# INTERNATIONAL STANDARD

# IEC 60393-6

First edition
2003-05



## Potentiometers for use in electronic equipment –

## Part 6: Sectional specification: Surface mount preset potentiometers



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## Publication numbering

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

# POTENTIOMETERS FOR USE IN ELECTRONIC EQUIPMENT –

## Part 6: Sectional specification: Surface mount preset potentiometers

## FOREWORD

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2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical Specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.



International Standard IEC 60393-6 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

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

| FDIS | Report on voting |
|---|---|
| 40/1288/FDIS | 40/1324/RVD |

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Sectional Specification is to be used in conjunction with IEC 60393-1:1989.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended

A bilingual version of this publication may be issued at a later date.

# POTENTIOMETERS FOR USE IN ELECTRONIC EQUIPMENT –

## Part 6: Sectional specification: Surface mount preset potentiometers

## 1 General

### 1.1 Scope

This International Standard is applicable to surface mount preset potentiometers for use in electronic equipment.

### 1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select the appropriate quality assessment procedures, tests and measuring methods from IEC 60393-1 and to give general performance requirements for this type of potentiometer.

Test severities and requirements prescribed in Detail Specifications referring to this Sectional Specification shall be of equal or higher performance level, lower performance levels are not permitted.

### 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 60063:1963, *Preferred number series for resistors and capacitors*

Amendment 1 (1967)
Amendment 2 (1977)

IEC 60068-1, *Environmental testing. Part 1: General and guidance*

IEC 60068-2-20, *Environmental testing. Part 2: Tests. Test T: Soldering*

IEC 60068-2-21, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-45, *Environmental testing. Part 2: Tests. Test XA and guidance: Immersion in cleaning solvents*

IEC 60068-2-58, *Environmental testing – Part 2-58: Tests – Test Td – Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60393-1:1989, *Potentiometers for use in electronic equipment – Part 1: Generic Specification*

Amendment 1 (1992)

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC QC 001001:2000, *IEC Quality Assessment System for Electronic Components (IECQ) – Basic rules*

IEC QC 001002-3:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of procedure – Part 3: Approval procedures*

### 1.4 Information to be given in a Detail Specification

Detail Specifications shall be derived from the relevant Blank Detail Specification.

Detail Specifications shall not specify requirements inferior to those of the generic, sectional or Blank Detail Specification.

When more severe requirements are included, they shall be listed in 1.8 of the Detail Specification and indicated in the test schedules, for example by an asterisk.

NOTE The information given in 1.4.1 and 1.4.3 may, for convenience, be presented in tabular form.

The following information shall be given in each Detail Specification and the values quoted shall preferably be selected from those given in the appropriate Clause of this Sectional Specification.

#### 1.4.1 Outline drawing and dimensions

The Detail Specification shall incorporate an illustration of the surface mount preset potentiometer as aid to easy recognition and for comparison of the surface mount potentiometer with others.

Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the Detail Specification. All dimensions shall be stated in millimetres.

Normally the numerical values shall be given for the length, width and thickness of the body.

Where space is insufficient to show the detail dimensions required for inspection purposes, such dimensions shall appear on the drawing forming an annex to the Detail Specification.

Recommended land patterns shall be given in Detail Specification.

When the outline drawing is other than described above, the Detail Specification shall state such dimensional information as will adequately describe the surface mount potentiometer.

#### 1.4.2 Mounting

The Detail Specification shall give guidance on methods of mounting for normal use.

Mounting for test and measurement purposes (when required) shall be in accordance with the following Subclauses[1], unless otherwise specified.

**1.4.2.1** Surface mount potentiometers shall be mounted on a suitable substrate; the method of mounting will depend on the potentiometer construction. The Detail Specification shall indicate which material is to be used for electrical measurements.

The substrate shall have metallized land areas of proper spacing to permit mounting of surface mount potentiometers, and it shall provide electrical connection to the surface mount potentiometer terminals. The details shall be specified in the Detail Specification.

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[1] The text of 1.4.2 and its Subclauses will be integrated in a future edition of IEC 60393-1.

Examples of test substrates for mechanical and electrical tests are shown in Figures 1 and 2 respectively. If another mounting method applies, the method should be clearly described in the Detail Specification.

**1.4.2.2** When the Detail Specification specifies wave soldering, a suitable glue, details of which may be specified in the Detail Specification, shall be used to fasten the component to the substrate before soldering is performed.

Small dots of glue shall be applied between the conductors of the substrate by means of a suitable device securing repeatable results.

The surface mount potentiometers shall be placed on the dots using tweezers. In order to ensure that no glue is applied to the conductors, the surface mount potentiometers shall not be moved about.

The substrate with the surface mount potentiometers shall be heat-treated in an oven at 100 °C for 15 min.

The substrate shall be soldered in a wave soldering apparatus. The apparatus shall be adjusted to have a pre-heating temperature of 80 °C to 100 °C, a solder bath at 260 °C ± 5 °C, and a soldering time of 5 s ± 0,5 s.

The soldering operation shall be repeated a second time (two cycles in total).

The substrate shall be cleaned for 3 min in a suitable solvent (see 3.1.2 of IEC 60068-2-45).

**1.4.2.3** When the Detail Specification specifies reflow soldering, the following mounting procedure applies:

a) The solder used, in preform or paste form, shall be silver bearing (2 % minimum) eutectic Sn/Pb solder together with a non-activated flux, as stated in test T of IEC 60068-2-20. Alternative solders, such as 60/40 or 63/37 may be used on surface mounts whose construction includes solder leach barriers.

b) The surface mount potentiometer shall then be placed across the metallized land areas of the test substrate so as to make contact between surface mount and substrate land areas.

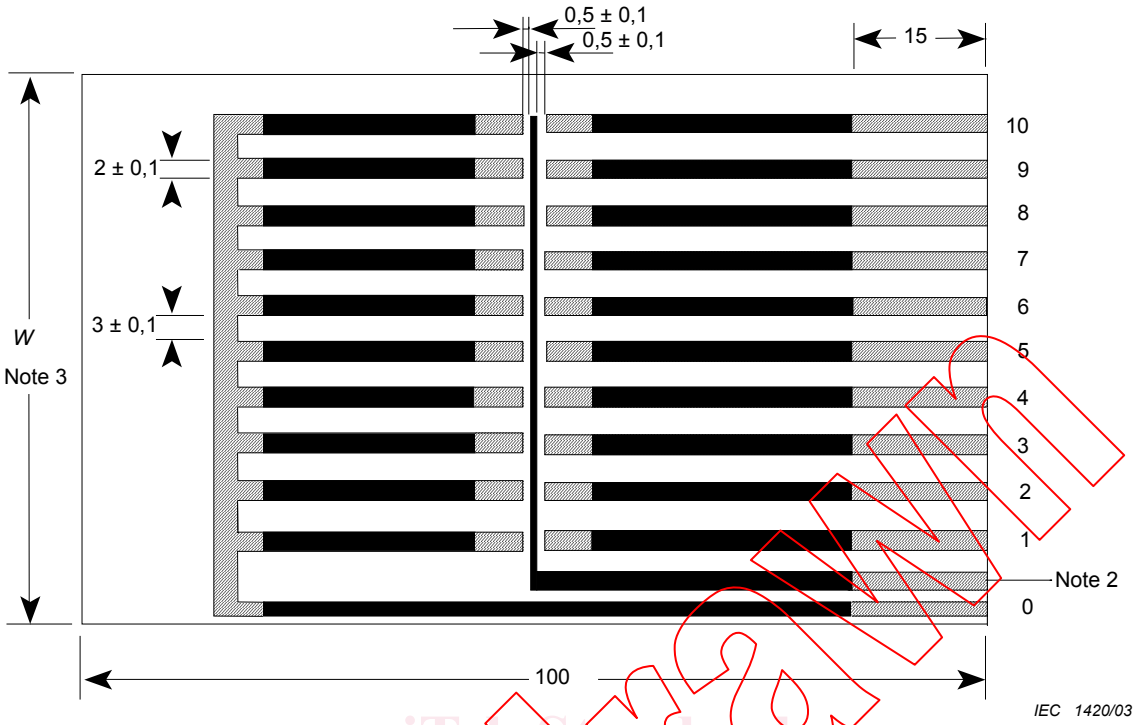
c) The substrate shall then be placed in or on a suitable heating system (molten solder, hot plate, tunnel oven, etc.). The temperature of the unit shall be maintained between 215 °C and 260 °C, until the solder melts and reflows forming a homogeneous solder bond, but for not longer than 10 s.

NOTE 1 The flux is removed by a suitable solvent (see 3.1.2 of IEC 60068-2-45). All subsequent handling is such as to avoid contamination. Care is taken to maintain cleanliness in test chambers and during post test measurements.

NOTE 2 The Detail Specification may require a more restricted temperature range.

NOTE 3 If vapour phase soldering is applied, the same method may be used with the temperatures adapted.

Dimensions in millimetres.




**Key**

Solderable areas.

Areas which shall not be solderable (covered with non-solderable lacquer).

Dimensions not given should be chosen according to the design and size of the specimens to be tested.

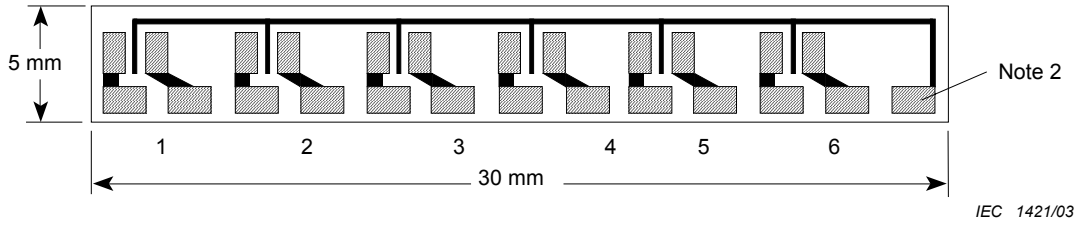
NOTE 1 Material: Epoxide woven glass.
Thickness: 1,6 mm ± 0,1 mm.

NOTE 2 This conductor may be omitted or used as a guard electrode.

NOTE 3 Dimension *W* is dependent on the design of the test equipment.

**Figure 1 – Suitable substrate for mechanical and electrical tests (may not be suitable for impedance measurements)**

Dimensions in millimetres.




**Key**

Solderable areas.

Areas which shall not be solderable (covered with non-solderable lacquer).

Dimensions not given should be chosen according to the design and size of the specimens to be tested.

NOTE 1 Material: 90 % to 98 % alumina.
Thickness: 0,635 mm ± 0,05 mm.

NOTE 2 This conductor may be omitted or used as a guard electrode.

**Figure 2 – Suitable substrate for electrical tests**

### 1.4.3 **Style** (See 2.2.3 of IEC 60393-1)

The style shall be presented by a double letter code for example AB, which is arbitrarily chosen for each Detail Specification.

The style designation therefore has no meaning unless the number of the Detail Specification is also given.

### 1.4.4 Resistance law

The resistance law is generally not verified. If required, the Detail Specification shall prescribe the measuring points and the associated limits for the output ratio and shall specify the position of the corresponding tests in the test schedules.

### 1.4.5 Ratings and characteristics

The ratings and characteristics shall be in accordance with the relevant Clauses of this Sectional Specification together with the following:

#### 1.4.5.1 Rated resistance range

See 2.2.1. The preferred values are those of the E-series of IEC 60063 and/or the 1, 2, 5 series.

NOTE When products approved to the Detail Specification have different ranges, the following statement should be added: “The range of values available in each style is given in the register of approvals”.

#### 1.4.5.2 Bump and shock

The bump and shock tests are considered to be alternatives. The Detail Specification shall indicate which test has been selected.

#### 1.4.6 Marking

The Detail Specification shall specify the content of the marking on the surface mount preset potentiometer and on the body.

Surface mount preset potentiometers are generally not marked on the body. If some marking can be applied, the surface mount preset potentiometer shall be clearly marked with the rated resistance and many of the remaining items in 2.4 of IEC 60393-1.

All items shall be marked on the package. Deviations from the above mentioned requirements shall be specifically stated.

## 2 Preferred ratings, characteristics and test severities

### 2.1 Preferred characteristics

The values given in the Detail Specification shall preferably be selected from the following:

#### 2.1.1 Preferred climatic categories

The surface mount preset potentiometers covered by this Sectional Specification are classified into climatic categories according to the general rules given in IEC 60068-1.

The lower and upper category temperature and the duration of the damp heat, steady state test shall be chosen from the following:

Lower category temperature: −65 °C, -55 °C, −40 °C and −25 °C

Upper category temperature: +70 °C, +85 °C, +100 °C, +125 °C and +155 °C

Duration of the damp heat, steady state test: 4, 10, 21 and 56 days.



The severities for the cold and dry heat tests are the lower and upper category temperatures respectively. Because of the construction of some surface mount preset potentiometers, these temperatures will occur between two of the preferred temperatures given in the IEC 60068-2 series. In this case, the nearest preferred temperature within the actual temperature range of the surface mount preset potentiometer shall be chosen for this severity.

#### 2.1.2 Temperature coefficients and temperature characteristics of resistance

The preferred limits of change in resistance for the temperature characteristic of resistance are given in Table 1.

Each line in the Table gives the preferred temperature coefficient and corresponding temperature characteristics for 20 °C to 70 °C and limits of change in resistance for the measurement of the temperature characteristic of resistance (see 4.14 of IEC 60393-1) on the basis of the category temperature ranges of 2.1.1 of this Sectional Specification.