

INTERNATIONAL STANDARD

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First edition
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**Potentiometers for use
in electronic equipment –**

**Part 6-1:
Blank detail specification
Surface mount preset potentiometers –
Assessment level E**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

POTENTIOMETERS FOR USE IN ELECTRONIC EQUIPMENT –

**Part 6-1: Blank detail specification:
Surface mount preset potentiometers –
Assessment level E**

FOREWORD

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International Standard IEC 60393-6-1 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
40/1289/FDIS	40/1325/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 Blank Detail Specification is to be used in conjunction with IEC 60393-1:1989 and IEC 60393-6:2003.

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- withdrawn;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 6-1: Blank detail specification: Surface mount preset potentiometers – Assessment level E

INTRODUCTION

Blank Detail Specification

A Blank Detail Specification is a supplementary document to the Sectional Specification and contains requirements for style, layout and minimum content of Detail Specifications. Detail Specifications not complying with these requirements are not to be considered as being in accordance with IEC Specifications nor are they to be so described.

In the preparation of Detail Specifications, the content of 1.4 of IEC 60393-6 is to be taken into account.

The numbers between square brackets on the first page correspond to the following information which is to be inserted in the position indicated.

Identification of the Detail Specification

- [1] The “International Electrotechnical Commission” or the National Standard Organization under whose authority the Detail Specification is drafted.
- [2] The IEC or National Standards number of the Detail Specification, date of issue and any further information required by the national system.
- [3] The number and issue number of the IEC or national Generic Specification.
- [4] The IEC number of the Blank Detail Specification.

Identification of the potentiometer

- [5] A short description of the type of potentiometer.
- [6] Information on typical construction (if applicable) for example: non-wirewound, lead-screw actuated.
- [7] Outline drawing with main dimensions which are of importance for interchangeability and/or reference to the national or international documents for outlines. Alternatively, this drawing may be given in an annex to the Detail Specification.
- [8] Application or group of applications covered and/or assessment level.
- [9] Reference data on the most important properties, to allow comparison between the various potentiometer types.

[1]	IEC 60393-6-1-XXX QC 410501XXXXXX	[2]
[3]	IEC 60393-6-1 QC 410501	[4]
	SURFACE MOUNT PRESET POTENTIOMETERS	[5]
[7]	Outline drawing and dimensions: (... angle projection)	
	(When necessary the dimensions may be given in annex to the Detail Specification)	[6]
Terminal connections:	Assessment level: E	[8]
For [1] to [9], see the Introduction.		

Information on the availability of components qualified to this Detail Specification is given in the register of approvals.

[9]

Table 1 – Important properties

Style	Rated dissipation at 70 °C W	Limiting element voltage (DC or AC r.m.s.) V	Insulation voltage (DC or AC peak) V	
			Normal air pressure	Low air pressure

1 General data

1.1 Recommended method(s) of mounting (to be inserted)

(See 1.4.2 of IEC 60393-6).

1.2 Dimensions

(When necessary, the dimensions may be given in an annex to the Detail Specification).

All dimensions are in millimetres.

1.3 Ratings and characteristics

Resistance range ¹	... Ω to ... Ω
Tolerances on rated resistance	\pm ... %
Resistance law (if other than linear)	...
Temperature characteristic of resistance (20 °C to 70 °C)	$\Delta R/R \leq$... %
Temperature coefficient	$\alpha \leq$... $10^{-6}/K$
Climatic category	-/-/-
Low air pressure	8 kPa
Limits of resistance change (after 500 h or 1 000 h electrical endurance test)	\pm (... % R + ... Ω)
Starting torque	... mN.m to ... mN.m
Total mechanical travel	... \pm ... turns or ... °
Limiting moving contact current	... mA

1.3.1 Derating

Potentiometers covered by this Specification are derated according to the following curve:

(A suitable curve to be included
in the Detail Specification)

NOTE See also 2.2.3 of IEC 60393-6

1.4 Normative references

Generic Specification: IEC 60393-1:1989, *Potentiometers for use in electronic equipment – Part 1: Generic specification*
Amendment 1 (1992)

Sectional Specification: IEC 60393-6:2003, *Potentiometers for use in electronic equipment – Part 6: Sectional specification: Surface mount preset potentiometers*

1.5 Marking

The marking of the component and package shall be in accordance with the requirements of 1.4.6 of IEC 60393-6.

The details of the marking of the component and package shall be given in full in the Detail Specification.

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

1.6 Ordering information

Orders for potentiometers covered by this Specification shall contain, in clear or in coded form, the following minimum information:

- a) rated resistance and tolerance on rated resistance;
- b) resistance law (if other than linear);
- c) number and issue reference of the Detail Specification and style;
- d) packaging instructions.

1.7 Certified records of released lots

Required/not required.

1.8 Additional information (not for inspection purposes)

(The Detail Specification may include information such as circuit diagrams, curves, drawings and notes needed for clarification of the Detail Specification).

1.9 Additional or increased severities or requirements to those specified in the Generic and/or Sectional Specification

NOTE Additions or increased requirements should be specified only when essential.

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2 Inspection requirements

2.1 Procedures

2.1.1 For qualification approval, the procedures shall be in accordance with 3.2 of IEC 60393-6.

2.1.2 For quality conformance inspection, the test schedule (Table 2) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by 3.3.1 of IEC 60393-6.

For the quality conformance inspection, the values representative of the whole approved range shall be tested within one year (Groups A, B and C only).

When drying is called for, Procedure I of 4.3 of IEC 60393-1 shall be used.

Table 2 – Test schedule for quality conformance inspection: lot-by-lot

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	IL (see NOTE 2)	AQL	Performance requirements (see NOTE 1)
GROUP A INSPECTION (lot-by-lot)					
Subgroup A1 4.4.1 Visual examination	ND		II	4,0 %	As in 4.4.1 of IEC 60393-1 As specified in 1.5 of this Specification
Subgroup A2 4.6 Element resistance	ND		II	1,0 %	As in 4.6.3 of IEC 60393-1
Subgroup A3 4.4.2 Dimensions (gauging)	ND		S-2	4,0 %	As specified in the Detail Specification
Subgroup A4 4.7 Terminal resistance 4.5 Continuity 4.15 Rotational noise 4.12 Voltage proof (insulated potentiometers only)	ND	Resistance between a and b Resistance between b and c Method B: Method: Insulation resistance (normal air pressure)	S-3	1,0 %	$R \leq \dots \Omega$ $R \leq \dots \Omega$ As in 4.5.2 of IEC 60393-1 $\leq \dots \% R$ or $\dots \Omega$ (whichever is the greater) As in 4.12.5 $\geq 100 M\Omega$
GROUP B INSPECTION (lot-by-lot)					
Subgroup B1 4.18 Starting torque 4.31 Sealing (if applicable)	D	Temperature: 85 °C to 90 °C	S-2	1,5 %	As specified in the Detail Specification As in 4.31.3 of IEC 60393-1

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	IL (see NOTE 2)	AQL	Performance requirements (see NOTE 1)
Subgroup B2 2.1.3.4 of IEC 60393-6 Solderability 4.45 Solvent resistance of the marking (if applicable)	ND	Aging (if applicable) Solder bath method Temperature: 235 °C ± 5 °C Duration: 2 s ± 0,5 s Solvent: Solvent temperature: ... Method 1 Rubbing material: cotton wool Recovery: ...	S-2	1,5 %	As in 2.1.3.4 of IEC 60393-6 Legible marking
<p>NOTE 1 Subclause numbers of tests and performance requirements refer to IEC 60393-1, except for some severities for environmental tests and limits of change in resistance or output ratio, which have to be taken from the relevant clauses of IEC 60393-6.</p> <p>NOTE 2 Inspection levels and AQL's are selected from IEC 60410.</p> <p>NOTE 3 In this Table: D = destructive ND = non-destructive IL = inspection level AQL = acceptable quality level } See IEC 60410</p>					

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Table 3 – Test schedule for quality conformance inspection

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	Sample size & criterion of acceptability (see NOTE 2)			Performance requirements (see NOTE 1)
			p	n	c	
GROUP C INSPECTION (periodic)						
Subgroup C1	ND		3	8	1	
4.14 Temperature characteristic of resistance		Lower category temperature/20 °C 20 °C/70 °C 20 °C/Upper category temperature				$\frac{\Delta R}{R} \leq \dots \%$ $\frac{\Delta R}{R} \leq \dots \%$ $\frac{\Delta R}{R} \leq \dots \%$
4.20 End stop torque		- For types fitted with end stops: As specified in 4.20.1 of IEC 60393-1 Not less than five times the upper limit of the starting torque (unless otherwise stated by the Detail Specification) - For types fitted with slipping clutches: As specified in 4.20.2 of IEC 60393-1				As in 4.20.1 of IEC 60393-1 As in 4.20.2 of IEC 60393-1
4.22 Thrust and pull on spindle		Only the thrust shall be applied. The pull is not applicable Half of the specimens: As specified in 4.22.2 of IEC 60393-1 Continuity Remaining specimens As specified in 4.22.3 of IEC 60393-1 Output voltage ratio				As in 4.22.2 of IEC 60393-1 $\Delta \frac{U_{ab}}{U_{ac}} \leq \dots \%$
4.4.4 Total mechanical travel		- Lead-screw styles: Effective operating turns: - Rotary styles:				$\geq 70 \%$ of total mechanical travel As specified in Detail Specification
4.4.6 Effective electrical travel		- Lead-screw styles: - Rotary styles: ...				$\geq 70 \%$ of the measured total mechanical travel As specified in Detail Specification
Subgroup C2A	D		3	7		
Part of the sample of Subgroup C2						
1.4.2 of IEC 60393-6 Mounting		Substrate material: ...				
2.1.3.2 of IEC 60393-6 Substrate bending test		Element resistance Visual examination				$\Delta R \leq \pm (\dots \% R + \dots \Omega)$ No visible damage

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	Sample size & criterion of acceptability (see NOTE 2)			Performance requirements (see NOTE 1)
			p	n	c	
2.1.3.3 of IEC 60393-6 Resistance to soldering heat (not applicable to potentiometers which are not suitable for total immersion)		Visual examination				As in 2.1.3.3 of IEC 60393-6 No visible damage
4.44 Component solvent resistance (if applicable)		Element resistance Resistance between a and b Resistance between b and c Solvent: ... Solvent temperature: ... Method 2 Recovery: ...				$\Delta R \leq \pm(\dots \% R + \dots \Omega)$ $R \leq \dots \Omega$ $R \leq \dots \Omega$ See Detail Specification
4.31 Sealing (if applicable)		Temperature: 85 °C to 90 °C				As in 4.31.3 of IEC 60393-1
Subgroup C2B	D		3	6		
Other part of sample of Subgroup C2						
1.4.2 of IEC 60393-6 Mounting		Substrate material: ...				
2.1.3.1 of IEC 60393-6 Shear		Element resistance				$\Delta R \leq \pm(\dots \% R + \dots \Omega)$
4.34 Change of temperature		Visual examination See NOTE 3 T_L = Lower category temperature T_B = Upper category temperature				No visible damage
4.36 Bump (or shock) (see 1.4.5.2 of IEC 60393-6)		Visual examination Output voltage ratio Element resistance				As in 4.34.5 of IEC 60393-1 $\Delta R \leq \pm(\dots \% R + \dots \Omega)$
4.37 Shock (or bump) (see 1.4.5.2 of IEC 60393-6)		For mounting method see 1.1 of this Blank Detail Specification Acceleration: 400 m/s ² Number of bumps: 4 000 Visual examination Element resistance				As in 4.36.3 of IEC 60393-1 $\Delta R \leq \pm(\dots \% R + \dots \Omega)$
		For mounting method see 1.1 of this Blank Detail Specification Pulse shape: half-sine Acceleration: 500 m/s ² Pulse duration: 11 ms Visual examination Element resistance				As in 4.37.3 of IEC 60393-1 $\Delta R \leq \pm(\dots \% R + \dots \Omega)$

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	Sample size & criterion of acceptability (see NOTE 2)			Performance requirements (see NOTE 1)
			p	n	c	
4.35 Vibration		<p>For mounting method see 1.1 of this Blank Detail Specification</p> <p>Frequency range: ... Hz to ... Hz</p> <p>Amplitude: 0,75 mm or acceleration 100 m/s² (whichever is the less severe)</p> <p>Sweep endurance</p> <p>Total duration: 6 h See NOTE 3</p> <p>Measurements during test</p> <p>Electrical continuity (as specified in 4.35.4)</p> <p>Final measurements</p> <p>Visual examination</p> <p>Output voltage ratio</p> <p>Element resistance</p>				<p>There shall be no discontinuity > 100 μs</p> <p>As in 4.35.5 of IEC 60393-1</p> $\Delta \frac{U_{ab}}{U_{ac}} \leq \dots \%$ $\Delta R \leq \pm(\dots \% R + \dots \Omega)$
<p>Subgroup C2</p> <p>Combined sample of specimens of Subgroups C2A and C2B</p> <p>4.38 Climatic sequence</p> <ul style="list-style-type: none"> - Dry heat - Damp heat, cyclic, Test Db, first cycle - Cold - Low air pressure - Damp heat, cyclic, Test Db, remaining cycles - DC load - Insulation voltage - Final measurements 	D	<p>Visual examination</p> <p>Starting torque</p> <p>8 kPa</p> <p>Voltage proof (insulated potentiometers only)</p> <p>See NOTE 4</p> <p>See NOTE 4</p> <p>Visual examination</p> <p>Element resistance</p> <p>Insulation resistance (insulated potentiometers only)</p> <p>Continuity</p> <p>Starting torque</p> <p>Voltage proof (insulated potentiometers only)</p>	3	13	2	<p>As in 4.38.2.2</p> <p>... mN.m to ... mN.m</p> <p>As in 4.38.5.3 of IEC 60393-1</p> <p>As in 4.38.8 of IEC 60393-1</p> <p>As in 4.38.10.1 of IEC 60393-1</p> $\Delta R \leq \pm(\dots \% R + \dots \Omega)$ <p>≥ 100 MΩ</p> <p>As in 4.5.1 of IEC 60393-1</p> <p>... mN.m to ... mN.m</p> <p>As in 4.38.10.7 of IEC 60393-1</p>

Subclause number and test of IEC 60393-1 (see NOTE 1)	D or ND	Conditions of test (see NOTE 1)	Sample size & criterion of acceptability (see NOTE 2)			Performance requirements (see NOTE 1)
			p	n	c	
Subgroup C3 4.43.2 Electrical endurance at 70 °C	D	Duration: 500 h or 1000 h (as specified in Detail Specification) - Loaded between <u>a</u> and <u>c</u> Examination at 48 h, 500 h and 1000 h: Visual examination Element resistance - Loaded between <u>a</u> and <u>b</u> Examination at 48 h, 500 h and 1000 h: Visual examination Resistance between <u>a</u> and <u>b</u> Element resistance All specimens Examination at 500 h or 1000 h (as specified in Detail Specification) Insulation resistance (insulated potentiometers only) Rotational noise, Method B:	3	8	1	As in 4.43.2.6 1) $\Delta R \leq \pm (\dots \% R + \dots \Omega)$ As in 4.43.2.6 1) $\Delta R \leq \pm (\dots \% R + \dots \Omega)$ $\Delta R \leq \pm (\dots \% R + \dots \Omega)$ $\geq 1 \text{ G}\Omega$ $\leq \dots \% R \text{ or } \dots \Omega$ (whichever is the greater)
Subgroup C4 4.40 Mechanical endurance (potentiometers)	D	Number of cycles: Rate: - Rotary types: 5 to 10 cycles per minute - Lead-screw types: ... Visual examination Element resistance Starting torque Rotational noise, Method B:	3	8	1	As specified in the Detail Specification As in 4.40.6 1) $\Delta R \leq \pm (\dots \% R + \dots \Omega)$ $\dots \text{ mN.m to } \dots \text{ mN.m}$ $\leq \dots \% R \text{ or } \dots \Omega$ (whichever is the greater)