systems predominate.

A.2.3 Starter

The type of glow starter to be used shall comply with the requirements of IEC 60155, and shall in any case be subject to agreement with the lamp manufacturer or responsible vendor.

A.2.4 Test voltage

The test voltage applied to the circuit shall be as specified on the relevant lamp data sheet.

A.3 Lamps having preheated cathodes for operation on a.c. mains frequencies without the use of a starter (starterless)

A.3.1 Test circuit

Lamps shall be tested with a 50 Hz or 60 Hz supply in the circuit shown in figure A.2.

A.3.2 Ballast

The ballast used shall be of the inductive type, and shall comply with the requirements of IEC 60921. It shall be rated as specified on the relevant lamp data sheet.

When the ballast, at its rated voltage, is associated with a test lamp, the lamp shall dissipate a power which does not differ from its rated value by more than 4 %. A test lamp is a lamp whose voltage at lamp terminals does not deviate by more than 2 % from its rated value, when operated with its reference ballast.

NOTE 1 In some cases the ballast may include an autotransformer to increase two reduce) the voltage to the proper value for starting and operation of the lamp. Ballasts incorporating transformers are particularly likely to be used in countries where 100 V, 120 V, 200 V, 277 V or 347 V power systems predominate.

NOTE 2 The earthing of the circuit as shown in figure A.2 may make it necessary to supply it through an isolating transformer.

A.3.3 Starting aid

The starting aid, a metal plate, shall be connected to earth potential together with one lamp cathode. Its length shall be not less than that of the lamp under test and it shall be 25 mm wide for 16 mm diameter lamps and 40 mm wide for 26 mm to 38 mm diameter lamps. The distance between the surface of the lamp and the starting aid shall be as specified on the relevant lamp data sheet.

The manufacturer or responsible vendor shall specify whether or not the lamps require an external starting aid, and whether one cathode shall be connected to earth potential. For lamps not requiring a separate starting aid, the metal plate shall be removed.

A.3.4 Test voltages

The voltage of the heating circuit to be applied to the cathode terminals and the open circuit voltage at the lamp terminals for the starting test shall be as specified on the relevant lamp data sheet.

NOTE The voltages specified for the starting test are chosen primarily to secure reproducibility of test results, and are not necessarily applicable to the design of ballasts.

The voltages of the main circuit and of the heating circuits shall be applied simultaneously.

The voltage applied to the cathode heating circuits shall not be so connected as to increase the voltage of the main circuit. The two circuits shall be connected to the same phase of the supply.

The two cathode heating transformers may be replaced by one with isolated secondary windings. The transformer(s) shall be such that the voltage does not change by more than 2 % when the maximum cathode load is connected.

If the lamp does not start at the specified open circuit voltage, this voltage shall be gradually increased up to a maximum of 110 % of the test value. If the lamp still does not start, it shall be rejected. If the lamp does start, it shall be operated for 30 min at rated voltage and the normal test shall be made again after a rest period of 24 h.

A.4 Lamps having non-preheated cathodes for operation on a.c. mains frequencies

A.4.1 Test circuit

Lamps shall be tested with a 50 Hz or 60 Hz supply in the circuit shown in figure A.3.

A.4.2 Ballast

The ballast used shall be of the inductive type, and shall comply with the requirements of IEC 60921. It shall have a suitable open circuit voltage.

A.4.3 Test voltage

The open circuit voltage at the lamp terminals for the starting test shall be as specified on the relevant lamp data sheet.

NOTE - The voltage specified for the starting test is chosen primarily to secure reproducibility of test results and is not necessarily applicable to the design of ballasts.

If the lamp does not start at the specified open circuit voltage, this voltage shall be gradually increased up to a maximum of 125 % of the test value. If the lamp still does not start, it shall be rejected. If the lamp does start, it shall be operated for 30 min at rated voltage, and the normal test shall be made again after a rest period of 24 h.

A.5 Lamps for operation on high frequency

A.5.1 Test circuit

Lamps shall be tested with an a.c supply with a frequency between 20 kHz and 26 kHz, unless otherwise specified on the relevant lamp data sheet, and in the circuits shown in:

- figure A.4 for lamps with preheated cathodes;
- figure A.5 for lamps with non-preheated cathodes

NOTE - The frequency range specified for this lamp test is not necessarily applicable to the design of ballasts (see also annex E).

A.5.2 Ballast

The non-inductive ballast resistor shall be so adjusted that the high frequency lamp current is equal to the value as specified on the relevant lamp data sheet.

A.5.3 Starting aid

For lamps with preheated cathodes, the starting aid, a metal plate, shall be connected to earth potential together with one lamp cathode. Its length shall be not less than that of the lamp under test, and it shall be 25 mm wide for 16 mm diameter lamps, and 40 mm wide for 26 mm to 38 mm diameter lamps. The distance between the surface of the lamp and the starting aid shall be as specified on the relevant lamp data sheet.

The manufacturer or resposible vendor shall specify whether or not the lamps require an external starting aid, and whether one cathode shall be connected to earth potential. For lamps not requiring a separate starting aid, the metal plate shall be removed

A.5.4 Test voltage and current

For lamps with preheated cathodes, the cathode heating supplies shall be adjusted to supply a preheat current as specified on the relevant lamp data sheet. During the preheat time, specified on the relevant lamp data sheet, switch S_1 shall be kept open and switches S_2 closed. After this period of time, switches S_2 shall be opened simultaneously as switch S_1 is closed.

The open circuit voltage applied to the circuit shall be as specified on the relevant lamp data sheet.

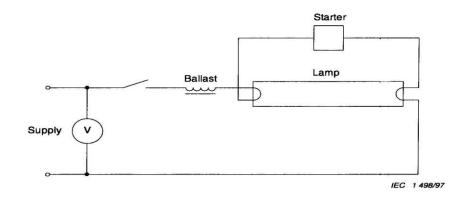


Figure A.1 – Circuit diagram for starting test for lamps for operating with starter

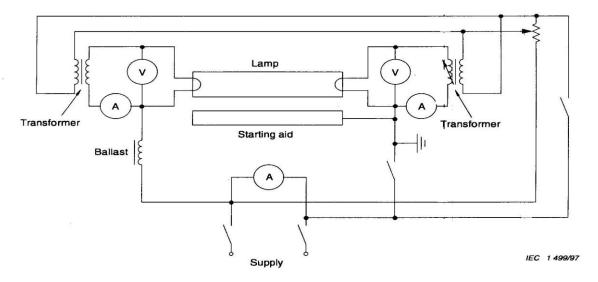


Figure A.2 – Circuit diagram for starting test for lamps with preheated cathodes for operation on starterless circuits

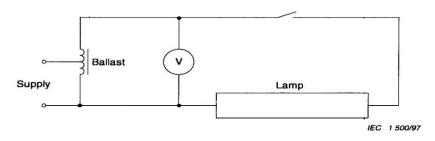


Figure A.3 – Circuit diagram for starting test for lamps with non-preheated cathodes

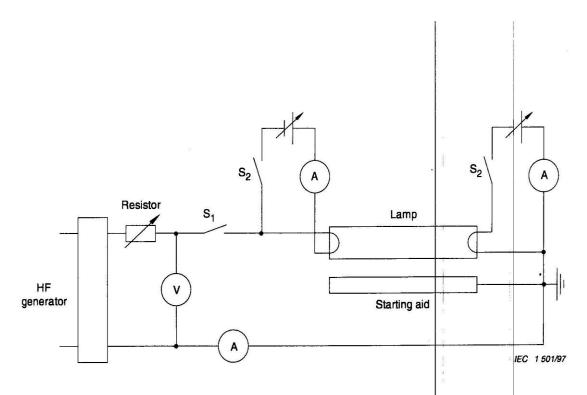


Figure A.4 – Circuit diagram for starting test for lamps with preheated cathodes for operation on high frequency

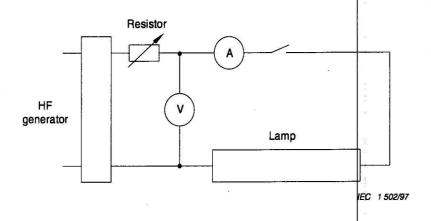


Figure A.5 – Circuit diagram for starting test for lamps with non-preheated cathodes for operation on high frequency

Annex B (normative)

Method of test for electrical, photometric and cathode characteristics

B.1 Electrical and photometric characteristics for lamps without supplementary cathode heating during operation

B.1.1 General

Photometric characteristics shall be measured in accordance with the relevant recommendations of the CIE (Commission Internationale de l'Eclairage).

Before the lamps are measured for the first time, they shall be aged for a period of 100 h of normal operation.

Measurements shall be made after a sufficient period of stabilisation of the lamp. An appropriate stabilisation time is 15 min, after the conditioning period as declared by the manufacturer or responsible vendor.

NOTE During shipping and normal handling of the lamps, e.g. rotating of the lamp, any excess amount of mercury may be distributed in small droplets within the discharge tube. Proper conditioning is reached when all the excess mercury has been collected at the coldest spot in the tube. Experience has shown that initially this process of lamp conditioning may take up to 20 h. A lamp is ready for measurement when it has passed the conditioning period.

For conditioning and pre-warming, the lamp may be operated in a location distant to the test location. When moving to the test location, provided that the lamp has been kept in the same position and not subjected to vibration or shock, and no warm glass parts are touched (i.e. creating a parasitic cold spot), a stabilisation period of 15 min to 60 min (see Table B.1) is necessary in the test location. To avoid cooling down of warm glass parts during moving the lamp to test location, thermally insulating gloves or similar technique shall be used. The interruption of the supply should be as short as possible. If deviating from the values in the Table B.1. the relevant specification of the manufacturer should be observed. See Clause B.4 for lamp conditioning and test position for 16mm tube diameter lamps.

Measurement of light output and lamp operating voltage shall be taken at least once per minute. During the final 5 min of stabilisation time, the difference of maximum and minimum readings of light output and lamp operating voltage shall be less than 1 % of the average of the readings. If this is not feasible, the real fluctuation shall be stated.

Table B.1 - Stabilisation time versus off time

Conditioning (can be part of aging)	h		:	20	
Scope		For lamps > 20 mm diameter		For lamps < 20 mm diameter	
Off time (transport to test location)	min	≤ 5	> 5	≤ 30	> 30
Stabilisation time	min	15	60	60	20 × 60

NOTE For 16 mm lamps with datasheet numbers 1020, 1030, 1040 and 1060, the stabilisation time for lamps > 20 mm is applied.

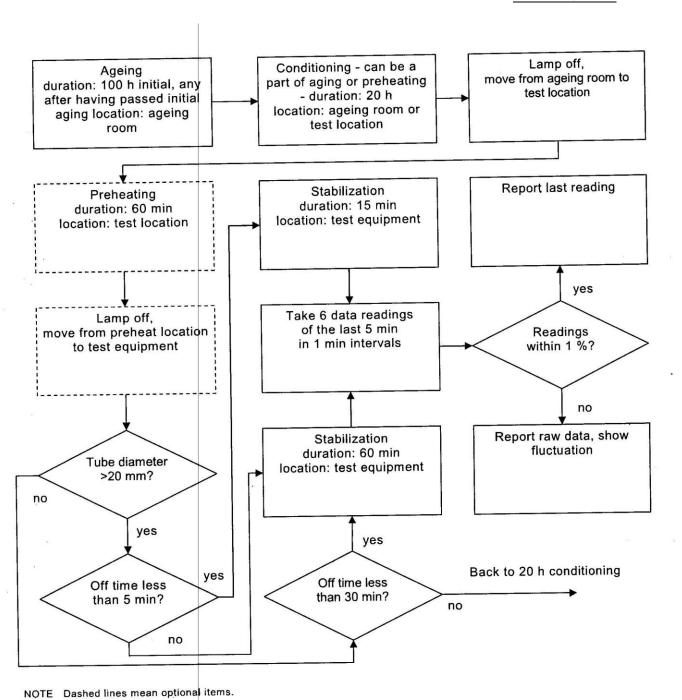
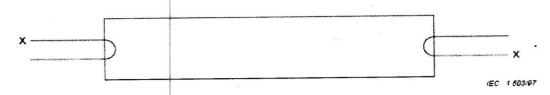


Figure B.1a - Typical flowchart of photometry test

Lamps shall be tested in a horizontal operating position.

The connections of the lamp contacts, with reference to the terminations of the ballast, shall not be changed for the whole course of the tests. For lamps having caps with two pins or contacts, by convention the following arrangement is used (where x indicates the contacts to be connected to the main circuit):



Lamps shall be tested in a draught-free atmosphere at an ambient temperature of 25 °C \pm 1 °C, unless otherwise specified on the relevant lamp data sheet.

When measuring in a suitable photometric integrator, the ambient temperature is taken to be the air temperature at the following position:

- at a distance from the bulb wall of not less than 10 % of the nominal diameter of the integrator;
- at a distance from the wall of the integrator of not less than one-sixth of the nominal diameter of the integrator;
- near the lamp axis on a level with the centre of the lamp.

A uniform temperature distribution in the integrator shall be maintained during the test. In the horizontal plane containing the lamp centre, except in the immediate vicinity of the lamp wall, a uniform temperature of ± 1 °C is required. Special care shall be taken if the integrator incorporates a heating system.

The temperature is usually measured by a thermocouple or a thermistor, both protected against radiation by a small shield.

B.1.2 Test circuit

Lamps shall be tested in the circuits shown in:

- figure B.1 for lamps having preheated cathodes;
- figure B.2 for lamps having non-preheated cathodes;
- figure B.3 for lamps for operation on high frequency.

Before making the measurements, any device used to start the lamp shall be idisconnected from the test circuit.

In the test circuit for lamps for operation on high frequency, given in figure B.3, connections shall be as short and straight as possible to avoid parasitic capacitance. The parasitic capacitance parallel to the lamp shall be less than 1 nF.

B.1.3 Ballast

Ballasts used for these tests shall be reference ballasts as specified in IEC 60921 for a.c. mains frequencies, or IEC 60929 for high frequency. The reference ballast electrical characteristics shall be as specified on the relevant lamp data sheet.

B.1.4 Supply voltage

The supply voltage shall be equal to the rated voltage of the reference ballast. During periods of stabilization, the supply voltage shall be stable within ± 0.5 %, this tolerance being reduced to 0.2 % during measurement.

For a.c. mains supplies, the frequency shall be equal to the rated frequency of the reference ballast, with a tolerance of 0,5 %. For high frequency supplies, the frequency shall be between 20 kHz and 26 kHz, unless otherwise specified on the relevant lamp data sheet.

NOTE - The frequency range specified for this lamp test is not necessarily applicable to the design of ballasts, see also annex E.

The wave shape of the supply voltage shall be a sine wave. The total harmonic content shall not exceed 3% of the fundamental (for high frequency supplies this value is under consideration). The total harmonic content is defined as the root-mean-square (r.m.s.) summation of the individual harmonic components, using the fundamental as 100 %.

NOTE – This implies that the source of supply should have sufficient power, and that the supply circuit should have a sufficiently low impedance, compared with the ballast impedance. Care should be taken that this applies under all conditions that occur during the measurement.

B.1.5 Electrical instruments

Instruments shall be of the true r.m.s. type, essentially free from waveform errors, and suitable for the frequency of operation.

The voltage measuring circuit of the instruments shall have an impedance of not less than $100\ 000\ \Omega$, and shall be disconnected when not in use. The current measuring circuit of the instruments shall have the lowest possible resistance and, if necessary, shall be short circuited when not in use.

When measuring the lamp wattage, no correction shall be made for the wattmeter consumption (the circuit connection being made on the lamp side of the current measuring circuit).

When measuring the luminous flux, the voltage measuring circuit of the voltmeter and of the wattmeter shall be open.

B.2 Electrical and photometric characteristics for lamps with supplementary cathode heating during operation

B.2.1 General

For lamps having preheated low-resistance cathodes, for operation on 60 Hz starterless circuits, the characteristics shall also be measured with supplementary cathode heating during operation.

The conditions and method of test are the same as given in B.1 except for the test circuit.

For lamps measured according to this method, the lamp power shall be considered to be the sum of the power delivered through the reference ballast (as measured in the conventional portion of the circuit) and the power used to heat the cathodes (being the power measured on the input side of the cathode heating transformers, minus the transformer losses determined as described in B.2.4).

B.2.2 Test circuit

Lamps shall be tested in the circuit shown in figure B.4.

Supply voltage A is the voltage specified for the reference ballast for the type of lamp being measured. Supply voltage B shall have separate voltage control so that it can be adjusted independently of supply voltage A. The voltage sources A and B shall come from the same supply, and shall not come from different phases of a polyphase power supply.

The primary voltage of the low voltage transformers, used to heat the lamp cathodes shall be adjustable in order that the desired output voltage may be obtained. The cathode transformers shall be so connected that their voltage subtracts from the voltage of the ballast circuit.

B.2.3 Cathode heating transformers

The two cathode heating transformers (or one transformer with two secondary windings) shall have good regulation, and have a current capacity several times the actual current required. They shall also have low losses to minimize the effect that any error in the measurement of these losses would have on the total lamp watts.

The centre value of the cathode voltage for low-resistance cathodes is 3,6 V, and it is convenient to use a regular 6,3 V filament transformer operated at a reduced primary voltage so that an output of 3,6 V is obtained.

B.2.4 Calibration of cathode heating transformer

Each cathode transformer (or pair of transformers) shall be individually calibrated to determine the power loss that will exist during normal operation.

This power will vary with the current to be supplied to the particular type of cathode involved. These loss values, however, need to be determined only once for a given transformer for each cathode type. The appropriate transformer loss can then be applied to the measurement of the various types of lamps.

It is convenient to obtain a "voltage calibration" on each transformer. This involves determining the primary voltage that must be set in order to obtain the required secondary output voltage. This calibration, although not entirely essential, makes it possible to use primary voltage settings in all routine work, thus avoiding the need for constant use of the more fragile low-range thermocouple voltmeters.

In making the calibration, each secondary winding of the transformer should be connected to a substitution resistor, having the electrical characteristics specified for the particular cathode type involved. The primary voltage should be adjusted so that the average of the two secondary voltages is 3,6 V, and the value of the primary voltage should then be recorded. It is essential that this calibration is repeated for any other cathode type with which the transformer is used.

The power loss in the transformer (core loss and E^2/R loss considered together) shall also be determined for each load condition. With the primary voltage again set so as to give the specified voltage of 3,6 V across the substitution resistors, the power input shall be read. (Since the total wattage to be read is likely to be below 10 W, a low range wattmeter shall be used). The loss in the transformer may be calculated as the wattage input reading, minus the instrument corrections, and also minus the power absorbed by the substitution resistors. This power in the resistors can be calculated as E^2/R for each of the windings.

The transformer loss is assumed to be constant for all lamps having the same cathode resistance, and no allowance is necessary for the slight differences resulting from variations in actual cathodes.

B.3 Cathode characteristics of lamps having preheated cathodes for operation on starterless circuits

B.3.1 Test circuit

Cathode resistance shall be measured using a suitable d.c. supply or a 50 Hz or 60 Hz a.c. supply.

B.3.2 Lamps for operation on a.c. mains frequencies

The voltage at the cathode terminals shall be adjusted to the value of the test voltage given on the relevant lamp data sheet, and the current shall be measured. From these, after deduction of the consumption of the voltmeter, the cathode resistance shall be getermined.

B.3.3 Lamps for operation on high frequency

The current flowing through the cathode shall be adjusted to the value of the test current given on the relevant lamp data sheet, and the supply voltage shall be measured. From these, after deduction of the voltage across the ammeter, the cathode resistance shall be determined.

B.4 Measurement procedure for the determination of the maximum luminous flux of 16 mm tube diameter lamps for operation on high frequency

B.4.1 General

This procedure applies when a requirement is given on the lamp data sheet concerning maximum luminous flux at ambient temperatures other than 25 °C. The tolerance of the ambient temperature at which the maximum luminous flux shall be obtained is given on the relevant lamp data sheet.

B.4.2 Conditioning of the lamp

The lamp shall be aged for 100 h in a vertical position. During ageing the cold chamber shall be at the lowest point. The position of the cold chamber shall be indicated by the manufacturer.

Measurements shall be made after a sufficient period of stabilization of the lamp. After stabilization, any lamp movement shall be carried out carefully with no vibration or shock and with the cold chamber always at the lowest point.

B.4.3 Absolute measurement

Apart from the conditioning procedure, the rated luminous flux measurement is performed as described in clause B.1.

B.4.4 Relative measurement

The maximum luminous flux measurement is based on a relative measurement of either luminous flux or of illuminance versus ambient temperature.

B.4.4.1 Equipment for relative measurement and operating position

A thermally insulated container of suitable shape (for example a rectangular box) and size shall be used.

Alternative: an un-insulated container, located inside a temperature-controlled chamber, i.e. "double-layer" (which allows air to circulate around the container without the presence of a draught on the lamp).

The internal temperature of the container shall be controllable within the temperature range of 20 °C to 45 °C, so that the temperature at which maximum luminous flux occurs is included.

The inner surface of the container shall be coated with a suitable material dependant upon the applied detection method (the recorded signal shall be proportional to luminous flux or illuminance in the temperature range of measurement).

The lamp shall be mounted in the centre of the container in a horizontal position. The distance between the lamp and the walls of the container shall be at least 200 mm in all directions.

NOTE If it can be shown that distances less than 200 mm give the same result, then smaller distances can be used.

Electrical connection to the lamp pins shall be made using a method which minimizes heat sinking of the lamp (for example using lamp holders with low thermal capacitance or connecting directly to the lamp pins).

The temperature within the container shall be measured at a position which is level with the centre of the lamp in the vertical plane, equidistant between the lamp ends in the horizontal plane and equidistant between the lamp and container wall.

NOTE In practice, an additional measurement point at the control point of the lamp is advised (in the vicinity of the cold chamber which determines the mercury vapour pressure).

A suitable light detector (thermally insulated and/or stabilized) shall be mounted outside the container or inside the container if its temperature dependence is known. For luminous flux measurements, the light detector shall receive light via reflection only with the direct light being blocked by a baffle. For illuminance measurements, the light detector shall receive light directly from the lamp.

The recorded signal from the detector shall be proportional to the luminous flux or the illuminance in the temperature range of measurement.

B.4.4.2 Execution of relative measurements

The lamp shall be tested in the appropriate circuit given in figure B.3. The reference ballast shall be positioned outside the container. After starting, the supply voltage of the reference ballast shall be held constant throughout the measurement.

There shall be no artificial air movement in the container. However, air ventilation is needed in order to obtain an isotropic temperature distribution.

The measurement shall start at the lowest temperature of interest. It is recommended that the rate of temperature rise in the range of 20 °C to 45 °C be less than 5 K/h.

NOTE This is required in order to achieve reproducible results with minimum measurement uncertainties.

Measurements of the luminous flux or illuminance and the ambient temperature shall be made in suitable temperature/time intervals throughout the period of measurement.

B.4.5 Translation into absolute values

Combining the absolute measurement with the relative measurements will provide a complete luminous flux versus ambient temperature profile for the lamp.

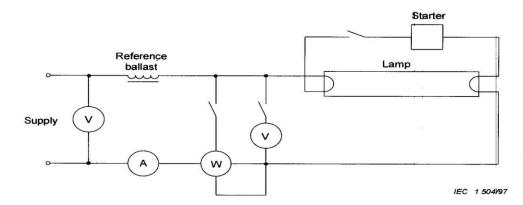


Figure B.1 – Circuit diagram for measurement of electrical and photometric characteristics for lamps with preheated cathodes

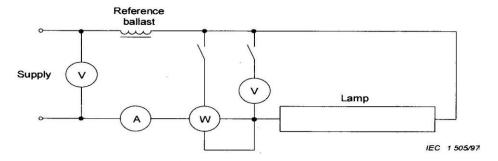


Figure B.2 – Circuit diagram for measurement of electrical and photometric characteristics for lamps with non-preheated cathodes

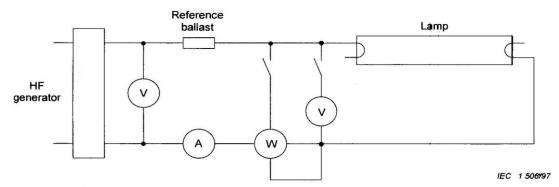


Figure B.3 – Circuit diagram for measurement of electrical and photometric characteristics for lamps for operation on high frequency

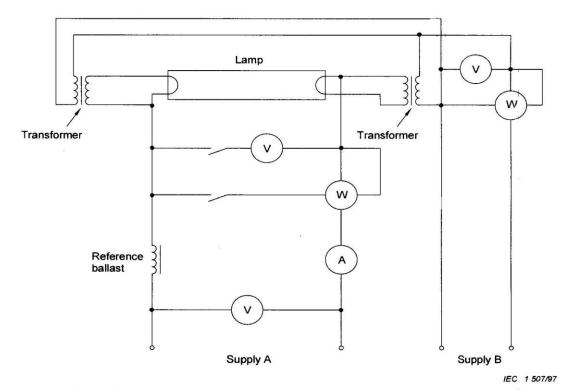


Figure B.4 – Circuit diagram for measurement of electrical and photometric characteristics for lamps with supplementary cathode heating

Annex C (normative)

Method of test for lumen maintenance and life

C.1 General

The luminous flux at a given time in the life of a lamp shall be measured as specified in Annex B.

During the life testing, lamps shall be operated as follows:

- lamps shall be operated at an ambient temperature of between 15 °C and 50 °C.
 Excessive draughts shall be avoided, and the lamps shall not be subject to extreme vibration and shock;
- lamps shall be operated in a horizontal position;
- the connections of the lamp contacts, with reference to the terminations of the ballast, shall not be changed for the whole course of the tests;
- lamps shall be operated in the circuit for which they are intended by the manufacturer;
- lamps shall be switched off for 15 min after each 2 h 45 min of operation.

NOTE 1 In North America, a cycle of 3 h on, 20 min off is used.

NOTE 2 If an additional cycle deviating from the 3 h cycle is requested, a 12 h cycle (11 h on, 1 h off) should be used.

C.2 Lamps for operation on a.c. mains frequencies

The ballast used shall comply with the requirements of IEC 60921. For capacitive circuits additionally the capacitor used shall comply with the requirements of IEC 61049.

When the ballast, at its rated voltage, is associated with a test lamp, the lamp shall dissipate a power which does not differ from its rated value by more than 4 %. A test lamp is a lamp whose voltage at lamp terminals does not deviate by more than 2 % from its rated value, when operated with its reference ballast.

NOTE The choice of the type of ballasts for these tests is left open, but the type used can have an influence on the results of the test. It is recommended that the type of ballast employed should be stated. In case of doubt, the use of an inductive type of ballast is recommended because such a type has the smallest number of parameters capable of affecting the results.

For lamps operated with a starter the preheating current, at rated supply voltage, shall not differ by more than 10 % from the rated value specified on the relevant lamp data sheet.

For lamps operated with a starter, the type of starter to be used shall comply with the requirements of IEC 60155, and shall in any case be subject to agreement with the lamp manufacturer or responsible vendor.

During the life testing, the supply voltage and frequency shall not differ by more than 2 % from the rated voltage and frequency of the ballast used.

C.3 Lamps for operation on high frequency

The ballast used shall comply with the requirements of IEC 60929.

Annex D (normative)

Chromaticity co-ordinates

D.1 General

This annex covers the standardized rated values and tolerance areas for the chromaticity coordinates x and y applying to fluorescent lamps.

For lamps with non-standardized chromaticity co-ordinates, the rated values shall be assigned by the manufacturer or responsible vendor.

NOTE – The chromaticity co-ordinates x and y are specified according to the CIE 1931 Standard Colorimetric System (see CIE Publication 15-2)¹⁾. The tolerance areas are based on the ellipses defined by D.L. MacAdam in his paper "Specification of small chromaticity differences", published in the Journal of the Optical Society of America, vol 1, No. 1, Jan. 1943, pp 18-26.

The tolerance areas are defined by MacAdam ellipses of 5 SDCM (standard deviation of colour matching). Co-ordinates 5 SDCM away from the rated values are given by the equation:

$$g_{11} \Delta x^2 + 2 g_{12} \Delta x \Delta y + g_{22} \Delta y^2 = 5^2$$

in which Δx and Δy represent the deviations with respect to the rated co-ordinates, while the coefficients g_{11} , g_{12} and g_{22} depend on these rated values. These coefficients are the basis for calculating θ , a and b, where θ is the angle between the major axis of the ellipse and the x-axis, and a and b are the major and minor semi-axes of an ellipse of 1 SDCM.

D.2 Standard chromaticity co-ordinates

For the standardized chromaticity co-ordinates the following rated values x and y apply for the different lamp "colours" (with the correlated colour temperatures T_c in kelvin given as extra information):

"Colour"	$ au_{ extsf{c}}$	x	у
F 6500	6400	0,313	0,337
F 5000	5000	0,346	0,359
F 4000	4040	0,380	0,380
F 3500	3450	0,409	0,394
F 3000	2940	0,440	0,403
F 2700	2720	0.463	0,420

For the coefficients g_{11} , g_{12} and g_{22} , the following values apply:

"Colour"	g_{11}	g ₁₂	g ₂₂
F 6500	86 × 10 ⁴	- 40 × 10 ⁴	45 × 10 ⁴
F 5000	56 × 10 ⁴	- 25 × 10 ⁴	28 × 104
F 4000	$39,5 \times 10^4$	$-21,5 \times 10^4$	26 × 104
F 3500	38 × 10 ⁴	-20×10^4	25 × 104
F 3000	79 × 104	$-19,5 \times 10^{4}$	27,5 × 104
F 2700	4 × 10 ⁴	$-18,6 \times 10^{4}$	27 × 104

For θ , a and b, the following values apply:

"Colour"	θ	а	ь
F 6500	58° 23'	0,00223	0.00095
F 5000	59° 37'	0,00274	10 00118
F 4000	54° 00'	0,00313	0.00134
F 3500	52° 58'	0,00317	0.00139
F 3000	53° 10'	0,00278	0.00136
F 2700	57° 17'	0,00258	D 00137

The tolerance areas are shown in figures D.1 to D.6, together with the rated values, a part of the black body locus, and lines of constant correlated colour temperature.

D.3 Shifted chromaticity co-ordinates

For some lamps, as specified on the relevant lamp data sheet, slightly shifted chromaticiy coordinates apply, but only for types having a general colour rendering index less than 80.

The same tolerance areas as given in D.2 shall be used, but centred on the rated values given in the following table:

"Colour"	x	у
F 6500	0,309	0,337
F 5000	0,342	0,359
F 4000	0,375	0,380
F 3500	0,403	0.394
F 3000	0,433	0.403
F 2700	-	_

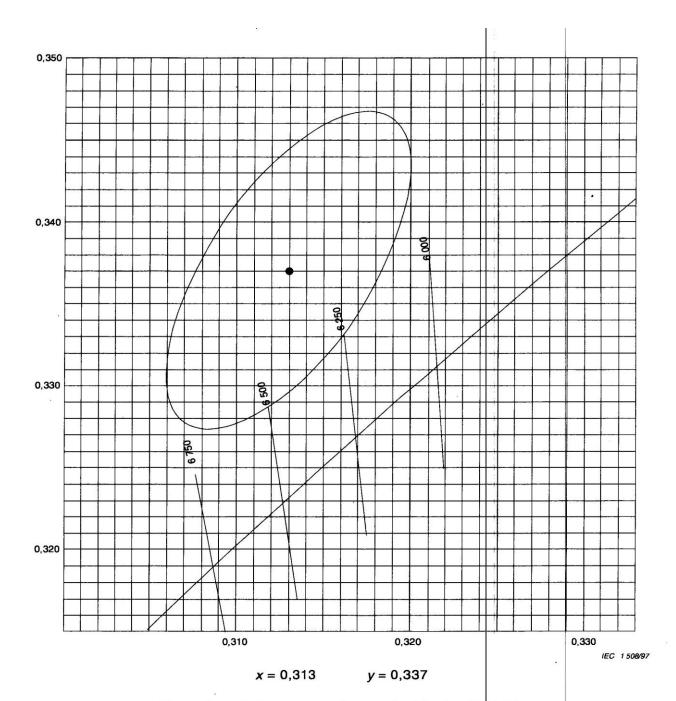


Figure D.1 – Tolerance area for standard "colour" F \$500

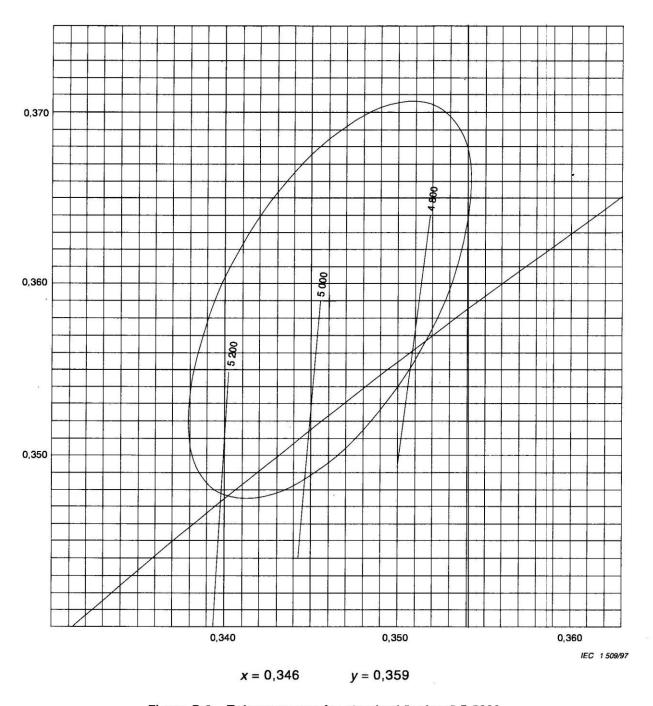


Figure D.2 - Tolerance area for standard "colour" F 5000

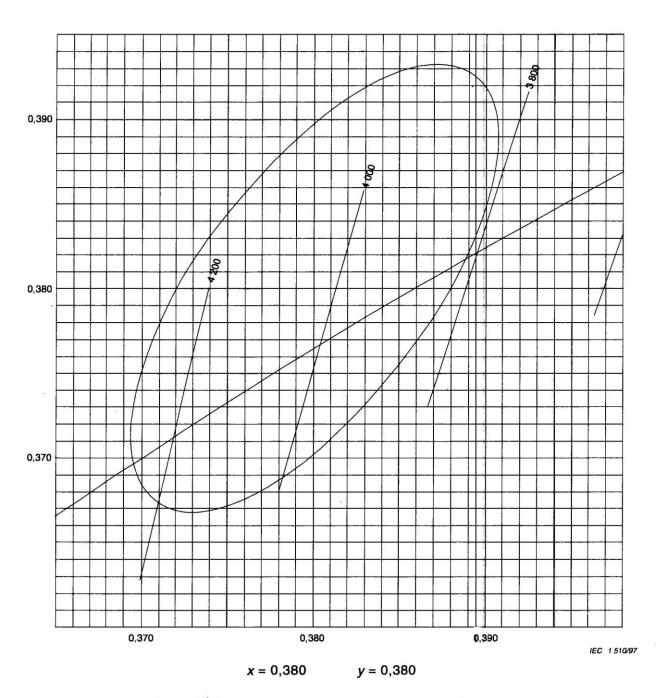


Figure D.3 - Tolerance area for standard "colour" F 4000

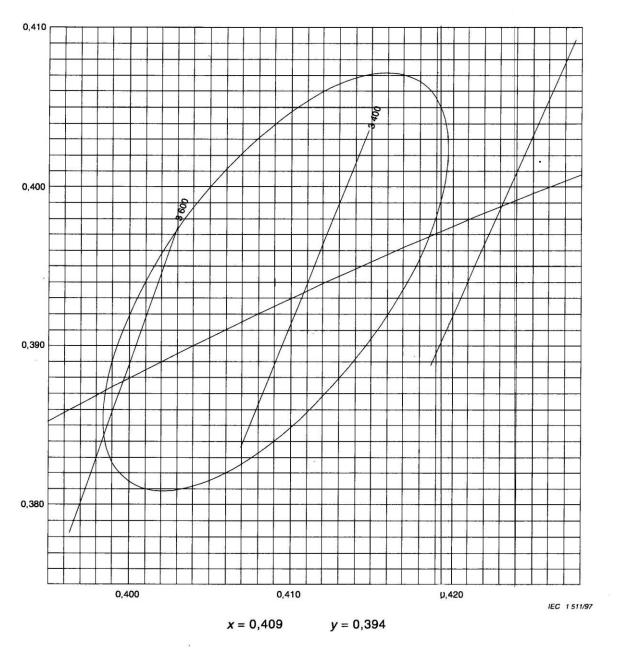


Figure D.4 - Tolerance area for standard "colour" F 3500

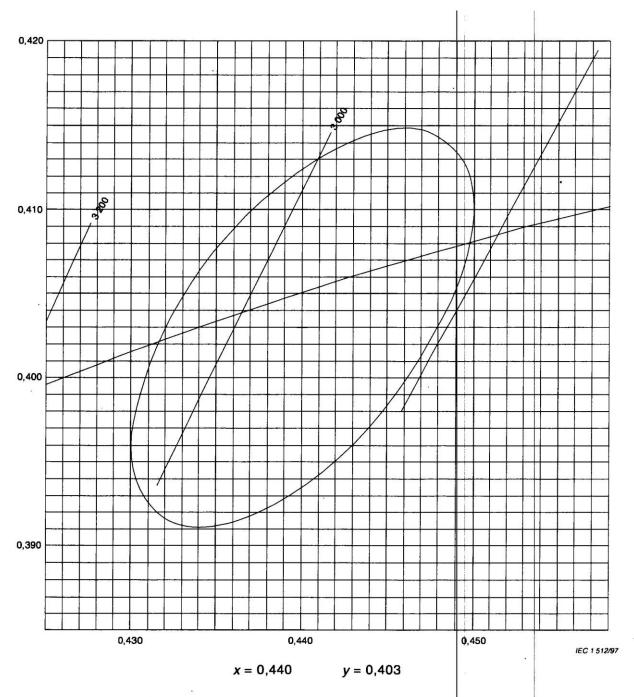


Figure D.5 - Tolerance area for standard "colour" F 3000

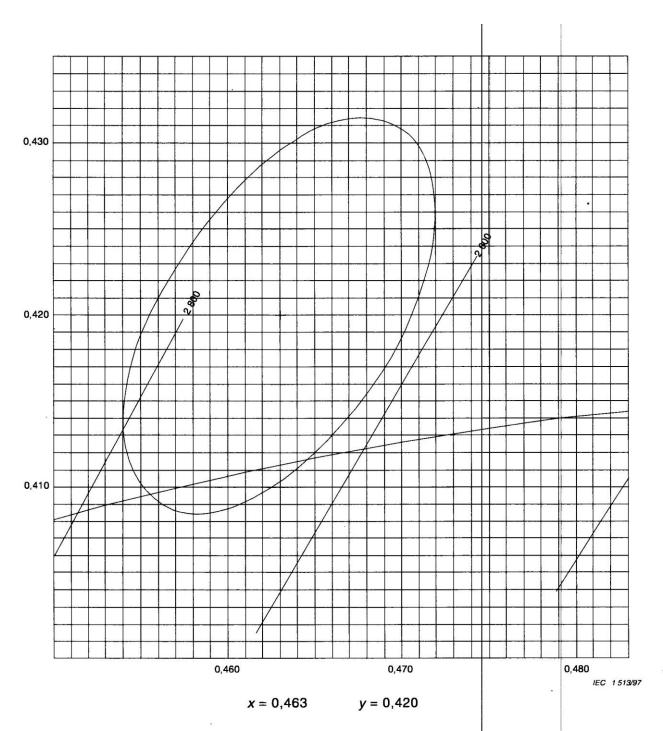


Figure D.6 – Tolerance area for standard "colour" F 2700

Annex E (informative)

Information for ballast and starter design

E.1 General

In order to safeguard proper functioning of the lamp, the relevant information, given on the lamp data sheet and in this annex, should be taken into account when designing ballasts and starters.

E.2 Prestarting conditions for high frequency operated lamps

For lamps operated on high frequency and having preheated cathodes, the requirements for proper preheating are specified on the relevant lamp data sheet. An explanation of these requirements is given in Annex D of IEC 60929 and in Annex B of IEC 60927.

For some lamps, additional information concerning high frequency non-preheat starting requirements is given on the relevant lamp data sheet.

E.3 Frequency to be used for high frequency operated lamps

For lamps designed for operation on high frequency, the lamp data sheets prescribe a frequency range for the reference ballast and for the testing of lamps (starting, electrical and photometric characteristics). This frequency range has been chosen for ease of reproducing test results and is not intended to restrict the design of high frequency ballasts, where for practical reasons a higher frequency may be appropriate.

E.4 Tolerable DC-offset during preheat

The peak-peak value of the open-circuit voltage shall be less than or equal to 2,8 times maximum r.m.s value of the open-circuit voltage for $t \le t_{\rm s}$. Narrow voltage peaks during the first half period of the mains voltage after switching on preheat shall be disregarded when testing the control gear against this sub-clause.

The DC-offset (mean value) of the open-circuit voltage shall not exceed the r.m.s. open circuit voltage for $t \le t_s$ as specified on the relevant lamp data sheet. In cases where the r.m.s. open circuit voltage for $t \le t_s$ is specified to less than 200 V, the DC-offset of the open-circuit voltage shall be less than or equal to 200 V.

Annex F (informative)

Information for luminaire design

F.1 General

In order to safeguard proper functioning of the lamp, the relevant information, given in this annex, should be taken into account when designing luminaires.

F.2 Free space

For mechanical acceptance of lamps complying with this standard, a free space should be provided in the luminaire, based on the maximum lamp dimensions specified on the relevant lamp data sheet.

F.3 Series capacitors used in capacitive circuits

An initial capacitor tolerance of 10 %, which is typical for shunt connected capacitors, is unsuitable for series capacitors. The summation of capacitor and ballast tolerances may lead to poor lamp performance, when unfavourable tolerances coincide.

In order to satisfy the requirements specified on the relevant lamp data sheets, either the capacitor tolerance should be narrow, or the capacitor and the inductive reactance component of the ballast should be selected so that unfavourable tolerances do not coincide.

F.4 Starting aid

Operation of lamps on a.c. mains or high frequency starterless circuits requires, in most cases, the presence of a conductive starting aid at earth potential. This can be a conventional part of the luminaire.

The distance between the surface of the lamp and the starting aid should not exceed the value specified for the lamp starting characteristics on the relevant lamp data sheet. In addition, a minimum distance of 3 mm should be observed.

2 Data sheets

2.1 General principles of numbering of data sheets

The first number represents the number of this standard "60081", followed by the letters "IEC".

The second number represents the data sheet number.

The third number represents the edition of the page of the data sheet. In cases where a data sheet has more than one page, it is possible for the pages to have different edition numbers, with the data sheet number remaining the same.

2.2 Diagrammatic data sheets for location of lamp dimensions

2.2.1 List of diagrammatic data sheets

60081-IEC-01 Linear-shaped lamps with G5 or G13 caps.

60081-IEC-02 Linear-shaped lamps with Fa6, Fa8, R17d caps or W4.3×8.5d.

2.3 Lamp data sheets

2.3.1 List of lamp data sheets

heet No. 60081-	Nominal wattage	Freque	ency	Nominal dimensions	Сар	Circ		Cathode type
IEC-	Wattage	Hz		mm		AC mains	High frequency	
	10 10 10	50		16 x 150	G 5	Starter		Preheated
1020	4	50 50	60 60	16 x 225	G 5	Starter	-	Preheated
1030	6 8	50	60	16 x 300	G 5	Starter	-	Preheated
1040 1060	13	50	60	16 x 525	G 5	Starter	_	Preheated
2120	15	50	60	26 x 450	G 13	Starter	Starterless	Preheated Preheated
2215*	15	50	60	26 x 550	G 13	Starter	Starterless	Preheated
2220	18	50	-	26 x 600	G 13	Starter	Starterless	Preheated
2230	20	50	60	32 x 600	G 13	Starter		Preheated
2240	20	50	60	38 x 600	G 13	Starter		Preheated
2315	25	50	- 1	38 x 970	G 13	Starter Starter	Starterless	Preheated
2320	30	50	60	26 x 900	G 13	Starter	- Otal telless	Preheated
2340	30	50	-	38 x 900	G 13	Starter	Starterless	Preheated
2420	36	50	-	26 x 1200	G 13 G 13	Starter	Starterless	Preheated
2425	38	50	-	26 x 1050	G 13	Starter	-	Preheated
2430	40	50	60	32 x 1200 38 x 1200	G 13	Starter	_	Preheated
2440	40	50	60	26 x 1500	G 13	Starter	Starterless	Preheated
2520	58	50 50	_	32 x 1500	G 13	Starter	_	Preheated
2530	65 65	50	_	38 x 1500	G 13	Starter	_	Preheated
2540	70	50	60	26 x 1800	G 13	Starter	Starterless	Preheated
2620 2640	75	50	-	38 x 1800	G 13	Starter	-	Preheated Brobested
2660*	80	50	-	38 x 1500	G 13	Starter	-	Preheated Preheated
2670*	85	50	_	38 x 1800	G 13	Starter	-	Preheated
2840	100	50	_	38 x 2400	G 13	Starter	-	Preheated
2880*	125	50	-	38 x 2400	G 13	Starter		Preheated, high resistance
3020	4	50	60	16 x 150	G 5	Starterless	=	Preheated, high resistance
3030	6	50	60	16 x 225	G 5	Starterless		Preheated, high resistance
3040	8	50	60	16 x 300	G 5	Starterless		Preheated, high resistance
4240	20	50	60	38 x 600	G 13	Starterless Starterless	-	Preheated, high resistance
4340	30	50	_	38 x 900	G 13	Starterless	i _ 1	Preheated, high resistance
4440	40	50	60	38 x 1200	G 13 G 13	Starterless	_	Preheated, high resistance
4540	65	50	-	38 x 1500 38 x 1800	G 13	Starterless	_	Preheated, high resistance
4640	75	50	_	38 x 1500	G 13	Starterless	_	Preheated, high resistance
4660*	80	50 50	_	38 x 1800	G 13	Starterless	-	Preheated, high resistance
4670*	85 125	50		38 x 2400	G 13	Starterless		Preheated, high resistance
4880	20	50	60	32 x 600	G 13	Starterless	-	Preheated, low resistance
5230 5240	20	50	60	38 x 600	G 13	Starterless	-	Preheated, low resistance
5340	30	50	60	38 x 900	G 13	Starterless	-	Preheated, low resistance
5430	40	50	60	32 x 1200	G 13	Starterless	_	Preheated, low resistance Preheated, low resistance
5440	40	50	60	38 x 1200	G 13	Starterless	-	Preheated, low resistance
5540	65	50	_	38 x 1500	G 13	Starterless	_	Preheated, low resistance
5840	85	50	-	38 x 2400	G 13	Starterless	_	Preheated, low resistance
5960	60	-	60	38 x 1200	R17d	Starterless	_	Preheated, low resistance
5970	87	-	60	38 x 1800	R17d	Starterless		Preheated, low resistance
5980	112	-	60_	38 x 2400	R17d	Starterless	Starterless	Preheated
6030	6		5 k	7 x 220	W4.3 W4.3	_	Starterless	Preheated
6040	8		5 k	7 x 320	W4.3		Starterless	Preheated
6050	11		5 k	7 x 420 7 x 520	W4.3	_	Starterless	Preheated
6060	13		5 k	16 x 550	G 5	_	Starterless	Preheated
6520	14		20 k	16 x 850	G 5	_	Starterless	Preheated
6530	21		20 k	16 x 550	G 5	_	Starterless	Preheated
6620	24		20 k	16 x 1150	G 5	-	Starterless	Preheated
6640	28		20 k	16 x 1150	G 5	_	Starterless	Preheated
6650	35		20 k	16 x 1430	G 5	_	Starterless	Preheated
6730	39		20 k	16 x 1450	G 5	_	Starterless	Preheated
6750	49		20 k	16 x 1450	G 5	_	Starterless	Preheated
6840	54	(T)	20 k	16 x 1450	G 5	_	Starterless	Preheated
6850	80		20 k	26 x 600	G 13	_	Starterless	Preheated
7220	16		20 k	26 x 1200	G 13	_	Starterless	Preheated
7420	32		20 k		G 13		Starterless	Preheated
7520	50		20 k	26 x 1500	Fa6	Starterless	-	Non-preheated
8240	20	50	-	38 x 600	Fa6	Starterless	1 -	Non-preheated
8440	40	50	-	38 x 1200	Fa6	Starterless	_	Non-preheated
8540	65	50	-	38 x 1500	Fa8	Starterless	_	Non-preheated
8640	39	-	60	38 x 1200 38 x 1800	Fa8	Starterless	_	Non-preheated
8740	57	_	60	38 x 1800	Fa8	Starterless	_	Non-preheated
8840	75			26 x 1200	Fa6	-	Starterless	Non-preheated
9420	32		20 k	26 x 1500	Fa6		Starterless	Non-preheated
9520	50	>	20 k	1 20 X 1000	1 40	122		

2.3.2 List of lamp data sheets in order of wattage

Sheet No.	Nominal	Frequency	Nominal dimensions	Сар	Circ	cuit	Cathode type
60081- IEC-	wattage W	Hz	mm		AC mains	High frequency	Cathode type
							Preheated
1020	4	50 60	16 x 150	G 5 G 5	Starter Starterless	_	Preheated, high resistance
3020	4	50 60	16 x 150 16 x 225	G 5	Starter	_	Preheated
1030	6	50 60	16 x 225	G 5	Starterless	-	Preheated, high resistance
3030	6	50 60	7 x 220	W4.3	Starteriess	Starterless	Preheated
6030	6 8	25 k 50 60	16 x 300	G 5	Starter	-	Preheated
1040	8	50 60	16 x 300	G 5	Starterless	_ 1	Preheated, high resistance
3040	8	25 k	7 x 320	W4.3	-	Starterless	Preheated
6040	11	25 k	7 x 420	W4.3	_	Starterless	Preheated
6050 1060	13	50 1 60	16 x 525	G 5	Starter	-	Preheated
6060	13	25 k	7 x 520	W4.3	-	Starterless	Preheated
6520	14	≥ 20 k	16 x 550	G 5	_	Starterless	Preheated
2120	15	50 60	26 x 450	G 13	Starter	Starterless	Preheated
2215*	15	50 60	26 x 550	G 13	Starter	Starterless	Preheated
7220	16	≥ 20 k	26 x 600	G 13	-	Starterless	Preheated
2220	18	50 -	26 x 600	G 13	Starter	Starterless	Preheated
2230	20	50 60	32 x 600	G 13	Starter	-	Preheated
2240	20	50 60	38 x 600	G 13	Starter	-	Preheated
4240	20	50 60	38 x 600	G 13	Starterless	=	Preheated, high resistance
5230	20	50 60	32 x 600	G 13	Starterless	-	Preheated, low resistance
5240	20	50 60	38 x 600	G 13	Starterless	-	Preheated, low resistance
8240	20	50 -	38 x 600	Fa6	Starterless		Non-preheated
6530	21	≥ 20 k	16 x 850	G 5	-	Starterless	Preheated
6620	24	≥ 20 k	16 x 550	G 5	-	Starterless	Preheated
2315	25	50 -	38 x 970	G 13	Starter	-	Preheated
6640	28	≥ 20 k	16 x 1150	G 5	-	Starterless	Preheated
2320	30	50 60	26 x 900	G 13	Starter	Starterless	Preheated
2340	30	50 -	38 x 900	G 13	Starter	-	Preheated
4340	30	50 -	38 x 900	G 13	Starterless	-	Preheated, high resistance
5340	30	50 60	38 x 900	G 13	Starterless	-	Preheated, low resistance
7420	32	≥ 20 k	26 x 1200	G 13	-	Starterless	Preheated
9420	32	≥ 20 k	26 x 1200	Fa6	-	Starterless	Non-preheated
6650	35	≥ 20 k	16 x 1450	G 5	-	Starterless	Preheated
2420	36	50 -	26 x 1200	G 13	Starter	Starterless	Preheated
2425	38	50 -	26 x 1050	G 13	Starter	Starterless	Preheated
6730	39	≥ 20 k	16 x 850	G 5	_	Starterless	Preheated
8640	39	- 60	38 x 1200	Fa8	Starterless	-	Non-preheated
2430	40	50 60	32 x 1200	G 13	Starter	: - :	Preheated
2440	40	50 60	38 x 1200	G 13	Starter	-	Preheated
4440	40	50 60	38 x 1200	G 13	Starterless	_	Preheated, high resistance
5430	40	50 60	32 x 1200	G 13	Starterless	-	Preheated, low resistance
5440	40	50 60	38 x 1200	G 13	Starterless	-	Preheated, low resistance
8440	40	50 -	38 x 1200	Fa6	Starterless	-	Non-preheated Preheated
6750	49	≥ 20 k	16 x 1450	G 5	-	Starterless	Preheated
7520	50	≥ 20 k	26 x 1500	G 13	-	Starterless	
9520	50	≥ 20 k	26 x 1500	Fa6	-	Starterless	Non-preheated
6840	54	≥ 20 k	16 x 1150	G 5	-	Starterless	Preheated
8740	57	- 60	38 x 1800	Fa8	Starterless	C11	Non-preheated Preheated
2520	58	50 -	26 x 1500	G 13	Starter	Starterless	Preheated, low resistance
5960	60	- 60	38 x 1200	R17d	Starterless	_	Preheated Preheated
2530	65	50 -	32 x 1500	G 13	Starter	-	Preheated
2540	65	50 -	38 x 1500	G 13	Starter		Preheated, high resistance
4540	65	50 -	38 x 1500	G 13	Starterless	_	Preheated, low resistance
5540	65	50 -	38 x 1500	G 13	Starterless	-	Non-preheated
8540	65	50 -	38 x 1500	Fa6	Starterless	Ctartariana	Preheated
2620	70	50 60	26 x 1800	G 13	Starter	Starterless	Preheated
2640	75	50 -	38 x 1800	G 13	Starter	_	Preheated, high resistant
4640	75	50 -	38 x 1800	G 13	Starterless Starterless	_	Non-preheated
8840	75	- 60	38 x 2400	Fa8		_	Preheated
2660*	80	50 -	38 x 1500	G 13	Starter Starterless	1 -	Preheated, high resistance
4660*	80	50 -	38 x 1500	G 13	Starteriess	Starterless	Preheated
6850	80	≥ 20 k	16 x 1450	G 5	Stortor	Granteness	Preheated
2670*	85	50 -	38 x 1800	G 13	Starter		Preheated, high resistant
4670*	85	50 -	38 x 1800	G 13	Starterless	_	Preheated, low resistance
5840	85	50 -	38 x 2400	G 13	Starterless	-	Preheated, low resistance
5970	87	- 60	38 x 1800	R17d	Starterless	1 -	Preheated Preheated
2840	100	50 -	38 x 2400	G 13	Starter Starterless	_	Preheated, low resistanc
5980	112	- 60	38 x 2400	R17d	Starter	_	Preheated
2880*	125	50 -	38 x 2400 38 x 2400	G 13	Starterless	I	Preheated, high resistance
4880	125						

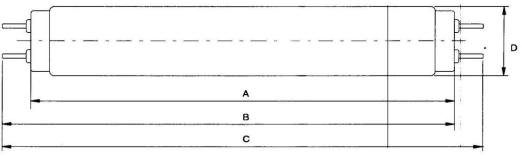
PS: 292/2012

DOUBLE-CAPPED FLUORESCENT LAMPS DIAGRAMMATIC DATA SHEET FOR LOCATION OF LAMP DIMENSIONS

Linear-shapeo

These drawings are intended only to indicate dimensions to be controlled and are to be used in conjunction with the relevant lamp standard sheets

G5 cap (see sheet 7004-52 of IEC 60061-1) G13 cap (see sheet 7004-51 of IEC 60061-1)



IEC 1514/97

For lamps with G5 and G13 caps

The values for dimensions A, B and C are derived from a basic value, designated X

A = cap face to cap face

 $A_{max} = X$

B = cap face to end of opposite pins

 $B_{max} = X + 7,1 mm$

 $B_{min} = X + 4.7 \text{ mm}$ (in some countries, $B_{min} = X + 4.6 \text{ mm}$)

C = overall length of the lamp between pin ends

 $C_{\text{max}} = X + (2 \times 7,1) = X + 14,2 \text{ mm}$

 C_{min} = not specified

The dimensions given on the lamp data sheets comply with the above system.

NOTE 1 - When converting the thus calculated values to inches it is obvious that the consistency between the rounded off converted values is lost.

NOTE 2 – In some instances, the dimensions in national specifications differ sughtly from those in the data sheets. Because these specifications are well established, it is not intended that they should be changed. The dimensions in the data sheets are quoted as a desirable objective.

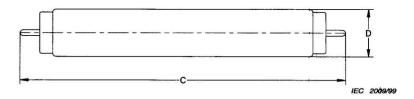
NOTE 3 – Original USA types are sometimes designated by the nominal overall length in inches of the lamp assembled in two lampholders, each 5/16 inch thick for G5 caps and 3/8 inch thick for G13 caps.

DOUBLE-CAPPED FLUORESCENT LAMPS DIAGRAMMATIC DATA SHEET FOR LOCATION OF LAMP DIMENSIONS

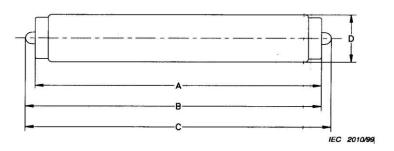
Linear-shaped

These drawings are intended only to indicate dimensions to be controlled and are to be used in conjunction with the relevant lamp standard sheets

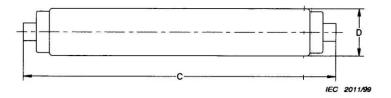
Fa6 cap (see sheet 7004-55 of IEC 60061-1)

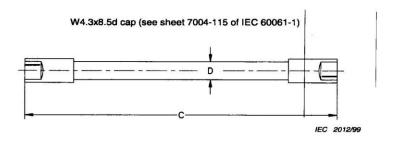


Fa8 cap (see sheet 7004-57 of IEC 60061-1)



R17d cap (see sheet 7004-56 of IEC 60061-1)





Texte français au verso French text overleaf

60081-IEC-02-2

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-4-E-G5-16/150 Nominal dimensions Nominal wattage Circuit Cathode Cap mm W 4 With starter Preheated G5 16 × 150 **Dimensions** mm В C D A Max. Max. Max. Min. Max. 150,1 16,0 135,9 140,6 143,0 Starting characteristics Frequency Ballast rated voltage Test voltage (r.m.s.) Starting time ٧ Hz 110/120 103,5 30 50 103,5 60 110/120 30 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated amp Rated preheat current current Hz W Rated Minimum Maximum Α 0,205 50 4,5 24 34 0,170 29 0,205 4,5 29 24 34 0,170 60 Chromaticity co-ordinates: see D.2, Annex D. **Cathode characteristics** Test current Resistance of each cathode Ω Α Maximum Rated Minimum 60 100 80 0,110 NOTE In Japan, the rated resistance of each cathode is 90 Ω and maximum is 120 Ω .. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-1020-2

Page 2

ILCOS: FD-4-E-G5-16/150

Reference ballast characteristics									
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto				
Hz	w	V	Α	Ω					
50	6	127	0,160	700	0,12				
60	6	118	0,160	650	0,075				

Information for	or ballast desig	j n			
Frequency		1	Hz	50	60
Preheat cathode current	A Min.			0,144	0,144
		Max.		0,275	0,275
Open circuit voltage across starter	v	Min. (r.m.s	.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peal	k)	400	400
Substitution resistor for both cathodes in series			Ω	140	140
Voltage across starter with lamp operating	V	Max. (r.m.s	.)	68	68

Information t	for starter design
Pulse voltage	Non-reclosure voltage
v	V
Minimum	Maximum
250	70

Texte français au verso French text overleaf

60081-IEC-1020-1

DOUBLE-CAPPED FLUORESCENT LAMP

			DATA S	HEET	*					Page 3
									ILCOS: FD	-4-E-G5-16/150
٠	li li	nformatio	n for high freq	uency ba	llast de	sign				
		Tv	pical lamp ch	aracterist	ics			+		
Frequency	Nomi	nal wattag			wattag	je		1	Lamp vo	Itage
kHz		w		100-03-00-0	w				V	
20 - 26		4			3,6				24	
Frequency						()			kHz	≥ 20
			Normal op	eration		2 16 11	0.000			
Lamp appeting aurent					-1-21		^	П	Min.	0,090
Lamp operating current	mp operating current I _D A						Π	Мах.	0,180	
Current in any lead to catho	des						Α		Мах.	0,190
			Dimming o	peration						
Lamp operating current		I _D					Α		Min.	0,015
									Max.	0,090
Minimum sum of squares le	ad currents		$^{2} = X_{1} - Y_{1} I_{D}$				A ²	X ₁	A ²	0,022
Target sum of squares lead	currents	/LH2 + /LL	$^2 = X_1 - 0.3 Y_1$	I _D				Y ₁	A	0,205
Maximum sum of squares le	ead currents	/LH2 + /LL	$^{2} = X_{2} - Y_{2} I_{D}$				A ²	X ₂	A ²	0,030
								Y ₂	A	-0,050
Current in any lead to catho	des	<i>I</i> LH					A	-	Nax.	0,190
		<i>/</i> LL					Α	-	Max.	0,120
Substitution resistor for each	h cathode for te	esting dimr	ming requireme	ents				RTest	200000	80
				1				RTest	Ω	90
				n =	10 %	R ₁₀	Ω	Min. Max.		1 500 1 800
Lamp substitution resistor a	t n % of the tes	t current			30 %	R ₃₀		Nomi		510
					60 %	R ₆₀	Ω	Nomi	-	240
										
Starti	ng requiremen	its with ca	athode prehea	ting, for s	tarting	times	0,4 s	-		1.0
Minimum cathode preheat e	energy	$E_{\min} = Q$	min + Pmin ts				J		min (J)	1,0
Voltage across each cathod	lo for E(t) < E						V		(r.m.s.)	0,7
Substitution resistor for each		-	imum cathode	nreheat re	quirem	ente	_	IVIA	Ω	50
			- 4 - 222	F. 0.1.00k TC	400111			O	max (J)	1,5
Maximum cathode preheat	energy	$E_{\text{max}} = C$	$P_{\text{max}} + P_{\text{max}} t_{\text{s}}$				J		nax (W)	1,1
Substitution resistor for each	h cathode, for t	esting max	kimum cathode	preheat r	equirem	ents			Ω	65
			Non-ignition		T	t ≤ t _s		Ma	(r.m.s.)	90
Open circuit voltage across	lamp	V	1		t >	t _s (+10 °	°C)	Mir	.(r.m.s.)	160
(with starting aid)			Ignition volta	ge	_	t _s (-15 °		Min	.(r.m.s.)	220
Substitution resistor range for	or each cathode	e, for testir	ng open circuit	voltage re	quireme	ents			Ω	50150
exte français au verso ench text overleaf		200	60081-IEC-	1020-1						Publication CEI 6008 IEC Publication 6008

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-6-E-G5-16/225 Nominal dimensions Cap Cathode Nominal wattage Circuit mm G5 16 × 225 Preheated 6 With starter Dimensions mm D В C Α Max. Max. Min. Max. Max. 16,0 219,2 226,3 216,8 212,1 Starting characteristics Starting time Ballast rated voltage Test voltage (r.m.s.) Frequency V V Hz 30 110/120 103,5 50 30 103,5 60 110/120 **Electrical characteristics** Rated lamp Rated preheat Voltage (r.m.s.) at lamp terminals Rated wattage Frequency current current A Maximum Minimum W Rated Hz 0,205 0,160 36 48 42 50 6 0,160 0,205 48 6 42 36 60 Chromaticity co-ordinates: see D.2, Annex D. Cathode characteristics Resistance of each cathode Test current Ω Α Maximum Rated Minimum 100 60 80 0,110 NOTE In Japan, the rated resistance of each cathode is 90 Ω and maximum is 120 $\Omega.$ Publication CEI 60081 IEC Publication 60081 60081-IEC-1030-2 Texte français au verso French text overleaf

Page 2

ILCOS: FD-6-E-G5-16/225

		Reference bal	last characteristics		
Frequency	Nominal wattage	age Rated voltage Calibration current		Voltage/current ratio	Power factor
Hz	w	V	A	Ω	02.5
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

Information for	r ballast desig	gn			
Frequency		ŀ	Iz	50	60
Preheat cathode current	A Min.			0,144	0,144
	0.00	Max.		0,275	0,275
Open circuit voltage across starter	V	Min. (r.m.s	.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series			Ω	140	140
Voltage across starter with lamp operating	V	Max. (r.m.s	.)	68	68

Information	for starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
250	70

	DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET								Page 3
							ILC	DS : FD-6	-E-G5-16/225
	Information f	or high frequ	ency ballas	st des	ign				
	7	cal lamp cha	ractoristics			-	_	-	
	Nominal wattage	cai tamp cha	Rated w		. 1		L	amp volta	ige
Frequency	W W	1	W					V	
kHz 20 - 26	6		5,4			-		36	
. 20-20									
requency								kHz	≥ 20
		Normal ope	ration						
_amp operating current	I _D					1	Mir		0,090
-amp operating current	Ü					+	Ma		0,180
Current in any lead to cathod	rent in any lead to cathodes							×. _	0,190
		Dimming op	eration			_	Mir	-	0,015
Lamp operating current	I _D					\			0,090
						+	Ma	X. A ²	0,022
Minimum sum of squares le		$= X_1 - Y_1 I_D$	9		A	2	X1	A	0,205
Target sum of squares lead	currents /LH* + /LL*	$= X_1 - 0.3 Y_1$	/D			+	X ₂	A ²	0,030
Maximum sum of squares le	ead currents $I_{LH}^2 + I_{LL}^2$	$= X_2 - Y_2 I_D$			A	2	¥2	A	-0,050
						1	Ma		0,190
Current in any lead to catho	des /LH						Ma		0,120
	<u> </u>			100			RTest1	Ω	80
Substitution resistor for eac	h cathode for testing dimm	ing requireme	nts				RTest2	Ω	90
						T	Min.		2 400
			10) %	R ₁₀	2	Max.		3 000
Lamp substitution resistor a	t n % of the test current		n =) %	R ₃₀	2	Nomina		820
			- 60) %	R ₆₀	2	Nomina	1	360
	ng requirements with car			and long	times 0.4		1 < 30		-
Starti	ng requirements with car	tnode prenea	ung, ioi su	arting	times 0,4	T		(J)	1,0
Minimum cathode preheat	energy $E_{min} = Q_{m}$	$n_{\text{in}} + P_{\text{min}} t_{\text{s}}$				J	Pmin		0,7
Voltage across each cathod	do for E(t) < E					v	Max.(r.m.s.)		11
Substitution resistor for each		mum cathode	preheat rec	uirem	ents		- - `	Ω	50
Substitution resistor for eac						. 1	Q _{ma}	x (J)	1,5
Maximum cathode preheat	energy $E_{max} = Q_0$	$_{\max} + P_{\max} t_{s}$				J		(W)	1,1
Substitution resistor for each	ch cathode, for testing max	imum cathode	preheat re	quirem	ents			Ω	65
		Non-ignition		1	t ≤ t _s		Max.(r.m.s.)	100
Open circuit voltage across	s lamp V			t>	t _s (+10 °C)	Min.(ı	.m.s.)	185
(with starting aid)		Ignition volta	age	t>	t _s (-15 °C		Min.(ı	.m.s.)	250
Substitution resistor range	for each cathode, for testing	ng open circuit	voltage rec					Ω	50150
				· · · · · ·					
									Publication CEI 66

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 DATA SHEET ILCOS: FD-8-E-G5-16/300 Nominal dimensions Cap Cathode Circuit Nominal wattage mm G5 16 × 300 Preheated With starter 8 **Dimensions** mm D С В Α Max. Max. Max. Min. Max. 16,0 302,5 295,4 293,0 288,3 Starting characteristics Starting time Test voltage (r.m.s.) Ballast rated voltage Frequency V Hz 30 103,5 110/120 50 30 110/120 103,5 60 Electrical characteristics Rated preheat Rated lamp Voltage (r.m.s.) at lamp terminals Rated wattage Frequency current current Maximum A Rated Minimum W Hz 0,145 0,205 56 48 7,1 50 0,205 0,145 48 64 57 60 7,2 Chromaticity co-ordinates: see D.2, Annex D. Cathode characteristics Resistance of each cathode Test current Ω Maximum Minimum Rated 100 80 0,110 NOTE In Japan the minimum resistance of each cathode is 50 Ω and maximum is 110 $\Omega.$ Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-1040-2

Page 2

ILCOS: FD-8-E-G5-16/300

Reference ballast characteristics									
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor				
Hz	w	V	A	Ω					
50	6	127	0,160	700	0,12				
60	6	118	0,160	650	0,075				

Information for	ballast desig	gn	3		
Frequency			Hz	50	60
Preheat cathode current	A Min.			0,144	0,144
	1.00	Max.		0,275	0,275
Open circuit voltage across starter	V	Min. (r.m.s	.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peal	k)	400	400
Substitution resistor for both cathodes in series			Ω	140	140
Voltage across starter with lamp operating	٧	Max. (r.m.s)	68	68

Information for starter design					
Pulse voltage	Non-reclosure voltage				
V	V				
Minimum	Maximum				
250	70				

		DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET						Page 3			
end .									ILCOS:	FD-8	3-E-G5-16/300
		Information	for high frequ	ency ba	llast de	sign		_			
		Tym	ical lamp cha	racterist	ics	-	\vdash	_		<u> </u>	
Frequenc	No.	Nominal wattage Rated wattage			╽	_	Lamp	volta	age		
kHz	,	W			w			1 142900011170		V	
20 - 26		8 7,5								50	
							_			-	
requency							↓_		kl-	z	≥ 20
			Normal ope	ration			\vdash		Min.	Т	0,090
amp operating	current	l _D					A		Max.	+	0,180
Current in any le	ad to cathodos						A		Max.	+	0,190
Jurrent in any le	au to cathodes		Dimming op	eration			۲			-	
			g op				ŢΠ		Min.	TT	0,015
amp operating	current	ID				9	^		Max.		0,090
Minimum sum of	squares lead currents	/LH2 + /LL2	$= X_1 - Y_1 I_D$				A ²	>	(1	A ²	0,022
	uares lead currents	/LH2 + /LL2	$= X_1 - 0.3 Y_1$	ю)	1	Α	0,205
	ftood currents	1 2 1 1 2	= X ₂ - Y ₂ I _D				A ²	>	2	A ²	0,030
waximum sum o	f squares lead currents	ווא דיונ	- /2 - 12 /0				Ш		2	Α	-0,050
Current in any le	ad to cathodes	I _{LH}					A		Max.	\sqcup	0,190
		<i>I</i> LL					A .	_	Max.		0,120
Substitution resi	stor for each cathode fo	r testing dimm	ing requireme	nts			-		est1	Ω	90
	- Leve	***		T		T	+	Mi	est2	Ω	3 300
			10 %		% R ₁₀			ıx.	+	5 100	
Lamp substitutio	n resistor at n % of the	test current	n = 30 %	R ₃₀	h		minal		1 200		
				-	60 %	R ₆₀	Ω		minal	\vdash	560
				<u> </u>							
	Starting requiren	nents with ca	tnode prehea	ung, for	starting	times 0,	4 \$	≺ ls	< 3,0 s Q _{min} (J)	Т	1,0
Minimum cathod	le preheat energy	$E_{\min} = Q_{n}$	nin + P _{min} t _s				J		P _{min} (W)	+	0,7
Voltage acress	each cathode for E(t) <	Fla					V	٨	fax.(r.m.s		11
	stor for each cathode, f		mum cathode	preheat	requiren	nents	٢		,	Ω	50
· · · · · · · · · · · · · · · · · · ·					•				Q _{max} (J)		1,5
Maximum catho	de preheat energy	$E_{\text{max}} = Q$	max + P _{max} t _s				J		P _{max} (W)		1,1
Substitution resi	stor for each cathode, f	or testing max	imum cathode	preheat	require	ments				Ω	65
		Non-ignition voltage $t \le t_s$				N	lax.(r.m.s	.)	100		
Open circuit volt (with starting aid	age across lamp	V	Ignition volta	ne .	t >	> t _s (+10 °C	3)	1	/lin.(r.m.s	.)	200
(with starting all			igrittori volta	90	t:	> t _s (-15 °C		_ '	/lin.(r.m.s)	280
Substitution resi	stor range for each cath	node, for testin	ig open circuit	voltage r	equiren	nents	-			Ω	50150
xte français au verso	211		60081-IEC-	-1040-1							Publication CEI 60081 IEC Publication 60081

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 DATA SHEET ILCOS: FD-13-E-G5-16/525 Nominal dimensions Cap Cathode Circuit Nominal wattage mm W 16 × 525 G5 Preheated With starter 13 Dimensions mm D C В Max. Max. Max. Min. Max. 16,0 531,1 524,0 521,6 516,9 Starting characteristics Starting time Test voltage (r.m.s.) Ballast rated voltage Frequency s Hz 30 198 220 50 30 198 220 60 Electrical characteristics Rated preheat Rated lamp Voltage (r.m.s.) at lamp terminals Rated wattage Frequency current current Maximum Minimum Rated W Hz 0,225 0,165 85 105 95 13 50 0,225 ,165 * 95 13 60 Chromaticity co-ordinates: see D.2, Annex D. Cathode characteristics Resistance of each cathode Test current Ω Α Maximum Minimum Rated 100 60 80 0,110 * Under consideration Publication CEI 60081 IEC Publication 60081 60081-IEC-1060-2 Texte français au verso French text overleaf

Page 2

ILCOS: FD-13-E-G5-16/525

		Reference bal	last characteristics		17 17 902207
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	13	220	0,165	1070	0,12
60	13	236	0,165	1200	0,075

Information for balla	st desig	n			
Frequency			1z	50	60
Preheat cathode current	Α	Min.		0,146	0,146
		Max.		0,297	0,297
Open circuit voltage across starter	٧	Min. (r.m.s	.)	198	198
Open circuit voltage across lamp	٧	Max. (peal	()	400	400
Substitution resistor for both cathodes in series			Ω	140	140
Voltage across starter with lamp operating	V	Max. (r.m.s	i.)	128	128

Information f	or starter design
Pulse voltage	Non-reclosure voltage
V	v
Minimum	Maximum
400	140

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-13-E-G5-16/525 Information for high frequency ballast design Typical lamp characteristics Nominal wattage Rated wattage Lamp voltage Frequency W V W kHz 20 - 26 13 12,8 85 kHz ≥ 20 Frequency **Normal operation** 0,090 Min. Lamp operating current 1_D Max. 0,180 Max. 0,190 Current in any lead to cathodes **Dimming operation** Min. 0,015 Lamp operating current 0,090 Max. $I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$ 0,022 Minimum sum of squares lead currents $I_{LH}^2 + I_{LL}^2 = X_1 - 0.3 Y_1 I_D$ 0,205 Target sum of squares lead currents A² 0,030 $I_{LH}^2 + I_{LL}^2 = X_2 - Y_2 I_D$ Maximum sum of squares lead currents -0,050 0,190 Max. **I**LH Current in any lead to cathodes 0,120 Max. 80 RT st1 Ω Substitution resistor for each cathode for testing dimming requirements RT st2 90 Ω Min 6 200 10 % R₁₀ Max. 9 100 Lamp substitution resistor at n % of the test current n= 30 % Nominal 2 200 R₃₀ 60 % Nominal 1 000 R₆₀ Starting requirements with cathode preheating, for starting times $0.4 \text{ s} < t_s < 3.0 \text{ s}$ Q_{min} (J) 1,0 Minimum cathode preheat energy $E_{\min} = Q_{\min} + P_{\min} t_{s}$ 0,7 P_{min} (W) 11 Max.(r.m.s.) Voltage across each cathode for $E(t) < E_{min}$ 50 Substitution resistor for each cathode, for testing minimum cathode preheat requirements 1,5 Q_{max} (J) Maximum cathode preheat energy $E_{\text{max}} = Q_{\text{max}} + P_{\text{max}} t_{\text{s}}$ P_{max} (W) 1,1 65 Substitution resistor for each cathode, for testing maximum cathode preheat requirements Ω Non-ignition voltage Max.(r.m.s.) 120 $t \leq t_s$ Open circuit voltage across lamp 230 $t > t_{\rm s} \ (+10 \ ^{\circ}{\rm C})$ Min.(r.m.s.) (with starting aid) Ignition voltage Min.(r.m.s.) 330 $t > t_{\rm s} \ (-15 \ ^{\circ}{\rm C})$ Substitution resistor range for each cathode, for testing open circuit voltage requirements 50.....150 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-1060-1

Page 1

ILCOS: FD-15-E-G13-26/450

	20 9
4	mm
eated G13	26 × 450
•	eated G13

		Dimensions		
		mm		a'.
Α	В		С	D
Max.	Min.	Max.	Max.	Max.
437,4	442,1	444,5	451,6	28,0

	Starting cha	aracteristics	
Frequency	Ballast rated voltage	Test voltage (r.m.s.)	Starting time
Hz	V	v	s
50	110/120	103,5	30
60	110/120	103,5	30

		Ele	ctrical characteris	tics		
Frequency	Rated wattage	Voltage	(r.m.s.) at lamp t	Rated lamp current	Rated prehea current	
Hz	w	Rated	Minimum	Maximum	A	A
50	15	55	46	64	0,310	0,440
60	15	55	46	64	0,305	0,550

Chromaticity co-ordinates: see D.2, annex D.

Page 2

ILCO\$: FD-15-E-G13-26/450

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	15	127	0,310	325	0,12
60	15	118	0,300	305	0,075

Information f	or ballast desig	g n			
Frequency	3000		Hz	50	60
Preheat cathode current	Α	Min.		0,280	0,280
	A STANDARD SEE SON MARKED SEE	Max.		0,650	0,650
Open circuit voltage across starter	V	Min. (r.m.	.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (pea	k)	400	400
Substitution resistor for both cathodes in series	PAG- 10 PAGE 10 TO		Ω	50	50
Voltage across starter with lamp operating	V	Max. (r.m.	s.)	68	68

Information f	for starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
250	70

Texte français au verso French text overleaf

60081-IEC-2120-1

DATA SHEET

Page 3

	DATA	SHEET					Page 3
		•		J	LCOS	: FD-1	5-E-G13-26/4
	Information for high f	requency ballast design	gn				
					-		
	Typical lamp	characteristics					
Frequency	Lamp wattage	Lamp voltage	•	Τ	L	amp cur	rrent
kHz	w	V				Α	
≥ 20	13,5	45				0,310)
Current in any lead to	cathodes		A		Max.		*
Lamp operating curre	ent	*****	A	<u> </u>	Min.		•
					Мах.		*
1		olled preheating		г —			
Minimum preheat cur $i_k = (a/t_e + i_m^2)^{0.5}$	rent i_{k} (A) to emission time t_{e} (s)				а		0,130
					i _m (A)		0,260
Maximum preheat cur	rrent	Α	t:	≤ 0,4			1,400
	,		0,4 <	t < 2	2,0	1,580	0 - 0,450 <i>t</i>
			t :	≥ 2,0		0	0,680
Open circuit voltage a	across lamp	V	t ≤ 1	e	Max.	(r.m.s.)	*
			t > 1	e	Min.	(r.m.s.)	*
Voltage to starting aid	1	V	t≤i	e	Max.	(peak)	*
			t > 1	e	Min.	(peak)	*
Substitution resistor f	or each cathode		Ĭ,			Ω	12,5*
	Voltage contr	olled preheating					
	Without	preheating		7.000000000000000000000000000000000000			
Open circuit voltage a	across lamp			٧	Min.	(r.m.s.)	*
Current through lamp	substitution resistor			Α	٨	lin.	*
Lamp substitution res	istor					Ω	*
Substitution resistor f	or each cathode	****	-			Ω	*
Cathode current		***		<u> </u>	N	ax.	
* Under consideratio	n	F-10-12-1				0.000 000 000	
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		DOUBLE-CAPPE	D FLUORESC	ENT LAM	P			Page 1
							ILCOS:	FD-15-E-G13-26/550
Nominal w	attage	Circuit	Ca	thode		Сар	inal dimensions mm	
15		With starter	Pre	heated		G13		26 × 550
			Dimensions	1			•	
			mm					
A		В			-	С		D Max.
Max.		Min.	Max.			Max.		28,0
549,0		553,7	556,1			63,2	. 1	26,0
		Star	ting characteristics					
Freque		Ballast rated voltage V	Test	voltage (r.m.s V)			ng time s
50		110		103,5	-	_		30
. 60								
1990								
		Elec	trical characteristics					
Frequency	Rated wattag	ye Voltag	ge (r.m.s.) at lamp te	minals		Rate	d lamp rrent	Rated preheat current
Hz	l w	Rated	Minimum	Maxim	um		Α	A
50	15	57	50	64		0	300	0,450
60	_	-	_	-			-	-
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DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-15-E-G13-26/550 Reference ballast characteristics Rated voltage Calibration current Voltage/current ratio Power factor Frequency Nominal wattage Hz W A Ω 50 15 127 0,300 327 0,10 60 Information for ballast design Frequency 0,270 Preheat cathode current Min. 0,630 Max. Open circuit voltage across starter Min. (r.m.s.) 103,5 Open circuit voltage across lamp Max. (peak) 400 50 Substitution resistor for both cathodes in series Voltage across starter with lamp operating Max. (r.m.s.) 68 Information for starter design Puise voltage Non-reclosure voltage Minimum Maximum 800 70 Publication CEI 60081 IEC Publication 60081 60081-IEC-2215-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-15-E-G13-26/550 Information for high-frequency ballast design Typical lamp characteristics Lamp voltage V Lamp current Lamp wattage W Frequency kHz 13 52 0,245 ≥ 20 0,650 Current in any lead to cathodes Max. Min. Lamp operating current Max. Current controlled preheating Minimum preheat current i_k (A) to emission time t_e (s) 0,240 a $i_k = (a/t_0 + i_m^2)^{0.5}$ im (A) 0,315 Maximum preheat current t ≤ 0,4 1,800 0,4 < t < 2,02,100 - 0,300 t t≥ 2,0 0,900 $t \leq t_0$ Open circuit voltage across lamp 270 Max. (r.m.s.) $t > t_{\rm e}$ Mn. (r.m.s.) 280 Voltage to starting aid t ≤ t_e Max. (peak) $t > t_e$ Min. (peak) 12,5* Substitution resistor for each cathode Voltage controlled preheating Without preheating Open circuit voltage across lamp Min. (r.m.\$.) Current through lamp substitution resistor Min. Lamp substitution resistor Ω Substitution resistor for each cathode Ω Cathode current Max. * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-2215-1

60081-IEC-2220-1

Page 2

ILCOS: FD-18-E-G13-26/600

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
50	20	127	0,370	270	0,12
60	_	_	_	_	

Information for ballast de	sig	ın			
Frequency		Н	z	50	60
Preheat cathode current	A	Min.	14.	0,333	_
		Max.		0,800	_
Open circuit voltage across starter	v	Min. (r.m.s.)	103,5	-
Open circuit voltage across lamp	v	Max. (peak)	400	-
Substitution resistor for both cathodes in series			Ω	50	_
Voltage across starter with lamp operating	v	Max. (r.m.s)	68	-

Information f	or starter design
Pulse voltage	Non-reclosure voltage
V	V
Minimum	Maximum
800	70

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60081-IEC-2220-1

DOUBLE-CAPPED FLUORESCENT LAMP

Page 3

	DATA	SHEET					
				IL	cos	: FD-18	8-E-G13-26/
	Information for high fr	requency ballast design	n				
	Typical lamp	characteristics					¥
Frequency	Lamp wattage	Lamp voltage			La	mp cur	rent
kHz	w	v				A	
≥ 20	16	55				0,290)
Current in any lead to catho	des		A		Max.		0,650
Lamp operating current			A	100 - 100	Min.		*
				-	Мах.		*
2	Current contro	olled preheating					
Minimum preheat current i_k $i_k = (a/t_e + i_m^2)^{0.5}$	(A) to emission time $t_{\rm e}$ (s)				а		0,240
				i	m (A)		0,315
Maximum preheat current		А	t ≤	0,4			1,800
			0,4 <	t < 2,	,0	2,000	0 - 0,560 <i>t</i>
			t ≥	2,0			0,900
Open circuit voltage across	lamp	v	$t \leq t_{\epsilon}$		Max.	(r.m.s.)	270
			$t > t_{\epsilon}$	•	Min.	(r.m.s.)	280
Voltage to starting aid		v	$t \leq t_{\epsilon}$,	Max.	(peak)	*
			$t > t_e$,	Min.	(peak)	*
Substitution resistor for eac	h cathode				•	Ω	12,5*
	Voltage contro	olled preheating			5		
		*					
							0.2
Open circuit voltage across		oreheating		V	Min	(r.m.s.)	•
Current through lamp substi				A		lin.	*
_amp substitution resistance						Ω	•
Substitution resistor for eac	h cathode					Ω	•
Cathode current	****			Α	М	lax.	*
outhous surroin	02		1000		10000		

60081 @ IEC:199/ DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-20-E-G13-32/600 Nominal dimensions Cap Nominal wattage Circuit Cathode mm W 32 × 600 Preheated G1\$ 20 With starter Dimensions mm D С В Α Max Max. Max. Min. Max. 604 0 34,1 589,8 594,5 596,9 Starting characteristics Starting time Frequency Ballast rated voltage Test voltage (r.m.s.) s Ηz V 30 110 95 50 30 95 60 110 Electrical characteristics Rated preheat current Rated lamp Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current w Rated Minimum Maximum Α A Hz 19 58 52 64 0,360 0,550 50 0,360 0,550 60 19 64 Chromaticity co-ordinates: see D.2, annex D. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2230-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-20-E-G13-32/600 Reference ballast characteristics Frequency Nominal wattage Rated voltage Calibration current Voltage/current ratio Power factor V Hz W Α Ω 50 20 127 0,370 270 0,12 20 118 0,380 240 0,075 Information for ballast design Frequency 60 Preheat cathode current Α Min. 0,333 0,333 0,800 0,800 Max. Open circuit voltage across starter Min. (r.m.s.) 95 95 V 400 400 Open circuit voltage across lamp Max. (peak) Substitution resistor for both cathodes in series 50 50 Voltage across starter with lamp operating Max. (r.m.s.) 68 68 Information for starter design Pulse voltage Non-reclosure voltage Maximum Minimum 800 70 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2230-1

Page 1

ILCOS: FD-20-E-G13-38/600

Nominal wattage	Circuit	Cathode	Сар	Nominal dimensions
w				mm
20	With starter	Preheated	G13	38 × 600

		Dimensions		
		mm		
Α		В	С	D
Мах.	Min.	Max.	Max.	Max.
589,8	594,5	596,9	604,0	40,5

Frequency	Ballast rated voltage	Test voltage (r.m.s.)	Starting time
Hz	v	v	s
50	110	103,5	30
60	110	103,5	30

		Ele	ctrical characteris	tics		
Frequency	Rated wattage	Voltage	e (r.m.s.) at lamp t	erminals	Rated lamp current	Rated preheat current
Hz	w	Rated	Minimum	Maximum	A	A
50	19,3	57	50	64	0,370	0,550
60	20,5	57	50	64	0,380	0,550

Chromaticity co-ordinates: see D.2, annex D.

Page 2

ILCOS: FD-20-E-G13-38/600

		Reference bal	last characteristics		
Frequency	Nominal wattage Rated voltage Calibration current Volt		age Calibration current Voltage/current rat		Power factor
Hz	w	V	Α	Ω	
50	20	127	0,370	270	0,12
60	20	118	0,380	240	0,075

Information for b	allast desig	jn			
Frequency			Hz	50	60
Preheat cathode current	А	Min.		0,333	0,333
·		Max.		0,800	0,800
Open circuit voltage across starter	٧	Min. (r.m.s	.)	103,5	103,5
Open circuit voltage across lamp	٧	Max. (peal	()	400	400
Substitution resistor for both cathodes in series	- 200 200 0		Ω	50	50
Voltage across starter with lamp operating	V	Max. (r.m.s	.)	68	68

Information f	or starter design
Pulse voltage	Non-reclosure voltage
V	v
Minimum	Maximum
250	70

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60081-IEC-2240-1

	ŧ	DOUBLE-CAPPED FLUORESCENT LAMP							Page 1
		(8)			villo	2		ILCOS	: FD-25-E-G13-3
Nominal watt	age	Circuit		Catho	ode	Сар		No	minal dimensions
25		With starte	starter Preheat		neated G13		-		38 × 970
			A MAN CO SAME					,	•
				Dimer	nsions m				
A B						С			D
Max.		Min.		Max		Max.	1		Max.
970,0		974,7		977,	.1	984,2			40,5
150 14011			St	arting cha	aracteristi	cs			
Frequency Ballast rated vo				Test voltage (r.m.s.)				s	arting time s
50			220	198					30
60	-213		-					-	
0.000		***	Ele	ctrical ch	aracterist	ics			
Frequency	Rated watt	age	Voltage		s.) at lamp terminals V			ted lamp current	Rated prehe current
Hz	w		Rated	Minimum N		Maximum		A	A
50	24,5		94	84		104		0,290	0,450
60 Chromaticity co	_	<u> </u>				-	<u> </u>	-	-

Page 2

ILCOS: FD-25-E-G13-38/970

Reference ballast characteristics									
Frequency Nominal wattage		Rated voltage Calibration current		Voltage/current ratio	Power factor				
Hz	w	V	Α	Ω					
50	25	220	0,290	605	0,10				
60	_	-	_	_ [-				

Information for ballast design						
Frequency		Hz	50	60		
Preheat cathode current	Α	Min.	0,261	-		
		Max.	0,609	-		
Open circuit voltage across starter	٧	Min. (r.m.s.)	198	-		
Open circuit voltage across lamp	V	Max. (peak)	400	-		
Substitution resistor for both cathodes in series	0723	Ω	50			
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	<u>-</u>		

Information	for starter design
Pulse voltage	Non-reclosure voltage
V	V
Minimum	Maximum
400	140

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 DATA SHEET ILCOS: FD-30-E-G13-26/900 Nominal dimensions Cap Circuit Cathode Nominal wattage mm W G13 26×900 30 With starter Preheated Dimensions mm В С D Α Max Max. Max. Min. Max. 908,B 28,0 894,6 899,3 901,7 Starting characteristics Starting time Test voltage (r.m.s) Ballast rated voltage Frequency s V Hz 30 198 50 220 220 198 30 60 Electrical characteristics Voltage (r.m.s.) at lamp terminals Plated lamp Rated preheat Frequency Rated wattage current current Minimum Maximum A Α W Rated 0,365 0,550 30 96 86 106 50 0,530 89 109 0,355 30,5 99 60 Chromaticity co-ordinates: see D.2, annex D. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2320-1

DOUBLE-CAPPED FLUORESCENT LAMP						Page 2		
	DATA SHEET						Page 2	
			*			-	ILCOS:	FD-30-E-G13-2
		Reference ball	ast characteris	tics	\dashv	-		
Frequency	Nominal wattage	Rated voltage	Calibration co	urrent Volt		tage/current ratio		Power factor
Hz	w	v	Α			Ω		
50	30	220	0,360			480		0,10
60	30	236	0,355	0,355			548	0,075
		Information f	or ballast desig	gn		,		
Frequency			000000 100 100		-	lz	50	60
Preheat cathode	current		· А	M	lin.		0,328	0,328
			-	Max.			0,766	0,766
Open circuit volta	age across starter		v	Min. ((r.m.s.	.)	198	198
Open circuit volta	age across lamp		v	Мах.	(peak)	400	400
Substitution resis	stor for both cathodes	s in series				Ω	50	50
Voltage across s	tarter with lamp oper	ating	v	Мах.	(r.m.s	.)	128	128
								4.00
		Information t	or starter desig	-				
	Pulse voltage V			r	von-ne	ec io	sure voltage V	
	Minimum		V e			Ma	kimum	
	400							
		5 6 5 5 1			1	•		
							•	
	· ·							
	_	*						
	•							

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60081-IEC-2320-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-30-E-G13-26/900 Information for high frequency ballast design Typical lamp characteristics Lamp current Frequency Lamp wattage Lamp voltage kHz W 0,260 95 24 ≥ 20 Current in any lead to cathodes Max. 0,630 Min. Lamp operating current Max. Current controlled preheating 0,240 Minimum preheat current i_k (A) to emission time t_e (s) $i_{\rm k} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$ 0,310 i_m (A) Maximum preheat current $t \leq 0,4$ 1,600 0.4 < t < 2.01,810 - 0,525 t $t \ge 2,0$ 0,760 ٧ $t \le t_{\rm e}$ Max. (r.m.s.) Open circuit voltage across lamp $t > t_e$ Min. (r.m.s.) Max. (peak) Voltage to starting aid t ≤ t_e Min. (peak) $t > t_{\rm e}$ 12,5 Substitution resistor for each cathode Ω Voltage controlled preheating Without preheating Min. (r.m.s.) Open circuit voltage across lamp * Min. Current through lamp substitution resistor Ω Lamp substitution resistance Ω Substitution resistor for each cathode Max. Cathode current

60081-IEC-2320-1

Publication CEI 60081 IEC Publication 60081

* Under consideration.

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DOUBLE-CAPPED FLUORESCENT LAMP

			22 3.82	ń		ILCOS:	FD-30-E-G13-3	
		<u> </u>	0-11-			1 1		
Nominal watta W	ige	Circuit Cathode		ae	Сар	Nomi	mal dimensions	
30	Wi	th starter	Prehea	ited	G13		38 × 900	
			Dimen	sions			5/14/0-48/000 WOOX	
			mı	m		1		
Α		E	3		С		D	
Max.		Mir.	Max		Max.		Max.	
894,6		899,3 901		7	908,8		40,5	
			Starting cha	racteristi	cs			
Freque	ncy	Ballast rated	Ballast rated voltage Test		voltage (r.m.s.)	Sta	rting time	
Hz		v	V		V		s	
50		220			198		30	
60					-	1	_	
1/			Electrical cha	aracterist	ics			
		je Vol	Itage (r.m.s.) at lamp terminals			Rated lamp current	Rated prehea	
Frequency	Rated wattag						Α .	
Frequency Hz	Rated wattag	Rated	Mini	mum	Maximum	A	1	
		Rated 81		mum 1	Maximum 91	0,405	0,620	

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60081-IEC-2340-1

Page 2

ILCOS: FD-30-E-G13-38/900

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto
Hz	w	V	A	Ω	
50	30	220	0,405	460	0,10
60	_	_	_	_	-

Information fo	or ballast desig	gn			
Frequency			Hz	50	60
Preheat cathode current	Α	Min.		0,365	-
		Max.		0,850	-
Open circuit voltage across starter	٧	Min. (r.m.s	s.)	198	_
Open circuit voltage across lamp	V	Max. (pea	k)	400	-
Substitution resistor for both cathodes in series			Ω	40	-
Voltage across starter with lamp operating	V	Max. (r.m.:	s.)	128	_

Information for	or starter design
Pulse voltage	Non-reclosure voltage
v	v v
Minimum	Maximum
400	140

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60081-IEC-2340-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-33-E-G13-26/1150 Nominal wattage Circuit Cathode Cap Nominal dimensions W 33 With starter Preheated G13 26×1150 Dimensions mm В С D A Max. Мах. Min. Max. Max. 1163,2 28,0 1149,0 1153,7 1156,1 Starting characteristics Frequency Ballast rated voltage Test voltage (r.m.s.) Starting time Hz 50 220 198 30 60 _ _ Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Rated preheat current Α W Rated Minimum Maximum 0,570 50 33 103 93 113 0,380 -60 1 Chromaticity coordinates: see D.2, annex D.

60081-IEC-2415-1

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Page 2

ILCOS: FD-33-E-G13-26/1150

		Reference balla	ast characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	33	230	0,380	474	0,10
60				- 1	-

Informati	on for ballast de	sign		
Frequency		Hz	50	60
Preheat cathode current	Α	Min.	0,342	_
	Ì	Max.	0,798	-
Open circuit voltage across starter	V	Min. (r.m.s.)	198	-
Open circuit voltage across lamp	V	Max. (peak)	400	_
Substitution resistor for both cathodes in series		Ω	40	-
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	_

Information for	or starter design
Pulse voltage	Non-reclosure voltage
V	V
Minimum	Maximum
800	140

Texte français au verso French text overleaf

60081-IEC-2415-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-33-E-G13-26/1150 Information for high-frequency ballast design Typical lamp characteristics Lamp wattage W Lamp voltage V Lamp current Frequency 0,304 103 30 ≥ 20 Max. 0.750 Current in any lead to cathodes Α Min. Lamp operating current Max. Current controlled preheating Minimum preheat current i_k (A) to emission time t_e (s) 0,340 0,300 $i_k = (a/t_0 + i_m^2)^{0.5}$ im (A) 1,900 Maximum preheat current Α t ≤ 0,4 0,4 < t < 2,02,150 - 0,630 t 0,900 t ≥ 2,0 Open circuit voltage across lamp t ≤ t_e Max. (r.m.s.) 290* Min. (r.m.s.) 330* $t > t_0$ $t \le t_0$ Max. (peak) 410* Voltage to starting aid $t > t_{\rm e}$ Min. (peak) 465* 10* Substitution resistor for each cathode Voltage controlled preheating Without preheating Min. (r.m.s.) 800 Open circuit voltage across lamp 0,200 Current through lamp substitution resistor Min. 1000 Lamp substitution resistor Substitution resistor for each cathode Ω 2 Max. 2,200 Cathode current Under consideration. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2415-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-36-E-G13-26/1200 Nominal wattage Circ uit Cathode Cap Nominal dimensions W mm 36 With starter Preheated G13 26 × 1200 Dimensions mm Α В С D Max. Min. Max. Max Max. 1199,4 1213,6 1204,1 1206,5 28,0 Starting characteristics Ballast rated voltage Frequency Test voltage (r.m.s.) Starting time v Hz 50 220 198 30 60 Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Rated preheat current current W Rated Minimum Maximum A A 50 36 103 113 0,430 0,650 Chromaticity co-ordinates: see D.2, annex D.

60081-IEC-2420-1

Publication CEI 60081 IEC Publication 60081

Texte français au verso French text overleaf

Page 2

ILCOS: FD-36-E-G13-26/1200

		Reference bal	last characteristics		
Frequency Hz	Nominal wattage	Rated voltage V	Calibration current	Voltage/current ratio	Power factor
50	40	220	0,430	390	0,10
60	_	_	_	_	_

Information for ball	ast desig	gn			
Frequency	12 55% 15	H	ız	50	60
Preheat cathode current	Α	Min.		0,387	_
		Max.		0,904	_
Open circuit voltage across starter	v	Min. (r.m.s	.)	198	-
Open circuit voltage across lamp	V	Max. (peak	:)	400	-
Substitution resistor for both cathodes in series			Ω	40	-
Voltage across starter with lamp operating	V	Max. (r.m.s	.)	128	

Information t	or starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
800	140

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60081-IEC-2420-1

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** ILCOS: FD-36-E-G13-26/1200 Information for high frequency ballast design Typical lamp characteristics Lamp voltage Lamp current

Frequency	Lamp wattage	Lamp voltage	'	L	amp cu	rrent
kHz	W				Α	
≥ 20	32	102			0,320	
Current in any lead to cathod	es		A	Max.		0,750
Lamp operating current			A	Min.		•
				Max.		*
*				WILL.	<u> </u>	
	Current contro	lled preheating	-			
Minimum preheat current i_k ($i_k = (a/t_e + i_m^2)^{0.5}$	A) to emission time t_{e} (s)			а		0,340
	£			<i>i</i> _m (A)		0,300
Maximum preheat current		Α	<i>t</i> ≤ 0,	4		1,900
			0,4 < t <	2,0	2,15	0 - 0,630 <i>t</i>
	(96)	Ţ	t ≥ 2,	0		0,900
Open circuit voltage across la	amp	V	' ≤ t _e	Max.	(r.m.s.)	290*
			t > t _e	Min.	(r.m.s.)	330*
Voltage to starting aid		V	∮ ≤ t _e	Max.	(peak)	410*
			> t _e	Min.	(peak)	465*
Substitution resistor for each	cathode			•	Ω	10*
	Voltage contro	lled preneating		-		
	Without p	reheating				
Open circuit voltage across la	ımp			/ Min.	(r.m.s.)	800
Current through lamp substitu	tion resistor		,	N	lin.	0,200
Lamp substitution resistor					Ω	1000
Substitution resistor for each	cathode				Ω	2
Cathode current	27 - 100 St. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	187	/	M	ax.	2,200

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60081-IEC-2420-1

Publication CEI 60081 IEC Publication 60081

Page 3

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-38-E-G13-26/1050 Circuit Nominal dimensions Nominal wattage Cathode Cap W mm 38 With starter Preheated G13 26 × 1050 **Dimensions** mm В D Α C Max. Mir. Max Max. Max. 1047,0 1051,7 1054,1 1061,2 28,0 Starting characteristics Ballast rated voltage Frequency Test voltage (r.m.s.) Starting time ٧ Hz ٧ 50 220 198 30 60 Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Rated preheat current current Hz W Rated Minimum Maximum A Α 50 38,5 104 114 0,430 0,650 60 Chromaticity co-ordinates: see D.3, annex D. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-2425-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-38-E-G13-26/1050 Reference ballast characteristics Rated voltage Calibration current Voltage/current ratio Power factor Nominal wattage Frequency ٧ W Hz 390 0,10 50 40 220 0,430 60 _ Information for ballast design Ηz 60 Frequency 50 0,387 Preheat cathode current A Min. Max. 0,904 ٧ Min. (r.m.s.) 198 Open circuit voltage across starter Max. (peak) 400 Open circuit voltage across lamp Substitution resistor for both cathodes in series 40 Max. (r.m.s.) 128 Voltage across starter with lamp operating Information for starter design Non-reclosure voltage Pulse voltage Minimum Maximum 140 800

60081-IEC-2425-1

Texte français au verso French text overleaf

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-38-E-G13-26/1050 Information for high frequency ballast design Typical lamp characteristics Lamp voltage Lamp current Lamp wattage Frequency Α W kHz 0,310 ≥ 20 32 105 0,750 Current in any lead to cathodes Α Max. Min. Lamp operating current Max. Current controlled preheating 0,340 Minimum preheat current i_k (A) to emission time t_e (s) $i_{\rm k} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$ i_m (A) 0,350 1,900 Maximum preheat current $t \leq 0,4$ 0,4 < t < 2,02,150 - 0,630 t 0,900 $t \ge 2,0$ Open circuit voltage across lamp $t \le t_{\rm e}$ Max. (r.m.s.) 240* 230* $t > t_e$ Min. (r.m.s.) Voltage to starting aid t ≤ t_e Max. (peak) 340* $t > t_{\rm e}$ Min. (peak) 325* 10* Ω Substitution resistor for each cathode Voltage controlled preheating Without preheating Min. (r.m.s.) 800 Open circuit voltage across lamp 0,200 Min. Current through lamp substitution resistor Ω 1000 Lamp substitution resistor 2 Ω Substitution resistor for each cathode 2.200 Cathode current Max. * Under consideration. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2425-1

Page 1

ILCOS: FD-40-E-G13-32/1200

Nominal wattage	Circuit	Cathode	Cap	Nominal dimensions
w				mm
40	With starter	Preheated	G13	32 × 1200

		Dimensions		
		mm		
Α		В	С	D
Мах.	Mir.	Max.	Max	Max.
1199,4	1204,1	1206,5	1213,6	34,1

Starting characteristics								
Frequency	Ballast rated voltage	Test voltage (r.m.s.)	Starting time					
Hz	V	v	s					
50	220	180	30					
60	220	180	30					

		Ele	ctrical characteris	tics		
Frequency	Rated wattage	Voltage	(r.m.s.) at lamp t	Rated lamp current	Rated preheat current	
Hz	w	Rated	Minimum	Maximum	A	A
50	39	106	99	113	0,420	0,650
60	39,5	105	98	112	0,425	0,650

Chromaticity co-ordinates: see D.2, annex D.

Texte français au verso French text overleaf

60081-IEC-2430-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-40-E-G13-32/1200 Reference ballast characteristics Calibration current Voltage/current ratio Power factor Nominal wattage Rated voltage Frequency Hz W V Ω 390 0,10 0,430 40 220 50 0,075 40 236 0,430 439 Information for ballast design Hz 60 50 Frequency Α 0,387 0,387 Preheat cathode current Min. 0,904 0,904 Max. Min. (r.m.s.) 180 180 Open circuit voltage across starter ٧ Max. (peak) 400 400 Open circuit voltage across lamp 40 40 Substitution resistor for both cathodes in series V Max. (r.m.s 128 128 Voltage across starter with lamp operating Information for starter design Pulse voltage Non-reclosure voltage V Maximum Minimum 900 130 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2430-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-40-E-G13-38/1200 Cap Naminal dimensions Cathode Nominal wattage Circuit W mm 40 With starter Preheated G13 38×1200 **Dimensions** mm В C D Α Max. Max Max. Min. Max. 1206,5 1213 6 40,5 1199,4 1204,1 Starting characteristics Frequency Ballast rated voltage Test voltage (r.m.s.) Starting time Hz 220 198 30 50 198 30 60 220 Electrical characteristics Pated lamp Rated preheat Rated wattage Voltage (r.m.s.) at lamp terminals Frequency current current Maximum Α Minimum Α W Rated Hz 0,430 0,650 39,5 103 93 113 40 92 112 0,435 0,650 60 Chromaticity co-ordinates: see D.2, annex D. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2440-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-40-E-G13-38/1200 Reference ballast characteristics Voltage/current ratio Power factor Nominal wattage Calibration current Rated voltage Frequency W V Hz Ω 390 0,10 40 220 0,430 236 0,430 439 0,075 60 40 Information for ballast design Hz Frequency 50 60 0,387 0,387 A Min. Preheat cathode current 0,904 0,904 Max. Min. (r.m.s.) 198 198 Open circuit voltage across starter 400 400 Max. (peak) Open circuit voltage across lamp 40 40 Substitution resistor for both cathodes in series Voltage across starter with lamp operating Max. (r.m.s.) 128 128 Information for starter design Pulse voltage Non-reclosure voltage Maximum Minimum 140 400 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-2440-1

Page 1

ILCOS: FD-58-E-G13-26/1500

Nominal wattage	Circuit	Cathode	Сар	Nominal dimensions
w				mm
58	With starter	Preheated	G13	26 × 1500

		Dimensions		
		mm		1
Α	В		С	D
Max.	Mir.	Max.	Max	Max.
1500,0	1504,7	1507,1	1514,2	28,0

Starting characteristics									
Frequency	Ballast rated voltage	Test voltage (r.m.s.)	Starting time						
Hz	V	v	s						
50	220	198	30						
60	_	-	_						

		Ele	ctrical characteris	tics		
Frequency	Rated wattage	Voltage	e (r.m.s.) at lamp t	Rated lamp current	Rated preheat current	
Hz	w	Rated	Minimum	Maximum	A	A
50	58	110	100	120	0,670	1,000
60	_	-	-	-		_

Chromaticity co-ordinates: see D.3, annex D.

Page 2

ILCOS: FD-58-E-G13-26/1500

Reference ballast characteristics									
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor				
Hz	w	V	Α	Ω					
50	65	220	0,670	240	0,10				
60	_	-	-	_	-				

Information for t	allast desig	jn			
Frequency		11111111	Hz	50	60
Preheat cathode current	А	Min.		0,603	_
		Max.		1,410	_
Open circuit voltage across starter	٧	Min. (r.m.s	:.)	198	_
Open circuit voltage across lamp	٧	Max. (pea	k)	400	_
Substitution resistor for both cathodes in series			Ω	25	-
Voltage across starter with lamp operating	V	Max. (r.m.	s.)	132	-

Information for	or starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
900	140

Texte français au verso French text overleaf

60081-IEC-2520-1

Page 3

Publication CEI 60081 IEC Publication 60081

	*	2	1	LCOS:	FD-58-	E-G13-26	
	Information for high fre	quency ballast design					
	·						
	Typical lamp c	haracteristics					
Frequency	Lamp wattage	Lamp voltage	77	La	amp cur	rent	
kHz	W	V			A		
≥ 20	50	111	\perp		0,455	8	
Current in any lead to catho	des		A	Max.	Т	1,100	
Lamp operating current			A	Min.		•	
				Max.		*	
	Current controll	led preheating	-				
Minimum preheat current ik (es preneating	+1	а		0,390	
$i_{\rm k} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$				i (A)		0,350	
Maximum preheat current		A	t ≤ 0,4	<i>i</i> _m (A)		2,900	
Maximum preneat current		^_	0,4 < t <			0 - 0,970	
		-	t ≥ 2,0		0.074.000.010.00	1,350	
Open circuit voltage across	lamp	V	t ≤ t _e		(r.m.s.)	295*	
- F	<u>-</u> -	-	$t > t_{\rm e}$		(r.m.s.)	335*	
Voltage to starting aid		v	t ≤ t _e	Max.	(peak)	420*	
			t > t _e	Min.	(peak)	475*	
Substitution resistor for each	cathode	-			Ω	8*	
	Voltage controll	ad probacting					
	voltage controll	ed preneating					
	Without pr	eheating					
Open circuit voltage across I		ccamiy	\ \ \ \ \	Min.	(r.m.s.)	800	
Current through lamp substit	ution resistor		1 4	N	lin.	0,250	
Lamp substitution resistor					Ω	800	
Substitution resistor for each	cathode				Ω	2	
Cathode current			A	M	ax.	3,000	

60081-IEC-2520-1

Texte français au verso French text overleaf

		DOUBL			LUORE: SHEET	SCENT LAM	P			Page 1		
					^		-	ILCOS	: F[)-65-E-G13-32/		
Nominal watta	age	Circuit Cathode		Са	·	N		nal dimensions				
65		With starter		Prehea	ated	G1:	3		;	32 × 1500		
				Dimer	nsions							
				m	m							
Α			В			С			D			
Max.		Min.		Max	۲.	Max	τ.	Max.		Max.		
1500,0		1504,7		1507	,1	1514	,2	2		34,1		34,1
* * * * * * * * * * * * * * * * * * *	10-X3	· · · · · · · · · · · · · · · · · · ·	Sta	arting cha	racteristi	cs				,		
Frequer	псу	Ballast	ated volt	age	Test	voltage (r.m.s	.)		Star	ting time		
Hz			V			V		s		s		
50			220		198					30		
60			-			-				-		
			Fled	etrical ch	aracterist	ics	-	- 11				
Frequency	Rated watt	age		(r.m.s.)	at lamp te			Rated lan		Rated prehea		
Hz	w	Ra	ted	Mini	mum	Maximum		Α		A		
50	62	1	10	10	00	120		0,670		1,000		
60	-		-	-	-					-		

Texte français au verso French text overleaf

60081-IEC-2530-1

Page 2

ILCOS: FD-65-E-G13-32/1500

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
50	65	220	0,670	240	0,10
60		=	=	_	1-

Information for	ballast desiç	jn			
Frequency			Hz	50	60
Preheat cathode current	Α	Min.		0,603	-
		Max.		1,410	-
Open circuit voltage across starter	V	Min. (r.m.s	.)	198	-
Open circuit voltage across lamp	V	Max. (pea	k)	400	_
Substitution resistor for both cathodes in series	00 VI		Ω	25	_
Voltage across starter with lamp operating	v	Max. (r.m.:	s.)	132	-

Information	for starter design
Pulse voltage	Non-reclosure voltage
v	V
Minimum	Maximum
900	140

Texte français au verso French text overleaf 60081-IEC-2530-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-65-E-G13-38/1500 Nominal dimensions Cap Nominal wattage Circuit Cathode W mm 65 With starter Preheated G13 38 ×1500 Dimensions mm С D Α В Max. Max Max. Max. Min. 1504,7 1507,1 1514,2 40,5 1500,0 Starting characteristics Ballast rated voltage Starting time Frequency Test voltage (r.m.s.) V Hz V 50 220 198 30 60 Electrical characteristics Rated lamp Rated preheat Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current current Maximum Α Α W Rated Minimum 110 100 120 0,670 1,000 50 64 60 _ Chromaticity co-ordinates: see D.2, annex D. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2540-1

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Page 2

ILCOS: FD-65-E-G13-38/1500

Reference ballast characteristics							
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor		
Hz	w	V	A	Ω			
50	65	220	0,670	240	0,10		
60	-	-	-	_	-		

Information fo	or ballast desig	gn n			
Frequency	22.17.02.11. 212	Hz			60
Preheat cathode current	Α	Min.		0,603	-
		Max.		1,410	-
Open circuit voltage across starter	V	Min. (r.m.s	.)	198	
Open circuit voltage across lamp	٧	Max. (peak	()	400	
Substitution resistor for both cathodes in series			Ω	25	
Voltage across starter with lamp operating	v	Max. (r.m.s	.)	132	_

Information for	or starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
400	140

Texte français au verso French text overleaf

60081-IEC-2540-1

Page 1

ILCOS: FD-70-E-G13-26/1800

Nominal wattage	Circuit	Cathode	Сар	Nominal dimensions	
w				mm	
70	With starter	Preheated	G13	26 × 1800	

		Dimensions		4
		mm		
Α		В		D
Max.	Min.	Max.	Max.	Max.
1763,8	1768,5	1770,9	1778,0	28,0

	Starting cha	aracteristics	
Frequency	Ballast rated voltage	Test voltage (r.m.s.)	Starting time
Hz	V	v	s
50	240	216	30
60	240	216	30

	Ele	ctrical characteris	tics		
requency Rated wattage Voltage (r.m.s.) at lamp terminals			erminals	Rated lamp current	Rated preheat
w [Rated	Minimum	Maximum	Α	A
69,5	128	118	138	0,700	1,000
69,5	128	118	138	0,700	1,000
	W 69,5	Rated wattage Voltage W Rated 69,5 128	W Rated Minimum 69,5 128 118	W Rated Minimum Maximum 69,5 128 118 138	Rated wattage Voltage (r.m.s.) at lamp terminals V Rated lamp current W Rated Minimum Maximum A 69,5 128 118 138 0,700

Chromaticity co-ordinates: see D.3, annex D.

	DOL	JBLE-CAPPED		ENT I	_AM	P		Page 2	
		DATA	SHEET						
							ILCOS:	FD-70-E-G13-26/180	
		Reference ball	ast characteris	tics		-	V 4 W 4 T T T		
Frequency	Nominal wattage	Rated voltage	ige.	/current ratio	Power factor				
Hz	w	V	A				Ω		
50	70	240	0,700				240	0,10	
60	70	240	0,700				240	0,10	
-		Information f	or ballast desig	ın					
Frequency						Ηz	50	60	
Preheat cathode	current		Α	N	lin.	1000000	0,590	0,590	
				М	ax.		1,470	1,470	
Open circuit volta	age across starter		v	Min. (r.m.s	.)	216	216	
Open circuit volta	age across lamp	Market Ma	v	Max.	(peal	()	400	400	
Substitution resis	tor for both cathodes	in series				Ω	25	25	
Voltage across st	tarter with lamp opera	ating	v	Мах.	(r.m.s	.)	160	160	
		Information for	or starter desig	ın					
**************************************	Pulse voltage				Von-r	ecio	osure voltag	e	
	V V			15			V		
	Minimum					Ma	ıximum		
	900	WO 10 10 10 10 10 10 10 10 10 10 10 10 10					170		
			1			-	VACCOUNT		
							*		
	8								
JC	73						- 1000-210-		

DOUBLE-CAPPED FLUORESCENT LAMP Page 3 **DATA SHEET** ILCOS: FD-70-E-G13-26/1800 Information for high frequency ballast design Typical lamp characteristics Frequency Lamp wattage Lamp voltage Lamp current kHz W A ≥ 20 60 129 0,470 Current in any lead to cathodes A Max. 1,160 Lamp operating current Min. Max. Current controlled preheating Minimum preheat current i_k (A) to emission time t_e (s) 0,800 a $i_{\rm k} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$ i_m (A) 0,400 Maximum preheat current $t \le 0,4$ 3,100 0,4 < t < 2,03,500 - 1,030 t $t \ge 2.0$ 1,450 Open circuit voltage across lamp ≤ t_e Max. (r.m.s.) 410* > t_e Min. (r.m.s.) 465* Voltage to starting aid ≤ t_e Max. (peak) 580* $> t_{\rm e}$ Min. (peak) 660* Substitution resistor for each cathode 8* Ω Voltage controlled preheating Without preheating Open circuit voltage across lamp Min. (r.m.s.) Current through lamp substitution resistor Min. Lamp substitution resistor Ω Substitution resistor for each cathode Ω Cathode current A Max. * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-2620-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-75-E-G13-38/1800 Nominal dimensions Nominal wattage Circuit Cathode Cap mm W 75 Preheated G13 38×1800 With starter Dimensions mm D В С Α Max. Min. Max. Max. Max. 1768,5 1770,9 1778,0 40,5 1763,8 Starting characteristics Starting time Ballast rated voltage Test voltage (r.m.s) Frequency Hz 30 240 216 50 60

Frequency	Notes Proceedings Voltage (r.m.s.) at lamp terminals V			Rated lamp current	Rated preheat	
Hz	w	Rated	Minimum	Maximum	Α	A
50	75	130	120	140	0,670	1,000
60	_	_	_	-		_

Chromaticity co-ordinates: see D.2, annex D.

Page 2

ILCOS: FD-75-E-G13-38/1800

NAT - 4 (24 T)		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	v	A	Ω	
50	75	235	0,670	240	0,10
60		-	_	_	_

NOTE - A 65 W reference ballast is used, operated at 235 V.

Information for	or ballast desig	gn		
Frequency		Hz	50	60
Preheat cathode current	А	Min.	0,570	-
_		Max.	1,410	_
Open circuit voltage across starter	V	Min. (r.m.s.)	216	-
Open circuit voltage across lamp	V	Max. (peak)	400	-
Substitution resistor for both cathodes in series Ω				-
Voltage across starter with lamp operating	٧	Max. (r.m.s.)	160	_

Information f	or starter design
Pulse voltage	Non-reclosure voltage
V	V
Minimum	Maximum
800	170

Texte français au verso French text overleaf

60081-IEC-2640-1

		DOORFE-C		SHEET	SCENT LAMP			Page 1
Mainly intended	for replace	ment purposes.		•			ILCOS:	FD-80-E-G13-38/15
Nominal watta	age	Circuit	Catho	ode	Сар	No		ninal dimensions
w								mm
80		With starter	starter Preheated G13				38 × 1500	
			Dimer	nsions		 		
			m	m			7 / 5000	
Α .		В С				D		
Max.		Min.	Мах	۲.	Max.	.1		Мах.
1500,0		1504,7	1507	,1	1514,2			40,5
			Starting cha	racteristic	cs			
Frequer	ncv	Ballast rated			voltage (r.m.s.)		St	arting time
Hz		v v			İ	8		
50		240 198		198			30	
60				\dashv		_		
			Electrical ch	aracteristi	cs			
Frequency	Rated watt	age Volt	age (r.m.s.)	at lamp te V	rminals		ted lamp current	Rated preheat current
Hz	w	Rated	Mini	mum	Maximum		A	Α
50	76	99	8	19	109		0,870	1,300
60	_	-	-	-	-		-	-
Chromaticity co-	ordinates: s	ee D.3, annex D.						
exte français au verso rench text overleaf			60081-IEC	-2660-1				Publication CEI 60081 IEC Publication 60081

Page 2

ILCOS: FD-80-E-G13-38/1500

Reference ballast characteristics							
Frequency Hz	Nominal wattage	Rated voltage V	Calibration current	Voltage/current ratio	Power facto		
50	80	240	0,865	223	0,06		
60	_	-	_	_	_		

Information for	or ballast desig	gn		1	
Frequency			Hz	50	60
Preheat cathode current	Α	Min.		0,790	_
		Max.		1,830	=
Open circuit voltage across starter	V	Min. (r.m.s	.)	198	_
Open circuit voltage across lamp	V	Max. (pea	k)	400	_
Substitution resistor for both cathodes in series			Ω	25	-
Voltage across starter with lamp operating	V	Max. (r.m.s	5.)	128	-

Information (for starter design
Pulse voltage	Non-reclosure voltage
V	v
Minimum	Maximum
400	140

Texte français au verso French text overleaf

60081-IEC-2660-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** Mainly intended for replacement purposes. ILCOS: FD-85-E-G13-38/1800 Nominal wattage Cathode Circuit Cap Nominal dimensions W mm 85 With starter Preheated G13 38×1800 **Dimensions** mm Α В С D Max. Min. Max. Max. Max 1763,8 1768,5 1770,9 1778,0 40,5 Starting characteristics Frequency Ballast rated voltage Test voltage (r.m.s.) Starting time Hz 50 240 216 30 60 NOTE - An 80 W/240 V inductive ballast is used. Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Rated preheat current current W Rated Minimum Maximum Α Α 50 84 120 110 130 0,800 1,300 _ 60 Chromaticity co-ordinates: see D.3 annex D. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2670-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-85-E-G13-38/1800 Reference ballast characteristics Nominal wattage Rated voltage Calibration current Voltage/current ratio Power factor Frequency Hz W V Α Ω 80 240 0,865 223 0,06 60 Information for ballast design Frequency Hz 50 60 0,680 Preheat cathode current Min. Max. 1,700 Open circuit voltage across starter V Min. (r.m.s.) 216 400 Max. (peak) Open circuit voltage across lamp Substitution resistor for both cathodes in series 25 Voltage across starter with lamp operating Max. (r.m.s.) 160 Information for starter design Non-reclosure voltage Pulse voltage V Minimum Maximum 800 170 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-2670-1

DOUBLE-CAPPED FLUORESCENT LAMP

Page 1

ILCOS: FD-100-E-G13-38/2400

Nominal wattage	Circuit	Cathode	Сар	Nominal dimensions
w				mm
100	With starter	Preheated	G13	38 × 2400

		Dimensions		
		mm		
Α	В		С	D
Max.	Min.	Max.	Max.	Max.
2374,3	2379,0	2381,4	2388,5	40,5

	Starting characteristics								
Frequency Hz	Ballast rated voltage	Test voltage (r.m.s.)	Starting time						
50	240	220	30						
60	_	-	_						

NOTE - An 80 W/240 V inductive ballast is used, together with a 6,8 µF capacitor in series.

		Ele	ctrical characteris	tics		
Frequency Rated wattage Voltage (r.m.s.) at lamp terminals V					Rated lamp current	Rated preheat
Hz	w [Rated	Minimum	Maximum	Α	A
50	102	125	110	140	0,960	1,300
60	-	=	-	-		_

Chromaticity co-ordinates: see D.2, annex D.

Texte français au verso French text overleaf

60081-IEC-2840-1

Page 2

ILCOS: FD-100-E-G13-38/2400

Reference ballast characteristics								
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto			
Hz	w	V	Α	Ω				
50	100	350	0,940	308	0,06			
60	_	-	_	-	_			

Information fo	or ballast desig	gn			
Frequency		+	ız	50	60
Preheat cathode current	A	Min.		0,810	_
		Max.		2,000	_
Open circuit voltage across starter	V	Min. (r.m.s.	.)	216	_
Open circuit voltage across lamp	V	Max. (peak)	400	-
Substitution resistor for both cathodes in series	000000000000000000000000000000000000000		Ω	25	-
Voltage across starter with lamp operating	٧	Max. (r.m.s	.)	160	_

Information	for starter design
Pulse voltage	Non-reclosure voltage
v	v
Minimum	Maximum
900	170

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-125-E-G13-38/2400 Mainly intended for replacement purposes. Nominal wattage Circuit Cathode Cap Nominal dimensions W G13 38×2400 Preheated 125 With starter Dimensions mm С D В Α Max. Max. Min. Max. Max. 2379,0 2381,4 2388,5 40,5 2374,3 Starting characteristics Starting time Ballast rated voltage Test voltage (r.m.s.) Frequency Hz 240 220 30 50 60 NOTE - An 80 W/240 V inductive ballast is used, together with a 6,8 µF capacitor in series. Electrical characteristics Rated lamp Rated preheat Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current current Maximum Α Α W Rated Minimum Hz 0,940 1,300 149 134 164 50 123 Chromaticity co-ordinates: see D.3, annex D.

60081-IEC-2880-1

Texte français au verso French text overleaf

Page 2

ILCOS: FD-125-E-G13-38/2400

Reference ballast characteristics							
Frequency	Nominal wattage	Rated voltage Calibration current Volt		Voltage/current ratio	Power factor		
Hz	w	V	A	Ω			
50	125	350	0,940	300	0,06		
60	_		-		_		

Information fo	or ballast desig	gn			
Frequency	нг				
Preheat cathode current	Α	Min.	0,800	_	
		Max.	1,970	=	
Open circuit voltage across starter	V	Min. (r.m.s.)	216	=	
Open circuit voltage across lamp	v	Max. (peak)	400	_	
Substitution resistor for both cathodes in series		Ω	25	_	
Voltage across starter with lamp operating	٧	Max. (r.m.s.)	160	_	

Information f	or starter design
Pulse voltage	Non-reclosure voltage
V	v
Minimum	Maximum
800	180

Texte français au verso French text overleaf

60081-IEC-2880-1

		DOUBLE-CAPPED FLUORESCENT LAM					P		Page 1			
						~				ILCOS:	FD-4-L/P/H-G5-10	
Nominal wat	Nominal wattage Circuit				Cathode C			ар	No	minal dimensions		
4		Star	terless	Preheated, high resistance			sistance	G 5			16 × 150	
	1,194	9			Dimen	sions		- 100 27 1			•	
					mı	m						
Α				В				С			D	
Max.			Min.		Max			Max			Max.	
135,9			140,6		143,	0		150,	1		16,0	
				0 1002 10	Starting cha	racte	ristics				1	
Frequency		nominal ttage		st rated Itage	Starting distance		Cathode (r.m.	voltage s.)	Open circuit voltage (r.m.s.)		Starting time	
Hz	,	w		v	mm		v		v		s	
50	4/	/6/8	2	220	6		8,0)	200		10	
60	4/	/6/8	2	220 6			8,0		200		10	
					Electrical cha	aracte	ristics					
Frequency	F	Rated wat	tage		Voltage	(r.m.	s.) at lam	p termin	als		Rated lamp current	
Hz		w	1	F	Rated	ted Minim			Maxin	num	Α	
50		4,5			29		24	34				
60		4,5			29		24		34		0,170	
thromaticity o	o-ordina	ates: see	D.2, an		Cathode cha	racte	ristics		-			
Englishment William Control Co		voltage (r.m.s.)				e of each catho		ode				
		•			Rate	Rated			Minimum			
High resistance		8,0	70		1000 MOS			50				

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60081-IEC-3020-1

Page 2

ILCOS: FD-4-L/P/H-G5-16/150

Reference ballast characteristics							
Frequency Nominal wattage		Rated voltage Calibration current		Voltage/current ratio	Power factor		
		V	A	Ω			
50	6	127	0,160	700	0,12		
60	6	118	0,160	650	0,075		

			CONTROL OF THE PROPERTY OF THE		
Information f	or ballast desi	gn			
Frequency		•	-lz	50	60
Preheat cathode voltage	V	Min. (r.m.s.	.)	6,5	6,5
		Max. (r.m.s	.)	9,2	9,2
Open circuit voltage across lamp	V	Min. (r.m.s.)	105	105
		Max. (r.m.s	.)	145	145
Open circuit voltage across two lamps in series	V	Min. (r.m.s.)		120	120
		Max. (r.m.s.)	165	165
Starting capacitor	μF	Min.		•	0,008
		Max.		•	0,060
Substitution resistor for each cathcde		ا	Ω	70	70
Voltage to starting aid	V	Min. (peak)		400	400
Current in any lead to cathodes	А	Max.		*	

* Under consideration.

Texte français au verso French text overleaf

60081-IEC-3020-1

Page 1

ILCOS: FD-6-L/P/H-G5-16/225

Nominal wattage	Circuit	Cathode	Сар	Nominal dimensions
w				mm
6	Starterless	Preheated, high resistance	G5	16 × 225

		Dimensions		
		mm		
A	В		С	D
Max.	Min.	Max.	Max	Max.
212,1	216,8	219,2	226,3	16,0

		S	Starting characte	eristics		
Frequency	Ballast nominal wattage	Ballast rated voltage	Starting aid distance	Cathode voltage (r.m.s.)	Open circuit voltage (r.m.s.)	Starting time
Hz	w	V	mm	V	V	s
50	4/6/8	220	6	8,0	200	10
60	4/6/8	220	6	8,0	200	10

		Electrical ch	naracteristics		
Frequency	Rated wattage	Voltag	e (r.m.s.) at lamp ter V	minals	Rated lam current
Hz	w	W Rated	Minimum	Maximum	A
50	6	42	36	48	0,160
60	6	42	36	48	0,160

Chromaticity co-ordinates: see D.2 annex D.

	Cathode chara	cteristics	¥.
Cathode	Test voltage (r.m.s.)	Resistance of each cathode Ω	
		Rated	Minimum
High resistance	8,0	70	50

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60081-IEC-3030-1

Page 2

ILCOS: FD-6-L/P/H-G5-16/225

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	Α	Ω	
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

			-		
Information f	or ballast desi	gn			
Frequency			Hz	50	60
Preheat cathode voltage	V	Min. (r.m.s	.)	6,5	6,5
		Max. (r.m.s	.)	9,2	9,2
Open circuit voltage across lamp	V	Min. (r.m.s	.)	105	105
		Max. (r.m.s	.)	145	145
Open circuit voltage across two lamps in series	V	Min. (r.m.s.)	130	130
		Max. (r.m.s	.)	180	180
Starting capacitor	μF	Min.		•	0,008
		Max.		•	0,060
Substitution resistor for each cathode	, , , , , , , , , , , , , , , , , , , ,		Ω	70	70
Voltage to starting aid	٧	Min. (peak)		400	400
Current in any lead to cathodes	Α	Max.		*	*

* Under consideration.

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60081-IEC-3030-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-8-L/P/H-G5-16/300 Nominal wattage Circuit Cathode Nominal dimensions Cap mm 8 Starterless Preheated, high resistance G5 16 × 300 **Dimensions** mm Α В С D Max. Min. Max. Max. Max. 288,3 293,0 295,4 302,5 16,0 Starting characteristics Frequency Ballast nominal Ballast rated Starting aid distance Cathode voltage (r.m.s.) Open circuit voltage (r.m.s.) Starting time wattage voltage W ٧ ٧ Hz mm s 50 4/6/8 220 6 8,0 500 10 4/6/8 220 60 6 8,0 200 10 Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Hz W Rated Minimum Maximum Α 50 7,1 56 48 64 0,145 60 7,2 57 48 64 0,145 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Cathode Test voltage (r.m.s.) Resistance of each cathode ٧ Ω Rated Minimum High resistance 8,0 70 50 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-3040-1

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET ILCOS: FD-8-L/P/H-G5-16/300 Reference ballast characteristics

16200755309		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	Α	Ω	
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

Information f	or ballast desi	gn			
Frequency		Н	z	50	60
Preheat cathode voltage	V	Min. (r.m.s.)		6,5	6,5
		Max. (r.m.s.)		9,2	9,2
Open circuit voltage across lamp	V	Min. (r.m.s.)		105	105
		Max. (r.m.s.)		145	145
Open circuit voltage across two lamps in series	٧	Min. (r.m.s.)		140	140
		Max. (r.m.s.)		190	190
Starting capacitor	μF	Min.		•	0,008
		Max.		•	0,060
Substitution resistor for each cathode		Ω		70	70
Voltage to starting aid	V	Min. (peak)		400	400
Current in any lead to cathodes	А	Max.		*	*

* Under consideration.

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60081-IEC-3040-1

Circuit Starterless Min. 594,5 minal Ballast r voltag V 220 220	Preheated, h Dimer m B Max 596 Starting cha ated Starting distance mm 13	aracteristics		Open c volta (r.m.	Nom	-20-L/P/H-G13-38, ninal dimensions mm 38 × 600 D Max. 40,5
Min. 594,5 minal Ballast revoltage V 220	Preheated, h Dimer m B Max 596 Starting cha ated starting distant mm 13	igh resistance	C Max 604, ode voltage r.m.s.)	Open c volta (r.m. V	ircuit ge s.)	mm 38 × 600 . D Max. 40,5
Min. 594,5 minal Ballast r voltag V 220	B Max 596 Starting chatated Starting distance mm 13	nsions m x. ,9	C Max 604, ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	D Max. 40,5
ominal Ballast r yoltag V	B Max 596 Starting chatated Starting distance mm 13	m,9 aracteristics aid Catho	Max 604 ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	D Max. 40,5
ominal Ballast r yoltag V	B Max 596 Starting chatated Starting distance mm 13	m,9 aracteristics aid Catho	Max 604 ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	Max. 40,5 Starting time
ominal Ballast r yoltag V	B Max 596 Starting chated starting distance mm 13	aracteristics	Max 604 ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	Max. 40,5 Starting time
ominal Ballast r yoltag V	Starting characted Starting distance mm	aracteristics	Max 604 ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	Max. 40,5 Starting time
ominal Ballast r yoltag V	Starting cha ated Starting distant mm	aracteristics	ode voltage r.m.s.)	Open c volta (r.m.	ge s.)	Starting time
y voltag	ated Starting distant	aid Catho	r.m.s.) V	volta (r.m. V	ge s.)	
y voltag	ated Starting distant	aid Catho	r.m.s.) V	volta (r.m. V	ge s.)	
y voltag	mm		r.m.s.) V	volta (r.m. V	ge s.)	
220	13		-	v	(16)	
			8,0			s
220	13			180		10
			8,0	180	o	10
				-		100
		aracteristics		ļ.——		
ed wattage	Voltag	e (r.m.s.) at l V	lamp termin	als		Rated lamp current
w	Rated	Minimi	um	Maximu	m	A
19,3	57	50		64		0,370
20,5	57	50		64		0,380
s: see D.2, anne	x D.					
		aracteristics	200 66 0	_		
Test volt	Test voltage (r.m.s.) Resist		Resistan	nce of each cath Ω		ode
	Rated				Minimum	
	8,0		20	<u> </u>		14
	20,5 s: see D.2, annex Test volt	20,5 57 s: see D.2, annex D. Cathode ch Test voltage (r.m.s.)	20,5 57 50 s: see D.2, annex D. Cathode characteristics V F	20,5 57 50 String Stri	20,5 57 50 64 s: see D.2, annex D. Cathode characteristics Test voltage (r.m.s.) Resistance of each V Ω Rated	20,5 57 50 64 s: see D.2, annex D. Cathode characteristics Test voltage (r.m.s.) V Rated

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60081-IEC-4240-1

IEC Publication 60081

Page 2

ILCOS: FD-20-L/P/H-G13-38/600

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	20	127	0,370	270	0,12
60	20	118	0,380	240	0,075

Information	n for ballast desi	gn		
Frequency	- 10	Hz	50	60
Preheat cathode voltage	٧	Min. (r.m.s.)	6,5	6,5
		Max. (r.m.s.)	10,0	10,0
Open circuit voltage across lamp	V	Min. (r.m.s.)	180	180
		Max. (peak)	345	345
Substitution resistor for each cathode		Ω	19	19
Voltage to starting		Min. (peak)		*
Current in any lead to cathodes	Α	Max.	0,650	0,650

* Under consideration.

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60081-IEC-4240-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-30-L/P/H-G13-38/900 Nominal dimensions Cap Cathode Nominal wattage Circuit mm G13 Preheated, high resistance 38×900 30 Starterless **Dimensions** mm D В C Α Max Max. Max. Min. Max. 901,7 908, 40,5 894,6 899,3 Starting characteristics Open circuit voltage (r.m.s.) Starting time Cathode voltage Starting aid Frequency Ballast nominal Ballast rated wattage voltage distance (r.m.s.) V ٧ Hz W mm s 50 220 13 8,0 205 10 60 -Electrical characteristics Rated lamp Voltage (r.m.s.) at lamp terminals Frequency Rated wattage current Hz W Rated Minimum Maximum Α 29,5 81 0,405 50 60 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Cathode Test voltage (r.m.s.) Resistance of each cathode V Rated Minimum 20 14 High resistance 8,0 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-4340-1

Page 2

ILCOS: FD-30-L/P/H-G13-38/900

		Reference bal	llast characteristics		U 2004 20030 - 200
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	v	A	Ω	
50	30	220	0,405	460	0,10
60	_	_	-	-	_

Informat	ion for ballast desi	gn			
Frequency	1.250.5 (1)	1	Hz	50	60
Preheat cathode voltage	V	Min. (r.m.s	.)	6,5	-
		Max. (r.m.s	.)	10,0	-
Open circuit voltage across lamp	v	Min. (r.m.s	.)	205	-
2		Max. (peal	k)	420	-
Substitution resistor for each cathcde			Ω	19	:—:
Voltage to starting aid	v	Min. (peak)	•	=
Current in any lead to cathodes	Α	Max.		0,750	_

* Under consideration.

			DOUB	LE-C	APPED FLU DATA SI			NI LAM	Di Al			Page 1
· · · · · · · · · · · · · · · · · · ·						13			11	LCOS: F	0-40	o-L/P/H-G13-38/
Nominal watt	age	Ci	rcuit		Catho	ode			Cap		Nominal dimensions	
- W 40		Star	terless	P	reheated, hig	h res	istance	0	313		- 3	38 × 1200
											-	·
					Dimens						L	
A				В	В			С			-	D
Max.		Min.			Max.			Ma			-	Max.
1199,4	9,4 12		1204,1		1206,5			121	3,6		-	40,5
					Starting char	acter	istics			11.0000	+	
Frequency				t rated			Cathod (r.	de voltage r.m.s.)		Open circuit voltage (r.m.s.)		Starting time
Hz	3	w		v	mm		V		V		-	s
50		40	2	20	13	13		8,0	ļ.,	205	-	10
60		40	2	20	13		8,0		205		+	10
				-	Electrical cha	aracte	ristics		+		+	
Frequency	, T	Rated wa	attage		Voltage	e (r.m.s.) at lamp terminals					Rated lamp current	
Hz		w			Rated M		Minimum		Maximum			A
50		39,	5		103		93		113			0,430
60		40			102		92		1.	112		0,435
Chromaticity	co-ordi	nates: se	e D.2, ar	nex D.			-1-4/	<u> </u>	-		+	
				volto a =	Cathode cha	aracte	ristics	Resista	ance	of each c	atho	ode
Cati	node	Test voltage			(1.111.5.)	1/2				Ω	-	
						P	ated	-	+	_	Minimum 14	
High re	sistanc	e		8,0				20	+			
									ļ			

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60081-IEC-4440-1

Page 2

ILCOS: FD-40-L/P/H-G13-38/1200

		Reference bal	last characteristics		10.00
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	40	220	0,430	390	0,10
60	40	236	0,430	439	0,075

Informati	on for ballast desig	gn		
Frequency	Hz	50	60	
Preheat cathode voltage	٧	Min. (r.m.s.)	6,5	6,5
		Max. (r.m.s.)	10,0	10,0
Open circuit voltage across lamp	v	Min. (r.m.s.)	205	205
		Max. (peak)	420	420
Substitution resistor for each cathode	HATT 2000 20	ρ	19	19
Voltage to starting	V	Min. (peak)	*	•
Current in any lead to cathodes	Α	Max.	0,750	0,750

* Under consideration.

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60081-IEC-4440-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-65-L/P/H-G13-38/1500 Nominal wattage Circuit Cathode Cap Nominal dimensions mm W G13 38 × 1500 65 Starterless Preheated, high resistance Dimensions mm D С Α В Max. Min. Max. Max Max. 1500,0 1504,7 1507,1 1514,2 40,5 Starting characteristics Cathode voltage Open circuit Starting time Ballast nominal Ballast rated Starting aid Frequency (r.m.s.) voltage voltage distance wattage (r.m.s.) W ٧ V V s Hz $\mathbf{m}\mathbf{m}$ 220 13 8,0 220 10 60 Electrical characteristics Voltage (r.m.s.) at lamp terminals Rated lamp Frequency Rated wattage current Minimum Maximum A Hz W Rated 110 0,670 50 64 100 120 60 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Test voltage (r.m.s.) Resistance of each cathode Cathode Minimum Rated 11 High resistance 8,0 * Under consideration. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-4540-1

Page 2

ILCOS: FD-65-L/P/H-G13-38/1500

		Reference bal	last characteristics		
Frequency Hz	Nominal wattage	Rated voltage V	Calibration current	Voltage/current ratio	Power factor
50	65	220	0,670	240	0,10
60	_	_	_	_	_

Information	for ballast desi	gn		
Frequency		Hz	50	60
Preheat cathode voltage	V	Min. (r.m.s.)	6,5	-
		Max. (r.m.s.)	11,0	-
Open circuit voltage across lamp	V	Min. (r.m.s.)	220	-
		Max. (peak)	475	_
Substitution resistor for each cathode	TO 100	Ω	11	_
Voltage to starting aid	V	Min. (peak)	*	-
Current in any lead to cathodes	Α	Max.	1,100	_

* Under consideration.

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60081-IEC-4540-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-75-L/P/H-G13-38/1800 Nominal dimensions Nominal wattage Circuit Cathode Cap W mm 75 Starterless Preheated, high resistance G13 38×1800 Dimensions mm В С Α Max. Max. Min. Max. Max. 1778,0 1763,8 1763,5 1770,9 40,5 Starting characteristics Cathode voltage Open circuit Frequency Ballast nominal Ballast rated Starting aid Starting time wattage voltage distance (r.m.s.) voltage (r.m.s.) w V V Hz mm S 75 13 8,0 250 10 50 240 60 Electrical characteristics Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Frequency current Rated Maximum W Minimum A Hz 140 0,670 50 75 130 120 60 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Resistance of each cathode Cathode Test voltage (r.m.s.) V Rated Minimum High resistance 8,0 12 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-4640-1

Page 2

ILCOS: FD-75-L/P/H-G13-38/1800

Reference ballast characteristics									
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto				
Hz	w	V	A	Ω					
50	75	235	0,670	240	0,10				
60		_	_	-	-				

NOTE - A 65 W reference ballast is used, operated at 235 V.

Informati	on for ballast desi	gn			70120
Fréquency			Hz	50	60
Preheat cathode voltage	V	Min. (r.m.	s.)	6,5	-
		Max. (r.m	.s.)	11,0	_
Open circuit voltage across lamp	V	Min. (r.m.	s.)	220	1-
		Max. (pea	ak)	500	-
Substitution resistor for each cathode			Ω	11	-
Voltage to starting aid	٧	Min. (peak)	*	-
Current in any lead to cathodes	А	Max.		1,100	-

* Under consideration.

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60081-IEC-4640-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-80-L/P/H-G13-38/1500 Mainly intended for replacement purposes. Сар Nominal dimensions Nominal wattage Cathode Circuit W mm G13 80 Starterless Preheated, high resistance 38×1500 Dimensions mm A В С Max. Min. Max. Max. Max. 1514,2 40,5 1500,0 1504,7 1507,1 Starting characteristics Cathode voltage Open circuit Starting time Frequency Ballast, nominal Ballast rated Starting aid wattage voltage distance (r.m.s.) voltage (r.m.s.) Hz W ٧ mm V 50 80 240 13 8,0 220 10 60 Electrical characteristics Rated lamp Rated wattage Voltage (r.m.s.) at lamp terminals Frequency current Hz W Rated Minimum Maximum Α 50 76 99 89 109 0,870 Chromaticity co-ordinates: see D.3, annex D. Cathode characteristics Resistance of each cathode Cathode Test voltage (r.m.s.) Rated Minimum 12 9 High resistance 8,0 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-4660-1

Page 2

ILCOS: FD-80-L/P/H-G13-38/1500

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto
Hz	w	v	A	Ω	
50	80	240	0,865	223	0,06
60	-	_	-	-	_

Informat	ion for ballast desi	gn		
Frequency	Hz	50	60	
Preheat cathode voltage	V	Min. (r.m.s.)	6,5	-
		Max. (r.m.s.)	11,0	_
Open circuit voltage across lamp	V	Min. (r.m.s.)	220	-
		Max. (peak)	475	-
Substitution resistor for each cathode		Ω	11	-
Voltage to starting	v	Min. (peak)	*	-
Current in any lead to cathodes	Α	Max.	1,600	-

* Under consideration.

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60081-IEC-4660-1

				1000 JS	DATA	J11EE	- 1				
ainly intende	d for re	eplacem	ent puri	oses.					ILC	OS: FD	-85-L/P/H-G13-38
Nominal wat	tage	С	ircuit		Cathode C			ар	Noi	minal dimensions	
W											mm
85	85 Starterless			Р	reheated, h	igh res	sistance	G	13		38 × 1800
,					Dimer	sions					
		-			m	m					
Α				В				С			D
Max.			Min.		Мах	ζ.		Max			Max.
1763,8	-12	İ	1768,5		1770	9	ų s	1778	,a		40,5
				;	Starting cha	aracte	ristics				
Frequency				st rated Itage	Starting distant			voltage s.)	Open circu voltage (r.m.s.)		Starting time
Hz		w		V	mm		V		v		s
50		85	- 2	240	13		8,0		250		10
60		-	,	-	_					_	
700				E	lectrical ch	aracte	ristics				
Frequency	e Î	Rated wa	ttage		Voltage	e (r.m.	.s.) at lam	p termin	ais		Rated lamp current
Hz		w	- N - M	R	ated		Minimum		Maxii	mum	Α
50		84		33	120		110		13	30	0,800
60		-		L			-			•	
Chromaticity c	o-ordin	ates: see	D.3, ar								
Catho	odo.		Tant		Cathode cha	aracte		Besistes	ca of o	ach cath	ode
Catho	oue		1381	voltage (r V	.111.5.)			nesisian	Ω	aun cam	
				2.110			Rate	d			Minimum
High resi	istance			8,0		8-	12	1			9

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FD-85-L/P/H-G13-38/1800 Reference ballast characteristics Calibration current Voltage/current ratio Power factor Frequency Nominal wattage Rated voltage Hz W Ω 0,865 223 0,06 50 80 240 60 Information for ballast design Frequency Preheat cathode voltage Min. (r.m.s.) 6,5 Max. (r.m.s.) 11,0 Open circuit voltage across lamp Min. (r.m.s.) 250 Max. (peak) 500 Substitution resistor for each cathcde 11 Voltage to starting aid V Min. (peak) Current in any lead to cathodes A Max. 1,300

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-125-L/P/H-G13-38/2400 Nominal dimensions Cathode Cap Nominal wattage Circuit mm W G13 125 Starterless Preheated, high resistance 38×2400 Dimensions mm С D Α В Max. Min. Max. Max Max. 2374,3 2379,0 2381,4 2388,5 40,5 Starting characteristics Starting time Frequency Ballast nominal Ballast rated Starting aid Cathode voltage Open circuit wattage voltage distance (r.m.s.) voltage (r.m.s.) W mm V V Hz 125 315 10 50 240 13 8,0 ---60 Electrical characteristics Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Frequency current V Minimum Maximum Α w Rated Hz 0,940 149 134 164 50 123 Chromaticity co-ordinates: see D.3, annex D. Cathode characteristics Test voltage (r.m.s.) Resistance of each cathode Cathode Minimum Rated 12 High resistance 8,0 9

60081-IEC-4880-1

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Page 2

ILCOS: FD-125-L/P/H-G13-38/2400

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	A	Ω	
50	125	350	0,940	300	0,06
60	_	_	_	- 1	_

sig	gn		
	Hz	50	60
,	Min. (r.m.s.)	6,5	_
	Max. (r.m.s.)	11,0	-
v	Min. (r.m.s.)	315	-
	Max. (peak)		<u> </u>
	Ω	11	_
<i>,</i>	Min. (peak)	*	-
4	Max.	1,600	-
	<i>'</i>	/ Min. (r.m.s.) Max. (r.m.s.) / Min. (r.m.s.) / Max. (peak) / Min. (peak)	Hz 50 / Min. (r.m.s.) 6,5 Max. (r.m.s.) 11,0 / Min. (r.m.s.) 315 Max. (peak) * Ω 11 / Min. (peak) *

* Under consideration.

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60081-IEC-4880-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-20-L/P/L-G13-32/600 Nominal wattage Circuit Сар Cathode Nominal dimensions W mm 20 Starterless Preheated, low resistance G13 32 × 600 **Dimensions** mm Α В С D Max. Min. Max. Max. Max. 589,8 594,5 596,9 604,0 34,1 Starting characteristics Ballast nominal Ballast rated Frequency Starting aid Cathode voltage Open circuit Starting time wattage voltage distance (r.m.s.) voltage (r.m.s.) Hz W V mm V V 40 220 50 16 3,05 180 10 60 40 220 16 3,05 180 10 Electrical characteristics Test method Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Annex Hz W Rated Minimum Maximum Α 0.360 52 64 B.1 60 19 58 52 64 0,360 60 **B.2** Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Cathode Test voltage (r.m.s.) Resistance of each cathode Rated Minimum Low resistance 3,6 10 7 * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-5230-1

Page 2

ILCOS: FD-20-L/P/L-G13-32/600

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage V	Calibration current	Voltage/current ratio	Power facto
50	20	127	0,370	270	0,12
60	20	118	0,380	240	0,075

Information	on for ballast desi	gn			
Frequency	4 100m 100 cg y	H	z	50	60
Preheat cathode voltage	V	Min. (r.m.s.)		3,05	3,05
		Max. (r.m.s.)	5,5	5,5
Open circuit voltage across lamp	v	Min. (r.m.s.)		180	180
		Max. (peak)		345	345
Substitution resistor for each cathode		Ω	2	9	9
Voltage to starting aid	v	Min. (peak)		•	*
Current in any lead to cathodes	Α	Max.	Т	0,650	0,650

* Under consideration.

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60081-IEC-5230-1

								ILCOS: F	D-	20-L/P/L-G13-38
Nominal wa	ttage		Circu t	Catho	de		Сар	No	mi	nal dimensions
w									mm	
20		Sta	rterless	Preheated, low	resistanc	e (313			38 × 600
		-		Dimensi	ons	******				
				mm				000000000000000000000000000000000000000		0.0000000
А				В		9				D
Max	•>		Min.	Max.		М	ıx.			Max.
589,	8		594,5	596,9	•	60	04.0			40,5
				Starting chara	cteristics		-	-	-	
Frequency	Ballast noi wattag		Ballast rated voltage	Starting aid distance		de voltage m.s.)	Open circuit voltage (r.m.s.)			Starting time
Hz	w		V	mm		v		v		s
50	40		220	13	;	3,05		180		10
60	40		220	13	;	3,05	180			10
				Electrical chara	acteristics	·	+		_	
est method	Frequer	псу	Rated wattage	Volta	ge (r.m.s.) at lamp te	rmina	als		Rated lamp current
Annex	Hz		w	Rated	Min	imum	N	laximum		A
B.1	50		19,3	57		50		64		0,370
B.1	60		20,0	56		49		63		0,380
B.2	60		. *	*		*		*		•
hromaticity	co-ordinate	s: se	e D.2, annex D	·		10100 p.				
				Cathode chara	cteristics					
Cat	hode			ge (r.m.s.) V		Resista	ance	of each ca	thc	ode
						Rated			N	linimum
Low re	sistance		3	1,6		10				7

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60081-IEC-5240-1

Page 2

- 1

ILCOS: FD-20-L/P/L-G13-38/600

	2000	Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power factor
Hz	w	V	Α	Ω	
50	20	127	0,370	270	0,12
60	20	118	0,380	240	0,075

Informat	ion for ballast desi	gn		
Frequency		Hz	50	60
Preheat cathode voltage	V	Min. (r.m.s.)	3,05	3,05
		Max. (r.m.s.)	5,5	5,5
Open circuit voltage across lamp	V	Min. (r.m.s.)	180	180
		Max. (peak)	345	345
Substitution resistor for each cathode		Ω	9	9
Voltage to starting aid	v	Min. (peak)	•	*
Current in any lead to cathodes	Α	Max.	0,650	0,650

* Under consideration.

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60081-IEC-5240-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-30-L/P/L-G13-38/900 Nominal wattage Circuit Cathode Cap Nominal dimensions mm 30 Starterless Preheated, low resistance G 3 38×900 Dimensions mm Α В С D Max. Min. Max. Max Max. 894,6 899,3 901,7 908,8 40,5 Starting characteristics Frequency Ballast nominal Ballast rated Starting aid Cathode voltage Open circuit Starting time wattage voltage voltage distance (r.m.s.) (r.m.s.) Hz W V mm V s 50 30 220 13 3,05 405 10 60 30 220 13 3,05 205 10 Electrical characteristics Test method Frequency Rated Voltage (r.m.s.) at lamp terminals Rated lamp wattage current Annex Hz W Rated Minimum Max mum Α B.1 50 29,5 81 71 0,405 **B.1** 60 31,5 78 70 86 0,435 **B.2** 60 32,5 # 77 85 0,430 # Includes approximately 2 W for supplementary cathode heating with 3,6 V across each cathode Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Cathode Test voltage (r.m.s.) Resistance of each cathode Rated Minimum Low resistance 3,6 10 7 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-5340-1

Page 2

ILCOS: FD-30-L/P/L-G13-38/900

		Reference I	pallast characteristics		
Frequency Hz	Nominal wattage W	Rated voltage V	Calibration current A	Voltage/current ratio	Power factor
50	30	220	0,405	460	0,10
60	30	180	0,430	335	0,075

Information	for ballast design	p.121			
Frequency			Hz	50	60
Preheat cathode voltage	V	Min.	(r.m.s.)	3,05	3,05
		Мах.	(r.m.s.)	5,5	5,5
Open circuit voltage across lamp	V	Min.	(r.m.s.)	205	205
		Max	(peak)	420	420
Substitution resistor for each cathode		1811.00.00	Ω	9	9
Voltage to starting aid	V	Min.	(peak)	*	*
Current in any lead to cathodes	Α	N	lax.	0,750	0,750

Information for ballast design (North American practice)			
Frequency			Hz	60
Preheat cathode voltage	V	Min.	(r.m.s.)	3,4
		Мах.	(r.m.s.)	4,5
Operating cathode voltage	V	Min.	(r.m.s.)	2,5
		Max.	(r.m.s.)	4,0
Substitution resistor for each cathode			Ω	9,6

				The state of the s	
			One lamp	Two lamps in series	Three lamps in series
Open circuit voltage across lamp ^a	V	Min. (r.m.s.)	150	215	305
		Max. (r.m.s.)	205	290	410
Voltage to starting aid ^b	V	Min. (peak)	280	280	280
Crest factor of open circuit voltage across lamp and to starting aid	70	Max.	2,0	2,0	2,0
Starting aid capacitor @ 60 Hz	μF	Min.	-	0,04	0,04
		Max.	-	0,06	0,06

* Under consideration.

60081-IEC-5340-2

These values are for capacitive circuits only. For inductive circuits add 3 %.

These values are for crest factors 1,55 - 2,0. For crest factors less than 1,55 add 10 %.

	i			DATA SH	IEET		1000			Page 1		
	- 1		<u>;</u>		3	,		ILCOS	FD-	40-L/P/L-G13-32/		
Nominal wa	ttage	C	Dircuit	Cathoo	de	7	Cal	p	Non	ninal dimensions		
w										mm		
40		Sta	rterless	Preheated, low	resistance		31:	13		32 × 1200		
				Dimensio	ons	300 000 000				ALC		
				mm								
Α				В		(5			D		
Max	. 8		Min.	Max.		Ma	ax.			Max.		
1199	,4		1204,1	1206,	5	121	3,6			34,1		
				Starting chara	cteristics							
Frequency	Ballast n		Ballast rate		Cathode	e voltage n.s.)		Open circuit voltage (r.m.s.)		Starting time		
Hz	w	,	v	mm	(6	v		v		V		s
50	40)	220	16	3	,05		205 205		10		
60	40)	220	16		,05				10		
				Electrical chara								
Test method	Frequ	ency	Rated			at lamp te	rm	inals		Rated lamp		
			wattage			v				current		
Annex	Н	z	w	Rated	Minir	mum		Maximur	n	Α		
B.1	50	,	39,0	106	9	6		116		0,420		
B.1	60)	39,5	105	9	8		112	•	0,425		
B.2	60)	40,5 #	104	9	7		111		0,420		
# Includes a Chromaticity	pproxima co-ordina	tely 2 W ates: se	for suppleme e D.2, annex I	entary cathode he	ating with	3,6 V acros	s s	each cath	ode.			
	7 (1870) 1870 1870	***		Cathode chara	cteristics							
Cat	hode		Test volt	age (r.m.s.)		Resista	anc	e of each	cati	node		
						Rated				Minimum		
	sistance			3,6		10				7		

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60081-IEC-5430-1

Page 2

				8	ILCOS	s: FD-40	-L/P/L-	G13-32/1200
1.576		Reference b	allast characterist	ics				
Frequency	Nominal wattage	Rated voltage	Calibration currer	nt Vol	age/cu	urrent rat	io F	Power factor
Hz	w	V	Α	e	9	Ω		
50	40	220	0,430		39	90		0,10
60	40	236	0,430		4:	39		0,075
		Informatio	on for ballast desig	n	-			
Frequency					H	z	50	60
Preheat catho	ode voltage			V Min.	(r.m.s	.) ;	3,05	3,05
20				Max.	(r.m.s	5.)	5,5	5,5
Open circuit v	oltage across lamp			V Min.	(r.m.s	.)	205	205
				Max	(peal	()	420	420
Substitution r	esistor for each catho	de			Ω		9	9
Voltage to sta	arting aid			V Min	(peak	()	*	*
Current in an	y lead to cathodes			A I	lax.	C	,750	0,750
	Additional in	formation for peal	k lead ballast desig	ın (Japan	ese pr	actice)		
Open circuit v	oltage across lamp			V Min.	(r.m.s	.)	188	188
Crest factor of	f open circuit voltage	across lamp		1	lax.		2,3	2,3
	Infor	mation for ballast	design (North Ame	rican pra	ctice)	W		
Frequency	-4	-			V	1.00	Hz	60
Preheat catho	ode voltage				•		(r.m.s.) (r.m.s.)	
Operating cat	hode voltage	-			V	_	(r.m.s.) (r.m.s.)	
Operating car	node voltage				•		(r.m.s.)	
Substitution r	esistor for each catho					, wax.	Ω	9,6
				One la	mp	Two lar	nps	Three lamps
	voltage across lamp a		Min. (r.m.s.)	200	+	256	-	395
Open circuit v			Max. (r.m.s.)	260		330		525
Open circuit v		V		240		240		280
Open circuit v	arting aid ^b			2,0		2,0		2,0
Voltage to sta	of open circuit voltage	across lamp	Max.	2,0			description of the second	
Voltage to sta Crest factor of and to startin	of open circuit voltage	across lamp μΙ		-		0,04		0,04
Voltage to sta Crest factor of and to startin	of open circuit voltage g aid					0,04		0,04 0,06

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60081-IEC-5430-2

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-40-L/P/L-G13-38/1200 Nominal wattage Circuit Cap Nominal dimensions Cathode W 40 Starterless Preheated, low resistance G13 38×1200 Dimensions mm Α В С D Max. Min. Max. Max. Max. 1199,4 1206,5 1213,6 1204,1 40,5 Starting characteristics Frequency Ballast nominal Ballast rated Starting aid Cathode voltage Open circuit Starting time voltage wattage voltage distance (r.m.s.) (r.m.s.) Ηz W V V V mm s 50 40 220 13 3,05 205 10 40 220 13 3,05 205 10 Electrical characteristics Test method Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Annex Hz W Rated Minimum Maximum A **B**.1 50 39,5 103 113 0,430 B.1 60 40,0 102 92 0,435 112 **B.2** 60 41,0 # 101 91 111 0,430 # Includes approximately 2 W for supplementary cathode heating with 3,6 V across each cathode. Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Test voltage (r.m.s.) Cathode Resistance of each cathode ٧ Rated Minimum Low resistance 3,6 10 7

60081-IEC-5440-1

Publication CEI 60081 IEC Publication 60081

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		DA	TA SHEET					Page 2
		-	w			5D 40		242 2844000
				• 42	ILCOS:	FD-40	-L/P/L	-G13-38/1200
_	1		allast characterist		 		<u> </u>	
Frequency	Nominal wattage	Rated voltage	Calibration currer	nt Voi	tage/cur		0	Power factor
Hz	W	V	Α		Ω			0.024 MIQUO 198
50	40	220	0,430		390		-	0,10
60	40	236	0,430		439	9	Ш.	0,075
,		Informatio	n for ballast desig	n				
Frequency	-	41 T T annual 2 C T T T T T T T T T T T T T T T T T T			Hz	T	50	60
Preheat catho	de voltage		,	V Min.	(r.m.s.)		3,05	3,05
				Max	(r.m.s.))	5,5	5,5
Open circuit v	oltage across lamp	-	- ,	V Min.	(r.m.s.)		205	205
				Max	(peak)		420	420
Substitution re	esistor for each catho	de		7.17	Ω		9*	9*
Voltage to sta	rting aid	-		V Min	(peak)		*	•
Current in any	lead to cathodes			Α Ι	Мах.	C	,750	0,750
	Infor	mation for ballast o	design (North Ame	rican pra	ctice)			
Frequency		<u>, </u>			1	1	Hz	2 2000
Preheat catho	de voltage				. V		(r.m.s.	
	18.10						(r.m.s	
Operating cath	hode voltage				V		(r.m.s.	
<u> </u>						Max.	(r.m.s	
Substitution re	esistor for each catho	de					Ω	9,6
				One la	mp	Two lar		Three lamps in series
Open circuit v	oltage across lamp a	V	Min. (r.m.s.)	200		256		395
			Max. (r.m.s.)	260		330		525
Voltage to sta	rting aid ^b	v	Min. (peak)	240		240		280
Crest factor of and to starting	f open circuit voltage g aid	across lamp	Max.	2,0		2,0		2,0
Starting aid ca	apacitor @ 60 Hz	μF	Min.	_		0,04		0,04
No. andrew a con-			Max.			0,06		0,06
	ues are for capacitive ues are for crest facto				10 %.			
			8-	4-03				
* Under cons	sideration.							
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			DOUBLE-	DATA S		CENT LA	MP		Page 1
				9F7 8 4.			11	LCOS: FD)-65-L/P/L-G13-38/150
Nominal wa	attage	C	Dircuit	Catho	ode		Cap	No	minal dimensions
65		Sta	rterless	Preheated, lov	v resistano	се	G13		38 × 1500
	J K-90			Dimens	ions	-2			
A				B	i		С		D
Max	ſ.		Min.	Max			лах.	1	Max.
1500	,0		1504,7	1507	,1	15	514,2		40,5
				Starting chara	acteristics				
Frequency	Ballast nor wattage	ninal	Ballast rated voltage	Starting aid distance	Cathod (r.	de voltage .m.s.)	V	en circuit oltage r.m.s.)	Starting time
Hz	w		V	mm		V	i '	v	s
50	65		220	13		3,05		220	10
60	_		_			-	Ц	-	_
				Electrical char	acteristics	s			
Test method	Frequer	ncy F	Rated wattage	Volta	ıge (r.m.s.) at lamp t	erminal	s	Rated lamp current
Annex	Hz		w	Rated	Min	imum	Ма	ximum	A
B.1	50		64	110	1	00		120	0,670
B.1	60		-	-	3	_		=	-
B.2	60		_			_		_	-
Chromaticity	co-ordinate	s: see	D.2, annex D.						
				Cathode chara	acteristics				
Cat	hode		Test voltag			Resis		f each cat Ω	hode
						Rated			Minimum
Low re	sistance	,	3,	6		6			4
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Page 2

ILCOS: FD+65-L/P/L-G13-38/1500

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto
Hz	w	V	Α	Ω	
50	65	220	0,670	240	0,10
60	-	_	_	-	-

Informa	ation for ballast desig	gn		2.834.77
Frequency		Hz	50	60
Preheat cathode voltage	V	Min. (r.m.s.)	3,05	-
*		Max. (r.m.s.)	5,5	-
Open circuit voltage across lamp	V	Min. (r.m.s.)	220	_
		Max. (peak)	475	-
Substitution resistor for each cathode		Ω	6	-
Voltage to starting aid	V	Min. (peak)	•	3 — 3
Current in any lead to cathodes	А	Max.	1,100	-

* Under consideration.

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60081-IEC-5540-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FD-85-L/P/L-G13-38/2400 Cap Nominal dimensions Nominal wattage Circuit Cathode W mm 85 W G13 Starterless Preheated, low resistance 38×2400 Dimensions mm Α В C D Max. Min. Max. Max Max. 2374,3 2381,4 2388,5 40,5 2379,0 Starting characteristics Ballast nominal Ballast rated Cathode voltage Oper circuit Frequency Starting aid Starting time distance voltage wattage voltage (r.m.s.) (r.m.s.) W ٧ Hz mm S 50 85 325 240 13 3,05 10 60 Electrical characteristics Rated lamp Test method Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current Annex w Rated Minimum Hz Max mum Α **B**.1 50 85 178 163 193 0,550 B.1 60 60 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Cathode Test voltage (r.m.s.) Resistance of each cathode Minimum Rated Low resistance 3,6 6 * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-5840-1

Page 2

ILCOS: FD-85-L/P/L-G13-38/2400

		Reference bal	last characteristics		
Frequency	Nominal wattage	Rated voltage	Calibration current	Voltage/current ratio	Power facto
Hz	w	V	Α	Ω	
50	85	350	0,550	480	0,06
60	_	_	_		_

Informat	ion for ballast desi	gn	8		
Frequency			Hz	50	60
Preheat cathode voltage	v	Min. (r.m	.s.)	3,05	-
		Max. (r.m	.s.)	5,5	-
Open circuit voltage across lamp	٧	Min. (r.m.	.s.)	•	-
A		Max. (pe	ak)		_
Substitution resistor for each cathode			Ω	6	-
Voltage to starting aid	V	Min. (peal	<)	•	
Current in any lead to cathodes .	Α	Max.		*	_

* Under consideration.

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60081-IEC-5840-1

			DOUL	SLE-C	DATA SH		ILA	M				Page 1	
		11 - 12 - 12				76			ILCO	S: FD-6	50-L	_/P/L-R17d-38/1	
Nominal wa	ittage	(Circuit		Cathod	е		Ca	P	Nor	ninal dimensions		
60		Sta	arterless		Preheated, low	I, low resistance R17d					38 × 1200		
-					Dimensio	ns		_			_		
					mm								
				;	100000						,		
	Min.				Max.			\dashv		Ма	ıx.		
*	1161	,2		,	1166,0)				40	,5		
												* *****	
					Starting charac	teristics		1					
Frequency		nominal tage	Ballast volta		Starting aid distance	Cathode vo			volt	circuit age		Starting time	
Hz	N	W	v		mm	v				′		s	
50	59.	_			_	_			-	-	W 23	-	
60		30	*		13	3,05	1		20	5		10	
	5450				Electrical chara	cteristics							
Test method	Freq	uency	Rated wa	ttage	Voltag	ge (r.m.s.) at V	lamp	terr	ninals			Rated lamp current	
Annex	+	-lz	w		Rated	Minimun	n		Maxim	num		A	
B.1		50	_			_			<u> </u>			_	
B.1	6	60	•		*	*			*	•		*	
B.2	6	30	63 #		78	70			86			0,800	
# Includes ap	pproxim co-ordir	ately 7 V nates: *	V for supp	lement	ary cathode hea	ting with 3,6	V acro	oss	each c	athode.		20000	
					Cathode charac	teristics							
Cat	hode		Test	voltage V	e (r.m.s.)		Resis	tan	ce of ea	ach cat	hod	e	
	5-9	20 00 00				Ra	ted				Mir	nimum	
Low re	sistance	•		3,6	3	3,	,2	\dashv				2,8	
* Under cons	ideratio	ın.											
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Page 2

		DA	~					
	<u> </u>	*			Lcos	FD-60-	L/P/L-F	R17d-38/120
		Reference b	allast characterist					
Frequency	Nominal wattage	Rated voltage	Calibration currer	t Vol	tage/cu	urrent rat	tio F	Power factor
Hz	w	V	Α		2	2		
50	-	-	-		7 -	_		-
60	60	230	0,800		24	44		0,075
	1							
		Information	on for ballast desig	n				
Frequency		2000			Hz	z	50	60
Preheat catho	de voltage		1	V Min.	(r.m.s	.)	-	*
				Max.	(r.m.s	i.)	_	*
Open circuit v	oltage across lamp		13	V Min.	(r.m.s	.)	-	*
				Max	. (peak	()	_	*
Substitution re	esistor for each catho	de			Ω		_	*
\/-I4	sting old			20000000				*
voltage to sta	rting ato		1	∨ Min	(peak	(1)	_	
	lead to cathodes			Α Ι	lax.	(1)	-	+ :
Voltage to sta Current in any Frequency	lead to cathodes	mation for ballast		Α Ι	lax.	(1)	-	*
Current in any	lead to cathodes	mation for ballast		Α Ι	lax.		-	60
Current in any	lead to cathodes	mation for ballast		Α Ι	dax.	Min.	- Hz	60
Current in any Frequency Preheat catho	Information of the contract of	mation for ballast		Α Ι	dax.	Min.	Hz	60 3,4) 4,5
Current in any Frequency Preheat catho	Information of the contract of	mation for ballast		Α Ι	viax.	Min. Max. Min.	Hz (r.m.s.)	60) 3,4) 4,5) 3,0
Current in any Frequency Preheat catho Operating catl	Information of the contract of			Α Ι	viax.	Min. Max. Min.	Hz (r.m.s.) (r.m.s.)	60) 3,4) 4,5) 3,0
Current in any Frequency Preheat catho Operating catl	Information of the contract of			Α Ι	vax.	Min. Max. Min.	- Hz (r.m.s.) (r.m.s. Ω mps	60) 3,4) 4,5) 3,0) 4,0 3,2
Current in any Frequency Preheat catho Operating catho Substitution re	Information of the contract of	de	design (North Ame	rican pra	vax.	Min. Max. Min. Max.	- Hz (r.m.s.) (r.m.s. Ω	60) 3,4) 4,5) 3,0) 4,0 3,2 Three lamp
Current in any Frequency Preheat catho Operating catho Substitution re	Information of the control of the co	de	design (North Ame	rican pra	vax.	Min. Max. Min. Max.	- Hz (r.m.s.) (r.m.s. Ω	60) 3,4) 4,5) 3,0) 4,0 3,2 Three lamp in series
Current in any Frequency Preheat catho Operating catho Substitution re	Information of the control of the co	de	Min. (r.m.s.) Max. (r.m.s.)	rican pra	viax.	Min. Max. Min. Max.	- Hz (r.m.s.) (r.m.s.) (r.m.s.) Ω mps ies	60) 3,4) 4,5) 3,0) 4,0 3,2 Three lampin series 385
Frequency Preheat catho Operating cath Substitution re Open circuit v Voltage to sta Crest factor of	Information of the second of t	de V	Min. (r.m.s.) Max. (r.m.s.)	One late	viax.	Min. Max. Min. Max. Two lar in seri	- Hz (r.m.s.) (r.m.s.) (r.m.s.) Ω mps ies	60) 3,4) 4,5) 3,0) 4,0 3,2 Three lampin series 385
Frequency Preheat catho Operating cath Substitution re Open circuit v Voltage to sta Crest factor of and to starting	Information of the second of t	de V	Min. (r.m.s.) Max. (r.mek) Max.	One lai	viax.	Min. Max. Min. Max. Two lai in seri	- Hz (r.m.s.) (r.m.s.) (r.m.s. Ω mps ies	60) 3,4) 4,5) 3,0) 4,0 3,2 Three lamp in series 385 - 325

8-4-03

* Under consideration.

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60081-IEC-5960-2

				DATA SH	EET			Page 1		
		·		<u> </u>	h	IL	COS: FD-8	87-L/P/L-R17d-38		
Nominal wa	attage	Circuit		Cathod	le	Сар	Nor	minal dimensions		
w								mm		
87	St	tarterless		Preheated, low	resistance	R17d		38 × 1800		
				Dimensio	uns	-				
				mm						
		C	>				D)		
	Min.			Max.			Ма	ıx.		
	1770,8			1775,6			40	,5		
-	T			Starting charac	1	_		1		
requency	Ballast nominal wattage	Ballast volta		Starting aid distance	Cathode voltage (r.m.s.)	v	en circuit oltage r.m.s.)	Starting time		
Hz	w	V V		mm	V	V s				
50	-	_		-	-		-	-		
60	87	*		13	3,05		275	10		
			-	Electrical chara	cteristics					
est method	Frequency	Rated wa			e (r.m.s.) at lamp t	erminal		Rated lamp		
001	, , , , ,	110100 11	llage		V			current		
Annex	Hz	w		Rated	Minimum	Ма	aximum	A		
B.1	50	_		_	_		_	-		
B.1	60	•		*	*		*			
B.2	60	87 #		117	105		129	0,780		
Includes ap hromaticity	pproximately 7 \ co-ordinates: *	N for supp	ement	ary cathode hea	iting with 3,6 V acre	oss eac	h cathode.			
				Cathode charac	teristics					
Cat	thode	⊤est	voltage V	e (r.m.s.)	Resis		f each catl Ω	ode		
					Rated			Minimum		
Low re	sistance	ı	3,6		3,2			2,8		

Texte français au verso French text overleaf 60081-IEC-5970-1

		ı	DATA	SHEET						Pa	ige 2
						-					
						14	.cos:	FD-87-	L/P/L-I	R17d	-38/180
All All All All All All All All All All	50 KA	Reference	e bal	last characteristi	cs						
Frequency	Nominal wattage	Rated voltage		Calibration curren	t Vo	lt	age/cur	rent rat	io	Powe	er factor
Hz	w	V		Α	V 183		Ω				
50	_		\perp	=			-				-
60	87	300		0,800			315	i		0	,075
# 1 B	220	- Inform	-tion	for ballast design		4	İ				
Frequency			ation	for ballast design		-	Hz	T	50	1	60
Preheat catho	ode voltage				/ Mir	1.	(r.m.s.)	-	_	+	*
	ac comago					-	(r.m.s.)			+	*
Open circuit v	oltage across lamp			,		\rightarrow	(r.m.s.)		_		*
	•						(peak)		_	+	*
Substitution re	esistor for each catho	de				7	Ω		-		*
Voltage to sta	arting aid		8	,	√ Mi	n.	(peak)		-	\top	*
Current in any	y lead to cathodes	7.			Α	N	lax.		-		*
	Infor	mation for balla	st de	sign (North Ame	rican pr	aç	tice)	V 384522	2		
Frequency									Hz	:	60
Preheat catho	ode voltage						V	Min.	(r.m.s.	.)	3,4
								Мах.	(r.m.s	.)	4,5
Operating cat	hode voltage						V	Min.	(r.m.s	.)	3,0
					97			Max.	(r.m.s	.)	4,0
Substitution r	esistor for each catho	ode							Ω		3,2
				A - A - A - A - A - A - A - A - A - A -	One I	an	ηp	Two la			ee lamp series
Open circuit v	oltage across lamp ^a		V	Min. (r.m.s.)	26	0		395			550
				Max. (r.m.s.)	-			-			-
Voltage to sta	arting aid ^b		V	Min. (peak)	32	5		325			325
Crest factor o	of open circuit voltage g aid	across lamp		Max.	2,	0		2,0			2,0
Starting aid c	apacitor @ 60 Hz		μ F	Min.	212			0,0			0,06
	10.40			Max.	_			0,12			0,12
	es are for capacitive es are for crest factor					d	10 %.				
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* Under consideration.

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60081-IEC-5970-2

		וטסטו	sLE-C	DATA SH		LAÑ			Page 1
				-	•		ILCOS	s: FD-112	-L/P/L-R17d-38
Nominal wa	ttage	Circu t		Cathod	le		Сар	Nomi	nal dimensions
112	SI	arterless		Preheated, low	resistance	F	117d		38 × 2400
				Dimensio	ons				
						Т		D	
	Min.			Max.	-			Max	
	2380,4			2385,2		\top		40,5	
				Starting charac			-		
Frequency	Ballast nominal wattage	Ballast		Starting characters Starting aid distance	Cathode volt	age	volt	circuit age	Starting time
Hz	w	\	,	mm	v		Officers.	/	s
50	_	-		-	-		-	-	-
60	112			13	3,05		3	15	10
				Electrical chara	cteristics				
Test method	Frequency	Rated wa	attage		ge (r.m.s.) at la	mp te	rminals		Rated lamp current
Annex	Hz	w		Rated	Minimum		Maxii	mum	Α
B.1	50	_	1.00.	-			_		-
B.1	60			•	•		*	-	*
B.2	60	113		153	138	\perp	16		0,790
f Includes a Chromaticity	pproximately 7 co-ordinates: *	W for sup	plemen	tary cathode hea	ating with 3,6 V	acro	ss each o	cathode.	
				Cathode chara	cteristics			-	
Cat	thode	Tes	t voltaç V	ge (r.m.s.)	F	lesist	ance of e	ach cath	ode
					Pate	<u>ــــــــــــــــــــــــــــــــــــ</u>			Minimum

Cathode	Test voltage (r.m.s.)	Resistance o	f each cathode
	v		Ω
		Rated	Minimum
Low resistance	3,6	3,2	2,8

* Under consideration.

Texte français au verso French text overleaf 60081-IEC-5980-1

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

ILCOS: FD-112-L/P/L-R17D-38/2400

		Reference I	pallast characteristics		
Frequency Hz	Nominal wattage W	Rated voltage V	Calibration current A	Voltage/current ratio	Power factor
50	-	_	_	-	· -
60	112	400	0,800	415	0,075

Information	for ballast design			16	
Frequency			Hz	50	60
Preheat cathode voltage	V	Min.	(r.m.s.)	-	3,05
×		Max.	(r.m.s.)	_	5,0
Open circuit voltage across lamp	V	Min.	(r.m.s.)	-	315
		Max	(peak)	-	*
Substitution resistor for each cathode	9475 1990-19		Ω	-	3,2
Voltage to starting aid	V	Min	(peak)	-	*
Current in any lead to cathodes	Α	ľ	Лах.	-	*

Frequency						Hz	60
Preheat cathode voltage				V	Min.	(r.m.s.)	3,4
					Max.	(r.m.s.)	4,5
Operating cathode voltage				V	Min.	(r.m.s.)	3,0
					Max.	(r.m.s.)	4,0
Substitution resistor for each cathode						Ω	3,2
			One lan	пр	Two la		Three lamps in series
Open circuit voltage across lamp a	V	Min. (r.m.s.)	295		465	,	660
		Max. (r.m.s.)	-		-		_
Voltage to starting aid ^b	V	Min. (peak)	325		325	5	325
Crest factor of open circuit voltage across lamp and to starting aid)	Max.	2,0		2,0		2,0
Starting aid capacitor @ 60 Hz	μ F	Min.	-		0,0	3	0,06
· · · · · · · · · · · · · · · · · · ·		Max.	-		0,1	2	0,12

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* Under consideration.

Texte français au verso French text overleaf 60081-IEC-5980-2

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 DATA SHEET ILCOS: FDH-6-L/P-W4.3x8.5d-7/220 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 6 W4.3x8.5d 7 × 220 HF starterless Preheated **Dimensions** mm C D Max. Min. Max. 217,3 219,3 7,0 Starting characteristics Open circuit voltage (r.m.s.) Frequency Starting aid Preheat current Preheat time Starting time distance kHz mm 20 - 266 0,120 1,5 290 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Current Maximum kHz W Rated Minimum Α 20 - 265,0 51 46 56 0,100 Chromaticity coordinates: see D.2, Annex D. Cathode characteristics Test current Resistance of each cathode Ω Rated Minimum Maximum A 0,100 100 75 125 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6030-3

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

	Ref	erence	e bal	last characte	eristics	5		†		***
Frequency	Nominal wattage	Γ	Rate	ed voltage	T	Calib	ration cur	rent	F	Resistance
kHz	w			V			Α			Ω
20 – 26	6			220			0,100			1 690
		ia.								
	Informatio	on for	high	frequency b	allast	desia	n			
Frequency									kHz	≥ 20
		- No	orma	loperation		-	W 1000			
		110000						1	Min.	0.080
Lamp operating current /	D			11			Α	<u> </u>	Max.	0,135
Current in any lead to ca	thodes	-					Α		lax.	0,140
1880 1880		Din	mmin	g operation						
No. 2							*	1	Min.	0,010
_amp operating current /	D						Α		lax.	0,080
Minimum sum of squares	s lead currents: ILH2 + ILL2 =	= X ₁ - `	Y ₁ / _D					X ₁	A ²	0,018
Target sum of squares le	ead currents: $I_{LH}^2 + I_{LL}^2 =$	= X ₁ - (0,3 Y	1 /D			A ²	Y ₁	A	0,185
Acremum arms of a sures	-11						. 2	X ₂	A ²	0,022
waximum sum or square	s lead currents: $I_{LH}^2 + I_{LL}^2 =$	= X ₂ - `	Y ₂ I _D				A^2	Y ₂	A	-0,047
LL max; /LH max							A	0	105	0,140
Substitution resistor for e	ach cathode for testing dim	ming r	requir	ements:			F	Test1	Ω	100
								Test2	Ω	115
-				10 %	R ₁₀	Ω	Min.			4 700
ama aubatitutian maiata							Max.	T		8 200
amp substitution resisto	r at n % of the test current	n	= .	30 %	R ₃₀	Ω	Nomina	1		1 800
			-	60 %	R ₆₀	Ω	Nomina	1		910
Sta	rting requirements with a	ath a de		basting for	_44	4!	0.4	1		
Jia	rting requirements with c	atnoue	e pre	neating, for	startin	g tim	es 0,4 s	1		1
dinimum cathode prehea	tenergy: $E_{min} = Q_{min} + P_{min}$	nin ts					J	H	in (J)	0,50
oltage across each cath	ode for E/t) < E							H	(W)	0,35
	ach cathode, for testing min	ina	0046	ا ا - ما مام			V	мах.	r.m.s.)	11
accuration resistor for ea	activatione, for testing min	mum	catno	oue preneat r	equirer	nents			Ω	54
faximum cathode prehea	at energy : $E_{\text{max}} = Q_{\text{max}} + F$	max ts					J		x (J)	1,00
	ach cathode, for testing max		octi-	odo prebest				Pma	k (W)	0,70
agontation resistor for ea	acti cathode, for testing max	T		ode preneat i	equire			Man	Ω	68
pen circuit voltage acros	ss lamp V	NON	-ignit	on voitage		t ≤		 	r.m.s.)	160
with starting aid)		Ignit	tion v	oltage			10 °C) 15 °C)	-	r.m.s.)	290
ubstitution resistor range	e for each cathode, for testing	ad ope	n circ	ruit voltago re			15 -C)	iviiri.(r.m.s.)	350
		.g ope	0110	on voltage it	Admen	icilla			Ω	54 162
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DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-8-L/P-W4.3x8.5d-7/320 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 7 × 320 8 HF starterless Preheated W4.3x8 5d **Dimensions** mm С D Min. Max. Max. 318,9 320,9 7,0 Starting characteristics Frequency Starting aid Preheat current Preheat time Open circuit Starting time distance voltage (r.m.s.) kHz mm s 310 20 - 266 0,120 1,5 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Current Minimum Maximum kHz W Rated 70 86 0,100 20 - 267,7 78 Chromaticity coordinates: see D.2, Annex D. Cathode characteristics Resistance of each cathode Test current Ω Maximum Α Rated Minimum 125 0,100 100 75 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6040-3

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

			DA	TA SHEET							*
	¥						· · · · · · · · · · · · · · · · · · ·	-			
							ILC	os	s: FDH	-8-L/P-V	V4.3x8.5d-7/320
		Refe	rence ba	llast characte	ristics		10		1		
Frequency	Nominal	wattage	Rat	ed voltage		Calibr	ation co	rre	nt		Resistance
kHz	w			V			Α		$\perp \sqcup$		Ω
20 – 26	. 8		186	220		K-10-1	0,100		+		1 410
*											
		Information	for high	n frequency b	allast	desig	1				
Frequency									+	kHz	≥ 20
	 	<u> </u>	Norm	al operation				+			T 0.000
Lamp operating c	urrent ID						Α	 -		lin.	0,080
Coment in any lan								₩	_	lax.	0,135
Current in any lea	d to cathodes	•					A	1	- I ^N	lax.	0,140
			Dimmi	ng operation		-		1	+.		1 0010
Lamp operating c	urrent I _D						Α	1	_	lin.	0,010
00000		. 2 . 2					100000	H	_	ax.	0,080
	squares lead currents:						A^2	1 -	×	A ²	0,018
arget sum of squ	ares lead currents:	$I_{LH}^2 + I_{LL}^2 =$	$X_1 - 0.3$	Y ₁ / _D				1	Y	A	0,185
Maximum sum of	squares lead currents:	! ILH2 + ILL2 =	X ₂ – Y ₂ / ₁	D			A^2		_X	A ²	0,022
	•							1.1	Y	Α	-0,047
LL max, /LH max							A	Ш	_	105	0,140
Substitution resist	or for each cathode fo	r testing dimm	ning requ	irements:				RTE		Ω	100
								Rte	st2	Ω	115
				10 %	R ₁₀	Ω	Min.				7 500
amn substitution	resistor at n % of the	test current	n=				Max.				15 000
Lamp substitution	resistor at 11 78 of the	test current	"-	30 %	R ₃₀	Ω	Nomi	al			3 000
				60 %	R ₆₀	Ω	Nomi	al			1 200
	Starting requirem	ents with ca	thode pr	eheating, for	startin	g time	es 0,4	s <	t _s < 3,	0 s	
			149112					T		in (J)	0,50
Minimum cathode	preheat energy : Emi	$_{\rm n} = Q_{\rm min} + P_{\rm min}$	n ts				J			(W)	0,35
Voltage across ea	ch cathode for E(t) < E	min					V	11		r.m.s.)	11
Substitution resist	or for each cathode, for	or testing mini	mum cat	hode preheat	require	ments	0	1		Ω	54
								T	ф _т	ax (J)	1,00
Maximum cathode	preheat energy : E _m	$_{\text{lax}} = Q_{\text{max}} + P_{\text{r}}$	_{nax} t _s				J	1		(W)	0,70
Substitution resist	or for each cathode, for	or testing maxi	mum cat	hode preheat	require	ments	,	+	-	Ω	68
				ition voltage		t ≤	8	1	Max	r.m.s.)	170
Open circuit voltag	je across lamp	V				558 5	10 °C)	#		r.m.s.)	310
with starting aid)			Ignition	voltage			15 °C)	H		r.m.s.)	390
Substitution resist	or range for each cath	ode, for testin	g open c	ircuit voltage r			.5 0)			Ω	54 162
										30 367	
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3	D(OUBLE-CAPPED F	SHEET	LAMP	1	Page
¥				ILCOS:	FDH-11-L/	P-W4.3x8.5d-7/42
Nominal wattage	e Circu	it Ca	hode	Сар	No	minal dimensions mm
11	HF starte	erless Preh	neated	W4.3x8.5d		7 × 420
	· · · · · · · · · · · · · · · · · · ·		nsions			*,
		C	nm		D	
· N	tin.	. м	ax.		Max	
42	20,5	42	2,5		7,0	
					· ·	•
5)		Starting ch	aracteristics			
Frequency	Starting aid distance	Preheat current	Preheat time	Open cir voltage (r.	cuit m.s.)	Starting time
kHz	mm	A	s	V		s 0,1
Frequency	Rated wattage		naracteristics ge (r.m.s.) at lamp te V	erminals		Rated lamp
kHz	l w	Rated	Minimum	Maximu	m	Α Α
20 – 26	10,6	107	97	117		0,100
Chromaticity coordin	nates: see D.2, Annex	(D .	2.		ī.	
		Cathode ch	aracteristics			
Test currer	nt		Resistance of eac	ch cathode		
# P			Ω			Mandani in
0,100		Rated 100	Minimun 75	n		Maximum 125
0,100		100	,,,			120
					8	

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

ILCOS: FDH-11-L/P-W4.3x8.5d-7/420

	Refer	ence balla	st character				_		-	_		
Frequency	Nominal wattage		voltage		Ca	librat	2000	urre	ent			istance Ω
kHz	W		<u>v</u>	4-	_		A	_	-			670
20 – 26	11		277	<u>l</u>		0	,100	_	+			670
							_		-			
	Information	for high f	requency b	allast	des	sign	+		+-	kŀ	17	≥ 20
requency							+	_	+-		<u>''</u>	
		Normal	operation		-	_	+		tl-	Min.	T	0,080
amp operating current	lo.						1		Н	Max	+	0,135
						X1 (4 <u>1</u> 24	-	À -	t^{-}	Max	. 1	0,140
urrent in any lead to o	athodes	Dimmin	g operation				_		1			
		Din	в эрегия		_		_			Min		0,010
amp operating curren	t I _D						1	A		Max		0,080
Secretary of the second second section of the	res lead currents: $I_{LH}^2 + I_{LL}^2 =$	X ₁ - Y ₁ / _D						,	X1		A ²	0,018
inimum sum of squares		X ₁ - 0,3 Y	1 lo			20	A	2	Y ₁	\Box	Α	0,185
						-	Τ,	2	X ₂		A ²	0,022
Maximum sum of squa	res lead currents: ILH2 + ILL2 =	$X_2 - Y_2 I_D$							Y ₂		Α	-0,047
LL max; /LH max								A		0,10	5	0,140
Substitution resistor fo	r each cathode for testing dim	ming requi	rements:					L	R _{Test1}		Ω	100
Subotitution routes a									R est2		Ω	115
			10 %	R ₁₀		Ω	Nii	n.				10 000
					\perp	- 2	Ma	x.				18 000
Lamp substitution resi	stor at n % of the test current	n =	30 %	R ₃₀		Ω	No	mir	a			3 900
			60 %	R ₆₀		Ω	No	mir	ia			1 500
	Starting requirements with	cathode pr	eheating, fo	r star	ting	g tim	es (,4 :	s < t _s <	3,0	\$	
				306						Qmin	(J)	0,50
Minimum cathode pre	heat energy : $E_{min} = Q_{min} + F$	min ts						J		min	(W)	0,35
Voltage across each	cathode for E(t) < E _{min}					** **		٧	Ma	ax.(r	.m.s.)	11
Substitution resistor for	or each cathode, for testing m	inimum cat	hode prehea	t requi	irer	nents					Ω	54
	*				-			J	1		(J)	1,00
Maximum cathode pro	eheat energy : $E_{\text{max}} = Q_{\text{max}} +$	P _{max} t _s					\perp	J	1	max	(W)	0,70
Substitution resistor f	or each cathode, for testing m	aximum ca	thode prehe	at requ	ire	ment	s		4—		Ω	68
		Non-ig	nition voltage	,		t:	≤ t _s		-11-		m.s.)	180
Open circuit voltage a	across lamp V				_	> ts (.m.s.)	330
(with starting aid)			n voltage		_	> t _s (C)	N	lin.(ı	.m.s.)	430
Out stitution registers	range for each cathode, for te	ting open	circuit voltag	e requi	ire	ments	3				Ω	54 16

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DOUBLE-CAPPED FLUORESCENT LAMP Page 1 DATA SHEET ILCOS: FDH-13-L/P-W4.3x8.5d-7/520 Cab Nominal dimensions Nominal wattage Circuit Cathode W mm W4.3x8.5d 13 HF starterless Preheated 7°× 520 **Dimensions** mm С D Min. Max. Max. 524,1 7,0 522,1 Starting characteristics Open circuit Starting time Frequency Starting aid Preheat current Preheat time voltage (r.m.s.) distance kHz mm A 20 - 266 0,120 1,5 380 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp Current kHz W Rated Minimum Maximum Α 146 0,100 20 - 2613,2 133 120 Chromaticity coordinates: see D.2, Annex D. **Cathode characteristics** Test current Resistance of each cathode Ω Minimum Rated Maximum 0,100 100 75 125 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6060-3

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

ency ballast ation		n A A A A A A A			kHz	sistance Ω 1 740 ≥ 20 0,080 0,135 0,140 0,010 0,080 0,018
ration	st desig	0,100		Mill Ma Ma Mill Ma Mill Ma Kı	n. IX. IX. A ²	1 740 ≥ 20 0,080 0,135 0,140 0,010 0,080 0,018
ration	st desig	A A		Mill Ma Ma Mill Ma Mill Ma Kı	n. IX. IX. A ²	≥ 20 0,080 0,135 0,140 0,010 0,080 0,018
ration	st desig	A A A	A COLUMN TO THE PROPERTY OF TH	Mill Ma Ma Mill Ma Mill Ma Kı	n.	0,080 0,135 0,140 0,010 0,080 0,018
ration	st desig	A A A	A COLUMN TO THE PROPERTY OF TH	Mill Ma Ma Mill Ma Mill Ma Kı	n.	0,080 0,135 0,140 0,010 0,080 0,018
ration		A ²	A COLUMN TO THE PROPERTY OF TH	Mill Ma Ma Mill Ma Mill Ma Kı	n.	0,080 0,135 0,140 0,010 0,080 0,018
ration		A ²	A COLUMN TO THE PROPERTY OF TH	Ma Ma Mii Ma X ₁	n. A ²	0,135 0,140 0,010 0,080 0,018
is:		A ²	A COLUMN TO THE PROPERTY OF TH	Ma Ma Mii Ma X ₁	n. A ²	0,135 0,140 0,010 0,080 0,018
is:		A ²	A COLUMN TO THE PROPERTY OF TH	Ma Mii Ma	n.	0,140 0,010 0,080 0,018
is:		A ²		Min Ma	n.	0,010 0,080 0,018
is:		A ²	2	Ma K ₁	A ²	0,080 0,018
		A ²	2	Ma K ₁	A ²	0,080 0,018
		A ²	2	K ₁	A ²	0,018
	-	A		_		
		A		Y1	A	
						0,185
	-	A	1	K ₂	A ²	0,022
		Α	Ш	Y ₂	Α	-0,047
			1	0,1	05	0,140
R ₁₀			RTe	-	Ω	100
R ₁₀			RTe	st2	Ω	115
	οΩ	Min.				13 000
		Max	-	_		24 000
R ₃₀	0 Ω	Non	inal			4 700
R ₆₀	ο Ω	Non	inal			2 000
ng, for starti	rting tin	nes 0,	s <	t _s < 3,0	s	
-			ПТ	Qmin		0,50
			1	Pmin	(W)	0,35
		\	11	Max.(r	.m.s.)	11
eheat requir	irement	s			Ω	54
				Q _{max}	_x (J)	1,00
		•	1 [P _{max}	(W)	0,70
reheat requi	uirement	ts			Ω	68
oltage	t	≤ t _s		Max.(r	r.m.s.)	210
	$t > t_s$ (+10 °C		Min.(r	.m.s.)	380
•	$t > t_s$ ((-15 °C		Min.(r	.m.s.)	470
oltage require	irements	s	9		Ω	54 162
0	oreheat requoltage	oreheat requiremen oltage $t > t_s$ e $t > t_s$	preheat requirements oreheat requirements oltage $t \le t_s$ $t > t_s (+10 ^{\circ}\text{C})$	oreheat requirements oltage $t \le t_s$ $t > t_s (+10 ^{\circ}\text{C})$ e $t > t_s (-15 ^{\circ}\text{C})$	reheat requirements Qma Pmax oreheat requirements oltage $t \le t_s$ Max.(t_s) $t > t_s$ (+10 °C) Min.(t_s) $t > t_s$ (-15 °C) Min.(t_s)	reheat requirements Ω $\frac{Q_{max}\left(J\right)}{P_{max}\left(W\right)}$ oreheat requirements Ω oltage $t \le t_s$ Max.(r.m.s.) $t > t_s \left(+10 ^{\circ}\text{C}\right)$ Min.(r.m.s.) $t > t_s \left(-15 ^{\circ}\text{C}\right)$ Min.(r.m.s.)

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** Page 1 ILCOS: FDH-14-L/P-G5-16/550 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 14 HF starterless Preheated G5 16 × 550 **Dimensions** mm Α В d D Max. Min. Max. Max. Max. 549,0 553,7 556,1 563,2 17,0 Starting characteristics Open circuit voltage (r.m.s.) Frequency Starting aid Preheat current Preheat time Starting time distance kHz mm Α 20 - 26 6 0,210 2 230 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Maximum kHz W Rated Minimum Α 20 - 26 14,0 86 76 96 0,165 The maximum luminous flux shall be obtained at an ambient temperature between 34 C and 38 C. Chromaticity coordinates: see D.2, annex D. 8.4.03 Cathode characteristics Test current Resistance of each cathode Rated Minimum Maximum 0,160 30 50 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-6520-3

Page 2 **DATA SHEET** LCOS: FDH-14-L/P-G5-16/550 Reference ballast characteristics Resistance Calibration current Nominal wattage Rated voltage Frequency Ω kHz W 0,170 500 167 14 20 - 26 Information for high frequency ballast design kHz ≥ 20 Frequency kHz 0.220 Max. Current in any lead to cathodes 0,130 Α Min. Lamp operating current Max. 0,205 0,4 s < t_s < 3,0 s Starting requirements with cathode preheating, for starting times 0,9 Q_{min} (J) Minimum cathode preheat energy : $E_{min} = Q_{min} + P_{min} t_s$ 0,8 P_{min} (W) ٧ Max.(r.m.s.) 11 Voltage across each cathode for $E(t) < E_{min}$ 30 Ω Substitution resistor for each cathode, for testing minimum cathode preheat requirements 1,8 Q_{max} (J) J Maximum cathode preheat energy : $E_{\text{max}} = Q_{\text{max}} + P_{\text{max}} t_{\text{s}}$ P_{max} (W) 1,5 40 Substitution resistor for each cathode, for testing maximum cathode preheat requirements Ω Max.(r.m.s.) 130 Non-ignition voltage $t \leq t$ Open circuit voltage across lamp Min.(r.m.s.) 230 $t > t_s (+10 \,^{\circ}\text{C})$ Ignition voltage Min.(r.m.s.) 275 $t > t_{\rm s} (-15 \,{\rm ^{\circ}C})$ Max.(peak) Non-ignition voltage $t \leq t_s$ Voltage to starting aid * Min.(peak) Ignition voltage t > 18 Substitution resistor range for each cathode, for testing open circuit voltage requirements 30.....90 Starting requirements without cathode preheating, for starting times $t_{\rm s} < 0.1$ s Min.(r.m.s.) Open circuit voltage across lamp Min. A Current through lamp substitution resistor Ω Lamp substitution resistor Substitution resistor for each cathode Ω Max. Α Cathode current Typical characteristics for a lamp at 35 °C ambient temperature Lamp wattage Lamp voltage Lamp current A 0,170 82 13,7 * Under consideration Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6520-5

			DATA S	HEET				Page 1	
			X 10 10	s	-	ILC	os: FD	H-21-L/P-G5-16/850	
Nominal wattag	је	Circuit	Cath	ode	Ca	ıp	,	Nominal dimensions mm	
21	HF	starterless	Prehe	ated	G	5		16 × 850	
			Dimen m			1			
Α	_		В		d			D	
Max.		Min.	Ма	ix.	Ма	×.		Max.	
849,0		853,7	856	5,1	863	3,2		17,0	
			Starting cha	racteristics		-			
Frequency	Starting distance		heat current	Preheat tim	ne vo	Open oltage	circuit (r.m.s.)	Starting time	
kHz	mm		Α	s			ŀ	s	
20 - 26	6		0,210	2		35	0	0,1	
Frequency	Rated wat	ttage	Electrical cha	e (r.m.s.) at lan	mp termina	ıls		Rated lamp current	
kHz	w		Datad	V Mainting common		1		-	
20 - 26	20,6		Rated 126	Minimum 116		-	mum 6	0,165	
he maximum lur			at an ambient	temperature b	etween 3	t °C a	nd 38 °C		
			Cathode cha						
Test curre	ent			Resistance of	each cath Ω	node			
Α		Rate	ŧd.	Mini	mum			Maximum	
0,160		40		3	30			50	
						8	. 4 .0	3	

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60081-IEC-6530-3

Page 2

Name of the last o					ILC	S: F	DH-21-	L/P-G5-16/850	
		Refere	ence ballast characteris	stics		Ь,			
Frequency	Nomina wat	tage	Rated voltage	Calibratio	n curre	ht	R	esistance	
kHz	۱۷		V		4	\sqcup		. Ω	
20 - 26	2:1		246	0,1	70			725	
	Info	rmation	for high frequency ball	ast design				ш	
Frequency kHz			ioi ingii iioquoloj sull			 	kHz	≥ 20	
Current in any lead to	cathodes				AT	-	ax.	0,220	
Lamp operating curren					A		in.	0,130	
inp operating carron	•:					-	ax.	0,205	
Star	ting requirement	s with cat	hode preheating, for sta	rting times	0,4 s <	<i>t</i> _s < 3	,0 s		
Minimum cathode preh	eat energy (J):	$E_{min} = Q$	+ P t _s			Q	(J)	0,9	
								0,75	
Maximum cathode preheat energy (J) : $E_{max} = F \times E_{min}$							F	1,75	
Voltage across each ca	athode for $E(t) <$	Emin		200000000000000000000000000000000000000	V	Max.(r.m.s.)	10	
Substitution resistor fo	r each cathode,	for testing	g cathode preheat requir	ements		**	Ω	30	
Open circuit voltage ac	ross lamp	V	Non-ignition voltage	$t \leq t_s$		Max.(r.m s.)	200	
				t > t _s (+10	°C)	Min.(r.m.s.)	340	
			Ignition voltage	t > t _s (-15	°C)	Min.(r.m.s.)	390	
Voltage to starting aid		V	Non-ignition voltage	$t \leq t_s$		Max.	(peak)	*	
			Ignition voltage	$t > t_s$		Min.	peak)	*	
Substitution resistor ra	nge for each cat	hode, for	testing open circuit volta	age require	ments		Ω	3090	
		-4	ut cathode preheating, f	or storting t	imas t	< 0,1	_		
		ents witho	dt cathode preneating, i	or starting t	v I		r.m.s.)	*	
Open circuit voltage ac Current through lamp s		tor	 		Ā		in.	*	
Lamp substitution resis		101	***************************************				Ω	*	
Substitution resistor fo				W		-	Ω		
Cathode current	r each cambde				A	М	ax.	+	
Cathode current							<u> </u>		
	Typica: cha	racteristic	cs for a lamp at 35 °C ar	nbient temp	erature				
Lamp watta			Lamp voltage			_	np curre	ent	
W			V				Α	20	
20,7			123				0,170		
* Under consideration					5				

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-24-L/P-G5-16/550 Cap Nominal dimensions Circuit Cathode mm HF starteriess Preheated G5 16 × 550 **Dimensions** mm В ¢ D Max. Max. Min. Max. 553,7 556,1 563,2 17,0 Starting characteristics Starting aid Preheat current Preheat time Open circuit Starting time voltage (r.m.s.) distance mm Α S 6 0,440 2 250 0,1 **Electrical characteristics** Voltage (r.m.s.) at lamp terminals Rated wattage Rated lamp current W Rated Minimum Maximum Α 77 0,295 22,5 69 The maximum luminous flux shall be obtained at an ambient temperature between 34 o and 38 °C.

Chromaticity coordinates: see D.2, annex D.

Nominal wattage

W

24

Α

Max.

549,0

Frequency

kHz

20 - 26

Frequency

kHz

20 - 26

Cathode ch	naracteristics	
	Resistance of each cathode	
	Ω	
Rated	Minimum	Maximum
12	9	15
		Ω

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60081-IEC-6620-2

	i	0	OUBLE-CA	APPED FLUORESC	ENI LA	MP			Page	2
						ILO	cos:	FDH-		6/550
			Refer	ence ballast character	istics					
Frequen	у	Nominal	wattage	Rated voltage	Calibra	tion curi	rent		Resistance	•
kHz			V	V		Α			. Ω	
20 - 26		2	4	150	C	0,300	_	1	250	
			1f	for high formal last						
Frequency kH:	,		Information	for high frequency ba	liast desig	in	+	kHz	≥ 2	20
Current in any		athodes					\vdash	Max.	0,45	
Lamp operatin							\vdash	Min.	0,20	
						Ţ.	\vdash	Max.	0,4	
						+	┰			
	Start	ing requiren	ents with ca	thode preheating, for sta	arting time:	s 0,4 s	< t _s <	3,0 s		
Minimum catho			-					Q (J)	1,5	5
(F					43		-	P (W)	0,9	
Maximum cath	ode preh	eat energy (J) : E _{max} = F	x E _{min}			Н	F	1,7	5
Voltage across	each ca	thode for E(t) < E _{min}			V	Мах	x.(r.m.s	s.) 10)
Substitution re	sistor for	each catho	de, for testin	g cathode preheat requi	rements		+	Ω	8	
Open circuit vo	ltage ac	ross lamp	V	Non-ignition voltage	t ≤	ts	Max	c.(r.m.s	s.) 13	0
				V 1000	t > ts (+	10 °C)	Min	.(r.m.s	.) 28	0
				Ignition voltage	t > t _s (-1	5 °C)	Min	.(r.m.s	.) 35	0
Voltage to star	ting aid		V	Non-ignition voltage	t ≤ .	ts	Max.(peak)		() *	
				Ignition voltage	t >	ts	Min.(peak)		*) *	
Substitution re	sistor rar	ige for each	cathode, for	testing open circuit volt	age requir	ements		Ω	8	24
	Sta	arting requir	ements without	out cathode preheating,	for starting	times t	s < 0,	1 s		
Open circuit vo			*			Ψ	Min	.(r.m.s	.) *	2000
Current throug			esistor					Min.		
Lamp substitut							_	Ω	*	
Substitution re		each catho	de				_	Ω	*	
Cathode currer	nt					4		Max.		
		-								
	nn 11		cnaracteristi	cs for a lamp at 35 °C a	mbient tem	peratur	_			
Lai	np watta W	ge		Lamp voltage	1		La	amp cu	rrent	
	22,5			75			+	0.30	n	
* Under consi				73				0,300	J	
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DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** Page 1 ILCOS: FDH-28-L/P-G5-16/1150 Nominal wattage Circuit Cathode Cap Nominal dimensions W 28 HF starterless Preheated G5 16 × 1150 Dimensions mm Α ¢ D Max. Min. Max. Max. Max. 1149.0 1153,7 1156,1 1163 2 17,0 Starting characteristics Starting aid Open circuit voltage (r.m.s.) Frequency Preheat current Preheat time Starting time distance kHz mm Α S 20 - 26 6 0,210 2 375 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current kHz W Rated Minimum Maximum 20 - 26 27,9 166 0,170 149 183 The maximum luminous flux shall be obtained at an ambient temperature between 34 °C and 38 °C. Chromaticity coordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Rated Minimum Maximum 0,160 40 30 50 8.4.03 Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6640-3

			A contract statement contract							
					ILC	os:	FDH	-28-L/	P-G5-16/1150	
***		Refer	ence ballast characteris	tics						
Frequency	Nominal watta	ge	Rated voltage	Calibrati	on currer	t		Re	sistance	
kHz	w		V		A				. Ω	
20 - 26	28		329	0,		950				
	Info	ormation	for high frequency ball	ast design	+					
Frequency kHz							kHz	z	≥ 20	
Current in any lead to ca	athodes				Α	I	Мах.		0,220	
Lamp operating current					Α		Min.		0,130	
					[Мах.		0,205	
					1.					
St	arting requirements	s with ca	thode preheating, for st	arting times	0,45<			, T	0,9	
Minimum cathode prehe	eat energy : E _{min} = 0	Q _{min} + P _{mi}	n ts		J		_{min} (J _{nin} (W	_	0,8	
	oltage across each cathode for $E(t) < E_{min}$								11	
		stina mini	mum cathode preheat red	uirements	1		(r.m.		30	
Oubstitution resister for	000// 000//000// 10// 10/				\top	Q	_{max} (J)	1,8	
Maximum cathode preh	eat energy : E _{max} =	Q _{max} + P	max ts		1	Pn	_{nax} (W	()	1,5	
Substitution resistor for	each cathode, for tes	sting max	imum cathode preheat re	quirements			2	2	40	
Open circuit voltage acr	oss lamp	V	Non-ignition voltage	$t \leq t$	s	Max	k.(r.m	.s.)	240	
				t > t _s (+1	0 °C)	Min	.(r.m	.s.)	425	
			Ignition voltage	$t > t_s$ (-1	5 °C)	Min	.(r.m	.s.)	530	
Voltage to starting aid		V	Non-ignition voltage	t≤t	s	Ма	x.(pe	ak)		
			Ignition voltage	t > t	s	Mir	n.(pea	ak)	*	
Substitution resistor rar	nge for each cathode,	, for testir	ng open circuit voltage rec	quirements			2	Ω	3090	
	Starting requireme	nts with	out cathode preheating,	for starting	times ts	< 0,1	\$			
Open circuit voltage ac					V		n.(r.m	.s.)	*	
Current through lamp s					A		Min.	-	*	
Lamp substitution resis								Ω	*	
Substitution resistor for					-			Ω	*	
Cathode current	each camodo	11.000			A		Max.			
	Typical cha	racterist	ics for a lamp at 35 °C a	mbient tem	perature					
Lamp wa	ttage		Lamp voltage					currer	nt	
W			V				-	A		
27,8			167				0,	170		
* Under consideration										
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Page 1

ILCOS: FDH-35-L/P-G5-16/1450

Nominal wattage	Circuit	Cathode	Cap	Nominal dimensions
w				mm
35	HF starterless	Preheated	G5	16 × 1450

		Dimensions		
		mm		
Α .	В С		q	D
Max.	Min.	Max.	Max.	Max.
1449,0	1453,7	1456,1	1463,2	17,0

	Starting characteristics										
Frequency	Starting aid distance	Preheat current	Preheat time	Open cir voltage (r.		Starting time					
kHz	mm	A	s	\ \		s					
20 - 26	6	0,210	2	450		0,1					

		Electrical c	haracteristics				
Frequency	Rated wattage	Volta	ge (r.m.s.) at lamp ter V	rminals		Rated lamp current	
kHz	w	Rated	ed Minimum		num	A	
20 - 26	35,5	205	185	22	5	0,175	

The maximum luminous flux shall be obtained at an ambient temperature between 34 °C and 38 °C.

Chromaticity coordinates: see D.2, annex D.

	Cathode cl	naracteristics	
Test current .		Resistance of each cathode	
		Ω	
Α	Rated	Minimum	Maximum
0,160	40	30	50

8.4.03

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60081-IEC-6650-3

Publication CEI 60081
IEC Publication 60081

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

			DATA SHEET					
					IL	cos: i	FDH-35-L	/P-G5-16/1450
		Refer	ence ballast characteris	tics				- 1
Frequenc	y Nominal wat	tage	Rated voltage	Calibratio	n curre	nt	Re	esistance
kHz	w		V	,	•			Ω
20 - 26	35		413	0,1	70			1 200
	Ir	iformation	for high frequency ball	ast design	-		1.1.1-	> 00
Frequency kHz							kHz	≥ 20
	ead to cathodes	_			A		ax.	0,220
Lamp operating	current				A		lin. ax.	0,130
				**************************************			۵۸.	0,200
	Starting requiremen	ts with ca	thode preheating, for st	arting times	0.4 s <	t _s < 3,0) s	
	otal ang roquironen					_	n (J)	0,9
Minimum catho	de preheat energy : E _{min} =	Q _{min} + P _{mi}	n ts		J		(W)	0,8
Voltage across	each cathode for $E(t) < E_{mir}$	1		*	V	Max.(r.m.s.)	11
Substitution res	istor for each cathode, for to	esting mini	mum cathode preheat red	uirements			Ω	30
Marrian marka	de probest specific (F.)	-0 +0			J	Qma	_{1×} (J)	1,8
4	laximum cathode preheat energy : $E_{\text{max}} = Q_{\text{max}} + P_{\text{max}} t_{\text{s}}$						(W)	1,5
	istor for each cathode, for to		F	1			Ω	40
Open circuit vol	tage across lamp	V	Non-ignition voltage	t ≤ t _s		Max.(r.		275
			Ignition voltage $t > t_s$	$t > t_{\rm s}$ (+10	°C)	Min.(r.m.s.)		530
V 12			·go	t > t _s (-15	°C)	Min.(r.m.s.)	700
Voltage to starti	ng aid	V	Non-ignition voltage	t ≤ t _s			(peak)	*
C (8 (0 808-8/28			Ignition voltage	$t > t_{\rm s}$		Min.((peak)	*
Substitution res	istor range for each cathode	e, for testin	g open circuit voltage req	uirements			Ω	3090

	Starting requirem	ents witho	out cathode preheating,	for starting t	mes t	< 0,1 s		
Open circuit vol	tage across lamp		V	2.1	V	Min.(r.m.s.)	
Current through	lamp substitution resistor				Α	M	lin.	*
Lamp substitution	on resistor	(10)					Ω	*
Substitution res	istor for each cathode						Ω	*
Cathode current	t		- manufacturi		Α	М	ax.	*
		aracteristi I	cs for a lamp at 35 °C ar	nbient tempe	erature			
La	amp wattage		Lamp voltage	28		Lan	np currer	ıı
	W		V 200				A 0.170	- 14
	34,7	L	209		-		0,170	
* Under consid	leration		***		ļ.,			
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DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-39-L/P-G5-16/850 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 39 HF starterless Preheated G5 16 × 850 **Dimensions** mm В D Α Max. Max. Min. Max. Max. 849,0 853,7 856,1 863,2 17,0 Starting characteristics Open circuit voltage (r.m.s.) Starting aid distance Starting time Frequency Preheat current Preheat time kHz mm S 20 - 26 6 0,440 2 350 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current kHz W Rated Minimum Maximum A 20 - 26 38,0 118 108 128 0,325 The maximum luminous flux shall be obtained at an ambient temperature between 34 °C and 38 °C. Chromaticity coordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Ω Α Rated Minimum Maximum 0,350 12 9 15 8.4.03 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-6730-2

	S		DATA SHEET					Page 2		
						ILCOS:	FDH-39	9-L/P-G5-16/8		
		Ref	erence ballast character	istics						
Frequency	Nominal w	attage	Rated voltage	Calibra	tion cui	rent	R	esistance		
kHz	w		V		A			Ω		
20 - 26	39		224		,340		330			
		Ind			.,					
Frequency kHz		Informatio	n for high frequency bal	last design		- 		I		
Current in any lead	I to cathodes				A	1 N	kHz	≥ 20		
Lamp operating cu						H	ax.	0,450*		
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					A		in. ax.	0,260 0,425		
18								0,120		
	Starting requireme	nts with c	athode preheating, for st	tarting times	0,4 s	< t _s < 3,0	s	- War - War		
Minimum cathode i	preheat energy : Emin	-0.+0		85		Q _{mir}	(J)	1,5		
			nin ⁽ s		J	P _{min}	(W)	0,9		
	th cathode for $E(t) < E_{n}$				V	Max.(r	.m.s.)	11		
Substitution resisto	r for each cathode, for	testing min	imum cathode preheat red	quirements		Q _{max}	Ω	8,0		
Maximum cathode	Maximum cathode preheat energy : $E_{\text{max}} = Q_{\text{max}} + P_{\text{max}} t_{\text{s}}$							2,5		
Substitution resisto	r for each cathode, for	testing ma	kimum cathode preheat re	guiromente.	-	P _{max}	-	1,8		
Open circuit voltage		V	Non-ignition voltage	$t \le t_s$	-	Max.(r	Ω	10,5 175		
			g.m.o tomage	$t > t_s$ (+1)	-	Min.(r.	-	350		
			Ignition voltage	$t > t_s$ (-15	-	Min.(r.		390		
oltage to starting a	aid	V	Non-ignition voltage	t ≤ t _s	-	Max.(peak)	•		
			Ignition voltage	$t > t_{\rm s}$		Min.(peak)		(* 10)		
Substitution resistor	r range for each cathod	e, for testir	ng open circuit voltage req	uirements			Ω	824		
		ents with	out cathode preheating,	for starting	imes <i>t</i>	, < 0,1 s				
Open circuit voltage					V	Min.(r.	m.s.)	*		
current through lam	p substitution resistor				Α	Mir	n	*		
amp substitution re	esistor					0.000	Ω	•		
ubstitution resistor	for each cathode						Ω	•		
athode current					Α	Ma	×.	*		
	Tymical ob	orostoristi								
I amn	wattage	aracteristi	cs for a lamp at 35 'C an	nbient tempe	erature					
1.52	wattage N		Lamp voltage			Lamp	current			
	8,0		V 112		-		A 240			
Under consideration	·		112		-	0	,340			
français au verso		-	60081-IEC-6730-4			- 10	Pui	blication CEI 6008		

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-49-L/P-G5-16/1450 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 49 HF starterless Preheated G5 16 × 1450 **Dimensions** mm Α d В D Max. Max. Min. Max. Max. 1449,0 1453,7 1456,1 1463,2 17,0 Starting characteristics Open circuit voltage (r.m.s.) Frequency Starting aid Preheat current Preheat time Starting time distance kHz mm Α S 20 - 26 6 0,330 2 450 0,1 **Electrical characteristics** Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current kHz W Rated Minimum Maximum 20 - 26 49,2 195 175 215 0,255 The maximum luminous flux shall be obtained at an ambient temperature between 34 °C and 38 °C. Chromaticity coordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Ω Α Rated Minimum Maximum 0,260 16,5 12,4 20,6 8.4.03 Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-6750-2

Page 2 **DATA SHEET** ILCOS: FDH-49-L/P-G5-16/1450 Reference ballast characteristics Resistance Rated voltage Calibration curren Nominal wattage Frequency Ω kHz 765 390 0,255 20 - 26 49 Information for high frequency ballast design kHz ≥ 20 Frequency kHz 0,330 Max. Current in any lead to cathodes 0,180 Min. Lamp operating current Max. 0,295 Starting requirements with cathode preheating, for starting times 0,4 s < 1s < 3,0 s 1,1 Q_{min} (J) Minimum cathode preheat energy : $E_{min} = Q_{min} + P_{min} t_s$ P_{min} (W) 0,9 Max.(r.m.s.) 11 Voltage across each cathode for $E(t) < E_{min}$ 12,0 Substitution resistor for each cathode, for testing minimum cathode preheat requirements Ω Q_{max} (J) 2,2 Maximum cathode preheat energy : $E_{max} = Q_{max} + P_{max} t_s$ 1,8 P_{max} (W) 16,0 Ω Substitution resistor for each cathode, for testing maximum cathode preheat requirements Max.(r.m.s.) 225 Non-ignition voltage Open circuit voltage across lamp $t \leq t_s$ 450 Min.(r.m.s.) $t > t_{\rm s} (+10 \, {\rm ^{\circ}C})$ Ignition voltage 625 Min.(r.m.s.) $t > t_{\rm s} (-15 \, {\rm ^{\circ}C})$ Max.(peak) Non-ignition voltage $t \leq t_s$ Voltage to starting aid * Min.(peak) $t > t_s$ Ignition voltage 12....36 Substitution resistor range for each cathode, for testing open circuit voltage requirements Starting requirements without cathode preheating, for starting times & < 0,1 s Min.(r.m.s.) Open circuit voltage across lamp Min. Current through lamp substitution resistor Ω Lamp substitution resistor Ω Substitution resistor for each cathode Max. Cathode current Typical characteristics for a lamp at 35 °C ambient temperature Lamp current Lamp wattage Lamp voltage 0,260 49,3 191 * Under consideration Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-6750-4

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** Page 1 ILCOS: FDH-54-L/P-G5-16/1150 Nominal dimensions Cap Cathode Circuit Nominal wattage . mm W **G**5 16 × 1 150 54 HF starterless Preheated **Dimensions** mm D В A Max. Max. Max. Min. Max. 1 163,2 17,0 1 156,1 1 153,7 1 149,0 Starting characteristics Open circuit voltage (r.m.s.) Starting time Starting aid Preheat current Preheat time Frequency distance kHz mm A s 2 520 0,1 6 0,720 20 - 26 **Electrical characteristics** Rated lamp current Voltage (r.m.s.) at lamp terminals Rated wattage Frequency Maximum A W Rated Minimum kHz 110 30 0,455 120 20 - 26 54,1 The maximum luminous flux shall be obtained at an ambient temperature between 34 °C and 38 °¢. Chromaticity coordinates: see D.2, Annex D. Cathode characteristics Resistance of each cathode Test current Ω Maximum Minimum Rated A 10 6 0,480 8 Publication CEI 60081 IEC Publication 60081 60081-IEC-6840-3 Texte français au verso French text overleaf

Page 2 **DATA SHEET** LCOS: FDH-54-L/P-G5-16/1150 Reference ballast characteristics Nominal wattage Rated voltage Calibration current Resistance Frequency kHz W Ω 20 - 26 54 235 0.460 255 Information for high frequency ballast design Frequency kHz kHz ≥ 20 Current in any lead to cathodes A Max. 0,650 Lamp operating current A Min. 0.370 Max. 0.625 Starting requirements with cathode preheating, for starting times $0.4 \text{ s} < t_s < 3.0 \text{ s}$ 2,2 Q_{min} (J) Minimum cathode preheat energy : $E_{min} = Q_{min} + P_{min} t_s$ J 1,0 P_{min} (W) Voltage across each cathode for $E(t) < E_{min}$ Max.(r.m.s.) 11 Substitution resistor for each cathode, for testing minimum cathode preheat requirements 4,8 Ω Q_{max} (J) 3,8 Maximum cathode preheat energy : $E_{max} = Q_{max} + P_{max} t_s$ J P_{max} (W) 1,8 Substitution resistor for each cathode, for testing maximum cathode preheat requirements 6,5 Open circuit voltage across lamp Non-ignition voltage Max.(r.m.s.) 240 t > ts (+10 °C) Min.(r.m.s.) 520 Ignition voltage Min.(r.m.s.) 620 t > ts (-15 °C) Voltage to starting aid Non-ignition voltage Max.(peak) * Ignition voltage t > 1 Min.(peak) 4,8....14,4 Substitution resistor range for each cathode, for testing open circuit voltage requirements Ω Starting requirements without cathode preheating, for starting times $t_s < 0.1$ s Open circuit voltage across lamp V Min.(r.m.s.) Current through lamp substitution resistor Α Min. Lamp substitution resistor Ω Substitution resistor for each cathode Ω Cathode current Max. Typical characteristics for a lamp at 35 °C ambient temperature Lamp wattage Lamp voltage Lamp current Α 53,8 118 0,460 * Under consideration Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-6840-4

-	wi w		DATA	SHEET						Page 1
	-/				* 9		•	ILCOS: F	DH	-80-L/P-G5-16/1450
Nominal wattage	Circuit	Cathode Ca					Сар		No	ominal dimensions
80	HF starter	ess	Preh	eated		,	G 5			mm 16 × 1 450
										ş «
		/ ****	Dimer							
Α		В				1	С			D
Max.	Min.		Ma	2000		-	lax.			Мах.
1 449,0	1 453,7		1 45	56,1		1 4	63,2			17,0
	04-4514		Starting cha			_	-		_	
Frequency	Starting aid distance	Prehe	Preheat current Preheat time		Oper voltag	n circuit e (r.m.s.)		Starting time		
kHz 20 - 26	mm	Α -		s				V		s
		10		-	•			, , ,		
			Electrical ch	aracteristics						
Frequency	Rated wattage		Voltag	ge (r.m.s.) at I	amp term	ina	ls			Rated lamp current
kHz	W	R	ated	Minimu	m		Max	imum		Α
20 - 26	79,8		52	137		1		67		0,530
	us flux shall be obtain).			en 34 °C	and	d 38 °C). ·	0	
Test current			Cathode cha		of each o	200		76		
		Resistance of each cat					iode			
0,525		Rated Minimum			Maximum					
0,525		7,0 5,25				1		8,75		
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	DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET							Page 2
						ILCOS:	FDH-80	L/P-G5-16/145
F			erence ballast characteris	r——			<u> </u>	
Frequency	Nominal wattag	ge	Rated voltage	Calibi	ration cu	rrent	F	Resistance
kHz	W		V		Α		•	Ω
20 - 26	80		290	<u> </u>	0,550			260
	Info	rmatio	on for high frequency ball	aet doeig			<u> </u>	
Frequency kHz			ni ioi ingli irequelley ball	ast design	-		kHz	≥ 20
Current in any lead to cat	hodes			1.595	A	1	lax.	0,715
Lamp operating current					A	H	+	1
, .,					Α.	Min. Max.		0,440
					+	1	ian.	0,670
Sta	rting requirements	with c	athode preheating, for st	arting time	es 0.4 s	< t _e < 3.0) s	
***	William 15 MM					T	in (J)	2,2
Minimum cathode prehea		min + Pn	nin ts		J	1	(W)	1,0
Voltage across each cath					V	Max.(r.m.s.)	11
Substitution resistor for ea	ach cathode, for test	ing min	imum cathode preheat req	uirements			Ω	4,5
Maximum cathode preheat energy : $E_{\text{max}} = Q_{\text{max}} + P_{\text{max}} t_{\text{s}}$						Q _{ma}	× (1)	4,2
						P _{max}	(W)	1,9
Substitution resistor for each cathode, for testing maximum cathode preheat requirements Open circuit voltage across lamp V Non-ignition voltage							Ω	6,0
-per encen ronage acros	is lamp	٧	V Non-ignition voltage t ≤ t			H	r.m.s.)	250
			Ignition voltage				r.m.s.)	580
Voltage to starting aid			No.	$t > t_{\rm s}$ (-		H — —	.m.s.)	750
voltage to starting aid	The symbol volume 12 is					Max.(peak) Min.(peak)		•
Substitution resistor range	Ignition voltage $t>t_{\rm s}$ stitution resistor range for each cathode, for testing open circuit voltage requirements						peak) Ω	* 4,513,5
			ig open oneal voltage requ	in cities its	+		32	4,515,5
St	arting requirement	s with	out cathode preheating, f	or starting	times	< 0.1 s	1	
Open circuit voltage acros					V	·	.m.s.)	*
Current through lamp subs	titution resistor	78.0			A	Mi	-	•
amp substitution resistor					1		Ω	
Substitution resistor for ea	ch cathode		*** *** ***		1		Ω	*
Cathode current					A	Ма	-	.
	Typical charac	cteristi	cs for a lamp at 35 °C am	bient tem	perature			
Lamp wattag	е		Lamp voltage			Lam	p curren	t
W			V				Α	200
80,0			145			(555	
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DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-16-L/P-G13-26/600 Cap Nominal dimensions Nominal wattage Circuit Cathode w mm 16 HF starterless Preheated G13 26 × 600 Dimensions mm В D Α Мах. Max. Min. Max. Max. 604,0 28,0 589,8 594,5 596,9 Starting characteristics Open circuit voltage (r.m.s.) Preheat current Preheat time Starting time Starting aid Frequency distance kHz mm Α 2 20b 0,1 20 - 26 19 0,510 Electrical characteristics Rated lamp Rated wattage Voltage (r.m.s.) at lamp terminals Frequency current w Rated Minimum Maximum A kHz 20 - 26 64 58 70 0,255 16 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Ω Minimum Maximum Α Rated 0,510 15 10 * Under consideration. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-7220-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FDH-16-L/P-G13-26/600 Reference ballast characteristics Calibration current Nominal wattage Rated voltage Resistance Frequency kHz Ω W 20 - 26 16 128 0,255 250 Information for high frequency ballast design KHZ ≥ 20 Frequency Current in any lead to cathodes A Max. 0,450 A Min. Lamp operating current Max. Current controlled preheating Minimum preheat current i_k (A) to emission time t_e (s) 0,200 $i_{\rm k} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$ 0,250 $i_{m}(A)$ Maximum preheat current 1,600 $t \leq 0,4$ 0.4 < t < 2.01,800 - 0,500 t 0,800 $t \ge 2,0$ Open circuit voltage across lamp $t \leq t_{e}$ Max. (r.m.s.) Min. (r.m.s.) 200 $t > t_{\rm e}$ Max. (peak) Voltage to starting aid $t \leq t_{\rm e}$ $t > t_{\rm e}$ * Min. (peak) 10 Substitution resistor for each cathode Ω Voltage controlled preheating

Under consideration.

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60081-IEC-7220-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-32-L/P-G13-26/1200 Nominal dimensions Nominal wattage C-rcuit Cathode Cap W mm 32 HF starterless Preheated G13 26×1200 Dimensions mm D A В Max. M≀n. Max. Max. Max. 1199,4 1204,1 1206,5 1213,6 28,0 Starting characteristics Open circuit voltage (r.m.s.) Frequency Starting aid Preheat current Preheat time Starting time distance kHz Α s 20 - 26 0,510 2 240 19 0,1 Electrical characteristics Voltage (r.m.s.) at lamp terminals Frequency Rated wattage Rated lamp current kHz W Rated Minimum Maximum 20 - 26 32 0,255 128 118 138 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Α Rated Minimum Maximum 0,510 15 10 * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-7420-1

DOUBLE-CAPPED FLUORESCENT LAMP DATA SHEET

Page 2

		DATA SHEET							raye z
	· ·	*	,		IL	cos	S : FC	I H-32-L	/P-G13-26/1
* *	Refe	erence ballast characte	ristics	-	-	\vdash			
Frequency	Nominal wattage	Rated voltage	Calibr	ation	curr	ent	1	Resi	stance
kHz	w	v		Α					Ω
20 - 26	32	256		0,255				. 5	500

	Informatio	n for high frequency ba	ıllast desig	ın					
Frequency							k	Hz	≥ 20
Current in any lead to	cathodes				Α		Мах.		0,450
Lamp operating curre	ent				A		Min.		
			.09	_	\perp	_	Мах.		*
				_					
A AP - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	(A)	rrent controlled prehea	iting		Т	┼—	3000	ı	0.000
Minimum preheat cur i _k = (a/t _e + i _m ²) ^{0,5}	rent i_k (A) to emission tim	e t _e (s)	34				а		0,200
eron sentra servi delle di U					ŀ	Τ.	i _m (A)		0,250
Maximum preheat cu	rrent		А	\dashv	t≤	-			1,600
				0,4		< 2	,0	1,80	0 - 0,500 t
					<i>t</i> ≥	2,0	0.000		0,800
Open circuit voltage a	across lamp		V	t	$t \le t_{\rm e}$ Max. (280
				t	> t _e	H	Min.	(r.m.s.)	240
Voltage to starting aid		ele Amilie	v	t	≤ t _e	H	Max.	(peak)	•
			5,5,516	_	> t _e	\vdash		(peak)	•
Substitution resistor f	or each cathode	* * * *		-	_	╁╌		Ω	10
				1		\vdash			
	Vo	Itage controlled prehea	ıting						
**************************************		*							
		No. 1 Committee of the committee of the							
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DOUBLE-CAPPED FLUORESCENT LAMP Page 1 **DATA SHEET** ILCOS: FDH-50-L/P-G13-26/1500 Nominal wattage Cap Circuit Cathode Nominal dimensions W mm 50 HF starterless Preheated G 3 26 × 1500 Dimensions mm В A D Max. Min. Max. Max. Max. 1500,0 1504,7 1507,1 1514,2 28,0 Starting characteristics Open circuit voltage (r.m.s.) Starting time Frequency Starting aid Preheat current Preheat time distance kHz mm A ٧ 20 - 26 19 0,640 2 280 0,1 Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current kHz W Rated Maximum Minimum 20 - 26 50 142 132 15 0,355 Chromaticity co-ordinates: see D.2, annex D. Cathode characteristics Test current Resistance of each cathode Α Rated Minimum Maximum 0,640 10 * 7 * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-7520-1

DOUBLE-CAPPED FLUORESCENT LAMP Page 2 **DATA SHEET** ILCOS: FDH-50-L/P-G13-26/1500 Reference ballast characteristics Rated voltage Calibration current Resistance Frequency Nominal wattage kHz w V Ω 0,355 20 - 26 50 284 400 Information for high frequency ballast design Frequency kHz ≥ 20 Current in any lead to cathodes A Max. 0,600 Lamp operating current A Min. * * Max. Current controlled preheating 0,310 Minimum preheat current i_k (A) to emission time t_e (s) $i_{\rm K} = (a/t_{\rm e} + i_{\rm m}^2)^{0.5}$ i_m (A) 0.320 2,200 Maximum preheat current Α $t \leq 0.4$ 0,4 < t < 2,02,500 - 0,750 t 1,000 $t \ge 2.0$ 320 Open circuit voltage across lamp Max. (r.m.s.) t ≤ t_e Min. (r.m.s.) 280 $t > t_{\rm e}$ Voltage to starting aid t ≤ t_e Max. (peak) $t > t_{\rm e}$ Min. (peak) Substitution resistor for each cathode 7 Ω Voltage controlled preheating * Under consideration. Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-7520-1

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** ILCOS: FD-20-L/N-Fa6-38/600 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm20 Starterless Non-preheated Fa6 38 × 600 **Dimensions** mm C D Min. Max. Мах. 606,5 611,0 40.5 Starting characteristics Open circuit voltage (r.m.s.) Starting time Frequency Hz 50 190 10 60 _ Electrical characteristics Frequency Rated wattage Voltage (r.m.s.) at lamp terminals Rated lamp current Hz Rated Minimum Maximum 50 20 58 65 0,380 51 60 Chromaticity co-ordinates: see D.2, annex D. Reference ballast characteristics Frequency Nominal wattage Rated voltage Calibration Voltage/current Power factor current ratio V A Ω 50 20 127 0,370 270 0,12 60 Information for ballast design Frequency Hz 50 60 190 Open circuit voltage across lamp Min. (r.m.s.) Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-8240-1

	DOU	BLE-CAPPED I	FLUORESCENT	T LAM	P		
		DATA	SHEET				
	9		6			ILCOS	: FD-39-L/N-Fa8-38/
Nominal watta	ige Circuit	Ca	athode	Ca	ıp		Nominal dimensions
39	Starterle	ss Non-p	preheated	Fa	.8		38 × 1200
			ensions mm				
A		В		С			D
Max.	Min.	N	lax.	Ma	ζ.		Max.
1150,6	1153,7	11	59,5	1168	3,4		40,5
		Starting ch	naracteristics				
Fre	quency	Open circuit	voltage (r.m.s.)			Star	ting time
Hz V							\$
50 -					1		
	60		385		+		10
***		Electrical c	haracteristics		-		
Frequency	Rated wattage	Voltage (r.m.s.) at lamp terminals					Rated lamp current
Hz	w	Rated	Minimum	r	/laxim	um	Α .
50	_	_	_	-		_	
60	39	100	90		110		0,425
Chromaticity co-	ordinates: *						
		Reference balla	st characteristics				
Frequency	Nominal wattage	Rated voltage	Calibration current	Vol	ratio	urrent	Power factor
Hz	w	V	A	1	Ω		+
50		_	-		-		-
60	39	430	0,425		930		0,075
		Information fo	r ballast design				
requency				Н	z	50	60
pen circuit volta	ge across lamp		V Min.	(r.m.s.)		_	385
Under consider							

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** I_COS: FD-40-L/N-Fa6-38/1200 Nominal wattage Circuit Cathode Cap Nominal dimensions W mm 40 Starterless Non-preheated Fa6 38 × 1200 **Dimensions** С D Max. Max. 1216,0 1220,5 40,5 Starting characteristics Starting time Frequency Open circuit voltage (r.m.s.) Hz 205 10 Electrical characteristics Rated lamp Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current Hz W Rated Minimum Maximum Α 50 39,5 109 119 0,425 99 60 Chromaticity co-ordinates: see D.2, annex D. Reference ballast characteristics Nominal wattage Calibration Voltage/current ratio Power factor Frequency Rated voltage current Hz W V Ω 50 40 220 0,430 390 0,10 60 Information for ballast design Frequency HZ 50 60 205 Open circuit voltage across lamp Min. (r.m.s.) Texte français au verso French text overleaf Publication CEI 60081 IEC Publication 60081 60081-IEC-8440-1

	DOU		ED FLUORES	SCEN	TLAM	P		
				**			LCOS:	FD-65-L/N-Fa6-38/15
Nominal wattag	e Circuit	Circuit Cathode Cap						Nominal dimensions
65	Starterie	tarterless Non-preheated Fa						38 × 1500
			Dimensions mm					
		С						P
N	lin.		Мах.				N	Ла х.
15	1516,6 1521,1							10,5
		Starti	ing characteristic	s				
Frequency Open circuit voltage (r.m.s.)							Start	ing time
	1z 50		V 190		+			10
•	60 –							+ 1
			ical characteristi	500 Sec.		ļ.,		
Frequency	Rated wattage	V	oltage (r.m.s.) a		terminal	\$		Rated lamp current
Hz	w	Rated	Minim	um		Maximi	m	A
50	64	110	100)		120		0,670
60								
Chromaticity co-or	dinates: see D.2, an		ballast characte	riation.				
Frequency	Nominal wattage	Rated volta			Vo	tage/c	urrent	Power factor
Hz	w	V	curr	ent		ratio		
50	65	220	0,6	some:		240		0,10
60		_	_			-		
		Informati	on for ballast de	sian	7. 38/1.			
Frequency		omati		oigii	н	2	50	60
Open circuit voltage	e across lamp		V	Min.	(r.m.s.)		190	-
tte français au verso noch text overleaf 60081-IEC-8540-1						T.		Publication CEI 60081 IEC Publication 60081

DOUBLE-CAPPED FLUORESCENT LAMP **DATA SHEET** LCOS: FD-57-L/N-Fa8-38/1800 Nominal wattage Circuit Cap Nominal dimensions Cathode W mm 57 Fa8 Starterless Non-preheated 38×1800 Dimensions mm C D Α В Max. Min. Max. Max. Max. 1760,2 1763.3 1769,1 1778,2 40,5 Starting characteristics Starting time Frequency Open circuit voltage (r.m.s.) Hz 60 475 10 Electrical characteristics Rated lamp Frequency Rated wattage Voltage (r.m.s.) at lamp terminals current w Rated Minimum Maximum Α 50 60 149 0,425 57 134 164 Chromaticity co-ordinates: * Reference ballast characteristics Nominal wattage Rated voltage Calibration Frequency Voltage/current Power factor current ratio Hz w V A Ω 50 1100 0,075 60 57 525 0,425 Information for ballast design Frequency Open circuit voltage across lamp Min. (r.m.s.) 475 * Under consideration. Publication CEI 60081 IEC Publication 60081 Texte français au verso French text overleaf 60081-IEC-8740-1

	550	BLE-CAPPED F DATA	SHEET	LAM			Page 1
						LCOS:	FD-75-L/N-Fa8-38/2
Nominal watta	ge Circuit	Circuit Cathode Car					lominal dimensions mm
75	Starteries	ss Non-p	reheated	Fa	8		38 × 2400
							•
			nsions nm		:		
Α		В		С			D
Max.	Min.	м	ax.	Max	ζ.		Max.
2369,8	2372,9	23	78,7	2387	,6		40,5
TI		Chambia a ab			-		
Ero	augney		aracteristics	—	+	Storti	ing time
rie	Frequency Open circuit voltage (r.m.s.) Hz V					Starti	s
	50 –						_
00.004.00	60		665		<u> </u>		10
		Electrical ch	naracteristics			184	
Frequency	Rated wattage	Voltage	(r.m.s.) at lamp t	erminal	s		Rated lamp current
Hz	l	Rated	V	Ι,	Maxim	um	A
50	- +	-	-	1	-		_
60	75	197	177	1	217		0,425
Chromaticity co-	ordinates: *						
		Reference balla	st characteristics				
Frequency	Nominal wattage	Rated voltage	Calibration current	Vol	tage/c ratio	urrent	Power factor
Hz	W	V	A		Ω		
50							-
60	75	625	0,425		128	0	0,075
	· · · · · · · · · · · · · · · · · · ·	Information for	r ballast design		1		
Frequency	,			Н	z	50	60
Open circuit volta	ge across lamp		V Min.	(r.m.s.)		_	565
* Under consider	ration.						
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06