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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

NORME DE LA CEI

INTERNATIONAL ELECTROTECHNICAL COMMISSION

IEC STANDARD

Publication 337-2C

1977

# Troisième complément à la Publication 337-2 (1972)
# Auxiliaires de commande (appareils de connexion à basse tension pour des circuits de commande et des circuits auxiliaires, y compris les contacteurs auxiliaires)
## Deuxième partie: Prescriptions particulières pour des types déterminés d'auxiliaires de commande
# Section Cinq: Voyants lumineux
# Section Six: Normalisation du trou de fixation des boutons-poussoirs et des voyants lumineux fixés en un seul trou

# Third supplement to Publication 337-2 (1972)
# Control switches (low-voltage switching devices for control and auxiliary circuits, including contactor relays)
## Part 2: Special requirements for specific types of control switches
# Section Five: Indicator lights
# Section Six: Standardization of fixing hole of single hole mounted push-buttons and indicator lights



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**Third supplement to Publication 337-2 (1972)**

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# Section Six: Standardization of fixing hole of single hole mounted push-buttons and indicator lights

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FOREWORD

1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
2) They have the form of recommendation for international use and they are accepted by the National Committees in that sense.
3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

Section Five of this standard has been prepared by Sub-Committee 17B, Low-voltage Switchgear and Controlgear, of IEC Technical Committee No. 17, Switchgear and Controlgear.

A first draft was circulated in April 1975 and examined in The Hague in September 1975. The draft, Document 17B(Central Office)91, was submitted to the National Committees for approval under the Six Months' Rule in December 1975.

The following countries voted explicitly in favour of publication:

Australia
Belgium
Bulgaria
Canada
Denmark
Finland
France
Germany
Israel
Italy
Japan
Korea (Democratic People's Republic of)
Netherlands
Poland
South Africa (Republic of)
Spain
Sweden
Switzerland
Turkey
Union of Soviet Socialist Republics
United Kingdom
Yugoslavia

Section Six of this standard has been prepared by Sub-Committee 17B, Low-voltage Switchgear and Controlgear, of IEC Technical Committee No. 17, Switchgear and Controlgear.

Three successive drafts were respectively circulated in April 1972, February 1974 and July 1974. The second one was examined in Paris in February-March 1974 and the third one in The Hague in September 1975. The draft, Document 17B (Central Office)90, was submitted to the National Committees for approval under the Six Months' Rule in November 1975.

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Canada
Denmark
Finland
Germany
Hungary
Israel
Japan
Korea (Democratic People's Republic of)
Netherlands
Poland
Romania
Spain
Sweden
Switzerland
Turkey
Union of Soviet Socialist Republics
United Kingdom
United States of America

*Other IEC publications quoted in this standard:*

Publications 50(45): International Electrotechnical Vocabulary — Chapter 45: Lighting.
73: Colours of Indicator Lights and Push-buttons.
337-1: Control Switches (Low-voltage Switching Devices for Control and Auxiliary Circuits, including Contactor Relays), Part 1: General Requirements.
337-2: Part 2: Special Requirements for Specific Types of Control Switches; Section One: Push-buttons and Related Control Switches.
439: Factory-built Assemblies of Low-voltage Switchgear and Controlgear.

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**Third supplement to Publication 337-2 (1972)**

**Control switches (low-voltage switching devices for control and auxiliary circuits, including contactor relays)**

**Part 2: Special requirements for specific types of control switches**

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## SECTION FIVE: INDICATOR LIGHTS

### 1. General

1.1 *Scope*

This standard applies to indicator lights, fitted with one or more lamps, utilized in industry, such as incandescent-lamp indicator lights, discharge-lamp indicator lights, indicator lights with built-in voltage-reducing device (transformer, resistor, etc.).

In particular, it deals with indicator lights so designed that they fit in the same physical space as the push-buttons dealt with in IEC Publication 337-2, Control Switches (Low-voltage Switching Devices for Control and Auxiliary Circuits, Including Contactor Relays), Part 2: Special Requirements for Specific Types of Control Switches.

1.2 *Object*

This standard gives additional requirements not found in IEC Publication 337-1, Part 1: General Requirements, concerning definitions, classification, characteristics, identification and standard conditions for construction.

To comply with this standard, indicator lights shall be fitted with lamps in accordance with IEC publications in force.

### 2. Definitions

For the purpose of this standard, the following definitions shall apply.

2.1 *Indicator light* (Term 45-60-055 of the third edition (1970) of I.E.V. Chapter 45: Lighting)

Light signal giving information either by lighting or extinguishing.

2.2 *Lens of an indicator light*

The visible part, removable or not, constituting the surface intentionally made transparent.

2.3 *Bezel*

The holder of a lens.

2.4 *Indicator light with a built-in voltage-reducing device*

An indicator light, the body of which contains a device (transformer, resistor, etc.) intended to supply, at the terminals of the lamp, a voltage different from the rated operational voltage of the light.

## 3. Classification

Indicator lights may be classified by:

— the rated electrical power;
— the colour;
— the fixing hole diameter;
— the means of connection;
— the nature of the current applied and its frequency if any (e.g. lights with built-in transformer);

— the type of lamp socket;
— etc.

## 4. Characteristics

Refer to IEC Publication 337-1.

4.2.1.2 *Rated operational voltages*

A value of voltage, assigned by the manufacturer, which, in combination with the rated electrical power of a light, determines its application.

In the case of a light with a built-in transformer, the recommended values of the rated secondary voltage $U_{n2}$ of the transformer are: 6 V, 12 V and 24 V.

In the case of a light with a built-in voltage-reducing device, the manufacturer shall, in addition, indicate the rated voltage and the rated electrical power of the lamp.

4.2.1.3 *Rated power of a light*

The maximum lamp power which an indicator light is designed to withstand under specified conditions.

*Note.* — As the power of the light has an effect on the temperature rise, it may be necessary to limit the power according to the mounting conditions; the manufacturer of the light may assign two values of rated power (see Clause 8.1):
— the rated power of the light for mounting on a steel plate;
— the rated power of the light for mounting in an insulating enclosure.

## 5. Identification

The requirements of Clause 5.1 of IEC Publication 337-1 apply except for Items *d)*, *e)* and *f)*, which are modified in the following manner:

*d)* the rated power of the light (see Clause 4.2.1.3) corresponding to the test conditions of Clause 8.1;

*e)* the rated electrical power (or type number) of the lamp, in the case of a light with a built-in voltage-reducing device (see Clause 4.2.1.2).

Item *f)* of IEC Publication 337-1 does not apply.

## 6. Standard conditions of service

See Clause 6 of IEC Publication 337-1.

## 7. Standard conditions for construction

Refer to IEC Publication 337-1.

7.2 *Clearances and creepage distances*

Under consideration.

7.3 *Protection against ingress of liquids*

See Clause 2.4 of IEC Publication 337-2.

7.4 *Temperature-rise*

Replace this clause by:

No part of the light shall attain a temperature rise greater than the values indicated below when the light is supplied at a voltage not exceeding its rated voltage and at the rated frequency assigned by the manufacturer for the intended mounting conditions (see Clause 5):

Terminals: +70 °C.

Lens (external surface) { +30 °C if part of the surface is metal.
+40 °C if the whole surface is insulating.

Body of the light: limited solely by the necessity of not causing any damage to the light.

*Note.* — These limits are in accordance with Clause 7.3 of IEC Publication 439, Factory-built Assemblies of Low-voltage Switchgear and Controlgear.

The manufacturer shall state the maximum temperature rise admissible for the light body.

7.5 *Operating conditions*

The standard limits of the supply voltage at the light terminals are 0.85 and 1.1 times the rated operational voltage(s).

7.5.1 *Indicator lights with built-in transformers*

The following additional conditions shall be fulfilled:

*a)* The transformer shall have separated windings.

*b)* The transformer shall be able to withstand permanently the short circuit of its secondary winding. It is assumed that this condition is fulfilled if the apparatus passes the test described in Clause 8.3.

7.6 *Lens*

The colour of the lens when viewed in reflected light with the lamp extinguished shall be approximately the same as when viewed in the dark with the lamp illuminated.

7.6.1 *Colour*

It is recommended that the colour be chosen among those mentioned in IEC Publication 73, Colours of Indicator Lights and Push-buttons.*

The colour shall remain essentially unchanged in spite of the adverse influence of the environment, including the effect of ultra-violet light.

* See also Publication No. 2 of the International Commission of Illumination (CIE).

7.7 *Mechanical conditions — Fixing of lights*

When an indicator light forms an integral part of a push-button range, then it shall fulfil the requirements of Section Six of this standard.

## 8. Tests

The tests are type tests. No additional test (routine test or special test) is prescribed in this standard.

Each of the tests 8.1, 8.2 and 8.3 shall be made on new and completely mounted apparatus.

8.1 *Temperature-rise tests*

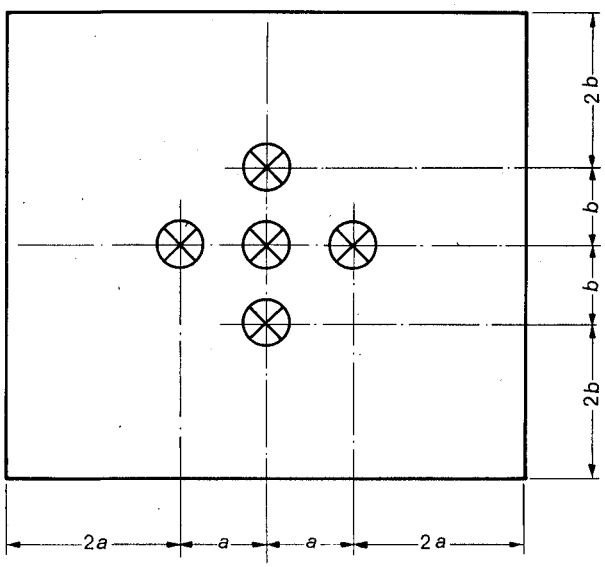
The tests below are conventional tests.

The tests are made successively with the two following mountings:

— on a steel plate,
— in an insulating enclosure,

in order to verify the rated power of the light (see Clause 4.2.1.3).

8.1.1 *Mounting on a steel plate*

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Five lights fitted with green lenses are fixed in accordance with the diagram on a steel plate 2 mm thick, painted mat.

Dimensions *a* and *b* are:

1) For indicator lights forming an integral part of a push-button range: in accordance with Section Six of this standard.

2) For other lights: as stated by the manufacturer, but the values used shall be recorded in the test report.

The lights are fitted with lamps as stated by the manufacturer and, if any, with built-in devices such as transformers, resistances, etc. The conductor sizes shall be as specified in IEC Publication 337-1.

The plate is located vertically on a table and the lights are supplied at their rated voltage. The duration of the test shall be such that a steady-state temperature is reached.

8.1.2 *Mounting in an insulating enclosure*

The test described in Clause 8.1.1 is carried out again with the lights mounted into an enclosure of insulating material, such as bakelite-coated paper 2 mm thick, the front face of which has the same dimensions as the steel plate in Clause 8.1.1 and the depth of which is 110 mm. The lights are fitted with lamps as stated by the manufacturer for this type of use; they are supplied at their rated voltage.

The duration of the test shall be such that a steady-state temperature is reached.

8.1.3 *Results to be obtained*

At the end of each of the tests described in Clauses 8.1.1 and 8.1.2, the temperatures are measured:

— on the body of the light;
— on the terminals;
— on the accessible part of the lens.

None of the corresponding temperature-rises shall exceed the limits referred to in Clause 7.4.

8.2 *Dielectric tests*

The light shall be capable of withstanding the test voltage applied for 1 min between the connection means connected together and the frame of the light.

8.2.1 *Test voltage*

The tests shall be made with alternative voltages, the r.m.s. values of which are in accordance with IEC Publication 337-1 (Clause 8.1.2.2), viz.:

| Rated insulation voltage $U_i$ Range (V) | Dielectric test voltage (a.c.) (r.m.s.) (V) |
|---|---|
| $U_i \leq 60$ | 1 000 |
| $60 < U_i \leq 300$ | 2 000 |
| $300 < U_i \leq 660$ | 2 500 |

8.2.2 *Lights with built-in transformer*

Two additional dielectric tests shall be made, the duration of each being 1 min:

*a)* Between the primary and the secondary windings of the transformer with the test-voltage value specified in Clause 8.2.1, depending on the rated insulation voltage of the light.

*b)* Between the secondary winding of the transformer and the frame of the light with a test-voltage value of 1 000 V, whatever the rated insulation voltage of the light may be.

8.3 *Short-circuit test (on built-in transformers, if any)*

The test shall be made under the following conditions:

— Primary voltage: 1.1 $U_n$.
— Ambient air temperature: +20 °C.
— Duration of the test: 1 h.

The value of the short-circuit impedance shall be negligible.

After the test and after cooling to ambient temperature, the transformer shall be essentially in the same condition as before the test.

8.4 *Operating tests*

Under consideration.

# SECTION SIX: STANDARDIZATION OF FIXING HOLE OF SINGLE HOLE MOUNTED PUSH-BUTTONS AND INDICATOR LIGHTS

## 1. Scope and object

This standard applies to single hole mounted control switches such as push-buttons (illuminated or non-illuminated) not fitted with enclosures and intended to be located on control panels or stations, as well as to indicator lights, signal lamps, etc.

Its object is to state dimensions and location of holes in the panels.

The method of fixing is not standardized.

This standard does not apply to measuring instruments.

*Note.* — In the rest of the standard, control switches, indicator lights, signal lamps, etc., are referred to as "devices".

## 2. Classification

The devices are classified into two sizes: D30 and D22.

## 3. Mounting of devices

The device is located in a circular hole of the panel which may have a rectangular recess for a key.

The dimensions are indicated in Table I.

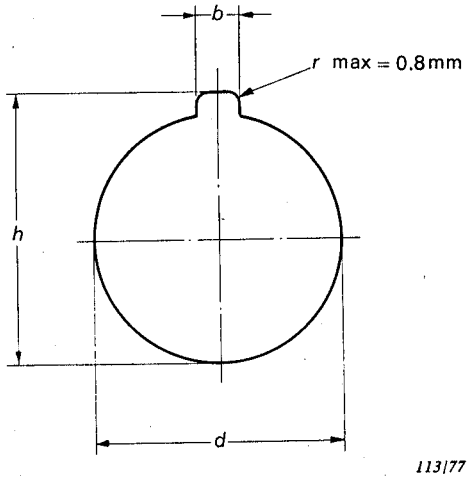


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TABLE I

*Mounting hole diameter and dimensions of the key recess (if any).*

| Size | Mounting hole diameter $d$ (mm) | Key recess (if any) | |
|---|---|---|---|
| | | Height $h$ (mm) | Breadth $b$ (mm) |
| D30 | $30.5\ ^{+0.5}_{0}$ | $33.0\ ^{+0.5}_{0}$ | $5\ ^{+0.2}_{0}$ |
| D22 | $22.5\ ^{+0.4}_{0}$ | $24.3\ ^{+0.4}_{0}$ | $3.5\ ^{+0.2}_{0}$ |

*Note.* — Where it is necessary to provide for smaller sizes, fixing hole diameters of $15.2\ ^{+0.2}_{0}$ mm and $12.1\ ^{+0.2}_{0}$ mm are recommended.

### 3.1 *Location of the key recess (if any)*

The standardized position of the key recess is the up position (12 o'clock).

3.2 *Range of panel thickness*

The device, with or without the sealing gasket indicated by the manufacturer, shall be capable of being mounted on any thickness of panel between 1 mm and 6 mm, if necessary by the use of packing piece(s) supplied for the purpose. If a device is to be mounted on a thicker panel, this shall be subject to an agreement between manufacturer and user.

*Note.* — The sealing gasket is not standardized.

## 4. Grouping of devices

When a number of devices of the sizes given in Clause 3 are mounted in rows on a panel, the distances *a* between the mounting centres in the same row and *b* between the centre lines of the rows shall be not less than those given in Table II, unless otherwise stated by the manufacturer.

TABLE II

*Minimum distances between centres of mounting holes*

| Size | *a* (mm) | *b* (mm) |
|---|---|---|
| D30 | 50 | 65 |
| D22 | 30 | 50 |

*Note.* — Distances *a* and *b* may be interchanged.

These values are intended to guide development; however, when it is intended to mount devices of different manufacture, the user shall establish the reciprocal compatibility of the devices and ensure that clearances and creepage distances are maintained when the devices are installed and connected.

*Note.* — Depending on design details, connections, labels, etc., some devices may be capable of being mounted at distances less than those given in Table II in accordance with the indication of the manufacturer of the devices. On the other hand, certain types of the devices may require distances greater than those given in Table II.